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

Academic Session
2022-23 onwards

MAA SHAKUMBHARI UNIVERSITY
SAHARANPUR

Rules for Admission in INTEGRATED B.Sc. B.Ed. COURSE
(Four Years Course)

Admission rules for the INTEGRATED B.Sc. B.Ed. course shall be the same as decided by the NCTE/Government of Uttar Pradesh from time to time. Reservation of seats for SC/ST/OBC and others shall be as per existing Uttar Pradesh Govt./University rules

A. Eligibility
   (a) Candidate with at least 50% marks in the senior secondary /+2 or its equivalent are eligible for admission.
   (b) The reservation and relaxation in marks for SC/ST/OBC/PWD and other category shall be as per the rules of the State Government.

B. Admission Procedure for B.Sc. B.Ed.
   Admission shall be made on the basis of marks obtained in the qualifying Examination or through the entrance examination or any other selection process or as per policy decided by the State Government and the University time to time.

C. Duration and Working Days Duration-
   The Integrated B.Sc. B.Ed. Programme shall be of duration of Four Academic Years, which must be completed in a Maximum of Six Years/ Session from the date of the admission to the programme.

   Working Days-
   - Working Days as per NCTE norms
   - The minimum attendance of student-teachers shall be 80% for all course work and practicum, and 90% for school internship
   - Candidates falling short in above stated attendance criteria will not be allowed to appear in the final examinations conducted by the university.
   - There will be six days week system.
   - Candidates remaining absent from college for 15 or more days without any justifiable reason or without any valid information, their names will be struck off from the college roll list. Such candidates will have to seek re-admission from a fresh end.

Criteria for Awarding Division

Successful candidates will be placed in three divisions both in theory and practice of teaching separately.

- **I Division:** Candidates obtaining 60% or more of aggregate marks
- **II Division:** Candidates obtaining 48% or more but less than 60% of the aggregate marks.
- **III Division:** Candidate obtaining 40% or more but less than 48% of the aggregate marks.

Rules: Examinations & Results

1. This integrated degree will include papers of B.Sc. as well as B.Ed. in all four years. The university will conduct the examinations every year for all papers.
2. Internship activities will be compulsory for students. Failing to attend /perform anyone of the mentioned activities shall result into a failure in that year.
3. It is mandatory for any student to attain 90% attendance in internship programme, failing which; they will be declared fail in that year.
4. Candidates will have to obtain 40% marks in theory, Internal & practical separately.
5. Candidates failing in more than two external papers will be declared fail & they will have to reappear in next year in all the theory papers. However, their internal marks can be carry- forwarded.
6. Candidates failing in two or less than two papers in external will be allowed a promotion in next year, provided that they will reappear in them at later stages. However, any candidate can get this benefit of promotion in a maximum of two papers. However, their internal marks can be carry-forwarded.
7. B.Sc. Practical of all the papers of particular subject (Botany/ Zoology/chemistry/ Physics) will be conducted prior to theory examinations with the allotted marks for each subject.
8. B.Sc. Practical Examination of all the papers of particular subject (Botany/ Zoology/chemistry/ Physics) will be conducted by the board of examiners consisting of two examiners (Faculty member of that subject) only.
9. A candidate will have to obtain 40% marks separately in the final lesson of B.Ed. Candidates failing in the final lesson will be declared fail. To pass the final lesson he/she has to appear in final lesson Examination next year and has to pass. Maximum of two chances will be given to pass final lesson exam. However, as an Ex-student, they can carry-forward their all other internal and external marks including Internship Marks.

10. Internship activities phase-I, in third year will be of 04 weeks and will include teaching of both the pedagogy subjects, peer observation, criticism lessons & Action Research/Survey/Case Study (Any one). All the above said activities will be compulsory for students. Failing to attend /Perform anyone of the above-said activities shall result into a failure in that year. These activities are
    (i) Candidates have to practice five skills (assigned by college) in micro teaching as a part of pre –internship activity. Each Skill will be performed twice as teach and reteach. They have to maintain the record of the micro lessons delivered.
    (ii) Candidates have to teach five lessons of each pedagogy as a simulated teaching. They have to maintain the record of the simulated lessons delivered.
    (iii) Individual appraisal of the student-teachers will be done by the supervisor on some set criteria about their year-long activities, individual attributes & personal qualities like discipline, honesty, dedication, commitment etc.
    (iv) The students will deliver at least 20 lessons of each pedagogy paper. It is expected that the students play the participative role in all school activities and take necessary responsibilities as and when required. If required they can take all vacant and required classes.
    (v) The students will observe the teaching lessons of their peers during real classroom teaching, whih will provide them feedback for the modification of their behaviour.
    (vi) There will be two criticism lessons (one in each pedagogy subject) for the progressive assessment of the student-teacher.
    (vii) The student-teacher will have to do an Action Research or a Case Study (Any one) as assigned by the concerned supervisor and will submit the report.
11. In fourth year, the total internship program will be spread in duration of 16 weeks. This rigorous internship in surrounding schools will enable the student-teacher to perform better as a teacher. Only 10 students will be allowed to deliver lessons in a school. During internship program the student-teacher will ensure that they get a teaching exposure of upper primary/secondary/senior secondary level preferably. Activities to be performed are as under-
    (i) School internship will include the participation of the student- teacher in all the activities of the school including teaching.
    (ii) The student teacher will prepare a project report as a portfolio and teacher's diary on the various aspects of the school on some set criteria where internship will be performed.
    (iii) The student teacher will deliver at least 5 ICT based lessons in each pedagogy while doing the internship and will maintain the records.
12. Each candidate should be prepared to teach two lessons (One in each Pedagogy subject) at the Practical Examination. However, the candidates will deliver one lesson (in each pedagogy) for final practical Lessons to be assessed by the Board of Examiners consisting of:
    (a) One external examiner of Science Pedagogy.
    (b) Two internal examiners, both from Teacher Education Dept. of govt.-aided college//govt. college of MS University, Saharanpur. However, convener of the practical exam will be the senior of the internal examiners.
13. Candidate will be awarded degree of this course only when he/she has passed all the papers, as well as practicum, internship and final practical.

Scheme of Examination:

The examination for the degree of B.Sc.- B.Ed. shall be held in Theory, Practical and Practice of teaching.

Paper-wise scheme of examination: Theory

B.Sc.- As mentioned with each paper for all the years in the syllabus.

B.Ed.-Papers with External weight-age of 80 Marks (3 hours duration)

1. Internal weightage of 20 marks will be divided as under:

Assessment in the papers with internal weight-age of 20 marks will be divided in following parts.

(i) Subject based presentation 05 marks

(ii) Subject based Assignment 05 marks

(iii) Internal Test 05 marks

(iv) Regularity and Punctuality 05 marks

For theory paper of **50 Marks** , the component of **internal assessment will be reduced to its half**.

2. Paper Pattern:

1. The format for the marking scheme for question papers in theory courses (Maximum Marks=80) in external written examination shall be as follows:
Total =80 marks

Section A: Three Questions with internal choices

(Three Questions of Sixteen marks each, 3x16=48)

Section B: Four out of Eight Questions

(Four Questions of Four marks each, 4x4=16)

Section C: Eight out of Ten Questions

(Eight Questions of Two marks each, 8x2=16)

2. The format for the marking scheme for question papers in theory courses (Maximum Marks=40) in external written examination shall be as follows:

Total =40 marks

Section A: Two Questions with internal choices

(Two Questions of Twelve marks each, 2x12=24)

Section B: Two out of Four Questions

(Two Questions of Four marks each, 2x4=08)

Section C: Four out of Six Questions

(Four Questions of Two marks each, 4x2=08)

NOTE: In third year and fourth year all the EPC, Practicum and Internship activities shall be assessed internally only by approved teachers by the university as per NCTE norms. In case of unavailability of approved teachers in the institution, the internal examiners will be appointed by the university for the internal assessment of the EPC, Practicum and Internship activities.

General Rules

1. Candidates can apply for re-evaluation in any of the theory papers as per rules stipulated by the University for B.Sc.-B.Ed. degree. Changes in statutes/ordinances/rules/regulations/syllabi and books may from time to time be made by amendment or remaking and a candidate shall, except in so far as the university determines otherwise, comply with any change that applies to years he/she has not completed at the time of change.
2. B.Sc. Optional Subjects Can be chosen as per University rules
3. Pedagogy Subjects in the third and fourth year of B.Ed. will be Chosen as per NCTE norms.
4. **General Science may be allowed to be offered by a candidate possessing B.Sc. with Chemistry and any one subject of Life Sciences i.e. Botany or Zoology.**

B.Sc. – B.Ed. Four Year Integrated Course (587)

	Paper	Title	Paper Code	Lecture-Th	Lecture-Pr	Ex-Theory	Internal	Practical	Total marks
Year-I				**Hrs/week**	**Hrs/week**	**Max(Min)**	**Max**	**Max(Min)**	**Max(Min)**
Qualifying	Elective-1	General English	0158715	2		50(17)			50(17)
				OR					
	Elective-2	General Hindi	0158716	2		50(17)			50(17)
Physics	Th-1	Mechanics	0158701	2		40(13)	10(4)		50(20)
	Th-2	Optics	0158702	2		40(13)	10(4)		50(20)
	Pr	Practical	0158780		4			50	50(20)
Chemistry	Th-1	Inorganic Chemistry	0158703	2		40(13)	10(4)		50(20)
	Th-2	Organic Chemistry	0158704	2		40(13)	10(4)		50(20)
	Pr	Practical	0158781		4			50	50(20)
Botany	Th-1	Algae, Lichens and Bryophytes	0158705	2		40(13)	10(4)		50(20)
	Th-2	Mycology Microbiology and Phytopathology	0158706	2		40(13)	10(4)		50(20)
	Pr	Practical	0158782		4			50	50(20)
Zoology	Th-1	Animal Diversity and Evolution	0158707	2		40(13)	10(4)		50(20)
	Th-2	Biology of Non chordates	0158708	2		40(13)	10(4)		50(20)
	Pr	Practical	0158783		4			50	50(20)
Mathematics	Th-1	Algebra and Co-ordinate Geometry in Two Dimension	0158709	3		60(20)	15(6)		75(30)
	Th-2	Calculus	0158710	3		60(20)	15(6)		75(30)

Education	Th-1	Childhood and growing up	0158711	4		80(32)	20(8)		100(40)
	Th-2	Basics in Education & Communication	0158712	4		80(32)	20(8)		100(40)
	Th-3	Language Across the Curriculum	0158713	4		80(32)	20(8)		100(40)
	Th-4	Conservation & Environmental Regeneration	0158714	2		40(16)	10(4)		50(20)
								Total	800
Year-II				**Hrs/week**	**Hrs/week**	**Max(Min)**	**Max**	**Max(Min)**	**Max(Min)**
Physics	Th-1	Electromagnetics	0258701	2		40(13)	10(4)		50(20)
	Th-2	Quantum Mechanics and Spectroscopy	0258702	2		40(13)	10(4)		50(20)
	Pr	Practical	0258780		4			50	50(20)
Chemistry	Th-1	Organic Chemistry	0258703	2		40(13)	10(4)		50(20)
	Th-2	Physical Chemistry	0258704	2		40(13)	10(4)		50(20)
	Pr	Practical	0258781		4			50	50(20)
Botany	Th-1	Palaeobotany, Pteridophytes and Gymnosperms	0258705	2		40(13)	10(4)		50(20)
	Th-2	Taxonomy of Angiosperms and Developmental Botany	0258706	2		40(13)	10(4)		50(20)
	Pr	Practical	0258782		4			50	50(20)
Zoology	Th-1	Chordate Structure and Function	0258707	2		40(13)	10(4)		50(20)
	Th-2	Developmental Biology	0258708	2		40(13)	10(4)		50(20)
	Pr	Practical	0258783		4			50	50(20)
Mathematics	Th-1	3D Geometry and Vector Calculus	0258709	3		60(20)	15(6)		75(30)
	Th-2	Differential Equations	0258710	3		60(20)	15(6)		75(30)
Education	Th-1	Fundamentals of Contemporary Indian Education	0258711	4		80(32)	20(8)		100(40)
	Th-2	Learning Enrichment through Information and Communication Technology	0258712	4		80(32)	20(8)		100(40)
	Th-3	Schooling, Socialization and Identity	0258713	4		80(32)	20(8)		100(40)

	Th-4	Health & Physical Education	0258714	2		40(16)	10(4)		50(20)
								Total	800
Year-III				**Hrs/week**	**Hrs/week**	**Max(Min)**	**Max**	**Max(Min)**	**Max(Min)**
Physics	Th-1	Electronics	0358701	2		40(13)	10(4)		50(20)
	Th-2	Relativity and Electrodynamics	0358702	2		40(13)	10(4)		50(20)
	Pr	Practical	0358780		4			50	50(20)
Chemistry	Th-1	Inorganic Chemistry	0358703	2		40(13)	10(4)		50(20)
	Th-2	Physical Chemistry	0358704	2		40(13)	10(4)		50(20)
	Pr	Practical	0358781		4			50	50(20)
Botany	Th-1	Cell Biology and Genetics, Plant Breeding and Evolution	0358705	2		40(13)	10(4)		50(20)
	Th-2	Ecology and Environment Biology	0358706	2		40(13)	10(4)		50(20)
	Pr	Practical	0358782		4			50	50(20)
Zoology	Th-1	Cell Biology and Genetics	0358707	2		40(13)	10(4)		50(20)
	Th-2	Animal Physiology and Biochemistry	0358708	2		40(13)	10(4)		50(20)
	Pr	Practical	0358783		4			50	50(20)
Mathematics	Th-1	Mechanics – I (Statics and Dynamics)	0358709	3		60(20)	15(6)		75(30)
	Th-2	Abstract Algebra	0358710	3		60(20)	15(6)		75(30)
Education	Th-1	Teaching, Learning & Assessment	0358711	4		80(32)	20(8)		100(40)
	Th-2	Gender Issues in Education	0358712	4		80(32)	20(8)		100(40)
	Th-3 & 4	Pedagogy Course I & II (Part I)							
		I-Pedagogy of Mathematics	0358713	2		40(16)	10(4)		50(20)
		II- Pedagogy of Physical Science	0358714	2		40(16)	10(4)		50(20)
		III- Pedagogy of Chemistry	0358715	2		40(16)	10(4)		50(20)
		IV- Pedagogy of Biological Science	0358716	2		40(16)	10(4)		50(20)
		V- Pedagogy of General Science	0358717	2		40(16)	10(4)		50(20)

		EPC, PRACTICUM AND INTERNSHIP (4-weeks)	0358784					150	150(60)
		Arts and Aesthetics (EPC)					20		
		Reading and Reflecting on Text (EPC)					20		
		Five Micro teaching lessons in each Pedagogy					10		
		Five Simulated Teaching Lessons in each Pedagogy					10		
		Real Classroom Teaching of 20 Lessons in Each Pedagogy					40		
		Peer Observation and Reporting					20		
		Criticism Lessons					20		
		Action Research/Case study (Any one)					10		
								Total	900
Year-IV				**Hrs/week**	**Hrs/week**	**Max(Min)**	**Max**	**Max(Min)**	**Max(Min)**
Physics	Th-1	Statistical Mechanics & Thermal Physics	0458701	2		40(13)	10(4)		50(20)
	Th-2	Solid State Physics	0458702	2		40(13)	10(4)		50(20)
	Th-3	Nuclear Physics	0458703	2		40(13)	10(4)		50(20)
	Pr	Practical	0458780		6			75	75(30)
Chemistry	Th-1	Inorganic Chemistry	0458704	2		40(13)	10(4)		50(20)
	Th-2	Organic Chemistry	0458705	2		40(13)	10(4)		50(20)
	Th-3	Physical Chemistry	0458706	2		40(13)	10(4)		50(20)
	Pr	Practical	0458781		6			75	75(30)

Botany	Th-1	Plant Systematics	0458707	2		40(13)	10(4)		50(20)
	Th-2	Plant Physiology and Biochemistry	0458708	2		40(13)	10(4)		50(20)
	Th-3	Plant Biotechnology and Molecular Biology	0458709	2		40(13)	10(4)		50(20)
	Pr	Practical	0458782		6			75	75(30)
Zoology	Th-1	Ecology and Behaviour	0458710	2		40(13)	10(4)		50(20)
	Th-2	Applied Zoology	0458711	2		40(13)	10(4)		50(20)
	Th-3	Biostatistics and Bioinformatics	0458712	2		40(13)	10(4)		50(20)
	Pr	Practical	0458783		6			75	75(30)
Mathematics	Th-1	Real and complex Analysis	0458713	3		60(20)	15(5)		75(30)
	TH-2	Numerical Analysis and Linear Programming	0458714	3		60(20)	15(5)		75(30)
	Th-3	Metric space and Topology	0458715	3		60(20)	15(5)		75(30)
Education	Th-1	Knowledge & Curriculum	0458716	4		80(32)	20(8)		100(40)
	Th-2	Understanding Inclusive Education	0458717	4		80(32)	20(8)		100(40)
	Th-3 & 4	Pedagogy Course I & II (Part II)							
		I-Pedagogy of Mathematics	0458718	2		40(16)	10(4)		50(20)
		II- Pedagogy of Physical Science	0458719	2		40(16)	10(4)		50(20)
		III- Pedagogy of Chemistry	0458720	2		40(16)	10(4)		50(20)
		IV- Pedagogy of Biological Science	0458721	2		40(16)	10(4)		50(20)
		V- Pedagogy of General Science	0458722	2		40(16)	10(4)		50(20)
		EPC, PRACTICUM AND SCHOOL INTERNSHIP (16 weeks)	0458784					150	150(60)
		Scout-Guide (EPC)					20		
		Work with community (EPC)					20		
		Teacher's Diary					50		
		A Project Report on the various aspects of school where internship was performed. (Portfolio)					40		

		ICT Based lessons (05 in each pedagogy)					20		
		Final Practical: Assessment of both Pedagogy	0458785			100			100(40)
								Total	775
								Gr. Total	**3275**

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

FIRST YEAR

2022-23

MAA SHAKUMBHARI UNIVERSITY
SAHARANPUR

B.Sc. B.Ed. Four Year Integrated Course (587)
Academic Session 2022-23 TEACHING AND EVALUATION
B.Ed. Syllabus Structure
First Year
(Choose any three subject out of Physics, Chemistry, Mathematics, Zoology ,Botany in B.Sc. I, II & III year)

Foundation Course (Qualifying)

Paper	Paper code	Name of the Paper	Ext	Int	Total	Passing Marks
1	0158715/ 0158716	General English /General Hindi	50	-	50	17

FOUNDATION COURSE: GENERAL ENGLISH

Paper Code-0158715

Unit I: Phrasal Verbs, Antonyms, Synonyms, Prefixes and Suffixes.

Unit II: Compound and Complex Sentences, Transformation of simple, Compound and Complex sentences.

Unit III: Modal auxiliaries, Common Errors involving the use of articles, prepositions and tenses

Unit IV: Active and Passive Voice, Direct and Indirect Speech, Formal and Informal Letters, Sequential Sentences.

Recommended Readings:

Close, R.A.*A Reference Grammar of English.*

Corder, S. Pit.*An Intermediate English Practical Book*.Orient Longman.

Seely, John.*Writing with a purpose.*Oxford University Press.

Thomson & Martinet.*A practical English Grammar*. Oxford University Press.

FOUNDATION COURSE: GENERAL HINDI

Paper Code-0158716

इकाई 1 – (क) वर्णों का वर्गीकरण – भेद प्रभेद, (ख) सन्धि (ग) समास (घ) उपसर्ग – प्रत्यय (ड़) तत्सम– तद्भव (च) शब्द शुद्धि, वाक्य शुद्धि

इकाई 2 – (क) संज्ञा और संज्ञा के विकारी तत्व–लिंग, वचन, कारक (ख) सर्वनाम (ग) विषेषण (घ) क्रिया और सहायक क्रिया–क्रिया, काल वृत्ति , पक्ष, वाच्य (ड़) अविकारी तत्व–क्रिया विषेषण, संबंध बोधक, समुच्चय बोधक, विस्मयादि बोधक, निपात (च) विराम–चिह्न

इकाई 3 – (क) अनेकार्थी शब्द (ख) युग्म शब्द (ग) वाक्यांष के लिए एक शब्द (घ)पर्यायवाची शब्द (ड़) विलोम शब्द (च) मुहावरे लोकोक्तियाँ

इकाई 4 – (क) देवनागरी लिपि की विषेषताएँ (ख) मानक हिन्दी वर्णमाला तथा अंक, (ग) हिन्दी वर्तनी का मानक रूप (घ) कार्यालयी पत्र लेखन (ड़) कार्यालयी टिप्पणी (च) पारिभाषिक शब्दावली (कार्यालयी)

सहायक पुस्तकें– हिन्दी शब्दानुशासन : किशोरीदास वाजपेयी हिन्दी व्याकरण : कामताप्रसाद गुरु हिन्दी का सामान्य ज्ञान : हरदेव बाहरी आल`ख –प्रारूप : शिवनारायण चतुर्वेदी टिप्पणी– प्रारूप : शिवनारायण चतुर्वेदी मानक हिन्दी वर्तनी तथा नागरी लिपि : वैज्ञानिक तथा तकनीकी शब्दावली आयोग, नई दिल्ली।

B.Sc. First Year

PHYSICS

Course	Nomenclature	Number of Papers	Number of Periods per week	External	*Internal	**Practical	Total
Paper I	Mechanics	1	2	40	10		50
Paper II	Optics	1	2	40	10		50
PRACTICAL COURSE			2	40	10		50

Duration of each theory paper 3 hours
Duration of practical examination 4 hours

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

**In practical examination out of 50 marks students have to score minimum of 20 marks to pass

Note: Each theory paper is divided in three parts i.e., Section-A, Section –B and Section–C.
Section-A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry of 1 mark.
Section –B: Will consist of 10 questions. Each unit will be having two questions; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question carries 3.5 Marks.
Section-C: will consist of total 05 questions. Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question carries 7.5 Marks.

PAPER -I
MECHANICS

Paper Code- 0158701

Unit I: Frames of Reference: Inertial frames, Galilean transformations, non-inertial frames, fictitious forces, Displacement, Velocity and acceleration in rotating coordinate systems and their transformations, Coriolis force, Focault's pendulum, Motion relative to earth. Centre of Mass, collision of particles in laboratory and C.M. frame.

Unit II: Special Theory of Relativity: Invariance of c, Michelson-Morley Experiment, Lorentz transformations, addition of velocities, time dilation and length contraction, conservation of momentum in collision at relativistic speeds and variation of mass with velocity, relativistic energy, mass-energy equivalence, work and energy, transformation equations for momentum, energy and rate of change of momentum.

Unit III: Oscillations: Qualitative idea of oscillations in an arbitrary potential well, General differential equation for the harmonic motion, mass on a spring, oscillation of two masses connected by a spring, reduced mass, coupled oscillations, normal modes, normal coordinates of two linear coupled oscillators, damped harmonic motion, Forced oscillations and resonances, Resonance width and quality factor.

Unit IV: Waves: General differential equation of one-dimensional wave motion and its solution, plane progressive harmonic wave, differential calculus methods for speed of transverse waves on a uniform string and for that of longitudinal waves in a fluid, energy density and energy transmission in waves, superposition of waves, group and phase velocity.
Fourier series, Fourier analysis of square and saw-tooth waves.

Unit V: Rigid Body Dynamics: Equation of motion of a rotating body, angular momentum of a rigid body, inertial coefficient and idea of principal axes, case of j not parallel to ω, kinetic energy of rotation. Elasticity: Young modulus, Bulk modulus and modulus of rigidity, Poisson ratio, relation between elastic constants, Theory of bending of a beam and torsion of a cylinder, experimental determination of Y by loading a beam in the middle and of η by static and dynamic methods, Searle's two bar experiment.

Books suggested

Berkeley: Physics Course, Vol. I, Mechanics, Tata McGraw Hill, New Delhi.
Berkeley: Physics Course, Vol. III, Waves and Oscillations, McGraw Hill, New Delhi.
A. P. French: Physics of Vibration and Waves.
Alonso and Finn: Fundamental University Physics, Vol. I, Mechanics.
R. S. Gambhir: Mechanics, CBS Publishers.
J.C. Upadhyaya: Mechanics, Ram Prasad & Sons, Agra.

PHYSICS PAPER -II OPTICS
Paper Code-0158702

Unit I: Geometrical Optics: Axial, Lateral and angular magnifications and their inter-relationship, Abbe's Sine condition for spherical surfaces, Aplanatic points for a spherical refracting surface.
Focal length of two thin lenses separated by a distance, Cardinal points of a co-axial lens system, properties of cardinal points, construction of image using cardinal points, Newton's formula and other relations for a lens system using cardinal points, Ramsden's and Huygen's eye pieces, their cardinal points, and relative merits.

Unit II: Interference: Division of Amplitude-Interference exhibited by thin film,
Production of colors in thin films, Wedge-shaped film, Newton's rings and determination of wavelength and refractive index of a liquid by Newton's rings.
Michelson Interferometer: Measurement of wavelength and difference between two close wavelengths. Fabry-Perot interferometer: Intensity Distribution, Co-efficient of sharpness and half width, measurement of wavelength.

Unit III: Lasers: Population inversion, laser as source of coherent radiation, Basic principles of He- Ne Laser and Ruby Laser.
Diffraction: Fresnel's class of diffractions, Zone Plate, Phase reversal Plate, Cylindrical wave front and its effect at an external point and geometrical construction, diffraction at a straight edge; thin wire, rectangular slit and circular aperture.

Unit IV: Fraunhofer class of diffraction: Amplitude and phase due to a number of SH Motions acting on a particle simultaneously, Diffraction at two slits and intensity distribution, Diffraction at N slits.
Plane Transmission Grating: Theory and formation of spectra, width of principal maxima, absent spectra, overlapping of spectral lines, number of spectra, measurement of wave-length of light, Rayleigh's criterion, Resolving Power of a Prism, Telescope, Microscope and plane transmission grating.

Unit V: Polarization: Double refraction, production of plane polarized light by double refraction, Nicol Prism, Double refraction in uniaxial crystals, Huygen's explanation of Double Refraction, Plane, circular and elliptically polarized light, Half-wave and quarter-wave plates, production and detection of plane, circularly and elliptically polarized light by Nicol Prism and Quarter-wave plate.
Rotatory Polarization, Fresnel's explanation, specific rotation, half shade and Biquartz Polarimeter, determination of specific rotation and strength of sugar solution.

Books suggested:

Jenkins and White: Optics, McGraw
Hill. Ghatak A.K.: Optics, Tata
McGraw Hill.
Khandelwal D.P.: Optics and Atomic Physics, Shivlal Agarwal & Co.
Subramanayam and Brijlal: A text book of Optics, S.Chand New Delhi.

EXPERIMENTS FOR PRACTICAL WORK

Paper Code-0158780

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

1. Study of bending of a beam and determination of Young's modulus.
2. Modulus of rigidity by statical method using horizontal apparatus.
3. Modulus of rigidity by statical method using vertical apparatus.
4. Elastic constants by Searle's method.
5. Nodal slide, determination of cardinal points of a combination of two lenses.
6. Formation of spectrum, prism spectrometer and determination of dispersive power of the material of a prism.
7. Wavelength of light by Newton's rings.
8. Wavelength of light by plane transmission grating.
9. Wavelength of light by biprism.
10. Specific rotation by polarimeter.
11. Resolving power of telescope.
12. To determine the Poisson's ratio of a rubber tube.
13. Determination of surface tension of water by Jagger's method.
14. Resolving power of a plane transmission grating.
15. To determine the polarizing angle for the glass prism surface and to determine the refractive index of material of prism using Brewster's law.
16. Modulus of rigidity by dynamical method using Hollow Maxwell needle.
17. Modulus of rigidity by dynamical method using Solid Maxwell needle.
18. Verification of Malus law.
19. Verification of Rutherford and Soddy’s law of radioactive disintegration using dices and statistical Board.

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

B.Sc. First Year

CHEMISTRY

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

Duration of each theory paper 3 hours
Duration of practical examination 4 hours

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

**In practical examination out of 50 marks students have to score minimum of 20 marks to pass

Note: Each theory paper is divided in three parts i.e. Section-A, Section –B and Section–C.
Section-A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry of 1 mark.
Section –B: Will consist of 10 questions. Each unit will be having two questions; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question carries 3.5 Marks.
Section-C: will consist of total 05 questions. Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question carries 7.5 Marks.

PAPER -I
INORGANIC CHEMISTRY
Paper Code-0158703

Unit I: Chemical Bonding-Covalent bond

Valence bond theory and its limitation, Directional characteristics of covalent bond, Hybridizations-sp, sp2, sp3, dsp2, sp3d, dsp3, sp3d2 and d2sp3 with suitable examples. Shapes of inorganic molecules and ions.

Valence shell election pair repulsion (VSEPR) theory and its application to study the geometryof NH_3, H_2O, H_3O^+, SF_4, ICl_2^-, ClF_3, ICl_4^-, XeF_4, XeF_6, molecules. Molecular orbital theory and molecular orbital diagrams for homo and heterodiatomic molecules-H_2, $H^{2+,}$ He^{2+}, He^+, Li_2, Be_2, B_2, C_2, N_2, O_2, F_2, O_2^+, O_2^-, O_2^{2-}, O_2^{2+}, CO and NO.

Bonding in diborane (3 c-2e bonding).

UNIT II: Chemical Bonding- Ionic Bond

Lattice energy and Born-Haber cycle. Solvation energy, solubility of ionic solids, Fajan's rule, polarizing power and polariziblity of ions.

Structures of ionic solids, radius ratio effect and co-ordination number. Limitations of radius ratio rule.

Hydrogen bonding and vander-waal's forces of attractions.

UNIT III: S-Block elements

Periodicity in properties of alkali and alkaline earth metals. Compexation tendency, Salvation tendency, stability and solubilities of carbonates, bicarbonates and sulphates of Magnesium and Calcium, Synthesis and applications of important hydrides: NaH, $NaBH_4$, LiH, $LiBH_4$, $LiAlH_4$ and CaH_2.

Cement: Composition and types of Cement, Manufacture of Portland cement.

Lime: Industrial preparation, Properties and Uses.

UNIT IV: P-Block elements

Periodicity in properties of III A, IV A, V A, VI A and VII A group elements. Silicates, oxides of nitrogen, phosphorous and Sulphur- their structure and preparations.

Glass: Types and properties of glasses, coloring agents, Industrial manufacturing of glass. **Nitrogen fixation-** Natural and Artificial fixation. Role of nitrogenase in biological nitrogen fixation.

UNIT V: Qualitative Analysis

Theoretical basis of qualitative analysis, Systematic analysis of Acidic and Basic radicals (including interfering radicals). Chemical reactions involved.

Common- ion effect, solubility product & their applications. Oxidizing and reducing agents and buffers used in analysis.

Books Recommended:

1. Inorganic Chemistry by Satya Prakash
2. Inorganic Chemistry by R.C. Agarwal
3. Inorganic Chemistry by B.R. Puri and L.R. Sharma
4. Inorganic Chemistry by P.L. Soni
5. Inorganic Chemistry by G.C. Shivhare and V.P. Lavania
6. Practical Chemistry by Giri, Bajpai and Pandey

PAPER -II

Organic Chemistry
Paper Code-0158704

Unit I: Mechanism of Organic Reactions

Classification of organic compounds their general characteristics. Types of reagents – electrophiles and nucleophiles. Types of organic reactions. Reactive intermediates – carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species. Methods of determination of reactions mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

Unit II: Stereochemistry of Organic Compounds

Concept of isomerism. types of isomerism

Optical isomerism – elements of symmetry, molecular chirality, enantiomers, stereo genic center, optical activity, properties of enantiomers, chiral and achiral molecules with two stereo genic centers, diastereomers, throe and erythron diastereomers, 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 geometrical isomers. E & Z system of nomenclature, geometrical isomerism in oximes and alicyclic compounds.

Conformational isomerism: Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. Difference between configuration and conformation.

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

Unit III: Alkanes, Cycloalkanes, Alkenes, Dienes and Alkynes

Mechanism of free radical halogenation 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 cyclopropane ring: banana bonds.

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, acidic nature of 1-alkynes. Mechamism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, oxidation and polymerization.

Unit IV: Arenes and Aromaticity

Nomenclature of benzene derivatives. Arylgroup. 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 α and π-complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientationand ortho/para ratio. Side chain reactions of benzene derivatives. Birch reduction.

Methods of formation and chemical reactions of alkylbenzenes, Structure, preparation and properties of naphthalene.

Unit V: Alkyl and Aryl Halides

Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides, S_N2 and S_N1 reactions with energy profile diagrams. Mechanism of elimination reactions of alkyl halides, regioselectivity in dehydrohalogenation, Saytzeff rule.

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

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

Books Recommended:

1. Advanced Organic Chemistry by Mukheri and Kapoor Vol. I & II
2. A Text Book of Organic Chemistry by M.K. Jain
3. A Text Book of Organic Chemistry by R.K. Bansal
4. Organic Chemistry, R.T. Morrison and R.N.Boyd, Prentice-Hall

Practical
Paper Code-0158781

Laboratory Course

Qualitative analysis [25]

Qualitative analysis of inorganic mixture, containing **5**-radicals. Cation analysis, separation and identification of ions (group 0, I, II, III, IV, V and VI). Interfering radicals mixtures and special combination of acidic radicals

Volumetric analysis [10]

Redox Titrations:

(i) To determine the strength of given unknown copper sulphate solution iodometrically using starch as indicator.

(i)To determine the strength of given unknown potassium dichromate solution iodometrically using starch as indicator.

Viva-Voce [5]

Internal (Sessional/Record) [10]

Books Suggested (Laboratory Courses):

1. Practical Chemistry S. Giri, D.N. Bajpai and O.P. Pandey Publ. S. Chand

B.Sc. First year BOTANY
Paper I
Paper Code-0158705

ALGAE, LICHENS AND BRYOPHYTES

Unit 1: General characters, Classification and economic importance of Algae. Important features and life history of Chlorophyceace and Charophyceae. Structure and life cycle of *Volvox, Oedogonium, Coleochaete* and *Chara*.

Unit 2: Important features and life history of Xanthophyceae and Phaeophyceae. Structure and life cycle of *Vaucheria, Ectocarpus* and *Sargassum*.

Unit 3: Important features and life history of Rhodophyceae. Structure and life cycle of *Polysiphonia*. Lichens: Morphology and structure of the two components; biological, ecological and economic importance. Vegetative multiplication methods with special reference to *Parmelia* and *Usnea*.

Unit 4: Bryophytes: General characters, alternation of generations and classification. Characters and classification of Hepaticopsida. Morphology and life history of *Riccia,* and *Marchantia*.

Unit 5: Characters and classification of Anthocerotopsida and Bryopsida. Morphology and life history of *Anthoceros* and *Sphagnum.*

Suggested Laboratory Exercises

Algae: Microscopic preparation and study of following algal materials: *Volvox, Oedogonium, Coleochaete, Vaucheria, Chara, Ectocarpus, Sargassum* and *Polysiphonia*

Lichens: Study of Lichens

Bryophytes: Study of external morphology and microscopic preparations of following Bryophytes: *Riccia, Marchantia, Anthoceros* and *Sphagnum*

Suggested Readings

Bold, H.C., Alexopoulous, C.J. and Delevoryas, T. Morphology of Plant and Fungi (4th Ed.) Harper & Foul Co., New York, 1980.

Ghemawat, M.S., Kapoor, J.N. and Narayan, H.S. A Text book of Algae, Ramesh Book Depot, Jaipur, 1976.

Gilbert, M.S. Cryptogamic Botany, Vol. I & II (2nd Ed.), Tata McGraw Hill, Publishing Co. Ltd., New Delhi, 1985.

Kumar, H.D. Introductory Phycology, Affiliated East–West Press, Ltd., New York, 1988. Pandey, S.N. and Trivedi, P.S. A Text Book of Botany 2000 Volume I, Vikas Pub. House Pvt. Ltd., New Delhi.

Puri, P. Bryophytes, Atmaram & Sons, Delhi, Lucknow, 1985.

Singh, V., Pande, P.C. and Jain, D.K.A Text Book of Botany, Rastogi & Co., Meerut, 2016. Vashista, B.R. Botany for Degree Students (Algae, Fungi Bryophyta), S. Chand & Co. Ltd., New Delhi, 2016.

BSc First Year PAPER -II
Paper Code-0158706

MYCOLOGY, MICROBIOLOGY AND PHYTOPATHOLOGY

Unit I: General characters, classification and economic importance of fungi. Important features and life history of Mastigomycotina–*Pythium* and *Albugo*; Zygomycotina–*Rhizopus*; Ascomycotina– *Saccharomyces, Aspergillus* and *Penicillium*.

Unit II: Important features and life history of Basidiomycotina– Puccinia, Agaricus and wild Mushroom and *Ustilago*; Deuteromycotina–*Collectotrichum* and *Alternaria*.

Unit III: Viruses: Chemical and physical nature; Structure, multiplication and transmission of plant viruses; Tobacco mosaic virus and yellow vein mosaic virus disease. General account of Viroids, AIDS and Prions.

Unit IV: Bacteria–Structure, nutrition, cell division, reproduction and economic importance. Biofilms and Quorum sensing in microbes.Cyanobacteria–Life history of Nostoc and Oscillatoria; Nitrogen fixation – by BGA (Blue green algae). General account and biology of Mycoplasma and Phytoplasma.

Unit V: Causes and symptoms of plant diseases with special reference to green ear disease of Bajra, smut of wheat, citrus canker, little leaf of brinjal and root knot disease. A brief account of principles of plant protection.

Suggested Laboratory Exercises Microscopic preparation and study of following fungal materials: Albugo, *Rhizopus, Saccharomyces, Aspergillus, Penicillium, Ustilago, Agaricus*, local Mushroom¸ *Colletotrichum* and *Alternaria*.

Viruses: Study of disease symptoms caused by Tobacco mosaic virus and yellow vein mosaic virus.

Bacteria: Gram staining of bacteria. *Nostoc, Oscillatoria* and study of bacteriological specimens.

Study of symptoms of following diseases: (specimen or photographs) Green ear disease of bajra Smut of wheat Citrus canker Rust of wheat Little leaf of bringal Root knot nematode.

Suggested Readings

Alexopoulos, C.J. and Mims.Introductory Mycology, John Wiley and Sons, New York, 2000.
Bilgrami, K.S. and Dube, H.C. A Text Book of Modern Plant Pathology, Vikas Publ. House, New Delhi, 1976.
Biswas, S.B. and Biswas, A. An Introduction to Viruses, Vikas Publ. House, New Delhi, 2000.
Clifton, A. Introduction to Bacteria, McGraw Hill Co., New York, 1985. Dube, H.C. Fungi, Rastogi Publication, Meerut, 1989.
Kaushik, P. Microbiology, Emkay Publication, 2001.
Madahar, C.L. Introduction to plant viruses, S. Chand & Co. Ltd., New Delhi, 1978.
Palezer, Chan and King. Microbiology, McGraw Hill Book Co., London, 1995.
Pathak, V.N. Fundamentals of Plant Pathology, Agro Botanica. 2000.
Purohit, S.S. Microbiology, Agro. Bot. Publication, Jodhpur, 2002.
Sharma, O.P. Fungi, Today and Tomorrow Publication, 2000. Sharma, P.D. Microbiology and Plant Pathology, Rastogi Publ. Meerut, 2003.
Singh, V. and Srivastava, V.Introduction to Bacteria, Vikas Publication, 1998.
Vashista, B.R. Botany for Degree student Fungi, S. Chand & Co., New Delhi, 2016.

Practical
Paper Code-0158782

Time : 4 Hours

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

Q. 1. Make suitable preparation of the given material A (Bryophyta) 8
Identify and comment upon your preparation
Leave your preparation for inspection.

Q. 2. Make suitable preparation of the given material B (Fungi) 6
Identify and comment upon your preparation
Leave your preparation for inspection.

Q. 3. Make suitable preparation of the given material C (Algae) 6
Identify and comment upon your preparation Leave your preparation for inspection.

Q. 4. Make suitable preparation of the given material D (Microbiology) 3
Identify and comment upon your preparation
Leave your preparation for inspection.

Q. 5. Identify and comment upon the given spots 1 to 6
(covering all disciplines of both Theory Papers) 2x6 = 12

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Q. 6. Practical record 5
Q.7. Internal Assessment 10

B.Sc. Zoology I year

Paper	Paper code	Name of the Paper	Period/ Week	External	Internal	Total
I		Animal Diversity and Evolution	2	40	10	50
II		Biology of Non chordates	2	40	10	50
III		Practical	4	40	10	50

Duration of examination of each theory papers 3 hours
Duration of examination of practical (for both papers on same day) 4 hours

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

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

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

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

PAPER I

Paper Code-0158707

Animal Diversity and Evolution

Functional morphology of the types included with special emphasis on the adaptations to their modes of life and environment. General characters and classifications of all invertebrate phyla up to class with examples emphasizing their biodiversity, economic importance and conservation measures where required.

Unit 1: General principles of taxonomy, concept of the five-kingdom, Concept of Protozoa, Metazoa and Levels of organization. Basis of classification of non-chordata: Symmetry, coelom, segmentation and embryogeny, Characters and Classification of Protozoa and Porifera up to classes with examples.

Unit 2: Salient features and classification of Coelenterata, Ctenophora, Platyhelminthes, Aschelminthes, Annelida, Arthropoda, Mollusca and Echinodermata with their suitable examples.

Unit 3: Origin of Life, Miller's experiment, Lamarckism and Darwinism, Natural Selection, genetic basis of evolution, speciation, Evidences of organic evolution.

Unit 4: Variations, Isolation and Adaptations, Geological time scale and animal distribution in different era.

Unit 5: Principal zoogeographical regions of the world with special reference to their mammalian fauna, Factors affecting the large-scale animal distribution, Origin and evolution of man.

PAPER II
Paper Code-0158708

Biology of Non-chordates

Unit 1: *Euglena:* Ultrastructure of flagellum and flagellar movement, osmoregulation and behaviour, reproduction.

Paramecium: Locomotion, nutrition, osmoregulation and reproduction.

Sycon: Cellular organization, canal system, reproduction and development.

Unit 2: *Obelia:* Structure of polyp and medusa, sense organs and reproductive systems, life cycle.

Fasciola: Digestive, excretory and reproductive systems, developmental stages and life cycle.

Taenia: Structure of body wall, excretory and nervous systems, reproduction and developmental stages in life cycle.

Unit 3: *Nereis:* Parapodial locomotion, digestive, blood vascular, excretory, nervous and reproductive systems, development and metamorphosis.

Hirudinaria: Digestive, haemocoelomic, excretory, nervous and reproductive systems, sense organs.

Unit 4: *Palaemon:* Appendages, Digestive, respiratory, blood – vascular, excretory, nervous, sense organs and reproductive systems.
Pila: Digestive, respiratory, blood vascular, nervous and reproductive systems, sense organs

Unit 5: *Lamellidens*: Digestive, respiratory, blood–vascular, excretory and nervous systems, sense organs, reproduction and development.

Asterias: Water – vascular system, digestive, circulating and nervous systems, sense organs, reproduction, life history and regeneration.

PRACTICAL

Paper Code-0158783

1.Dissection/demonstration of dissection [Major]:

Palaemon: Study of appendages, general anatomy, digestive and nervous systems

Pila: General anatomy and nervous system
Lamellidens / *Unio*: General anatomy and nervous system

2.Permanent preparations / Minor dissections of the following:

Protozoa: *Paramecium*

Porifera: Sponge spicules, fibers and gemmules

Coelenterata: *Obelia* colony, *Obelia* medusa

Annelida: *Nereis* parapodia

Arthropoda: *Palaemon*: Statocyst and hastate plate along with comb plates, *Cyclops* and *Daphnia*
Mollusca: *Pila*: Gill lamella, radula and L. S. Osphradium, *Lamellidens*: Gill-lamella

3. Identification, systematic position up to order and general study of the following animal forms, microscopic slides / museum specimens:

Protozoa: *Amoeba, Entamoeba, Euglena, Noctiluca, Trypanosoma, Trichomonas, Foraminifera* (Oozes), *Opalina, Balantidium, Nyctotherus, Paramecium, Paramecium* binary fission and conjugation and, *Vorticella* [Whole mounts].

Porifera: *Leucosolenia, Grantia, Scypha, Hyalonema, Euplectella, Spongilla* and *Euspongia*

Coelenterata: *Obelia* (colony and medusa), *Physalia, Porpita, Aurelia, Rhizostoma, Alcyonium, Corallium, Gorgonia, Tubipora, Pennatulla* and *Madrepora*
Ctenophora: *Beroe*
Platyhelminthes: *Dugesia, Fasciola* and *Taenia*

Nematoda: *Ascaris, Ancylostoma, Dracunculus, Wuchereria, Trichinella, Schistosoma*
and *Enterobius*

Annelida: *Nereis*, Phase Heteronereis, *Aphrodite, Arenicola, Pheretima, Pontobdella, Branchellion* and *Hirudinaria*
Onychophora: *Peripatus*

Arthropoda: *Limulus, Araneus, Palamnaeus, Apus, Lepas, Balanus, Sacculina, Palaemon, Lobster, Eupagurus, Carcinus, Lepisma, Odontotermes, Pediculus, Schistocerca, Papilio, Bombyx, Xenopsylla, Apis, Julus* and *Scolopendra*

Mollusca: *Chiton, Dentalium, Patella, Pila, Turbinella, Aplysia,* Slug, Snail, *Mytilus, Ostrea* (pearl oyster), *Lamellidens, Teredo, Nautilus, Sepia, Octopus* Enchinodermata: *Pentaceros, Asterias, Ophiothrix, Echinus, Holothuria* and *Antedon*

4.Study of sections, developmental stages and isolated structures from microscopic slides Porifera: L. S. and T. S. of *Scypha* / *Grantia*
Coelenterata: *Hydra,* Sections of *Hydra*, Developmental stages of *Aurelia*

Platyhelminthes: Transverse sections of *Dugesia, Fasciola* and *Taenia*, mature and gravid proglottids of *Taenia*, developmental stages of *Fasciola* and *Taenia*

Annelida: Transverse sections of *Nereis* and *Hirudinaria*, Trochophore larva of Nereis, parapodium of *Nereis* and *Heteronereis.*
Arthropoda: Crustacean larvae (*Nauplius, Zoea, Megalopa* and *Mysis*), mosquito larva & pupa. Mollusca: Transverse sections of *Lamellidens* and Glochidium larva Echinodermata: Pedicellariae of Star fish
Each regular student is required to keep a record of practical work done by him/her duly checked by the teachers which will be submitted at the time of practical examinations.

Distribution of Marks:
Maximum Marks: 50 Minimum Pass Marks:17

Practical exercises	**Marks**
Major dissection/ diagrammatic presentation of dissection	13
Minor dissection/ diagrammatic presentation of dissection	07
Permanent preparation	05
Spotting	10
Viva-voce	05
	40
Internal (sessional/ practical record)	10
Total	50

Recommended Books (All latest editions)

1.Prasad, Beni: *Pila*, Lucknow Publishing House, Lucknow.
2.Bhatia, M. L.: *Hirudinaria*, Lucknow Publishing House, Lucknow.
3.De Robertis, E. D. P. and De Robertis, E. M. F.: *Cell and Molecular Biology*, Halt Saunder, Tokyo, Japan.
4.Gardner, E. J.: *Principles of Genetics*, John Wiley & Sons, New York.
5.Kotpal, R. L.: Invertebrates, Rastogi Publications, Meerut.
6.Nigam, H. C.: A *University Course in Invertebrate Zoology*, Vol. I, Mc Milan, London.
7.Prasad, S. N.: Text *Book of Invertebrate Zoology*, KitabMahal, Allahabad.
8.Patwardhan, S. S.: Palaemon, Lucknow Publishing House, Lucknow.
9.Reese, A. M.: Outlines *of Economic Zoology*, Blackiston Co., Philadelphia, U.S.A.
10.VishwaNath: A *Text Book of Zoology*, Vol. I, Invertebrate, S. Chand & Co., New Delhi.
11.Rastogi, Veerbala: Invertebrate *Zoology*, KedarNath Ram Nath, Delhi.
12.Jordan, E. L. and P. S. Verma: *Invertebrate Zoology*, S. Chand & Co. Ltd., Ram Nagar, New Delhi.

B.Sc. B.Ed. Four Year Integrated Course(587)
Academic Session 2022-23 TEACHING AND EXAMINATION
Mathematics Syllabus Structure

Subject/Paper	**Paper Code**	**Period/ Week**		**Max Marks Theory (Minimum Marks)**	***Marks Summative* Test**	***Total(Passing Marks)***
Year-I (Compulsory)		Th	Pr			**Total Year-I = 150**
Algebra & Coordinate Geometry-2D	0158709		-	60(20)	15	75(30)
Calculus	0158710		-	60(20)	15	75(30)
Year-II (Compulsory)						**Total Year-II = 150**
3D-Geometry & Vector Calculus	0258709		-	60(20)	15	75(30)
Differential Equation	0258710		-	60(20)	15	75(30)
Year-III (Compulsory)						**Total Year-III = 150**
Abstract Algebra	0358709		-	60(20)	15	75(30)
Mechanics	0358710		-	60(	15	75(30)

				20)		
Year-IV (Optional)						**Total Year-IV = 225**
Numerical Analysis & Linear Programming	0458713		-	60(20)	15	75(30)
Complex & Real Analysis	0458714		-	60(20)	15	75(30)
Topology	0458715		-	60(20)	15	75(30)

Paper Pattern

Note: Each theory paper is divided in three parts i.e., Section – A, Section – B and Section – C
Section A will consist of 5 compulsory questions. Each question carries 4 marks.
Section B will consist of 3 questions. Attempt any two. Each question carries 5 marks.
Section C will consist of 5 questions. Attempt any three. Each question carries 10 marks.
Exam. Hours: 03:00, Max. Marks: 60

B.Sc. B.Ed. Part I

Mathematics

Paper - I : Algebra and Co-ordinate Geometry in Two Dimension.
Paper - II : Calculus

Paper I. (Paper Code- 0158709)
Algebra and Co-ordinate Geometry in Two Dimensions

Exam. Hours: 03:00 **Max. Marks: 60**

Unit1: The characteristic equation of a matrix, Eigen values and Eigen vectors, Cayley-Hamilton theorem and its use in finding the inverse of a matrix. Inequalities. Continued fractions.

Unit 2: Relations between the roots and coefficients of general polynomial equations in one variable, Symmetric functions of roots Transformation of equations. Descarte's rule of signs. Solution of cubic equations (Cardon's method). Bi-quadratic equations (Ferrari's Method).

Unit 3: Infinite series. Convergent series, tests for convergence of a series, comparison test, D'Alembert's Ratio test, Cauchy's root test, Logarithmic Ratio Test. Raabe's test, De Morgen and Bertrand's test, Cauchy's condensation test, Gauss's test. Alternating series, Leibnit'z test (Derivation of above tests not required).

Unit 4 : Polar equation of a conic, polar equations of tangent, normal, asymptotes, chord of contact, auxiliary circle, director circle of a conic and related problems.

Unit 5 : General equation of second degree. Tracing of conics (Cartesian coordinates).

SUGGESTED BOOKS

M. Ray: A Text Book of Higher Algebra, S.Chand & Co., New Delhi

Paper – II (Paper Code- 0158710) Title: Calculus

Exam. Hours: 03:00 **Max. Marks: 60**

Unit 1: Polar Co-ordinates. Angle between radius vector and the tangent. Angle between curves in polar form. Length of polar substangent and polar subnormal, Pedal equation of a curve, Derivatives of an arc, curvature, various formulae, Centre of curvature and chord of curvature and related problems.

Unit 2: Partial differentiation, Euler's theorem on homogeneous functions, chain rule of partial differentiation, Maxima and Minima of functions of two independent variables and of three variables connected by a relation, Lagrange's Method of undetermined multipliers.

Unit 3: Asymptotes, double points, curve tracing, Envelopes and evolutes.

Unit 4: Theory of Beta and Gamma functions. Rectification. Volume and Surfaces of solids of revolution. Differentiation and integration under the sign of integration.

Unit 5: Evaluation of double and triple integrals and their applications in finding areas and volumes. Dirichlet's integral. Change of order of integration and changing into polar co-ordinates.

SUGGESTED BOOKS

Gorakh Prasad: A Text Book of Differential Calculus; Pothishala Pvt.Ltd. Allahabad
Gorakh Prasad: Integral Calculus; Pothishala Pvt.Ltd.Allahabad

B.Sc. B.Ed. Part I

B. Ed. I

B.Ed.-Papers with External weight-age of 80 Marks (3 hours duration)

1. **Internal weightage of 20 marks will be divided as under:**

Assessment in the papers with internal weight-age of 20 marks will be divided in following parts.

(i) Subject based presentation 05 marks

(ii) Subject based Assignment 05 marks

(iii) Internal Test 05 marks

(iv) Regularity and Punctuality 05 marks

For theory paper of **50 Marks** , the component of **internal assessment will be reduced to its half**.

2. Paper Pattern:

1. The format for the marking scheme for question papers in theory courses (Maximum Marks=80) in external written examination shall be as follows:
Total =80 marks
Section A: Three Questions with internal choices

(Three Questions of Sixteen marks each, 3x16=48)

Section B: Four out of Eight Questions

(Four Questions of Four marks each, 4x4=16)

Section C: Eight out of Ten Questions

(Eight Questions of Two marks each, 8x2=16)
2. The format for the marking scheme for question papers in theory courses (Maximum Marks=40) in external written examination shall be as follows:
Total =40 marks
Section A: Two Questions with internal choices

(Two Questions of Twelve marks each, 2x12=24)

Section B: Two out of Four Questions

(Two Questions of Four marks each, 2x4=08)

Section C: Four out of Six Questions

(Four Questions of Two marks each, 4x2=08)

Paper	Paper code	Name of the Paper	Period/ Week	Ext	Int	Total	Passing Marks
I	0158711	Childhood and growing up	6	80	20	100	32+8
II	0158712	Basics in Education & Communication	6	80	20	100	32+8
III	0158713	Language Across the Curriculum	6	80	20	100	32+8
IV	0158714	Conservation & Environmental Regeneration (EPC)	3	40	10	50	16+4
Grand Total						**350**	

Paper I
Childhood and Growing up (Code- 0158711)

Objectives:

The student teacher will be able to:

- **Understand children of different ages by interacting and observing them in diverse social, economic and cultural context rather than through an exclusive focus on psychological theories of child development.**
- **The study of childhood, child development and adolescence.**
- **Understand learning as divergent process.**
- **Make aware about the importance of healthy liking and preventing disease.**
- **Introduce psychological trials of learners.**
- **Develop health awareness among prospective teachers.**
- **Understand the role of the family and the school in the child's development.**

COURSE CONTENT

UNIT – I: Childhood and child Development

1. Childhood: Meaning, concept and characteristics.
2. Development of the child with reference to diverse social, economic and cultural background.
3. Physical, social, emotional& intellectual development of child.
4. Development of concept formation, logical reasoning, problem-solving, creative thinking & language development.
5. Effects of family, schools, neighbourhood and community on development of a child.

UNIT – II: Adolescent Development

1. Adolescent: Meaning, Concept & Characteristics
2. Cognitive, Physical, Social, Emotional and moral Development patterns and characteristics of adolescent learner.
3. Adolescent Personality: Problems & Remedies: Fantasying, Hero-worship, Idealism Daydreaming, Adventurism, Drug addiction & smoking, inquisitiveness towards opposite sex, showing off, Social- media addiction.
4. Impact of urbanization, economic change, Social Taboos on adolescent.

UNIT – III: Intelligence & Creativity

1. Intelligence: Concept & Measurement
2. Creativity : Concept & Measurement

UNIT – IV Physical & Mental Hygiene:

1. Mental health & Hygiene: Meaning, Concept and Factors affecting mental Health & Hygiene.
2. Development of Good mental Health, characteristics of mentally healthy teacher, to improve mental health of teachers.
3. Personal and environmental hygiene, Family and school health/prevention of accident, Health information, disease prevention and health information.

UNIT – V Personality

Concept (Indian and Western), Measurement, factors affecting personality Development.

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

1. Assign a task to a student to speak 10 sentences about himself/herself and analyses them linguistically & psychologically
2. Organise a debate on any current issue of social concern. Note down the main points spoken for and against.
3. Administration and Interpretation of any one psychological test -
   (a) Intelligence (b) Creativity (c) Personality
4. Examine the hygenic conditions of a school or any social place and give suggestions to improve it.
5. Prepare a report on some existing social taboos and interpret it logically and scientifically.

References

1. Shrivashra D.N, Verma Preeti 2007, Child Psychology: Child Development Vinod Pustak Mandir, Agra.
2. Pareek Prof Matworeshwar, 2002, Child Development and Family Relationship, Research Publication, Jaipur.
3. Mangal Dr. S.K, Mangal Shubhra, 2005, Child Development, Arya Book Depot New Delhi.
4. Sharma, R.K, Sharma, H.S, Tiwari, Aryana, 2006, Psychological Foundation of Child development, Rodha Prakashan Mandir, Agra.
5. Singh. Dr. D.P, talang. Amritanshy, prakashved. 2002 psycho- social basis of learning and development, research publication, Jaipur.
6. Shrivasha. D.N. Verma, Verma, Dr.Preeti 2010, Modern Experimental Psychology and Teshing, Shri Vinod Pustak Mandir, Agra.
7. Mathur, Dr.S.S. 2007-08, Development of learner and Teaching learning process, Agrawal publication, Agra.
8. Mishra. R.C. 2010, child psychology. A.P.H publishing corporation, New Delhi.
9. Dweck, C. (2006). Mindset: The new psychology of success. Random House LLC.
10. Piaget, J. (1997) development and learning. In M gauvarin& M. Cole (Eds.) readings on the development of children. New York. WH freeman & company
11. Plato (2009) Reason and persuasion three dialogues in J. Holbo (Ed) meno: reason, persuasion and virtue. Person.
12. Saraswathi T. S. (1999) adult-child continuity in india: in adolescence a myth or an emerging relity? In T.S. Saraswathi 9Ed) culture, socialization and human development: theory research and applications in India. New Delhi Sage.

Paper-II (Code- 0158712)

Basics in Education & Communication

Objectives:

The student teacher will be able:

To understand the meaning, nature and process of education.

To clarify how educational determinants determine the individual's personality in a typical shape

To understand how ways of educating people changed with the process of time.

To equip a teacher with different skills needed for providing guidance and counselling To understand the concept & importance of guidance & counselling services.

To understand the different values & ways to inculcate them To develop oral, written and nonverbal communication skills

COURSE CONTENT

Unit 1: Education, Nature & Purpose

1. Education: Meaning, Nature and purpose of Education according to

a) Eminent Educationist: Vivekanand, Tagore, Gandhi, Aurobindo, Rousseau & John Dewey.

b) Important National documents: Kothari Commission, Education Policy 1986, NCF 2005 and National Education Policy 2020.

2. Educational Determinants Shaping the Personality: Teacher, School, Subjects, Peers and Co-Curricular Activities, Co-education, Media.

Unit 2: Evolution and Management of Education

1. Ancient Indian Education System: Vedic Era, Teacher, Student, Methods, Contents
2. A brief introduction of Buddhist Era, Muslim Era & British Era Education.
3. Educational development in post independent era.
4. Modern Educational means: Educational Radio, Educational Television, Edu-Sat, Digital Boards and Films.
5. Educational Management: Meaning, Basic Principles, Role and Responsibility of the Head Master, Effective supervision practices.

Unit 3: Educational Guidance &Counselling.

1. Meaning, Concept, Need and Importance of Guidance &counselling in Educational Institutions.
2. Group and individual techniques of Guidance.
3. Need of Guidance &counselling for children with special needs.

Unit 4: Education for Values and Peace Education

1. Values: Meaning, Types: Values enshrined in Indian Constitution, Aesthetic values, Spiritual Values, Universal Values, Moral and ethical values etc. Transformation of Values in Society
2. Education for Peace

(a) Issues of National and International conflicts, social injustice, Communal conflict (b) Individual alienation: A Critical understanding

(c) Role of School, Social organisations (UNESCO) and Individuals in promoting peace.

Unit 5: Communication Skills for the Teachers.

1. Communication: Meaning, Concept, 7 C's of Communication, Computer based communication, Audio-Visual-Communication. Importance of Nonverbal Communication Teaching.
2. Listening & Speaking Skills, Barriers to Listening & speaking, Effective Presentation. 3. Written Communication for Teachers: Circulars, Notices, Orders, Report, and Minutes.

Practicum/Field Work (Any two from the following)

1. Interview a less educated or uneducated person about a social issue & conclude the findings in present context.
2. "Are Modern Educational ways Effective in comparison to traditional ways of teaching" Organise a debate for or against and report the outcomes.
3. How students choose their career. Discuss with the Headmaster/Principal, Parents/Students & prepare a report on it.
4. Write a small reflective note on how you found yourself under a value conflict situation in recent past

Or

Analyse the contribution of any National or International personality in establishing peace.

5. Speak some fifty words & tell students to recall them back and note down who counts maximum.

Or

Draft two notices for the conduction of some activity in school.

References

1. Chahel S K (1994), Environment & the Morality: Towards a new paradigm
2. Gandhi K L (2000), Naitik Moolya: Sankaleen Parivesh Mein, Frank brothers, Delhi
3. Sheshadri C, M.A Khader and G L Adhya(eds) (1992), Education in values: A Source book, NCERT, New Delhi
4. Pal Rajendra, Korlahalli J S, (2005), Essentials of Business Communication, Sultan Chand & Sons, New Delhi
5. Elizabeth B. Hurlock, Personality Development, Tata McGraw Hill Edition 1976, New Delhi
6. Giri A. P (1991), School Broadcast programs: Problems & Prospects, Deep & Deep Publications New Delhi.
7. Verma R S and Upadhyaya: Shaikshik avam Vyavsayik Nirdeshan, Vinod Pustak Mandir, Agra.
8. Agrawal, J C: Educational & Vocational Guidance Doaba, Delhi.

Paper-III (Code- 0158713)

Language Across The Curriculum

Objectives

The student teacher will be able to:

Understand the language background of students as the first or second language users.
Create sensitivity to the language diversity that exists in the classroom.
Understand the nature of classroom discourse and develop strategies for using oral language in the classroom.
Understand the nature of reading comprehension in the content area & writing in specific content areas.
Understand interplay of language and society.
Understand function of language and how to use it as a tool.
Understand language and speech disorder and make remedial measures, too.

COURSE CONTENT

Unit-I Language and Society:-

1. Language: concept, functions and importance
2. Relationship of language and society: Identification, power and discrimination.
3. Three language formula

4.Language policy in Education

5. Unit- II Language development:-

1.Theories of language development and its implementation in teaching, psychological basis of language.
2.Social stimulation: gestures, emotional facial expression, posture and movements, articulate speech, physiognomy of language development in different ages
3. Speech defects: - lisping, slurring, stuttering and stammering and role of teacher in its resolution.
4. Physical, Environmental, Social and Psychological barriers to language learning.

Unit-III Language acquisition:-

1.Understanding Hindi alphabets & it's logical & simple classification
2. Language acquisition and cognitive development, Learning languages with fun
3. Culture acquisition through language.

Unit-IV Classroom and Language:-

1. Tools for language learning: Dictionary, Discussion, Natural exposition, Word puzzles.
2. Function of language: In the classroom and outside the classroom. 5.Classroom set up as a Language laboratory
6. Role of literature in language learning, learners' role on understanding literature.

Unit-V LSWR (Listening, Speaking, Reading, Writing) as basic skills for languages.

1.Listening and Speaking: Effective ways of speaking for Effective Listening: Pronunciation, Enunciation, pause, intonation, articulation, Pitch Raising & Dropping.
2. Importance of 3 V's (Vocal, Visual & Verbal) in language communication
3. Reading: Types (Silent, Loud, Extensive& Intensive reading), Reading strategies for children – note making, summarizing; reading and writing connection.
4. Writing: Analyse children's writing to understand their conception: writing with a sense of purpose, writing to learn and understand.

<u>Practicum/Field Work (Any two from the following)</u>

1.Draft a report on the efforts put in by Uttar Pradesh people to give Hindi Language a status of

constitutionally scheduled/recognized language.

2. Diagnose speech defects of primary level student and make a remedial strategy.
3. Prepare a list of at least 10 proverbs of Hindi Language and interpret their cultural significance.
4. Collect a literary style prose/poem of any language and critically analyse it.

Reference

1. Agnihotri, R.K. (1995). Multilingualism as a classroom resource. In K. Heugh, A Siegruhn, & P. Pluddemann (Eds.) Multilingual education for South Africa 9pp. 3-&). Heinemann Educational Books.
2. Anderson, R.C. (1984). Role of the Reader's Schema in comprehension, learning and memory. In R. C. Anderson, J. Osborn, & R.J. Tierney (Eds.), learning to read in American Schools: Basad readers and Content texts. Psychology Press.
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4. Erlwanger, S. H. (1973). Benny's conception of rules and answers in IPI Mathematics. Journal of children's Mathematical Behavior, 1(2), 7-26
5. Grellet, f. (1981). Developing reading skills: A practical Guide to reading comprehension exercises. CambridgeUniversity Press.
6. Ladson-Billings. G. (1995). Toward a Theory of Culturally Relevant Pedagogy. American Educational research journal. 32(3), 465-491.
7. NCERT. (2006d) Position Paper National Focus Group on teaching of Indian language (NCF-2005). New Delhi: NCERT.
8. Sankhla, Arjun Singh, (2013) Hindi Bhasha Shikshan aur Praveenta, Arihant Shiksha Prakashan Jaipur.
9. Thwaite, A. &Rivalland, J.(2009) How can analysis of classroom Taks help teachers reflect on their practices? Australian Journal of Language and Literacy, the 32(1) 38

Paper-IV (Code- 0158714)

Conservation Environmental Regeneration

Objectives:

The student teacher will be able:

To understand philosophical and epistemological basis of EVS as a composite area of study that draws upon the science, social science and environmental education.

To helping student teacher develop the ability to plan comprehensively and analyses & prepare projects on environmental issues.

To Understanding the issues of conservation and environmental regeneration

To analyze and understand environment concerns through the process of inquiry.

To develop in the pupil teachers a sense of awareness about the environment hazards and its causes and remedies.

COURSE CONTENT

Unit – I: Introduction to Environmental Studies

1. Environmental Studies: Historical background, concept and philosophical and epistemological basis of environmental studies.
2. Natural and social environment: concept, its components, and relationship,
3. Man & Environment: A symbiotic dependence.
4. Nature, scope and areas of EVS.
5. Disciplinary and Multidisciplinary approach of EVS, Role of media and ecotourism in creating environmental awareness.

UNIT – II: Environmental conservation:-

1. Meaning, concept, scope and need of environmental conservation and regeneration.
2. Role of individual in conservation of natural resources: water, energy and food.
3. Role of society in conservation.

Unit-III Sustainable development:-

1. Meaning, concept, need and importance of sustainable development.
2. Economic growth and sustainable consumption.
3. Organic farming
4. Changing Patterns of energy and water consumption.
5. Biological control for sustainable agriculture
6. Sustainable use of forest produces.

Unit – IV Environmental management:

1. Meaning, concept and importance of environmental management.
2. Waste, Garbage and sewage management.
3. Management of nuclear and biomedical waste.
4. Deforestation and measures for afforestation.
5. Consumerism and waste generation and its management.

Unit – V Biodiversity

1. Biodiversity:- Meaning, concept and ,types
1. Need and important of biodiversity at global/national/local level.
2. Biodiversity conservation: need and methods.

3. Traditional knowledge and biodiversity conservation.
4. Genetically- modified crops and food security.

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Practicum/Activity work (Any two activities from the following):-

1. Conduct a campaigning programme for plantation of Tulsi, Neem etc.
2. Celebrate important relevant days related to environmental conservation (such as earth day, world environmental days etc) in school or out of school with the help of students and make a systematic report on entire activities or work.

   Or

   Draft a report after analysing the scientific base of Environment related days of traditional Indian culture and present this report in class. (Basant Panchmi, Hariyali Amavasya etc.)
3. Conduct an activity in school and ask students to get opinion of their grandparents about changing life style and their merits and demerits and collect their ideas on domestic products which can be helpful in healthy life style. The pupil teacher will compile their experiences and draft a report to present it in class.
4. Organize a planned Visit to a hospital to study on biomedical waste, after visiting it present your report in class.
5. Analyse the direct or indirect message of Traditional Culture/folk songs of your area for social or natural environment enhancement.

References

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2. Kaushik,A. and Kaushik,C.P.(2004).Perspectives in Environmental studies, New Age International(P) Ltd. Publishers, New Delhi
3. Goel, M.K. (2006) Paryavaran Addhyayan, Vinod Pustak Mandir, Agra, Pp. 581.
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5. Rathore,H.C.S.,Bhattacharya, G. C., Singh, S.K., Singh, M. and Gardia,A.(2008) Society and Environmental Ethics, Seema Press, Varanasi, Pp. 242.
6. Sharma, R.C., Mahajan,B., Premi,K.K., Nuna, S.C., Menon,P.(1994). Source Book on environmental education For Elementary Teacher Educators, NIEPA, New Delhi.pp.278.
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9. Singh,S.K.(2006)Environmental Education,Sapna Ashok Prakashan , Varanasi,Pp.176
10. Singh,S.K.(2008)Environmental Education and Ethics,AmritPrakashan , Varanasi,Pp.114
11. Singh,S.K.(2010) Fundamentals of Environmental Education , Sharda Pustak Bhawan , Allahabad , Pp.175
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SYLLABUS FOR FOUR YEAR INTEGRATED B.Sc. B.Ed. COURSE

SECOND YEAR

2023-24

MAA SHAKUMBHARI UNIVERSITY
SAHARANPUR

B.Sc. B.Ed. Part II

Physics

Course	Nomenclature	Number of Papers	Number of Periods per week	External	*Internal	**Practical	Total
Paper I	Electromagnetics	1	2	40	10		50
Paper II	Quantum Mechanics & Spectroscopy	1	2	40	10		50
PRACTICAL COURSE		--	4	40	10		50

Duration of examination of each theory papers 3 hours
Duration of examination of practicals 4 hours

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

**In practical examination out of 50 students have to score minimum of 20 marks to pass

Note: Each theory paper is divided in three parts i.e. Section-A, Section –B and Section–C.
Section-A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry of 1 mark. **Section –B**: Will consist of 10 questions. Each unit will be having two questions; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question carries 3.5 Marks.
Section-C: will consist of total 05 questions. Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question carries 7.5 Marks.

PAPER -I
ELECTROMAGNETI
CS
Paper Code-0258701

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

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

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

Unit IV: Magnetics: Biot-Savart law, Ampere circuital law in integral and differential forms, divergence of Magnetic field, Force on a current carrying wire and torque on a current carrying loop in magnetic field. Magnetic field in matter: Magnetization Vector, uniform magnetization and surface current, non- uniform magnetization, B, M, H Vectors and their inter-relations, Bohr magnetron, orbital magnetic moment and angular momentum, Electron Spin and Magnetic moment, Magnetic Susceptibility.

Unit V: Electromagnetic Induction, Faraday's laws of Electromagnetic induction, its integral and differential form; Lenz's law; Self and mutual inductance, measurement of self inductance by Rayleigh method; Energy stored in magnetic field.
Transient response: Charge and discharge of condenser through resistance, determination of high resistance by leakage, growth and decay of current in LR circuit; A. C. Circuits, use of *j* operator in alternating current circuits. LCR circuit in series and in parallel (A.C.), phase diagram, Resonance and Q factor, Sharpness of resonance.

Books suggested:

Berkeley: Physics Course, Vol. II: Electricity and Magnetism, Tata McGraw
Hill. Spiegel, M.R.: Vector Analysis, Schaum's Outline Series, McGraw Hill.
Laud, B.B.: Electro-magnetics, Wiley Eastern.
Matveev, A.N.: Electricity and Magnetism, Mir Publishers,
Moscow. Griffiths: Introduction to Electrodynamics, P

PAPER -II

QUANTUM MECHANICS AND SPECTROSCOPY
Paper Code-0258702

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

Unit II: Wave Mechanics and Schrödinger equation: Phase velocity and group velocity of waves, wave particle duality; De Broglie Hypothesis; De Broglie group and phase velocity, wave packet, Heisenberg uncertainty principle, Statement and its equation from wavepacket in space and time; Application of uncertainty principle such as (i) Non-existence of electron in nucleus, (ii) Ground state of H-atom, (iii) Natural line width of spectral lines, X-ray microscope, Particles passing through (a) single slit and (b) double slit and observed on screen behind, explanation of distribution in terms of probability amplitude and interference of probability amplitude.
Postulates of Quantum Mechanics: Wave functions, Schrödinger superposition principle, operators in Quantum mechanics, Hermitian operators, expectation values, Interpretation of wave-function, symmetric and anti-symmetric wave functions, concept of parity; Probability density, Schrödinger equation, Schrödinger equation for free particle; Arguments in favour of this equation.

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

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

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

Unit V: Atom in magnetic field: Magnetic moment of atom, contribution from orbital and spin angular momentum, gyro-magnetic ratio; Interaction energy of atom in magnetic field, splitting of energy levels, using good quantum numbers in Normal Zeeman effect, Anomalous Zeeman effect and Paschen-Back effect, Selection rules for dipole transitions.
Molecular spectroscopy: qualitative features of molecular spectra, rigid rotator, rotational and vibrational energy levels of diatomic molecules, rotational-vibrational spectra.

Books suggested:

1. Semat: Atomic Physics

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

EXPERIMENTS FOR PRACTICAL WORK

Paper Code-0258780

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

1. To determine the Low resistance by Carey Foster Bridge.
2. To study thweVariation of magnetic field along the axis of circular Coil.
3. Study of an RL Circuit.
4. Study of CR Circuit.
5. Study of electro-magnetic function and verification of Faraday's Laws.
6. Determination of temperature coefficient of platinum resistance thermometer using Carey Foster Bridge.
7. Determine thermal conductivity of a bad conductor by Lee’s method.
8. Determination of Ballistic Constant of a Ballistic galvanometer using condenser.
9. Determination of Ballistic Constant of a Ballistic galvanometer by steady deflection method.
10. Determination of high resistance by leakage method.
11. Study of Gaussian distribution using statistical board.
12. Determination of mutual inductance of a coil.
13. Experimental verification of the first law of thermodynamics by discharging the condenser.
14. Study of variation of total thermal radiation with temperature.
15. Plot thermo emf versus temperature and find the neutral temperature and temperature of inversion.
16. Determination of Self Inductance of a Coil using Ballistic galvanometer.
17. To study the electromagnetic damping of a compound pendulum.
18. To study the excitation of normal modes and measure frequency splitting using two coupled oscillators.
19. Study of dependence of velocity of wave propagation on line parameters using torsional wave apparatus.
20. Study of variation of reflection coefficient on nature of termination using torsional wave apparatus.

B.Sc II

Year

CHEMIST

RY

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

Duration of examination of each theory papers 3 hours
Duration of examination of practicals 5 hours

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

**In practical examination out of 50 students have to score minimum of 20 marks to pass

Note: Each theory paper is divided in three parts i.e. Section-A, Section –B and Section–C.
Section-A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry of 1 mark. **Section –B**: Will consist of 10 questions. Each unit will be having two questions; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question carries 3.5 Marks.
Section-C: will consist of total 05 questions. Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question carries 7.5 Marks.

PAPER -I ORGANIC CHEMISTRY
Paper Code-0258703

Unit I: Electromagnetic Spectrum: Absorption Spectra

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

Classification and nomenclature.

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

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

Phenols

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

Unit III: Aldehydes and Ketones

Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction. Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff- Kishner, $LiAlH_4$ and $NaBH_4$.

Unit IV: Carboxylic Acid

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

Ethers and Expoxides

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

Unit V: Organic Compounds of Nitrogen

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

Alkyl and Aryl amines: Reactivity, structure and nomenclature of amines, physical properties. Stereochemistry of amines. Separation of a mixture of primary, secondary andtertiary amines. Structural features effecting basic nature of amines. Amine salts as phase transfe rcatalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds. nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactions of amines, electrophilic aromatic substitution in aryl amines,

reactions of amines with nitrous acid. Synthetic trans formationsof aryl diazonium salts, azo coupling.

Books Recommended:

1. Advanced Organic Chemistry by Mukherji, Singh & Kapoor
2. Organic Chemistry by Bahal and Bahal
3. Advanced Organic Chemistry by Morrison & Boyd

PAPER -II
PHYSICAL CHEMISTRY
Paper Code-0258704

Unit I: Mathematical Concepts

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

Unit II: Gaseous State

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

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

Unit III: Liquid and Colloidal State

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

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

Colloidal State: Definition of colloids, classification of colloids.

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

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

Unit IV: Solutions

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

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

Unit V: Chemical Kinetics

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

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

Books Suggested:

1. The Elements of Physical Chemistry, P.W. Atkins, Oxford.
2. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wile Eastern Ltd.
3. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma and M.S. Pathania, Shobhan Lal

Naginchand & Co.
4. Physical Chemistry, Bahl and Tuli, S. Chand & Co.(P) Ltd.
5. Physical Chemistry, Vol. I & II, S. Pahari, New Central Book Agency (P) Ltd

Laboratory Course
Paper Code-0258781

Organic Chemistry: [20]

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

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

Physical Chemistry: [15]

Viscosity and Surface Tension:

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

Viva-Voce [5]
Internal (Sessional/Record) [10]

Books Suggested (Laboratory Courses):

1. Practical Chemistry S. Giri, D.N. Bajpai and O.P. Pandey Publ. S. Chand.

BSc II year Paper 1

Paper Code-0258705

PAPER -I PALAEOBOTANY, PTERIDOPHYTES AND GYMNOSPERMS

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

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

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

Unit IV: Characteristics of seed plants, evolution of the seed habit. General features of gymnosperms and their classification; evolution, diversity and economic importance of Gymnosperms.

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

Suggested Laboratory Exercises

Palaeobotany: Microscopic examination of slides of Rhynia.

Pteridophytes: Study of external morphology of Lycopodium, Selaginella, Equisetm, Adiantum, Marsilea and Azolla.

Microscopic study of temporary double stained preparations of stem/rhizome of Lycopodium, Selaginella, Equisetum and Marsilea.

Study of temporary single stained microscopic preparations of cone of Selaginella and T.S. of Sporophyll of Adiantum and sections of sporocarp of Marsilea.

Gymnosperms: Study of external morphology of plant parts of Cycas: young and old foliage leaf, scale leaf, bulbils, male cone, microsporophyll, megasporophyll and mature seed (if material is not available show photographs). Microscopic temporary double stained preparations of rachis and leaflet of Cycas. Study of T.S. of normal and coralloid root by permanent slides. Study of external morphology of plant parts of Pinus: long and dwarf shoot, male cone; female cone; winged seeds. Microscopic temporary preparation of pollen grains (W.M.) of Pinus. Study through permanent slides T.S. stem: young and old; male/female cone of Pinus. Study of habit and structure of whole male and female cone of Ephedra. Microscopic preparation of male and female flowers of Ephedra.

Suggested Readings

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

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

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

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

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

Sporne, K.R. The Morphology of Gymnosperms, B.I. Publ. Pvt., Bombay, Calcutta, Delhi, 1991.

Vashista, P.C. Gymnosperm, S. Chand & Co. Ltd., New Delhi, 2016.

Vashista, P.C. Pteridophyta, S. Chand & Co. Ltd., New Delhi, 2016.

Wilson, N.S. and Rothewall, G.W.Palaeobotany and evolution of Plants, (2nd ed.), Cambridge University Press, U.K., 1993.

BSc Second Year Paper II

Paper Code-0258706

TAXONOMY OF ANGIOSPERMS & DEVELOPMENTAL BOTANY

Unit 1.: History of Plant Taxonomy, Angiosperm taxonomy; (Alpha-taxonomy, Omega-taxonomy, holotaxonomy) Taxonomic literature. Botanical nomenclature; principles and rules; taxonomic ranks, typification, principle of priority. Classification of angiosperms; salient features of the systems proposed by Bentham and Hooker and Engler and Prantl.

Unit II: Diversity of flowering plants as illustrated by members of the families Ranunculaceae, Papaveraceae, Caryophyllaceae, Capparidaceae, Cucurbitaceae, Rutaceae, Apiaceae, Asteraceae, Acanthaceae, Apocynaceae, Lamiaceae, Euphorbiaceae,and Poaceae.

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

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

Unit V: Anatomy of Angiosperms: Types of tissue; Root apical meristem; Shoot Apical meristem: The shoot apical meristem; Structure and function of xylem and Phloem; Cambium and its functions; Seconndary growth; Periderm. Root -stem transition; Abnormal secondary growth; Internal structure of dicot & monocot leaf

Suggested Laboratory Exercises

Taxonomy: Field study of diversities found in leaf shapes, size, thickness and surface properties of plant families given in the course. Field Visits are compulsory.

Economic Botany: Food plants: Study of morphology and structure. Simple micro chemicals tests of the food storing tissues in rice, wheat, maize, potato and sugarcane. Microscopic examination of starch in these plants (except sugarcane). Fibers: Study of cotton fiber, tests for cellulose. Vegetable oils: study of hand sections of Groundnut, Mustard and Coconut and staining of oils droplets by Sudan III and Sudan Black.

Embryology: Embryo dissection. Study of different types of ovules

Anatomy: Anatomy of root, stem & leaves (Dicot & monocot). Structure of secondary phloem and xylem. Growth rings in wood. Microscopic study of wood in T.S., T.L.S. and R.L.S.. Structure and development of stomata (using epidermal peels of leaf). Abnormal secondary growth in stem.

Suggested reading

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

Esau, K. Anatomy of Seed Plants, 2nd John Wiley & Sons, New York, 1977.

Fahn, A. Plant Anatomy. 2nd ed. Pergamon Press, Oxford, 1974

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

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

Fegerig K. and Vender PifiThe Principles of Pollination Ecology, Pergamon Press, 1979.

Gifford, E.M. and Foster, A.S. Morphology and Evolution of Vascular Plants, W.H. Freemad and Company, New York, 1979.

Heywood, V.H. and Moore, D.M. (eds.) Morphology and Evolution of Vascular Plants, W.H. Freeman and Company, New York, 1984.

Jeffrey, C. An Introduction to Plant Taxonomy, Cambridge University Press, Cambridge, London, 1982.

Jones, S.D. Jr. and Suchsinger, A.E. Plant Systematic (2nd ed.) McGraw-Hill Book Co., New York, 1986.

Maheshwari, J.K. Flora of Delhi, CSIR, New Delhi, 1963.

Radford, A.E.: Fundamentals of Plant Systematics, Harper and Row, New York, 1986.

Practical

Paper Code-0258782

Time : 5 Hours

Max. Marks : 50

Mim. Pass. Marks : 18

Q. 1. Cut a T.S of the given material "A" (Pteridophyta/ Gymnosperm) and make double stained temporary mount of the same. Draw labelled diagram. Identify the material giving reasons. Leave your preparation for inspection. 5

Q. 2. Make suitable preparation of the reproductive parts of the given material "B" (Pteridophyta/ Gymnosperm). Draw labeled diagram. Identify and comments upon the features of interest. Leave your preparation for inspection. 5

Q. 3. Describe the given flower in semi technical language with floral diagram and floral formula, mentioning special features of identification. 5

Q. 4. Prepare a temporary slide of the given Gynoecium / Androecium/Embryo material. Draw a Labeled Diagram and comment on it from Embryological point of view. 3

Q. 5. Cut aT.S./V.S. of given stem/root/leaf and make a double stained preparation of the same. Draw a labeled diagram (outline & cellular) and identify with special features. 5

Q. 6. Identify and comment upon the given spots 1 to 6 (covering all disciplines of Three Theory Papers) 2x6 = 12

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Q. 7. Practical record 5

Q.8. Internal Assessment 10

Paper	Paper code	Name of the Paper	Period/ Week	External	Internal	Total
I	0258707	Chordate Structure and Function	2	40	10	50
II	0258708	Developmental Biology	2	40	10	50
III	0258783	Practical	4	40	10	50

Duration of examination of each theory papers 3 hours
Duration of examination of practical (for both papers on same day) 4 hours

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

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

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

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

PAPER I

Paper Code-0258707

Chordate Structure and Function

Unit 1: Classification and characters of phylum Chordata (excluding extinct forms) up to orders, Comparisons of habit, habitat, external features and anatomy of *Balanoglossus*, *Herdmania* and *Branchiostoma* (excluding development).

Unit 2: Ascidian tadpole larva and its Metamorphosis, Affinities of Hemichordate, Urochordate and Cephalochordates, Habit, Habitat and salient features of Petromyzon, Ammocoete larva.

Unit 3: Integument including structure and development of placoid scales, feathers and hairs, Jaw suspensorium, limbs and girdles of *Rana, Uromastix, Columba* and *Oryctolagus*.

Unit 4: Heart and aortic arches, respiratory system and alimentary canal of *Scoliodon, Rana, Uromastix, Columba* and *Oryctolagus*.

Unit 5: Brain, urinogenital system (*Scoliodon, Rana, Uromastix, Columba* and *Oryctolagus*), Identification of poisonous and non-poisonous snakes. Biting mechanism in snakes, flight adaptations in birds. Adaptations in aquatic mammals.

PAPER II

Paper Code-0258708

Developmental Biology

Unit 1: Formation of egg and sperm, vitellogenesis and fertilization. Types of eggs and sperms, parthenogenesis, regeneration.

Unit 2: Planes and patterns of cleavage in chordates, significance of cleavage and blastulation, Morphogenetic cell movement, Fate maps and significance of gastrulation.

Unit 3: Development of *Branchiostoma* (*Amphioxus*) up to gastrulation; chick egg and its development up to the formation of primitive streak, Extra embryonic membranes of chick, development of placenta in rabbit, types and functions of placenta in mammals.

Unit 4: Various types of stem cells and their applications (with special reference to embryonic stem cells), Cloning of animals: nuclear embryonic transfer technique, nuclear transfer technique; Identical, Siemese and fraternal twins and Artificial insemination.

Unit 5: Organogenesis of alimentary canal, eye, kidney, gonads and brain in mammal.

Practical

Paper Code-0258783

1.DISSECTION/ demonstration of dissection

Scoliodon: General anatomy, alimentary canal, afferent and efferent blood vessels, urinogenital system, brain and cranial nerves – V, VII, IX and X only and internal ear

Labeo /Wallago, Brain V, VII, IX and X Cranial nerves, afferent and efferent blood vessels, air sacs, and internal ear.

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

2.OSTEOLOGY

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

3.PERMANENT PREPARATIONS

Scoliodon: Placoid scales, Ampulla of Lorenzini.

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

Urochordata: *Salpa, Doliolum* and *Herdmania*

Cephalochordata: Petromyzon and Myxine.

Pisces: *Zygaena, Scoliodon, Pristis, Torpedo, Trygon, Protopterus, Labeo, Heteropneustis* (*Saccobranchus*), *Belone, Exocoetus, Anabas* and *Echeneis.*

Amphibia: *Necturus, Amphiuma, Amblystoma, Axolotal larva, Hyla, Uraeotyphlus* .

Reptilia: *Trionyx, Chelone, Varanus, Uromastix, Ophiosaurus, Naja, Bungarus, Echis, Hydrophis, Eryx, Ptyas, Crocodilus* and *Gavialis*

Aves: *Columba, Pavo, Choriotis, Francolinus, Streptopelia*

Mammalia: *Meriones, Funambulus, Rattus, Hemiechinus, Suncus, Ptecopus, Presbytis* and *Macaca*

5.Microscopic Study

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

Scoliodon: T.S. gill and scroll valve

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

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

Chick embryology: Whole mounts of embryos of 18, 24-, 33-, 48- and 72-hours Mammalia: T.S. through various organs

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

Distribution of Marks

Maximum Marks: 50, Minimum Pass Marks: 17

Practical exercises	**Marks**
Major dissection/ diagrammatic presentation of dissection	13
Minor dissection/ diagrammatic presentation of dissection	07
Permanent mounting	05
Spotting	10
Viva-voce	05
	40
Internal (sessional/ practical record)	10
Total	50

List of Recommended Books

1.Arey, L.B. : Developmental Anatomy, Asia Publishing House, Mumbai

2.Das, S.M. : The Indian Zoological Memoirs, Herdmania, Lucknow Publishing House, Lucknow

3.Jorden, E.L. and Verma, P.S.: Chordate Zoology and Animal Physiology, S. Chand & Co., N. Delhi

4.Kotpal, R.L. : Chordate Zoology, Rastogi Publication, Meerut

5.Dalela, R.C. : A Text Book of Chordate Zoology, Jai Prakash Nath Publication, Meerut

6.Balinsky : Introduction to Embryology (CBS College Publishers)

7.Jain, P.C. : Text Book of Embryology, Vishal Publication, Jalandhar

8.Srivastava, M.D.L. : An Introduction to Comparative Anatomy of Vertebrates, Pothishala Ltd., Allahabad

8.Thillayampalam, E.M. : Scoliodon, Lucknow Publishing House, Lucknow

9.Weichart, G.K. : Anatomy of the Chrodates, McGraw Hill, New York

10.Agarwal, R.A., Srivastava, Anil Kumar and Kaushal Kumar: Animal Physiology and Biochemistry, S. Chand & Co. Ltd., New Delhi.

B.Sc. B.Ed. Part II

MATHEMATICS

Paper I : 3-D Geometry and Vector Calculus.
Paper II : Differential Equations.

Exam. Hours: 03:00 **Max. Marks: 60**

Paper – I (Paper Code- 0258709) Title: 3-D Geometry and Vector Calculus.

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

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

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

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

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

SUGGESTED BOOKS

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

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

Paper II (Paper Code- 0258710) Title: Differential Equations

Exam. Hours: 03:00 **Max. Marks: 60**

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

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

Unit 3: Linear differential equations of second order of the form
d2y/dx2 +P(x) dy/dx +Q(x) y = R(x). Exact Linear differential equations of nth order. Exact Non-Linear differential equations. Differential equations of the various forms such as d2y/dx2 = y(x) , equation not containing y directly, Equation not containing x directly and other forms. Method of variation of parameters to the solution of second order linear differential equations. Laplace and Inverse Laplace Trasform and its applications in PDE and ODE.

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

Unit 5: Partial differential equations of second and higher order. Classification of linear partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients. Monge's method of integrating Rr + S s + T t = V.

SUGGESTED BOOKS

Sharma, Gupta: Differential Equations; Krishna Prakashan, Meerut

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

B.Sc. B.Ed. Part II

B.Ed. II

B.Ed.-Papers with External weight-age of 80 Marks (3 hours duration)

1. **Internal weightage of 20 marks will be divided as under:**

Assessment in the papers with internal weight-age of 20 marks will be divided in following parts.

(i) Subject based presentation 05 marks

(ii) Subject based Assignment 05 marks

(iii) Internal Test 05 marks

(iv) Regularity and Punctuality 05 marks

For theory paper of **50 Marks** , the component of **internal assessment will be reduced to its half**.

2. **Paper Pattern:**

1. The format for the marking scheme for question papers in theory courses (Maximum Marks=80) in external written examination shall be as follows:
Total =80 marks
Section A: Three Questions with internal choices

(Three Questions of Sixteen marks each, 3x16=48)

Section B: Four out of Eight Questions

(Four Questions of Four marks each, 4x4=16)

Section C: Eight out of Ten Questions

(Eight Questions of Two marks each, 8x2=16)
2. The format for the marking scheme for question papers in theory courses (Maximum Marks=40) in external written examination shall be as follows:
Total =40 marks
Section A: Two Questions with internal choices

(Two Questions of Twelve marks each, 2x12=24)

Section B: Two out of Four Questions

(Two Questions of Four marks each, 2x4=08)

Section C: Four out of Six Questions

(Four Questions of Two marks each, 4x2=08)

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Paper	Paper code	Name of the Paper	Period/ Week	Ext	Int	Total	Passing Marks
I	0258711	Fundamentals of Contemporary Indian Education	6	80	20	100	32+8
II	0258712	Learning Enrichment through Information and Communication Technology	6	80	20	100	32+8
III	0258713	Schooling, Socialization and Identity	6	80	20	100	32+8
IV	0258714	Health & Physical Education	3	40	10	50	16+4
Grand Total						**350**	

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B.Ed-II Year Paper-I (Code 0258711)

Fundamentals of Contemporary Indian Education

Objectives:

The student teacher will be able to:

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

COURSE CONTENT

UNIT – I: Diversity in Society & Education:

1. Education: Meaning, Concept and Nature.
2. Social & Cultural Diversity: Meaning, Concept and their Impact on Education. 3. Social, Cultural, economic and Political Perspective of Society and Education. 4. Role of the school in developing National, Secular and Humanistic identities.

1. Determinants of identity formation in individuals and groups: Social categories, such as Caste, Class, Gender, Religion, Language and Age.

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

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

UNIT – IIISchool in Social Context

Understanding the nature and processes of socialisation

(i) At home: family as a social institution; parenting styles and their impact; transmission of parental expectations and values.

(ii) Socialisation and the community: neighbourhood, extended family, religious group and their socialisation functions.

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(iii) At school: impact of entry to school; school as a social institution; value-formation in the context of schooling.

(iv) Various dimensions of self and the impact of socialisation on development of self.

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(v) Understanding interface between home, community and school; inter-linkages within wider socio- cultural contexts.

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

UNIT– IV Emerging Indian Concerns and their educational implications

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

UNIT – V Contemporary Issues and Policies

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

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

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

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Paper II

(Code 0258712)

Learning Enrichment through Information and Communication Technology

Objectives:

The student teacher will be able to:

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

COURSE CONTENT

UNIT 1: RELEVANCE OF ICT IN EDUCATION

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

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

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

UNIT 3: USE OF COMPUTERS IN SCHOOLS

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

UNIT 4: VISUALISING TECHNOLOGY-SUPPORTED LEARNING SITUATIONS

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

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UNIT 5: TECHNOLOGICAL ADVANCEMENTS IN EDUCATION

(1) Innovative usage of technology: Use of technology integration in resource-plenty as well as resource-scarce situations
(2) Critical issues in 'internet usage' – authenticity of information, addiction, demerits of social networking group.

Practicum/Field Work (Any Two of the following)

1. Prepare a power point presentation on any 2 general topics and present them before peers.
2. Prepare a five minutes programme of teaching with a video recording of self and put the content on CD and summit it for appraisal.
3. Watch a programme broadcast on television on educational topics & prepare an interpretational report.
4. Through an intensive search on internet find out some Educational apps and mention their utilities.
5. How a mobile as a device can be used as teaching tool write a note on it on your self experiences.
6. Search at least four free educational e-books and write them on CD and submit it.

References:

1. Srinivasan, T. M. (2002).Use of computers and multimedia in education. Jaipur: Aavisakar Publication.
2. Alexis, M. L. (2001).Computer for every one. Leon: Vikas Publishing house Ltd: New Delhi.
3. Norton, P. (1998).Introduction to computers. New Delhi: Tata McGraw Hill Publishing Co 104
4. Peter Norton's Introduction to Computers (2000), Tata McGraw-Hill Publications, New Delhi
5. Schwatz&Schitz (2000), Office 2000, BPB Publications, New Delhi.
6. Smha P.K. (1992), Computer Fundamentals, BPB Publications, New Delhi.
7. Merrill, P.P., et al (1985), Computers in Education, Second Edition, Allyn and Bacon, New York,
8. Goel, Hemant Kumar. Computer Vigyan Shikshan. R Lal Book Depot (Hindi and English)

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Paper III

(Code 0258713)

Schooling, Socialisation and Identity

Objectives:

The student teacher will be able to:

Become aware of the processes of socialisation at home and school that act as shaping factors in identity formation of the school-going child (in Indian contexts);

Reflect critically on factors that shape identity formation and influence sense of self of the growing 'student' as well as 'teacher' in school aswell as in out of school situations;

Begin to understand the processes that have shaped/continue to shape one's own sense of identity as 'student' and a 'person' located in multiple social contexts and roles;

Begin to become critically aware of 'self' and 'identity' and 'free' oneself through self-understanding, from tendencies that lead to crystallising and limiting of one's identity as a teacher and a human being; and

Reflect on one's aspirations and possibilities in order to develop a growing sense of agency as a 'teacher', a 'professional', as well as a 'human being'.

COURSE CONTENT

UNIT 1: SOCIALISATION

1. Understanding the nature and processes of socialisation

(i) At home: family as a social institution; parenting styles and their impact; transmission of parental expectations and values;

(ii) Socialisation and the community: neighbourhood, extended family, religious group and their socialisation functions; and

(iii) At school: impact of entry to school; school as a social institution; value-formation in the context of schooling.

UNIT 2: SELF CONCEPT AND IDENTITY

1. Self Concept: Meaning, Self concept in reference to parents expectation, Attitude towards members of the family, physical state of the child, Biological Maturation(Early-average-late), Impact of radio & television etc, school opportunities, school demands, religious affiliations, opinion of peers, family economic problems, family personal problems, attitude towards peers.
2. The influence of technology and globalisation on identity formation.

UNIT 3: SCHOOLING AND IDENTITY FORMATION:

1. Schooling as a process of identity formation: ascribed, acquired and evolving.
2. Factors influencing teacher-student relationship, Early school experiences in Identity formation
3. Role of the school in developing national, secular and humanistic Identities.

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

1. Social Complexities: Expanding human activities and relations; increasing complexity, homogenisation of culture versus preservation of distinctive identities; competition, uncertainty and insecurities and the resultant identity conflicts.
2. Role of education in coping with social complexities.

UNIT 5: EVOLVING AN 'IDENTITY' AS A TEACHER

1.The impact of one's own socialisation processes; awareness of one's own shifting identities as 'student', 'adult' and 'student-teacher'.

2.Reflections on one's own aspirations and efforts in becoming a 'teacher'. 3. Social image of the teacher in present context.

Practicum/Field Work(Any Two Activities)

1. Recall your childhood experiences about your social surroundings & recollect the persons who played an imposing role in forming your- self& identity.
2. Recall a situation where you find yourself ill -treated, write your experiences.
3. What you thought of teaching profession before joining this B.Ed. Program & what you think now after joining this program. Prepare a note focusing on your weaknesses & strengths.

Reference

1. Hart J W teachers and Teaching, Macmillan, New York
2. Medley, D M (1982), 'Teacher Effectiveness' in Encyclopaedia of Education Reasearch, 5th edn, Vol IV, 1894-1903
3. Elizabeth B.Hurlock, Personality Development, (1976) McGraw Hill, Inc, New York
4. Pradhan, Ramchandra (1984), Education for Peace and Human Rights: Search for an Indian perspective, Gandhi Marg, Special issues on Peace Education(1984), (Editor: R RDiwakar), Vol. VI(Nos. 4 & 5) Gandhi peace foundation, New Delhi, pp270-87
5. Das Gupta, S N 1969, History of Indian Philosophy, KitabMAhal, Allahbad
6. Chopra, R K (1993) Status of Teachers in India, NCERT, New Delhi
7. Saidain, K G (1997), Problems of Educational Reconstruction, Doaba Publishing House, Delhi

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Paper IV

Code 0258714

Health and Physical Education

Objectives:

The student teacher will be able to:

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

COURSE CONTENT

Unit-I Health and Body Functioning

1. Concept of health, importance, dimensions and determinants of health; Health needs of children and adolescents, including differently-abled children
2. Common health problems in India: Malnutrition, Obesity, Substance Abuse, Mental Health, diabetes, Hyper tension, Other serious health problems as Cardio Vascular, HIV-AIDs, Cancer etc.– causes, prevention and cure.

Unit-II Food, Nutrition and Diseases

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

3. Communicable and Non-communicable diseases; Reproductive and sexual health, hygiene, RTI, STI, HIV/AIDS, responsible sexual behaviour, measures to prevent diseases transmission; Harmful effects of self-medication and patient's rights.

Unit-III Physical fitness safety & Security

1. Physical fitness, strength, endurance and flexibility, its components, sports skills, indigenous and self-defence activities.
2. Safety and security — Training for disaster management, First-aid for snake and dog bites and animal attacks.

Unit-IV Sports &HealthAnd Yoga

1. Fundamentals skills of games and sports; Sports for recreation and competition; sports ethics; sports awards and scholarships, sports-personship
2. Rhythmic activities, Gymnastics and their impact on health.
3. Development of physical fitness; Postures; Importance of relaxation; Fitness tests; Resources and services for games and sports
4. Yogic practices — importance of yoga, yogasanas, kriyas and pranayams.
5. Management of stress and strain.

Unit-V: Role of Institutions

1. Role of institutions (school, family and sports), health services, policies and media in promoting sports and health activities.
2. Major health and physical education-related programmes.

Practicum/Field Work (Any two of the following)

(1) Conduct a BMI (Body Mass Index) Test of the class & maintain the record.
(2) Prepare a chart of the common diseases, their causes & cure. Explain it to students.
(3) Conduct a survey of any institute/organisation and find out the unhygienic places and corners there and also find out the remedial suggestions to make the place tidy.
(4) Organise a session of Yogasanas & Kriyas and after the completion of the session, mention how it felt to you.
(5) Paste some sports related newspaper/magazine cuttings in your file and share the contents in a session organised in the class.
(6) Write an essay on any favourite game of yours and state how it helped you in keeping mentally & physically fit and what you liked most about the game.
(7) Prepare a dietary plan for a child of pre-adolescent age with the help of doctor/expert & display it in school & prepare it as a document.

References

1. Ministry of Education India: sharirk Shikshan aur ki Rashtriya Yojna New Delhi., 1960
2. Mondson Joseph Ed : Techniques Physical Education Gerge G Harrap London 1950
3. Wakhankar D.G.: Manual of Physical education G Bell London 1967
4. Randall M.W.: Objectives in Physical Education G.Bell, London,1967
5. Cowell Charles C., and Schwehn Hind M.: Modern Principles and Methods in High school Physical Education Allyn and Bacon Honstio,1962
6. Shepard, N.M. ;Foundation and Principles of Physical Education Rounald Press New York

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

THIRD YEAR

2024-25

MAA SHAKUMBHARI UNIVERSITY
SAHARANPUR

B.Sc. III Year Physics

Course	Nomenclature	Number of Papers	Number of Periods per week	External	*Internal	**Practical	Total
Paper I	Electronics	1	2	40	10		50
Paper II	Relativity & Electrodynamics	1	2	40	10		50
PRACTICAL COURSE			4	40	10		50

Duration of examination of each theory papers 3 hours
Duration of examination of practicals 4 hours

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

**In practical examination out of 50 students have to score minimum of 20 marks to pass

Note: Each theory paper is divided in three parts i.e. Section-A, Section –B and Section–C.
Section-A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry of 1 mark. **Section –B**: Will consist of 10 questions. Each unit will be having two questions; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question carries 3.5 Marks.
Section-C: will consist of total 05 questions. Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question carries 7.5 Marks.

PAPER-I

Paper Code-0358701

ELECTRONICS

Unit I: Intrinsic and extrinsic semi-conductors, Fermi levels, mass-action law; carrier injection, recombination, diffusion and diffusion length, drift and diffusion currents, continuity equation; p-n junction, potential barrier, biasing, current-voltage relation, space charge and diffusion capacitances; varactor diode; Zener diode; tunnel diode; photovoltaic effect, solar cell.
Power supplies: Full wave and half wave rectifiers; ripple factor, voltage regulation; filters; Zener regulation.

Unit II: Network theorems – Thevenin, Norton, Maximum power transfer and Miller theorems. Bipolar junction transistors, Ebers-Moll equations; CB, CE and CC configurations, BJT characteristics; biasing and thermal stabilization, self bias; hybrid parameters of a two port network; small signal hybrid equivalent model of a BJT at low frequencies, current, voltage and power gains; input and output impedances; high frequency hybrid pi model, short circuit current gain, fβ and fα; current gain with resistive load.

Unit III: Field effect transistors, JFET, MOSFET, construction and characteristics; FETs as voltage Controlled Devices, small signal model. Large signal amplifiers, class A, B and C operations and efficiencies; distortions; determination of second harmonic distortion; push-pull amplifiers; impedance matching.

Unit IV: Negative Feedback: Current and voltage negative feedbacks; effect on stability, input and output impedances, distortion, frequency response; emitter follower.
Oscillators: Positive feedback, Barkhausen criterion; RC phase-shift oscillator; Hartley and Colpitts oscillators, UJT and sweep generators using UJT; Transistor as a switch and Astable multi-vibrator.

Unit V: Operational amplifiers, inverting and non-inverting; differential amplifiers, CMRR; measurement of OP AMP parameters; use of OP AMPs as adder, in analog integration and differentiation.
Digital circuits, Boolean algebra; AND, OR, NOT, NOR, NAND, XOR gates; logic gate circuits; realization of logic functions.

Books suggested:

1. J. Millman and CC Halkias: Integrated Electronics: Analog and Digital Circuits and Systems, Tata McGraw Hill.
2. A. Mottertshead: Electronic Devices and Circuits – An Introduction, Prentice Hall India.

PAPER- II

Paper Code-
0358702

RELATIVITY AND ELECTRODYNAMICS

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

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

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

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

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

Books suggested:

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

EXPERIMENTS FOR PRACTICAL WORK

Paper Code-
0358780

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

1. Study of dependence of velocity of wave propagation on line parameters using torsional wave apparatus.
2. Measurement of inductance of coil by Anderson's bridge.
3. Measurement of capacitance and dielectric constant of a liquid and gas by De-Sauty Bridge.
4. To determine the energy Band gap in a semiconductor using junction diode.
5. Study of the characteristics of a given transistor (PNP/NPN) in common emitter configuration and find the value of parameter of given transistor.
6. Study of the characteristics of a given transistor (PNP/NPN) in common base configuration and find the value of parameter of given transistor.
7. Study the characteristics of rectifier junction diode and Zener diode.
8. Study of ripple factor for shunt capacitor, series inductor, L-section and π section filters using full wave rectifier circuit.
9. Study of frequency response of single stage transistor amplifier (variation of gain with frequency).
10. Study the characteristics of field effect transistor (FET).
11. Study the negative feedback effect on voltage gain, and input and output impedances of the amplifier.
12. Study of operational amplifier (OP-AMP).
13. Design and study of RC phase shift oscillator.
14. Design and Voltage study of AND, OR, NOT, NAND and NOR gates circuits using diodes and transistors.
15. Study of RC circuits as integrating and differentiating systems with Square input.
16. Study of Hybrid Solar and wind energy.
17. Transient Analysis of C-R and L-R circuit.
18. Determination of parameter of transformer.

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

B.Sc. III Year Chemistry

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

Paper -I

Paper Code- 0358703

Inorganic Chemistry

Unit I: Chemistry of Transition Elements

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

Unit II: Coordination compounds

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

Unit III: f-Block elements

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

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

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

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

Unit V: Quantitative analysis

Types of quantitative analysis: Gravimetric and volumetric analysis.

Precipitation, Co-precipitation and Post precipitation.

Errors in chemical analysis: types of error and their minimization; Accuracy, Precision, Standard Deviation.

Books Recommended:

1. Inorganic Chemistry by SatyaPrakash
2. Inorganic Chemistry by B.R. Puri & L.R. Sharma

PAPER – II

Paper Code- 0358704

Physical Chemistry

UNIT I

Thermodynamics – I

First Law of Thermodynamics: statement, definition of internal energy and enthalpy. Joule-Thomson Effect, 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. Second Law of Thermodynamics: need for the law, different statements of the law. Carnot cycle and its efficiency, Carnot theorem. Numerical based on above concept.

UNIT II

Thermodynamics – II

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. Gibbs and Helmholtz function as thermodynamic quantities, Gibbs – Helmholtz equation. Equilibrium constant and free energy. Reaction isotherm and reaction isochore-Clapeyron equation and Clausius-Clapeyron equation, applications.

Third law of thermodynamics: Nernst heat theorem, Statement of third law and evaluation of absolute entropy from heat capacity data. Numericals.

UNIT III

Phase Equilibrium

Statement and meaning of the terms – phase, component and degree of freedom, Gibbs phase rule, phase equilibria of one component system- water and sulphur systems.

Phase equilibria of two component system- solid-liquid equilibria, simple eutectic – Pb-Ag systems, desiliverisation of lead.

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

Nernst distribution law – deviations from Nernst Law, applications to study of complex ion and solvent extraction.

UNIT IV

Electrochemistry – I

Conductance, Specific conductance and equivalent conductance. Activity, activity coefficient and ionic strength. 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 K_a of acids, determination of solubility product of a sparingly soluble salt, Conductometric titrations and their types.

UNIT V

Electrochemistry – II

Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode-reference electrodes- standard electrode potential, sign conventions. 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 (ΔG, ΔH and K). Concentration cell with and without transport (mathematical treatment), liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient.
Potentiometric titrations, Determination of pH using hydrogen, quinhydrone and glass electrodes. Numericals.

Books Suggested:

1. The Elements of Physical Chemistry, P.W. Atkins, Oxford.
2. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wiley Eastern Ltd.
3. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma and M.S. Pathania, Shobhan Lal Naginchand & Co.

PRACTICALS

Paper Code- 0358781

Inorganic Chemistry: [20]
Gravimetric analysis

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

Physical Chemistry [15]

Chemical Kinetics:

(i) To study the hydrolysis of an ester catalyzed by an acid and determine the rate constant and order
of reaction.
(ii) To study saponification of ester and determine the rate constant and order of reaction.
(iii) To study the reaction b/w acetone and iodine with respect to iodine and determine the rate and order of reaction.

Viva-Voce [5]

Internal (Sessional/Record) [10]

Books Suggested (Laboratory Courses):

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

BSc III
PAPER -I

Paper Code- 0358705

CELL BIOLOGY, GENETICS, PLANT BREEDING AND EVOLUTION

Unit I: History of cell biology: Concept of cell and cell theory. Cell cycle and its regulation. Mitosis and meiosis. Structural and molecular organization of cell. Structure and function of cell wall; plasmodesmata, plasma membrane; golgi complex, plastid, mitochondria, endoplasmic reticulum, peroxisomes, vacuoles and nucleus.

Unit II: Chromatin organization: Organization and structure of chromosomes. Concept of Nucleosomes, chromatin remodeling, Types of chromosomes and determination of sex in plants. Chromosome alteration: Structural alteration; deletion, duplication, translocation, inversion; numerical variation: aneuploidy and polyploidy. Molecular basis of mutation: Spontaneous and induced, brief account of DNA damage and repair. Introduction to epigenetics.

Unit III: Nature of inheritance; Laws of Mendelian inheritance and its exceptions. Crossing over and linkage analysis. DNA the genetic material: Structure and replication, brief account of DNA- protein interaction. Definition of a gene-modern Concept of gene (Promoter, coding sequences, terminator). RNA polymerases and general transcription. Regulation of gene expression in prokaryotes and basics of gene regulation in eukaryotes.

Unit IV: Origin of Agriculture, Centers of origin of crop plants and centers of Diversity. Concepts of Centers and Non-center (Harlan Hypothesis) Principles of plant breeding- Domestication, Introduction, Selection, Clonal propagation, Hybridization, Mutation breeding; Breeding work done on wheat; Green revolution; Assessment and Consequences; Biodiversity and Conservation of germplasm.

Unit V: Theories of Evolution: Catastrophism, The Lamark's theory, Darwin's theory, Evidences of organic evolution, mechanism of evolution. Origin of basic biomolecules evolution of prokaryotic and eukaryotic cell and Origin of species. Population genetics: Allele and genotype frequency, HardyWeinberg principles.

Suggested Laboratory Exercises

Cytology

1. Study of cell structure from onion leaf peels
2. Comparative study of cell structure in onion cells and Hydrilla
3. Smear preparation of root tips for different stages in Allium root tip
4. Cytological examination special types of chromosomes (Slides)
5. Examination of electron micrographs of eukaryotic cells and cell organelles Genetics
1. Working out laws of inheritance using seed mixtures
2. Monohybrid, dihybrid and test crosses using seed samples

Plant Breeding

1. Demonstration of Emasculation techniques.

Suggested Readings

Alberts, B., Bray, D ., Lewis, J., Raff, M., Roberts, K. and Watson, I.D. Molecular Biology of cell. Garland Publishing Co., New York, USA

Chaudhary, H.K. Elementary Principles of Plant Breeding, Oxford & IBH Publishing New Delhi.

Gupta, P.K. A Textbook of cell and Molecular Biology, Rastogi Publications, Meerut, 2016.

Gupta, P.K. Cytology, Genetics, Evolution and plant Breeding, Rastogi, Publication Meerut, 2016.

Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J. Molecular Cell Biology, W.H. Freeman & Co. New York, USA Miglani, G.S. Advanced Genetics , Narosa publishing Co., Inc., USA

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

Shukla, R.S. and Chandel, P.S. Cytogenetics, Evolution and Plant Breeding, S. Chand & Co. Ltd., New Delhi

Singh B.D. Textbook of plant Breeding.Kalyani Publishers, Ludhiana,1999

Sinha, U. and Sinha, S. Cytogenetics, Plant Breeding and Evolution, Vikas Publishing House, New Delhi, 1997

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

BSc III
PAPER -II

Paper Code-
0358706

ECOLOGY AND ENVIRONMENTAL BIOLOGY

Unit I: Plants and Environment: Atmosphere (gaseous composition), water (properties of water cycle), light (global radiation, phytosynthetically active radiation), temperature, soil (development, soil profiles, physico-chemical properties) and biota. Morphological, anatomical and physiological responses of plants to water (hydrophytes and xerophytes), temperature (thermoperiodicity and vernalization), light (photoperiodism, heliophytes and sciophytes) and salinity

Unit II: Population ecology: Concept and characters, growth curves, biotic potential, ecotypes and ecads. Seed: The significance, suspended animation; ecological adaptation and dispersal strategies Community ecology and Succession: Community characteristics, frequency, density, cover, life forms and biological spectrum. Succession: concept, classification and examples (hydrosere & xerosere)

Unit III: Ecosystems and Productivity: Ecosystem — Structure, abiotic & biotic components, food chain, food web, ecological pyramids, energy flow, biogeochemical cycles of carbon, nitrogen, phosphorus and Sulphur. Productivity: Primary productivity, its measurements and factors affecting primary productivity

Unit IV: Environmental Biology of Indian Desert: Climate, vegetation types, adaptive strategies of desert plants. Desertification: meanings, causes, critical issues & driving forces. Agroforestry and its impact on desert agriculture. Desert biodiversity, Geomorphology, natural resources exploitation and their impact on desert environment

Unit V: Pollution Ecology: Definitions, classification, air, water and land pollution. Concepts of Industrial Ecology in pollution management. Global warming : Concepts and current status. Phytogeography: Vegetation types of India — Forest and Grasslands. Biogeographical regions of India, Remote sensing: The basics and applications in ecological studies

Suggested Laboratory Exercises

1. To determine minimum number of quadrats required for reliable estimation of biomass in herbaceous vegetation
2. To study the frequency of herbaceous species and to compare the frequency distribution with Raunkaier's Standard frequency diagram
3. To estimate Importance Value Index for herbaceous vegetation on the basis of relative frequency, relative density and relative biomass in protected and Gochar land
4. To measure the vegetation cover of grassland through point frame
5. To measure the above ground plant biomass in a natural field
6. To determine diversity indices (richness Simpson, Shannon-Weaver) in natural fields
7. To estimate bulk density and porosity of soil samples
8. To determine moisture contents, water holding capacity and texture of soil samples
9. To estimate qualitatively nitrate, phosphate and potassium in soil samples
10. To study the vegetation structure through profile diagram
11. To estimate transparency and pH of different water bodies

12. To measure dissolved oxygen content in polluted and unpolluted water samples
13. To estimate salinity, hardness, carbonates and bicarbonate in different water samples
14. To determine the percent leaf area injury of different leaf samples collected around polluted site
15. To estimate dust holding capacity of the leaves of different plant species
16. Plant adaptive modifications: Specimens/Slides: i) Succulents: Opuntia, Euphorbia ii) Salt secretion: *Atriplex, Chloris* iii) Salt accumulation: *Suaeda, Salsola, Zygophyllum* iv) Xerophytes: *Calligonum, Capparis, Leptadenia, Parkinsonia* v) Hydrophytes: *Eichhornia, Nymphaea, Hydrilla*

Suggested Readings

Dash, M.C. Fundamental of Ecology, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1996
Kormondy, E.J. Concepts of Ecology, Prentice – Hall of India Pvt., New Delhi, 1996
Kumar, H.D. General Ecology, Vikash Publishing House Pvt. New Delhi, 1995
Mukherjee, B. Environmental Biology, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1997
Odum, E.P. Basic Ecology, Sauders, Philadelphia, 1983
Sen, D.N. Environment and Plant Life in Indian Desert, Geobios International, Jodhpur, 1982
Sharma, P.D. Ecology and Environment, Rastogi Publications, Meerut 2016

Practical

Paper Code- 0358782

Time : 4 Hours

Max. Marks : 50
Min. Pass. Marks : 18

Q. 1. Prepare a suitable preparation of the given plant material (A) to observe any two visible stages of mitosis. Draw labeled diagrams of the same. Submit the slide for evaluation. 8

Q. 2. Perform the Ecological experiments allotted to you by lots and report the results in suitable form (Major). 10

Q. 3. Perform the Ecological experiments allotted to you by lots and report the results in suitable form (Minor). 5

Q. 4. Identify and comment upon the given spots 1 to 6 (covering all disciplines of Two Theory Papers) 2x6 = 12

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Q. 5. Practical record 5

Q.6. Internal Assessment 10

B.Sc. Zoology III year

Paper	Paper code	Name of the Paper	Period/ Week	External	Internal	Total
I	0358707	Cell Biology and Genetics	3	40	10	50
II	0358708	Animal Physiology and Biochemistry	3	40	10	50
III	0358783	Practical	6	40	10	50

Duration of each theory paper 3 hours
Duration of examination of practical (for both papers on same day) 4 hours

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

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

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

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

PAPER I

Paper Code- 0358707

Cell Biology and Genetics

Unit 1: Characteristics of prokaryotic and eukaryotic cells, Characteristics of cell membrane molecules, fluid-mosaic models of Singer and Nicolson, passive and active transport, Structures and functions of endoplasmic reticulum, ribosome, Golgi complex, lysosome, mitochondria, centriole, microtubules and nucleus.

Unit 2: Structure of Chromatin and Chromosomes, semiconservative mechanism of replication, elementary idea about topoisomerases, replication forks, leading and lagging strands, RNA primers and Okazaki fragments, RNA structure and types, mechanism of transcription, Genetic Code and protein synthesis.

Unit 3: Interphase nucleus and cell-cycle including regulation.

Mitosis: Phases and process of mitosis, structure and function of spindle apparatus, Theories of cytokinese.

Meiosis: Phases and process of meiosis, synaptonemal complex, formation and fate of chiasmata recombination and significance of crossing over.

Unit 4: Mendelism: Brief history of genetics and Mendel's work: Mendelian laws, their significance and current status, linked gene inheritance.

Chromosomal aberration: Structural - translocation, inversion, deletion and duplication; Numerical - haploidy,

diploidy, polyploidy, aneuploidy, euploidy, polysomy and genetic implications.

Unit 5: Genetic interaction: supplementary genes, complementary genes, duplicate genes, multiple gene interaction, ABO blood groups and their genotypes, Multiple alleles.

PAPER II

Paper Code- 0358708

Animal Physiology and Biochemistry

Unit 1: Digestion; digestive enzymes, process of digestion, digestion of protein, carbohydrate and lipid

Blood: Composition and functions, Blood groups, Rh factor and their significance, blood clotting mechanism, blood pressure and cardiac cycle, respiratory pigments, cardiac muscle activity.

Unit 2: Muscle: Structure of various types of muscles and mechanism of muscle contraction
Excretion: Structure of kidney, types of nephrons, mechanism of urine formation and its elimination and arginine, ornithine cycle.

Unit 3: Respiration: Structure of lung, mechanism of respiration, respiratory pigment, exchange and transport of oxygen and carbon dioxide.
Nervous System: Structure of neuron and its classification, Nerve impulse, impulse conduction and reflex action.

Unit 4: Endocrine glands: Structure and functions of various endocrine glands, diseases caused by hormonal deficiency; Mechanism of hormone action.

Unit 5: Structure of Protein and Carbohydrates; oxidation of glucose through glycolysis, Krebs cycle and oxidative phosphorylation, deamination, transamination and decarboxylation.

Practical

Paper Code- 0358783

1.Test for protein, lipid and carbohydrate.
2.Temporary acetocarmine squash preparation of chromosomes
3.Haemoglobin estimation of mammalian blood
4.Preparation of haemin crystals
5.Osmotic effect of R.B.C.
6.Preparation of mammalian blood film and identification of different types of blood cells
7.Determination of blood groups and Rh-factor
8.To determine the rate of oxygen consumption of rat
9.Analysis of urine for sugar, protein and pH
10.Estimation of E.S.R.
11.Demonstration of amylase activity
12.Estimation of packed cell volume [PCV]
13.Demonstration of working of pH meter
14.Demonstration of working of colorimeter
15.Measurement of blood pressure

Distribution of Marks
Maximum Marks: 50 Minimum Pass Marks: 17

Practical exercises	**Marks**
Physiological Experiment	13
Biochemical test.	07
Cell biology exercise	05
Spotting	10
Viva-voce	05
	40

Internal (sessional/ practical record)	10
Total	50

Recommended Books:

1.Srivastava, H.S. : Elements of Biochemistry, Rastogi Publications, Meerut
2.Goel, K.A. and Shastry, K.B. : Animal Physiology, Rastogi Publication, Meerut

3.Dalela, R.C. : Animal Physiology, S. Chand & Co. Ltd., New Delhi
4.Agarwal, R.A., Srivastava, Anil Kumar and Kaushal Kumar: Animal Physiology and Biochemistry, S. Chand & Co. Ltd., New Delhi
5.Kulshrestha, V.V. : Experimental Physiology, Vikas Publishing House, New Delhi
6.Samasiviah, I. et.al. : Text Book of Animal Physiology and Ecology, S. Chand & Co. Ltd., New Delhi
7.Verma, P.S., Tyagi, B.S. and Agarwal, V.K.: Animal Physiology, S. Chand & Co. Ltd., New Delhi
8.Hoar, S.: General and Comparative Physiology, Prentice Hall of India Pvt. Ltd.
9.Wood, D.W.: Principles of Animal Physiology
10.Prosser, C.B.: Comparative Animal Physiology, Satish Book Enterprise
11.Eckert, Animal Physiology. (W.H. Freeman)
12.Alberts, B. *et.al*. *The Cell* (Garland).
13.Lodish, H., *et.al*. *Molecular Cell Biology* (Freeman).
14.Gupta, P. K., Genetics, Rastogi Publications, Meerut.
15.Rastogi, Veer Bala, Cell Biology, Kedar Nath Ram Nath, Delhi.
16.De Robertis, E. D. P. and De Robertis, E. M. F.: *Cell and Molecular Biology*, Halt Saunder, Tokyo, Japan.
17.Gardner, E. J.: *Principles of Genetics*, John Wiley & Sons, New York.

B.Sc. B.Ed. Part III
Mathematics

Paper I : Mechanics – I
(Statics and Dynamics of a Particle)
Paper II : Abstract Algebra

Exam. Hours: 03:00 **Max. Marks: 60**

Paper - I (Paper Code- 0358709)
Title: Mechanics – I (Statics and Dynamics of a Particle)

Unit 1: Resultant and equilibrium of coplanar forces acting on a rigid body. Friction.

Unit 2: Stable and Unstable equilibrium. Forces in three dimensions, Poinsot's central axis, Wrenches.

Unit 3: Virtual work and common catenary.

Unit 4: Velocities and accelerations along radial and transverse directions and along tangential and normal directions. Simple harmonic motion and motion under inverse square law.

Unit 5: Motion on smooth and rough plane curves, circular and cycloidal motions. Central forces and central orbits (excluding planetary motion).

SUGGESTED BOOKS

S.L. Ioney : Statics
R.S. Verma: A Text Book on Statics; S. Chand & Co., New Delhi.
S.L. Loney: Dynamics of a particle & Rigid bodies.
Ray, M: A Text book on Dynamics; S. Chand & Co., New Delhi

Paper - II (Paper Code- 0358710) Title: Abstract Algebra

Exam. Hours: 03:00 **Max. Marks: 60**

Unit 1: Definition and example of groups. General properties of groups, Order of an element of a group. Permutations: Even and Odd permutations. Groups of permutations. Cyclic group, Isomorphism, Isomorphism of cyclic groups, Cayley's theorem.

Unit 2: Subgroups, Cosets, Lagrange's theorem, Product Theorem of subgroups, Conjugate elements, conjugate complexes, Centre of a group, Normaliser of an element and of a complex. Normal subgroups, quotient Groups, Commutator subgroup of a group. Homomorphism, Fundamental theorem of homomorphism.

Unit 3: Definition and kinds of rings, Integral domain, Division ring, Field, Subring of a ring, Subfield of a field. Characteristic of a ring and field.

Unit 4: Ideals of a ring, Quotient rings, Prime fields, Prime ideals, Field of quotients of an integral domain, Definition and examples of a vector space, subspace of a vector space, Linear combination and linear space, Linear dependence and independence of vectors. Direct product of vector spaces and internal direct sums of subspaces.

Unit 5: Bases and dimension of a finitely generated spaces, Quotient space, Isomorphism, Linear transformation (Homomorphism), Rank and nullity of linear transformation.

SUGGESTED BOOKS

Sharma, G.C.: Modern Algebra; Ram Prasad & Sons, Agra.
Agarwal, R.S.: Text Book on Modern Algebra; S. Chand & Co., New Delhi.

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

B.ED. THIRD YEAR

2024-2025

MAA SHAKUMBHARI UNIVERSITY
SAHARANPUR

(Choose any two pedagogy papers out of Mathematics, Physical Science, Chemistry, Biological Science and General Science in B.Ed. III & IV Year)

Evaluation Plan for B.Ed. Third Year

B.Ed.-Papers with External weight-age of 80 Marks (3 hours duration)

1. **Internal weightage of 20 marks will be divided as under:**

Assessment in the papers with internal weight-age of 20 marks will be divided in following parts.

(i) Subject based presentation 05 marks

(ii) Subject based Assignment 05 marks

(iii) Internal Test 05 marks

(iv) Regularity and Punctuality 05 marks

For theory paper of **50 Marks** , the component of **internal assessment will be reduced to its half**.

S.N	Paper	Name of the Paper	External	Internal	Total
1	First	Teaching, Learning & Assessment	80	20	100
2	Second	Gender Issues in Education	80	20	100
3	Third	Pedagogy Course I(Part I)	40	10	50
4	Fourth	Pedagogy Course II(Part I)	40	10	50
	Grand Total				300
		EPC, Practicum and Internship (4 weeks) (1)) EPC-Art and Aesthetics (2) EPC-Reading and Reflecting on Text (3) Five Micro Teaching Lessons in each Pedagogy (4) Five Simulated Teaching Lessons in each Pedagogy (5) Real classroom Teaching of 20 Lessons in each Pedagogy (6) Peer observation and Reporting **(7)** Criticism Lessons (8) Action Research/Case study (Any one)		20 20 10 10 40 20 20 10	150
	Grand Total				450

In Third year of B.Sc B.Ed, School internship will be of four weeks.

1. **EPC- Arts and Aesthetics**
   Objectives: To enable student-teachers to-
   gain direct experiences, develop motor skill, make students believe in the dignity of labour, to nurture children's creativity and aesthetic sensibilities.
   Activities: An artist or artisam may be invited to organize a workshop on Art & Aestretics. The student-teachers may be asked to prepare atleast 5-items of different categories: - Paper meshing Pot Decoration Wall hanging Paper cutting Flower making Candle Making Stiching Knitting Embroidery Soft toys making Paper framing Weaving or printing of textiles Making of poster Making of Rangoli Making of Puppets etc.
2. **EPC: Reading and Reflecting on Texts**
   Objectives: To enable student-teachers to- develop study – habits, develop skill of reading &writing, develop skill of summarization, develop skill of note-taking.
   Activities: Student-teachers are expected to sit in the library regularly and to review at least 10-books of different categories in about 500 word each. These may be as follows – Review of text books related to core courses Review of reference Book related to core courses Review of Text Books related to Pedagogy courses Review of Reference to Book related to Pedagogy courses. Review of Policy Documents, Autobiography, Commission Reports, etc. Review of studies about school, historical books and other educational miscellaneous books.
3. Candidate has to practice five skills in each pedagogy (assigned by college) in **micro teaching**. Each Skill will be performed twice as teach and reteach. They have to maintain the record of the micro lessons delivered.
4. Candidate has to practice five lessons in each pedagogy in **simulated teaching condition.**
5. **Real-Class Room Practice Teaching:** The student-teachers will be attached to a particular school, where they will deliver twenty (20) lessons in each pedagogy. These lessons will be observed by subject-supervisors daily, which will provide them feedback for the modification of their behavior. This shorter period is to provide the student-teachers adequate exposure to have a 'feel' of dealing with Real teaching-learning. It will help him/her to develop the basic teaching skill required to deal with students effectively in classroom.
6. **Peer Observation and Reporting:** Each students teacher will observe 10 lessons in each pedagogy of his/her peer during real class room teaching and maintain its record
7. There will be two criticism lessons (one in each pedagogy subject) for the progressive assessment of the student-teacher.
8. The student-teacher will have to do an Action Research or a Case Study (Any one) as assigned by the concerned supervisor and will submit the report.

Paper Pattern:

1. The format for the marking scheme for question papers in theory courses (Maximum Marks=80) in external written examination shall be as follows:
Total =80 marks
Section A: Three Questions with internal choices

(Three Questions of Sixteen marks each, 3x16=48)

Section B: Four out of Eight Questions

(Four Questions of Four marks each, 4x4=16)

Section C: Eight out of Ten Questions

(Eight Questions of Two marks each, 8x2=16)
2. The format for the marking scheme for question papers in theory courses (Maximum Marks=40) in external written examination shall be as follows:
Total =40 marks
Section A: Two Questions with internal choices

(Two Questions of Twelve marks each, 2x12=24)

Section B: Two out of Four Questions

(Two Questions of Four marks each, 2x4=08)

Section C: Four out of Six Questions

(Four Questions of Two marks each, 4x2=08)

B.Ed

Paper-I

Code 0358711

Teaching, Learning & Assessment

Objectives:

The student teacher will be able:

To develop scientific attitude for the process of teaching & learning.

To provide an overall view on teaching & learning style and ideas to enhance these activities. To develop insight for perfect teaching by its overall perspectives in detail.

To understand assessing children's progress, both in terms of their psychological development and the criteria provided by the curriculum.

Understand the different dimensions of learning and related assessment procedures, tools and techniques. Analyse, Manage and interpret assessment data.

Assessment for culturally responsive in diverse classroom.

Develop critical understanding of issues in assessment and explore, realistic, comprehensive and dynamic assessment process which are culturally responsive for use in the classroom.

Develop enabling processes which lead to better learning and more confident and creative learners.

Understand the critical role of assessment in enhancing learning Critiques the traditional purpose of assessment (as a mechanism to filter learners as per their abilities or potentials and thus reducing learning to a limited set of expertise that can be displayed on papers, assessment as a selective and competitive act and achievement as an outcome of individual's innate factors.)

COURSE CONTENT

Unit -1 <u>Effective Teaching and Teaching style:</u>

1. Effective Teaching: concept of Teaching, Meaning of effective Teahing, Component and Parameters of Effective Teaching.

2. Teacher behaviour and classroom climate (Flanders' interaction analysis system) Teacher behaviour, effect of Verbal and Non-Verbal behaviour of Teacher on students' learning.
3. Teaching Style: - Concept, Types and effect on learners' learning process, factor affecting teaching Style.

Unit-2 Micro –Teaching, Teaching Skills and Instructional Strategies-

1. Micro teaching-Concept, meaning, characteristics, Phases, Micro-teaching cycle,
2. Teaching Skills-meaning and characteristics; Introduction skill, skillof reinforcement, Skill of probing in Questioning, Skill of Stimulus Variation, Blackboard Writing Skill

Unit -3 Learning and Learning Style::

1. Learning – Meaning, and characteristics, factors influencing learning, principles of learning,

2. Role of motivation in learning – Concept, Motivational Strategies to be used in classroom teaching.
3. Learning Style: - concept, Types and importance in Teaching –Learning process, factors affecting learning style.

Unit -4 Concept And Types of Assessment:-

1. Meaning & concept of assessment, Measurement and Evaluation and Their Interrelationship, Purpose of Assessment (Prognostic, Monitoring of Learning, Providing Feedback, Promotion , Diagnosing), Principles of Assessment.
2. Classification of assessment: Based on purpose (Prognostic, Formative, summative and Diagnostic), Scope (Teacher made, Standardized) Attribute measured (Achievement, Aptitude, Attitude, etc), Nature of information gathered (Qualitative, Quantitative) Mode of response (Oral and written, Nature of interpretation (norm referenced, criteria referenced).
3. Continuous and Comprehensive Evaluation: Concept, Need and Process.
4. Grading: Concept, types and Application, Indicators for grading Psycho-Social dimensions of assessment.
5. Individual appraisal through portfolio.

Unit -5 Assessment Devices and practices:-

1. Use of projects, Assignments, Worksheet, Practical Work, and Performance based activities, seminars and reports as assessment devices.
2. Assessment of Group Processes – Cooperative Learning and Social Skills. 3. Self, Peer and Teacher Assessment.
4. Types of questions; Essay type, Short answer type, Objective type.
5. Construction of achievement test.
6. Analysis and interpretation of student's performance; calculation of percentage, measure of central tendency, percentile & percentile rank, graphical representations.

Group-A PRACTICUM/FIELD WORK (Any Two from the following):

1. Write a report about some best teachers in your past experiences & write some special features of their ways of teaching.

2. Prepare an achievement test of any subject from upper primary to senior secondary level, give suggestions for improvement.
3. Presentation of papers on examination and evaluation policies. 4. Individual appraisal of a school student through portfolio.
5. Prepare an annual plan for continuous and comprehensive evaluation of any subject at upper primary to secondary level.

2.

References

1- Siddiqui, mujebulhasan, 2009, teachings of teaching (classroom teaching). APH publishing, New Delhi.
2- Mathur, Dr. S.S, Mathur, Dr. Anju.2007-2008 development of learner and teaching learning process, agraw publication Agra.
3- Rao. V.K, reddy, R.s.1992, learning and teaching commonwealth publishers, New Delhi.
4- Bhatnagar, Dr. A.B, bhatnagar, Dr.Meehakshi, bhatnagaranurag, 2008, Development of learner and teaching learning process, R.lal book, depot, Meerut.

Paper-II

Code 0358712

Gender Issues in Education

Objectives:

The student teacher will be able to:

- Develop basic understanding and familiarity with key concepts–gender, gender bias, gender stereotype, empowerment, gender parity, equity and equality, patriarchy and feminism.
- Understand the gradual paradigm shift from women's studies to gender studies and some important landmarks in connection with gender and education in the historical and contemporary period.
- Learn about gender issues in school, curriculum and textual materials across disciplines, pedagogical processes and its intersection with class, caste, religion and region.
- Understand how gender, power and sexuality are related to education (in terms of access, curriculum and pedagogy).
- Develop an understanding of the paradigm shift from women studies to gender studies, based on the historical backdrop.
- Student to construct critically the impact of policies programmes and scheme for promotion of gender equality and empowerment.
- Apply the conceptual tools learnt regarding gender and sexuality to understand issues related to Sexual Harassment at the workplace and Child Sexual Abuse.
- Develop an understanding of different theories on gender and education and relate it to power relations. The institutions involved in socialisation processes would be analysed to see how socialisation practices impact power relations and identity formation.
- Understand how gender relates to education and schooling. The students will be able to understand on how school as an institution addresses gender concerns in curriculum, textual materials and pedagogy. It will enable the student to draw linkages between life skills and sexuality.

COURSE CONTENT

Unit 1: <u>Gender Issues: Key Concepts</u>

1. Concepts: Gender, Sex, Sexuality, Patriarchy, Masculinity and Feminism
2. Issues: Gender Bias, Gender Stereotyping and empowerment.
3. Equity and equality in relation with caste, class, religion, ethnicity, disability and regional disparity.

Unit 2: <u>Gender Studies: Paradigm Shifts</u>

1. Paradigm shift from women's studies to gender studies.
2. Landmarks in Gender Studies: Recommendations of policy initiatives, commissions and committees, schemes, programmes and plans.

Unit 3: <u>Gender, Power And Education in Indian Context</u>

1. Theories on Gender and Education
   - Socialisation theory
   - Gender difference

- Structural theory
- Deconstructive theory

2. Gender Identities and Socialisation Practices in: Family, Schools, Society.
3. Schooling of Girls: Inequalities and resistances (issues of access, retention and exclusion).

Unit 4: Gender Issues In Curriculum

1. Gender, culture and institution: Intersection of class, caste, religion and region
2. Gender stereo types in curriculum framework & Text-Books.
3. Teacher as an agent of change in the context of gender sensitivity.

Unit 5: Gender, Sexuality, Sexual Harassment and Abuse

1. Linkages and differences between reproductive rights and sexual rights.
2. Development of sexuality, including primary influences in the lives of children (such as gender, body image, role models).
3. Sites of conflict: Social and emotional.
4. Understanding the importance of addressing sexual harassment in family, neighbourhood and other formal and informal institutions.
5. Agencies perpetuating violence: Family, school, work place and media (print and electronic).
6. Institutions redressing sexual harassment and abuse.

Practicum/Field Work (Any two from the following)

1. Observe a co-educational class room and pick out the gender biased behaviour/situation/comments and conclude the report.
2. List some examples of gender discrimination in the prevalent society.
3. Conduct an interview of a girl student facing inequality and resistances in family and society and also mention how it affects her aspirations.
4. Debate on women role models in various fields with emphasis on women in unconventional roles.
5. Prepare a biography a women role model of yours and also mention how she phased out her life struggle.

References

1. Delpit, L.D. (2012) Multiplication is for white people: raising expectations for other people's children, the new press.
2. Deng, Z (2013) School subjects and academic disciplines. In A. Luke, A. Woods &Wer (Eds.), Curriculum syllabus design and equity A primer and model. Routledge.
3. GOI. (1966).Report of the education commission: Education and national development. New Delhi: ministry of education.
4. GOI (1986).National policy of education.GOI.
5. GOI. (1992, 1998), National policy on education, 1986 (As modified in 1992). Retrieved from http://mhrd.gov.in/sites/upload_files/mhrd/files/NPE86-mod92.pdf
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7. Nirantar. (2010) textbook regimes: A feminist critique of nation and identity. New Delhi
8. A. banon. Robent (2010) social psychology,pearson education New Delhi
9. Goswami. Acharyabalchand, (2003), vyaktiprivar and sex jaina publication Jaipur.
10. Mathursavitri (2008), sociological foundation of education, kavitaprakashan, jaipur.

11. Sidhuramindra, (2009), sociology of education, shrisaiprintographers, New Delhi
12. Mudgal S.D. (2007), social work education today and tomorrow, book enclave, jaipur
13. Nathpramanikrathindra, (2006), gender Lhequality and women's empowerment,abhijeet publication Delhi
14.Malik, C.D, (2008) social and political thought Dr. B.R. ambedkar,arise publishers and distriba, New Delhi
15. Naik, S.C.(2005) society and environment, oxford & 1B publishing co.Pvt.ltd.New Delhi
16. Runelasatypal, (2009), sociogy of the Indian education, rajadthanhindigranthakadmi, jaipur
1. www.teachernetwork.org/tnli/accomplishment
2. www.gender.com.ac.uk
3. www.genderstuddies.org.
4. www.genderparddigm.com/publiscation/html.
5. www.sparknotes.com/sociology/socialization/section4/rhtml.
6. www.unicef/org/sower96/ngirls.html.
7. www.jaipurrugs.org./about/our-story.

Paper-VI & VII
Pedagogy of
Mathematics (Part I)
Code 0358713

OBJECTIVES:

The students will be able to-

1. Gain insight into the meaning, nature, scope and objectives of mathematics education.
2. Appreciate mathematics as a tool to engage the mind of every student.
3. Understand the process of developing the concepts related to Mathematics.
4. Appreciate the role of mathematics in day to day life.
5. Learn important mathematics: mathematics more than formulas and mechanical procedures.
6. Pose and solve meaningful problems.
7. Construct appropriate assessment tools for evaluation mathematics learning.
8. Understand methods and techniques of teaching mathematics.
9. Perform pedagogical analysis of various Topics in mathematics at secondary level.
10. Understand and use I.C.T. in teaching of mathematics.
11. Understand and use continuous and comprehensive evaluation, diagnostic testing and remedial teaching in Mathematics.

COURSE CONTENTS

Unit: 1 Nature, Aims and Objectives of Mathematics Teaching

1. Nature of mathematics – building blocks of mathematics (Concept, objectives, variables, function & relation, symbolization).
2. Importance of mathematics in school curriculum.
3. Aims and objectives of teaching mathematics at secondary level.
4. Writing objectives in behavioral terms. Bloom's taxonomy (revised).

Unit: 2 Methods and Techniques of Mathematics Teachng

1. Methods of teaching mathematics at secondary level – (a)Lecture cum demonstration

(b)Inductive-
Deductive (c)
Problem Solving
(d) Project
(e) Heuristic
(f)Analytic & Synthetic

2. Techniques of teaching mathematics
(a) Oral work
(b) Written work
(c) Drill work
(d) Home assignment

Unit: 3 Pedagogical analysis and Lesson Planning

1. Pedagogical analysis of the units with reference to concepts, learning objectives, activities and learning experiences and evaluation techniques.
2. Lesson Planning: Meaning, Purpose, Approaches of Lesson Planning (Herbartian, RCEM, Evaluation, Constructivist).

Unit: 4 Assessment & Evaluation of Mathematics learning

1. Concept of Assessment and Evaluation.
2. Continuous and compressive evaluation (CCE) in mathematics (Formative and Summative Assessment).
3. Diagnostic Testing and Remedial Teaching.
4. Construction of achievement test/question paper in mathematics.

Practicum/Field Work-

Any two of the following-

1. Prepare a Concept map related to any theme of Mathematics and Explain how it facilitates teaching and learning.

2. Prepare a project related to Mathematics and report your steps.
3. Prepare a power point presentation on brief history and contribution of two mathematicians.
4. Conduct a group activity on any topic of mathematics and report your Experiences.
5. Observation of Mathematics class-room teaching in any secondary school and prepare a list of errors committed by students.

REFERENCES

1. Mangal, S.K. SadharanGanitShikshan, Arya Book Depot, New Delhi.
2. Bhatnagar A.B. New Dimensions in the teaching of Maths, Modern Publishers, Meerut.
3. Jain S.L.: GanitShikshanSansthan, Hindi Granth Academy ,Jaipur.
4. Agrawal S.M. Teaching of Modern Mathematics DhanpatRai& Sons, Delhi.
5. Jagadguru Swami: Vedic Mathematics, MotiLalBanarasidas Publisher, Delhi
6. Kapur J.N. Modern Mathematics for Teachers, Arya Book Depot, New Delhi

Paper-VI & VII
Pedagogy of Physical Science
(Part I)
Code 0358714

Objectives-

Student-teachers will be able to:-

1. Gain insight on the meaning, natureand scope of physical science for determining aims and strategies of teaching-learning.
2. Appreciate that science is a dynamic and expanding body of knowledge;
3. Trace historical background of Physical sciences.
4. Identify and relate everyday experiences with learning physical science;
5. Appreciate various approaches of teaching-learning of physical science;
6. Perform Pedagogical analysis of various topics in Physical Sciences.
7. Analyze the contents of Physical science with respect to Content, process, skills, knowledge organization and other critical issues.
8. Use effectively different activities/demonstrations/laboratory experiences for teaching-learning of physical science;
9. Integrate physical science knowledge with other school subjects.
10. To understand meaning, concept and various types of assessment.

COURSE CONTENT

Unit 1: Nature, Aims and Objectives of Physical Science Teaching

1. Concept and Nature of Physical Science.
2. Importance of Physical Science in school curriculum.
3. Aims & objectives of Physical Science Teaching at school level.
4. Writing objectives in behavioural terms. Bloom's taxonomy (revised).

Unit 2: Methodology of Teaching of Physical Science-

Lecture –cum -Demonstration, Team teaching, project method, problem solving method, Group discussion, Programmed instruction, Inductive- Deductive, Investigatory approach, Concept mapping, Collaborative learning, and Experiential learning in Physics: Facilitating learners for self-study.

Unit 3: Pedagogical Analysis and Lesson Planning

1. Pedagogical analysis of the units with reference to concepts, learning objectives, activities and learning experiences and evaluation techniques of following.
2. Lesson Planning: Meaning, Purpose, Approaches of Lesson Planning (Herbartian, RCEM, Evaluation, Constructivist).

Unit 4: Assessment & Evaluation of Physical Science learning

1. Concept of Assessment and Evaluation.
2. Meaning, concept and construction of Achievement test,

3. Continuous and Comprehensive Evaluation (CCE); Formative and Summative Assessment.

4. Assessment of project work in Physics (both in the laboratory and in the field).

5. Performance-based assessment; learner's record of observations, Oral presentation of learners work, portfolio.

6. Developing assessment framework in Physics; assessment of experimental work in Physics.

Practicum/Field Work-

Any two of the following-

1. Prepare a concept map on any topic and explain how it Facilitates Students' Learning.
2. Description and Design of an Improvised Apparatus
3. Planning an out of class activity to use local resources to teach Physics and report your experiences.
4. Prepare a plan to assess Students' Practical work in Physics.

References

1.Heiss, Oburn and Hoffman: Modern Science, the Macmillan Company, New York 1961. 2. Thurber W. and A. Collette: Teaching Science in Today's Secondary schools, Boston Allyan and Bacon Inc., New York, 1959.

3. Vaidya, N. "The Impact of Science Teaching", Oxford and IBH Publishing Company, New Delhi, 1971.

4. Richardson, S.: "Science Teaching in Secondary Schools", Prentice Hall, USA, 1957.

5. Sharma, R.C. and Sukla: "Modern Science Teaching" DhanpatRai and Sons, Delhi, 2002. 6. Ravi Kumar S.K., "Teaching of Science", Mangal deep Publications 2000.

7. Rao Aman: Teaching of Physics, Anmol Publications, New Delhi, 1993.

8. Wadhwa Shalini: Modern Methods of Teaching Physics, Sarup and Sons, New Delhi, 2001. 9. Gupta S.K. : Teaching Physics Sciences in Secondary Schools, Sterling Publishers (P) ltd.,

Paper-VI & VII
Pedagogy of
Chemistry (Part I)
Code 0358715

Objectives-

Student-teachers will be able to:-

1.Gain insight on the meaning and nature of chemistry for determining aims and strategies of teaching-learning.
2. Appreciate that science is a dynamic and expanding body of knowledge.
3. Appreciate the fact that every child possesses curiosity about his/her natural surroundings.
4. Identify and relate everyday experiences with learning chemistry.
5. Trace historical background of Chemistry..
6. Appreciate various approaches of teaching-learning of chemistry.
7.Analyze the contents of Chemistry with respect to Content, process, skills, knowledge organization and other critical issues.
8. Perform Pedagogical analysis of various topics in Chemistry.
9.Use effectively different activities/ demonstration/laboratory experiences for teaching-learning of chemistry.
10. Integrate chemistry knowledge with other school subjects.
11. To understand meaning, concept and various types of assessment.

COURSE CONTENT

Unit 1: Nature, Aims and Objectives of Chemistry Teaching

1. Concept and Nature of Chemistry.
2. Importance of Chemistry in school curriculum.
3. Aims & objectives of teaching Chemistry at school level.
4. Writing objectives in behavioural terms. Bloom's taxonomy (revised).

Unit 2: Methodology of Teaching Chemistry

Lecture –cum Demonstration, Team teaching, project method, problem solving method, Heuristic method, Group discussion, programmed instruction, Inductive- Deductive, investigatory approach, Concept mapping, Collaborative learning, and Experiential learning in chemistry: Facilitating learners for self-study.

Unit 3: Pedagogical Analysis and Lesson Planning

1. Pedagogical analysis of the units with reference to concepts, learning objectives, activities and learning experiences and evaluation techniques.
2. Lesson Planning: Meaning, Purpose, Approaches of Lesson Planning (Herbartian, RCEM, Evaluation, Constructivist).

Unit 4: Assessment & Evaluation of Chemistry learning

1. Meaning, concept and construction of Achievement test, Diagnostic testing and remedial teaching.
2. Continuous and Comprehensive Evaluation (CCE) in Chemistry (Formative and Summative Assessment).
3. Assessment of project work in work in Chemistry (both in the laboratory and in the field)
4. Performance-based assessment; learner's record of observations, field diary,. Oral presentation of learners work, portfolio.
5. Developing assessment framework in Chemistry; assessment of experimental work inChemistry.

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

1. Perform Some Simple Experiment to clarify any Concept in Chemistry and to develop Observation Skills. Prepare a report of entire activity.
2. Write a reflective notel on some innovative trends in Chemistry teaching and their importance in Achieving aims of teaching chemistry at different level.
3. Prepare an achievement test and apply it in school, after discussion with concerning teacher and give remedial measures.

References-

1. Yadav, M.S.1995, Teaching of Chemistry, Anmol Publication, New Delhi. 2. Megi, J.S. &Negi, Rasuita, 2001, Teaching of Chemistry.
3. Yadav,M.S. 2000: Teaching Science at Higher level, Anmol Publications, New Delhi.
4. Misra, D.C. : Chemistry Teaching, Sahitya Preparation, Agra
5. Khirwadbar, Anjab 2003: Teaching of Chemistry by Modern Method, Sarup& Sons. New Delhi.
4. Das, R.C., 1985: Science Teaching in Schools, Sterling publishers Pvt. Limited. New Delhi 7. Venkataih, S., 2001: Science Education in 21st Century, Anmol Publishers, New Delhi.
8. Rao,D.B., 2001 : World conference on Science Education Discovery publishing work, New Delhi.
9. Singh,U.K&Nayab, A.K. : 2003 : Science Education, Commonwealth Publishers, Daryaganj, New Delhi.
10. Singh,Y.K.& Sharma Archnesh, 2003 : Modern Methods of Teaching Chemistry A.P.H. Publishing corporation, Daryaganj,New Delhi.

Paper-VI & VII
Pedagogy of Biological Science
(Part I)
Code 0358716

Objectives-

Student-teachers will be able to:-

1. Develop insight on the meaning and nature of biological science for determining aims and strategies of teaching- learning.
2. Appreciate that science is a dynamic and expanding body of knowledge.
3. Appreciate the fact that every child possesses curiosity about his/her natural surroundings.
4. Identify and relate everyday experiences with learning of biological science.
5. Appreciate various approaches of teaching- learning of biological science.
6. Explore the process, skill in science and role of laboratory in teaching- learning.
7. Use effectively different activities / experiments/ demonstrations / laboratory experiences for teaching-learning of biological science.
8. Integrate the biological science knowledge with other school subjects.
9. Analyze the contents of biological science with respect to Content, process, skills, knowledge organization and other critical issues.
10. Perform Pedagogical analysis of various topics in Physical Sciences.
11. Develop process-oriented objectives based on the content themes/units.
12. To understand meaning, concept and various types of assessment.

COURSE CONTENT

Unit 1: Nature, Aims and Objectives of Biological Science Teaching

1. Concept and Nature of Biological science.
2. Importance of Biological science in school curriculum.
3. Aims & objectives of teaching Biological science at school level.
4. Writing objectives in behavioural terms. Bloom's taxonomy (revised).

Unit 2: Methodology of Teaching Biological science

1.Lecture –cum Demonstration, Team teaching, Project method, Problem solving method, Inquiry approach, Programmed instruction, Investigatory approach, Concept mapping,

Collaborative learning, and Experiential learning in biological science: Facilitating learners for self-study.

Unit 3: Pedagogical Analysis and Lesson Planning

1. Pedagogical analysis of the units with reference to concepts, learning objectives, activities and learning experiences and evaluation techniques.
2. Lesson Planning: Meaning, Purpose, Approaches of Lesson Planning (Herbartian, RCEM, Evaluation, Constructivist).

Unit 4: Assessment & Evaluation in Biological Sciences

1. Meaning, concept and construction of Achievement test
2. Continuous and Comprehensive Evaluation (CCE): Formative and Summative Assessment in Biology.
3. Assessment of project work in biology (both in the laboratory and in the field)
4. Performance based assessment: learners' record of observations, field diary, herbarium and collection of materials.
5. Oral presentation of learners' work in biological science, portfolio.
6. Developing assessment framework in biological science; assessment of experimental work in biological science.

Practicum/Field Work **(Any Two of the following)-**

1. Preparation of Scrap book to show the Contribution of any two Biologist
2. Conduct any activity among students for linking child's natural curiosity with natural phenomena like weather, flora and fauna; contexts. Report your Observations.
3. Prepare a low cost or waste material based experiment for secondary/ senior secondary schools.
4. Prepare a plan to assess Students' Practical work in Biology.

References-

1. Sood, J.K., 1987: Teaching Life Sciences, KohaliPublisher, Chandigarh.
2. Sharma, L.M., 1977: Teaching of Science & Life Science, DhanpatRai&Sons,Delhi
3. Kulshrestha, S.P., 1988: Teaching of Biology,Loyal Book Depot ,Meerut
4. Yadav K., 1993: Teaching of Life Science, AnmolPublisher, Daryaganj Delhi.

5. Yadav,M.S., 2000 : Modern Methods of Teaching Science, Anmol Publishers, Delhi.
6. Singh, U.K.&Nayab, A.K., 2003: ScienceEducationCommonwealth Publishers, Daryaganj,New Delhi
7. Venkataih, S., 2001: Science education in 21st century Anmol Publishers, Delhi
8. Yadav,M.S.(Ed.), 2000 : Teaching Science at Higher Level, AnmolPublishers,Delhi
9. Ediger,Marlow&Rao, D.B., 2003 : Teaching Science Successfully Discovery Publishing House, New Delhi
10. Mangal, S.K., 1996: Teaching of Science, Arya Book Depot, New Delhi
11. Dave,R.H., 1969 : Taxonomy of Educational objectives & Achievement Testing, London University Press, London.
12. Sood,J.K., 1989 : New Directions in Science Teaching, Kohli Publishers, Chandigarh.

Paper-VI & VII
Pedagogy of General Sciences
(Part I)

Code 0358717

Objectives-

Student-teachers will be able to-

1. Understand General Science as an interdisciplinary area of learning.
2. Understands aims and objectives of teaching General Science at different levels.
3. Explore different ways of creating learning situations for different concepts of science:
4. Formulate meaningful inquiry episodes, problem-solving situations, investigatory and discovery learning projects based on upper primary, secondary and higher secondary stages.
5. Facilitate development of scientific attitudes in learners.
6. Examine different pedagogical issues in learning science. 6. Stimulate curiosity, inventiveness and creativity in science.
7. Develop ability to use science concepts for life skills.
8. Develop competencies for teaching, learning of science through different measures.
9. Construct appropriate assessment tools for evaluating learning of science.
10. Understands the CCE pattern of Evaluation.

COURSE CONTENT

Unit 1: Nature, Aims and Objectives of General Science Teaching

1. Concept and Nature of General science.
2. Importance of General science in school curriculum.
3. Aims& objectives of teaching General science at secondary level.
4. Writing objectives in behavioural terms. Bloom's taxonomy (revised).

Unit 2: Methodology of Teaching General science

1.Methods and devices of teaching General science at secondary level – Lecture-cum- Demonstration, Project, Problem solving,Heuristic, Laboratory method.
2. Techniques of teaching General Science

Unit 3: Pedagogical Analysis and Lesson Planning

1.Pedagogical analysis of the units with reference to concepts, learning objectives, activities and learning experiences and evaluation techniques.

2. Lesson Planning: Meaning, Purpose, Approaches of Lesson Planning (Herbartian, RCEM, Evaluation, Constructivist).

Unit 4: Assessment & Evaluation of General Science learning

1. Meaning and concept of assessment and Evaluation.
2. Meaning, concept and construction of Achievement test, diagnostic test and remedial teaching.
3. Continuous and Comprehensive Evaluation (CCE) in Science: Formative and Summative Assessment.
4. Difficulties Faced by the teacher in evaluation process and suggestive measures to overcome them.

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

1.Prepare a concept map on any theme of General Science and explain its importance for Teaching and learning.
2.Collect Information about Indian Cultural traditions and find out the scientific basis or hidden concern for life and preservation of environment.
3.Being a Science teacher how you will remove superstitions from the Society. Report your Strategic planning.
4.Prepare an Achievement Test and apply it in school, after discussion with concerning teacher and give remedial measures.

References-

1. Sood, J.K. (1987): Teaching Life Sciences, Kohli Publishers, Chandigarh.

2. Sharma, L.M. (1977): Teaching of Science and Life Sciences, DhanpatRai& Sons, Delhi. 3. Kulshreshtha, S.P. (1988): Teaching of Biology, Loyal Book Depot, Merrut

4. Yadav, K. (1993): Teaching of Life Science Anmol Publishers, Daryaganj, Delhi.

5. Yadav, M.S. (2000): Modern Methods of Teaching Sciences, Anmol Publishers, Delhi

6. Singh, U.K.&Nayab, A.K. (2003) :ScienceEducationCommonwealth Publishers, Daryaganj, New Delhi

7. Venkataih, S. (2001): Science Education in 21st Century, Anmol Publishers, Delhi.

10. Yadav, M.S. (Ed.) (2000): Teaching Science at Higher Level, Anmol Publishers, Delhi. 9. Edger, Marlow &Rao, D.B. (2003): Teaching Science Successfully, Discovery Publishing House, New Delhi.

11. Mangal, S.K. (1996): Teaching of Science, Arya Book Depot, and New Delhi.

12. Dave, R.H.: (1969): Taxonomy of Educational Objectives and Achievement Testing, LondonUniversity Press, London.

13. Sood. J.K. (1989): New Directions in Science Teaching, Kohli Publishers, Chandigarh.

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

FOURTH YEAR

2025-2026

MAA SHAKUMBHARI UNIVERSITY
SAHARANPUR

(Choose any one subject out of Physics, Chemistry, Mathematics, Zoology ,Botany)

Physics

FOURTH YEAR

Course	Nomenclature	Number of Papers	Number of Periods per week	External	*Internal	**Practical	Total
Paper I	Nuclear Physics	1	2	40	10		50
Paper II	Solid State Physics	1	2	40	10		50
Paper III	Statistical Mechanics & Thermal Physics	1	2	40	10		50
PRACTICAL COURSE			4	60	15		75

Duration of each theory paper 3 hours
Duration of practical examination 4 hours

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

**In practical examination out of 50 marks students have to score minimum of 20 marks to pass

Note: Each theory paper is divided in three parts i.e. Section-A, Section –B and Section–C.
Section-A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry of 1 mark.
Section –B: Will consist of 10 questions. Each unit will be having two questions; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question carries 3.5 Marks.

Section-C: will consist of total 05 questions. Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question carries 7.5 Marks.

PAPER-I

Paper Code-0458701

STATISTICAL AND THERMAL PHYSICS

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

Unit II: Canonical ensemble, Boltzmann canonical distribution, partition function, a two state system, paramagnetic susceptibility, heat capacity, Boltzmann formula for entropy, average energy and fluctuations, free energy, adiabatic interaction, enthalpy, general interaction, Gibbs free energy, first law of thermodynamics, phase transitions, Clausius-Clapeyron equation.
Ideal Classical Gas, Maxwell velocity and speed distributions, partition function, entropy (Sackur-Tetrode relation), Gibbs paradox; equation of state, ideal gas temperature scale, Vander-Waal's equation of state; heat capacities of monatomic and diatomic gases, ortho and para hydrogen.

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

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

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

Books suggested:

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

PAPER-II

Paper Code-0458702

SOLID STATE PHYSICS

Unit I: Crystal structure: Different terms of crystal structure, Fundamental types of lattices, Two and three dimensional lattice types; Seven system of crystals, Characteristics of sc, bcc, fcc, hcp; Miller indices, orientation of planes in cubic lattices; Distribution of Atoms in atomic planes of cubic lattices. Distance between successive planes; Von-Laue's equations of diffraction of X- rays, Bragg's Law, scattering from lattice of point-atoms. Scattering factor. Geometrical Scattering factor for sc, bcc, fcc. Reciprocal lattice and its properties.

Unit II: Crystal binding and lattice vibrations: Inter-atomic forces of solids. Crystal of inert gases, cohesive energy and bulk modulus. Ionic crystals, Madelung energy and bulkmodulus. Covalent crystals. Hydrogen bonded crystals, Atomic radii. Concept ofphonons Vibration of monotomic lattices, lattice with two atoms per primitive cell. Localphonon modes. Density of states in one dimension, three dimensions, lattice heat capacityfor Einstein model, Debye model.

Unit III: Free Electron theory of metals: Free electron model, Density of states of electron gas, Fermi-Dirac distribution function, effect of temperature on Fermi-Dirac distribution function, Fermi energy at absolute zero temperature and low temperature. Electron heat capacity. Thermionic emission. Boltzmann transport equation, Sommerfeld theory of electrical conductivity, Thermal conductivity, Wiedmann-Franz Law. Hall effect.

Unit IV: Band theory: Formation of bands and origin of energy gap, Bloch theorem, Kronig Penney model, crystal momentum and velocity of an electron. Effective mass of electrons. Electrons and holes. Number of states in a band, insulator, semi-conductor and metal. Construction of Brillouin Zones and Fermi-surfaces. Fermi levels in intrinsic, n- type and p-type semi-conductors, Mass action Law. The static dielectric constants of solids. Local electric field at an atom.

Unit V: Magnetism: classical theory of diamagnetism and classical theory of Para-magnetism, free electron theory. Molecular theory of ferromagnetism. Experimental Survey of Superconductivity: Zero resistance, persistent currents, and effect of magnetic fields, flux exclusion, Intermediate state, Entropy effect, frequency effects, Gyromagnetic ratio, and Isotope effect. Occurrence of superconductivity. Thermoelectric effects, thermal conductivity. High temperature oxide, superconductors and their properties.BCS theory (elementary idea without mathematical derivation), Magnetic levitation.

Books Suggested:

2. Kittel: Introduction to Solid State Physics, Wiley Eastern.
3. A.J. Dekker: Solid State Physics, McMillian India.
4. L. Azaroff: Theory of Solids.

PAPER-III

Paper Code-
0458703

NUCLEAR PHYSICS

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

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

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

Unit IV: Alpha decay: Disintegration Energy, Range of α-particles, Geiger Nuttal's Law. α-spectrum and fine structure. Long range α- particles, α- particles paradox–Barrierpenetration, Gamow Theory of α-emission. Beta Decay: β -ray spectrometer (principle and working). β -ray spectrum; and itsqualitative explanation. Nuclear Energy: Nuclear induced fission, energy released in fission of U 235. Fission chain reaction, Neutron cycle in a thermal reactor. Four factor formula. Elementary idea of nuclear reactors. Nuclear fusion; fusion in stars, carbon and pp cycle problems of controlled fusion.

Unit V: Radiation Detectors: Introduction of various Methods used in detection of nuclear radiation. Detailed description of principle and working of following detectors based on detection of free-charge carriers – (i) Ionization Chamber, (ii) Proportional Counter, [iii) Geiger- Muller Counters, dead time, recovery time and paralysis time. Particle accelerators: Principle and working of Vande-Graff Generators Cyclotron and linear accelerators. Elementary Particles: Properties of particles, Classification into leptons, mesons and baryons, conservation laws (only qualitative discussion) energy, momentum, angular momentum, charge, Lepton numbers, Iso-spin, Strangeness and Baryon number. Quark model (only qualitative idea).

Books suggested:

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

EXPERIMENTS FOR PRACTICAL WORK

Paper Code-0458780

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

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

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

CHEMISTRY

FOURTH YEAR

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

CHEMISTRY

PAPER – I

Paper Code-0458704

Inorganic Chemistry

UNIT I

Metal-Ligand bonding in transition metal complexes:

Valence bond theory of complexes and its limitation, Crystal field theory, Crystal field splitting of energy levels in octahedral, tetrahedral and square planer complexes, crystal-field stabilization energy of octahedral complexes (Calculation Only).

UNIT II

Hard and soft Acid Base Concept (HSAB): Classification of acid and base as hard and soft. Pearson's HSAB concept and its application.

Magnetic properties of transition metal complexes: Types of magnetic behaviour, magnetic properties of metal complexes, spin only formula, methods of determining magnetic moment and magnetic susceptibility.

UNIT III

Stability of metal complexes: A brief outline of thermodynamic stability of metal complexes and factors affecting the stability. Kinetic stability, labile and inert complexes, colour of transition metal complexes, effective atomic number (EAN), pi accepter ligands, experimental determination of stability constant and composition of complex (Job's Method and Bjerrum's Method).

UNIT IV

Organometallic Chemistry: Defination, nomenclature and classification of organometallic compounds, bonding, preparation, properties and application of organometallic compounds of Li, Al, Hg and Sn (alkyls and aryl).

Bioinorganic Chemistry: Essential and trace elements in biological processes, Biological role of alkali (Na, K, Li) and alkaline earth (Mg, Ca) metals.

UNIT V

Basic principles of Metallurgy and metallurgical processes. Metallurgy of Copper, Zinc, Platinum and Uranium from their main ores.

Books Recommended:

1. Inorganic Chemistry Part I and part II by N.C. Sogani, M.L. Sharma, G.K.Rastogi
2. Inorganic Chemistry by G.C. Shivhare, V.P. Lawania
3. Text Book of Inorganic Chemistry by P.L. Soni
4. Text Book of Inorganic Chemistry by Satya Prakash, Tuli& Madan

PAPER II

Paper Code-0458705

ORGANIC CHEMISTRY

Unit I: Spectroscopy

Nuclear magnetic resonance (NMR) spectroscopy.

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

Unit II:

Heterocyclic Compounds

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic

substitution reactions in pyridine derivatives. Comparison of basic nature of pyridine, piperidine and pyrrole.

Introduction to condensed five and six–membered heterocycles. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

Unit III: Carbohydrates

Classification and nomenclature. Monosaccharides, interconversion of glucose and fructose,

chain lengthening and chain shortening of aldoses. Configuration of monosaccharides.

Erythro and threo diastereomers. Conversion of glucose into mannose, mechanism of osazone formation, Formation of glycosides, ethers and esters. Cyclic structure of D (+)-glucose.

Determination of ring size of monosaccharides, Mechanism of mutarotation. Structures of ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose and lactose) and

polysaccharides (starch and cellulose) without involving structure determination.

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

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

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

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

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

Books Recommended:

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

PAPER III

Paper Code-0458706

PHYSICAL CHEMISTRY

Unit I: Elementary Quantum Mechanics

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

Adsorption: Difference between adsorption, absorption and sorption, Chemisorption, adsorbent and adsorbate, reversible and irreversible adsorption, characteristics of

adsorption, adsorption of gases by solids, factors affecting adsorption, types of adsorption, types of adsorption isotherms, Freundlich and Langmuir adsorption isotherms. Numericals

Unit II: Spectroscopy

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

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

Unit III: **Vibration and Raman Spectroscopy**

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

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

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

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

Unit V: Solid State

Crystal state, classification of crystals, space lattice, unit cell.

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

X-ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method). Numericals.

Books Suggested:

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

Practical

Paper Code-0458781

Laboratory Course

Inorganic Preparations (Two): [10]
Micro cosmic salt., Tetraaminecopper(II) sulphate, Nickel ammonium sulphate, Sodium thiosulphate, Chrome Alum, Ferrous Sulphate, Ferrous Ammonium Sulphate

Volumetric analysis [15]
Redox Titrations:
(i) To determine the strength of given unknown solution of oxalic acid against standard potassium permanganate solution.
(ii)To determine the strength of given unknown solution of ferrous ammonium sulphate against potassium dichromate using potassium ferricyanide as an indicator.

Organic Chemistry:

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

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

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

(ii) Preparation of iodoform from ethanol and acetone.

(iii) Preparation of methyl orange.

Physical Chemistry [15]

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

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

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

Viva-Voce [5]
Internal (Sessional/Record) [10]

Books Suggested (Laboratory Courses):

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

B.Sc. IV Year Paper I

Paper Code-0458707

PLANT SYSTEMATICS

Uint 1. Cladistics: Systematics (concept & definitions); Bioststematics; Phylogeny & Ontogeny. Concept of Clade, Lineages; Grade; Clan; Monophyly & Semaphoront. Need of Cladistics, Component of Cladogram, How to read the tree/cladogram?**,** Clades at different hierarchical level, Identification of Clade, Crown clade, Total Clade; Anagenesis & Cladogenesis.

Unit 2. Phylocode: Preamble & Principles (with explanation) of Phylocode. Formulation & Illustrations of Phylogenetic definitions and naming of clades, Specifiers, qualifying clause. Parts of protologue (complete name/clade entry). Comparison of Traditional & Phylocode.

Unit 3. Clades in Angiosperm: Apomorphies of Monocots and Dicots, APG, Characteristics, Classification & Phylogeny of ANA/ANITA grade, Mesanangiospermae, Paleoherbs, Magnoliidae, Monocotyledoneae (Commelinidae), Eudicotyledoneae, Superrosidae, (Rosidae, Fabidae, Malvidae); Superasteridae (Asteridae Campanulidae, Lamiidae).

Unit 4. Variation & Speciation: Isolation: Definitions, classification & Mechanism. **Variations**: Definitions, Types & mechanism. **Speciation:** Definitions, causes, types & mode. Evolution of Flower, Origin & Evolution of Flowering Plants. Cradle of Flowering Plants

Unit 5. Data for plant Systematics: Taxonomic Evidence: Morphology, Phytochemistry and Cytology & Palynology. Methodologies for Revisionary studies, Structure and Role of Chloroplast Genome in Plant Systematics; Mitogenomics and Mitochondrial Genome in Plant Systematics; Nuclear Ribosomal DNA: Structure and use in Systematics. DNA barcoding.

Suggested Readings:

1. Barry G. Hall. (2007). Phylogenetic Trees Made Easy: A How-To Manual, Third Edition. Sinauer Associates, Inc., Publishers, Sunderland, USA.
2. Christenhusz, M. J. M., Chase, M. W. and Michael F. F. (2017). Plants of the World: An Illustrated Encyclopedia of Vascular Plants. University of Chicago Press.
3. Angiosperm Phylogeny Group, (2016). An update of the Angiosperm Phylogeny Group Classification for the orders and families of flowering plants: APG IV. Botanical Journal of the Linnaean Society, 181: 1-20.
4. Cronquist, A. (1968). The Evolution and Classification of Flowering Plants. Houghton Mifflin. Boston.
5. Davis, P.H., & Heywood V. H. (1965). Principles of Angiosperm Taxonomy. Oliver & Boyd. Edinburgh.
6. Hutchinson, J. (1973). The Families of Flowering Plants. 3rd Edition. Oxford University Press. Oxford.
7. Jain, S.K. & Rao R. R. (1977). A Handbook of Field and Herbarium Methods. Today and Tomorrow's Printers and Publishers, New Delhi.
8. Jones, S.B., & Luchsinger, A.E. (1987). Plant Systematics. 2nd Edition. McGraw-Hill Book Company. New York.

9. Judd, W. S., Campbell, C. S., Kellog, E. A., Stevens, P. F & Donoghue, M. J. (2015). Plant Systematics – A phylogenetic approach. Sinauer Associates, Inc, Massachusetts, USA
10. Lawrence, G.H.M. (1951). Taxonomy of Vascular Plants. The Macmillan Company. New York.
11. Naik, V. N. (2000). Taxonomy of Angiosperms. Tata McGraw – Hill Publishing Company Limited, New Delhi.

12. Radford, A.E., Dickinson, W.C., Massey, J. R. & Bell, C.R. (1974). Vascular Plant Systematics. Harper & Row. New York.
13. Simpson, M. G. (2006). Plant Systematics. Elsevier Academic Press, California, USA.
14. Singh, G. (2019). Plant Systematics: An Integrated Approach (4th Edition) CRC Press of Tailor and *Taylor* & Francis.
15. Sivarajan, V.V. (1989). Introduction to Principles of Plant Taxonomy. Oxford and IBH Publishing Co. New Delhi.
16. Soltis, D. E., Soltis, P.S., Endress, P. K. & Chase, M.W. (2017). Phylogeny and Evolution of Angiosperms. Sinauer Associates, Inc, Massachusetts, USA/ University of Chicago Press.
17. Stace, C.A. (1989). Plant Taxonomy and Biosystematics. Edward Arnold, London.
18. Stuessy, T. F. (2002). Plant Taxonomy. Bishen Singh Mahendra Pal Singh, Dehra Dun, India.
19. Takhtajan, A. (1969). Flowering Plants, Origin and Dispersal. Tr. Jeffery, Edinburgh.
20. Takhtajan, A. (1987). Flowering Plants, Origin and Dispersal: the cradle of the Angiosperms revisited. pp. 26-31 in Whitmore, T.C. Biogeographical Evolution of the Malay Archipelago. Clarendon Press, Oxford.
21. Takhtajan, A. (1997). Diversity and Classification of Flowering Plants. Bishen Singh and Mahendra pal Singh, Dehra Dun, India.
22. Winston, J. E. (1999). Describing Species: Practical Taxonomic Procedure for Biologists. Columbia University Press New York.
23. Radford, A.E. (1986). Fundamental of Plant Systeamtics. Harper and Row, Publisher, Inc.

Suggested Practical Exercises

1. Writing of technical descriptions.
2. Construction of keys.
3. Identification of local species using Floras, keys and campus field trips.
4. Identification of common families using diagnostic characters. Illustrate diagnostic characters.
5. Construction of phylogentic tree based on gene sequences available at NCBI database (each student may be given different gene sequences/taxa).
6. Construction of Cladogram on the basis of given characters.

BSc IV year PAPER II

Paper Code-0458708

PLANT PHYSIOLOGY AND BIOCHEMISTRY

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

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

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

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

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

Suggested Laboratory Exercises

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

Suggested Readings

Dennis, D.T., Turpin, D.H., Lefebvre, D.D. and Layzell (eds.). Plant Metabolism (2nd ed.), Longman, Essex, England, 1997

Galston, A.W. Life processes in Plants, Scientific American Library, Springer-Verlag, New York, USA, 1989

Hopkins, W.G. Introduction to Plant Physiology, John Wiley & Sons, Inc., New York, USA, 1995

Lea, P.J. and Leegood, R.C. Plant Biochemistry and Molecular Biology, John Wiley & Sons, Chichester, England, 1999

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

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

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

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

Suggested Readings (for Laboratory Exercises)

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

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

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

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

Scot, R.P.W. Techniques and Practice of Chromatography Marcel Dekker, Inc., New York, 1995
Wilson, K. and Goulding, K.H. A Biologists Guide to principles and techniques of Practical Biochemistry, Edward Arnold, London, 1986.

BSc IV Year Paper III

Paper Code-0458709

PLANT BIOTECHONOLOGY AND MOLECULAR BIOLOGY

Unit I: Cell theory and concept of totipotency and pluripotency. Introduction, History and application: plant tissue culture and biotechnology. Genes, genomics and proteomics: General introduction. Basic tools and techniques of molecular biology: History of genetic manipulation, restriction enzymes, ligases, electrophoresis (Agarose and PAGE) and PCR. General introduction and applications of DNA finger printing, bioinformatics and Nano Biotechnology.

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

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

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

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

Suggested Laboratory Exercises

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

Suggested Readings

Bhojwani, S.S. Plant Tissue Culture: Application and Limitation, Elsevier Science Publishers, New York, USA, 1990
Old, R.W. and Primrose, S.B. Principles of Gene Manipulation, Black well Scientific Publications, Oxford, U.K., 1986
Raghavan, O. Embryogenesis in Angiosperms: A Developmental and Experimental Study, Cambridge University, Press, New York, USA, 1986
Vasil, I.K. and Thorpe, T.A. Plant Cell and Tissue Culture, Kluwer Academic Publishers, The Netherlands, 1994

Suggested Readings (for Laboratory Exercises)

Ball, R.D. (ed.) Plant Cell Culture Protocols, Humana Press, Inc. New Jersey, USA, 1999
Dixon, R.A. (ed.) Plant Cell culture: A Practical Approach, IRL, Press Oxford, 1987
Glick, B.R. and Thompson, J.E. Methods in Plant Molecular Biology and Biotechnology, CRC Press, Boxa Raton, Florida, 1993

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

(Practical Examination)

Paper Code-0458782

Time : 4 Hours

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

Q. 1. Perform the Physiological experiments allotted to you by lots and report the results in suitable form (Major) 8

Q. 2. Perform the Physiological experiments allotted to you by lots and report the results in suitable form (Minor) 5

Q. 3. Prepare culture medium and aseptically inoculate Explants/ Extract DNA from the given plant material. 5

Q. 4. Construction of Cladogram/Phylogenetic tree on the basis of given data 5

Q. 4. Identify and comment upon the given spots 1 to 6 (covering all disciplines of Two Theory Papers) 2x6 = 12

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Q. 5. Practical record 5

Q. Internal Assessment 10

B.Sc. IV Year

Course	Paper code	Name of the Paper	Period/ Week	Ext	Int	Total
I	0458710	Ecology and Behavior	3	40	10	50
II	0458711	Applied Zoology	3	40	10	50
III	0458712	Biostatistics and Bioinformatics	3	40	10	50
IV	0458783	Practical	6	60	15	75

Duration of each theory paper 3 hours
Duration of examination of practical (for both papers on same day) 4 hours

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

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

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

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

PAPER- I
Paper ode-0458710
Ecology and Behaviour

Unit 1: Introduction of ecology, definition, history, sub division and scope of ecology. Environmental factors; physical factors- soil, water, air and temperature. Biotic factors- interspecific and intraspecific relations, neutralism, mutualism, commensalism, antibiosis, parasitism, predation, competition. Concept of limiting factors, Liebig's law of minimum, Shelford's law of tolerance, combined concept of limiting factors.

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

Food chain, food web, Ecological pyramid. Energy flow in an ecosystem, biogeochemical cycles of CO_2, N_2, O_2, S and P; Prospects and strategies of sustainable development.

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

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

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

PAPER II
Paper ode-0458711

Applied Zoology

Unit 1: Poultry keeping: Types of poultry breeds, poultry housing, farm and farm management, system of poultry farming; Grading, handling and marketing of eggs; Poultry diseases and Vermiculture; Methodology and products.

Unit 2: Sericulture: Different kinds of silk producing insects in India and its potentialities, Host plants of silk insects, Grainage, rearing and life cycle, Breeding and various diseases of silkworm, Reeling and fiber technology, Economics of sericulture.

Unit 3: Apiculture: Different kinds of honey bees found in India and, their identification. Identification of Queen, worker and drone, Importance of keeping bees in artificial hives and different kinds of hives, Care and management of bee colonies, Bee enemies and their control, Extraction and processing of honey from the comb, Utility and economics of production of honey, Honey bees and pollination strategy in agricultural crops.

Unit 4 : Pest Management : Insect pests of important crops (cotton, Rice, sugar cane & pulses), insect pest of veterinary and medical importance, pest outbreaks and assessment of losses caused by the insect pests on crops; population dynamics of insect pests; Principles of Biological, mechanical and cultural methods of pest control, Integrated Pest Management (IPM), Principles of pest control by pesticides, Important vertebrate pests, birds and mammals with special reference to rodents and their management.

Unit 5: General principles of aquaculture; transportation of fish seed and brooders, Induced Breeding, composite fish culture, Lay out of fish farm and its management, By-products of fishing industry; Prawn culture; Management of water bodies for aquaculture.

PAPER-III
Paper ode-0458712

Biostatistics and Bioinformatics

Unit 1 a. Biostatistics – Basic concepts, Fundamentals of measurements, Qualitative & Quantitative Variables, Collection, Classification, Tabulation & Presentation of data. b. Measures of Central Tendency – objectives of Averages, Various Measures of Central Tendency (Mean, Median, Mode) and their Merits & Demerits, Choice of suitable Averages.

Unit 2 a. Measures of Dispersion – Objective of measuring variability, Properties of good measure of dispersion, Types of measure of dispersion, Merit & demerits of Standard Deviation.

b. Correlation Analysis – Importance of Correlation Analysis, Types of Correlation, Measures of Correlation, Regression Analysis, Difference between Correlation & Regression, Regression of Y on X and X on Y.

c. Test of Significance – Testing of Hypothesis, Errors in Hypothesis Testing, Level of Significance, Chi-square test, 'Z' test &'t' test, Analysis of variance, Probability Distribution (Poisson, Binomial & Normal).

Unit 3 a. Bioinformatics – Introduction, Components of Computer, Number System, Logic Gates, Flow Chart, Comprehension of C & its programming.
b. Basics for operating system (Windows), MS-Word, Power Point, MS-excel, Introduction of Data Base Management System (DBMS).
c. Internet – Basics for Biologists (Electronic mail, Electronic Mail Servers, Downloading files with anonymous File Transfer Protocol, Gopher, WWW, Mosaic.
Unit 4: Primary Database, Secondary Database, Sequence Databases (European Molecular Biology Laboratory, GenBank, DNA Data Base of Japan (DDBJ), SWISS-PORT, Protein Information Resource, TREMBL), Protein Family/Domain Databases (Prosite, Pfam & Prints), Submitting sequence to Database and information retrieval through ENTREZ.

Unit 5: Sequence Database – Collecting & Storing Sequences, Local alignment, Global Alignment, BLAST (BLASTP, BLASTN, BLASTX, TBLASTN, TBLASTX), Phylogenetic Prediction, Gene Prediction & Analysis.

Practical
Paper ode-0458783

1.Study of different spraying and dusting equipment
2.Use of pesticides and precautionary measures
3.Measurement of temperature and relative humidity
4.Estimation of soil moisture
5.Estimation of water holding capacity of different soils
6.Ecosystem study: Aquarium
7.Pond water study to identify zoo-planktons and their permanent preparations
8.Permanent preparation of any two stored grain pests. Two parasitic insects and termites.
9.Honey bee: Permanent preparation of pollen basket and mouth parts
10.Permanent preparation of mouth parts of butterfly, moth, mosquito and cockroach
11.Project report based upon study of local fauna

Distribution of Marks
Maximum Marks: 75Minimum Pass Marks: 27

Practical exercises	**Marks**
Applied Zoology Experiment	10
Ecology Experiment	10
Biostatistics exercise (numerical based on mean, median mode etc)	05
Bioinformatics exercise	05
Spotting	10
Project report on local fauna	10
Permanent preparation	05
Viva-voce	05
	60
Internal (sessional/ practical record)	15
Total	75

Recommended Books

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

19.Bioinformatics for geneticists, Wiley (2003)
20.Lesk: Bioinformatics, Oxford (2003, Indian ed)
21.Westhead et al: Bioinformatics Instant Notes, Viva Books (2003, Indian ed)
22. P.K. Sinha: Computer fundamentals, BPB publications

B.Sc. B.Ed. Part IV

MATHEMATICS

Paper I : Real and complex Analysis
Paper II : Numerical Analysis and Linear Programming.
Paper III **: Metric space and Topology.**

Exam. Hours: 03:00 **Max. Marks: 60**

Paper – I (Paper Code- 0458713). Title: Real and Complex Analysis

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

Unit 2 : Theory of Riemann integration, Darboux theorem. Fundamental theorem of integral calculus, Mean value theorem of integral calculus, RS-Integral and Bounded of variation with applications.

Unit 3 : Uniform Convergence of sequence and series of functions, Power series with application, Functions of several variables.

Unit 4 : Functions, Limits, and continuity. Differentiability, Concept of an analytic function, Cartesian and Polar form of Cauchy-Riemann equations. Harmonic function, Conjugate function, Laplace's differential equations, Orthogonal system, Construction of analytic functions. Power Series: Absolute convergence of power series, circle and radius of convergence of power series, sum function of a power series, Conformal Mapping with applications.

Unit 5: Basic definition and Properties of complex integration , Complex integration as the sum of two line integrals, Inequality for complex integrals. Curves in complex plane, Cauchy-Goursat theorem, Connected regions, Indefinite integral (or Anti Derivative). Derivative of Single-valued functions F(z). Cauchy's integral formula, Extension of Cauchy's integral formula to multi-connected, regions, Cauchy's integral formula for the derivative of an analytic function, Successive derivative of an analytic function, Morera's Theorem. Liouville's Theorem, Poisson's integral formula, Residue and contour Integration.

SUGGESTED BOOKS

Shanti Narayan: Real Analysis; S.Chand & Co., New
Delhi.
Shanti Narayan: Theory of Functions of a Complex Variable; S.Chand & Co., New
Delhi. Gupta, K.P. : Complex Analysis; Pragati Prakashan; Meerut
S. Ponnusamy: Foundations of Complex Analysis, Narosa Publishing
House, Bombay, New Delhi.
V. Karunakaran: Complex Analysis, Narosa Publishing House. Bombay,
New Delhi (2002).
N.Levinson and R.M. Redheffer: Complex Variables, Tata McGraw-Hill
Publ. Co. Ltd., New Delhi (1980).

Paper II (Paper Code- 0458714)

Title: Numerical Analysis and Linear Programming

Exam. Hours: 03:00 **Max. Marks: 60**

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

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

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

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

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

SUGGESTED BOOKS

Jain R. K. , Iyengar S.R.K & Others :Numerical Analysis, New Age International Publisher

Hardy, G. : Linear Programming (5th Edition), Narosa Publishing House,

2002

Saxena, H.C. : Numerical Analysis; S.Chand & Co., New Delhi

Shastry S.S. : Numerical Analysis; PHI, New Delhi

Paper III
(Paper Code- 0458715) Title : Metric space and Topology.

Exam. Hours: 03:00 **Max. Marks: 60**

Unit-1 : Product spaces, Structure of open balls in a product space, Closures and interiors in a product space, Finite product of metric spaces. Contraction Mapping Principle, Baire's Category Theorem, Connectedness: Connected metric spaces, Connected sets, Characterization of connected subsets of the real line, Properties of connectedness

Unit-2 : Convergent sequences, Cauchy sequences, Characterisation of adherent points and limit points in terms of convergent sequences, Convergence in products, Convergence in Euclidean spaces, Cluster points of a sequence, Subsequence, Cluster points and convergent subsequences, Algebra of convergent real sequences, Spaces of sequences.

Unit-3 : Definition and examples of topological space, Closed sets, Closure, Dense subset, Neighbourhoods, Interior, Exterior, Boundary and accumulation points, Derived sets, Bases and sub-bases, Subspaces, Product spaces and relative topology.

Unit-4 : Continuous functions, Homeomorphisms, The Pasting lemma, Connected and disconnected sets, Connectedness on the real line, Components, Locally connected spaces. Countability axioms – First and second countable spaces, Lindelof's Theorems, Separable spaces, Second countability and Separability.

Unit-5 : Compact spaces and compact subsets, Compact subsets of the real line, Sequential compactness and its characterization, Countable compactness, Bolzano-Weierstrass Property (BWP), Sequential characterization of BWP, Equivalence of BWP and sequential compactness, Covering characterization of the BWP, BWP and total boundedness, BWP and compactness, Lebesgue covering lemma, Compactness and completeness, Compactness and uniform continuity, Boundedness of continuous real-valued functions on compact metric spaces.

Suggested Readings:

1. **Simmons, G. F:** Introduction to Topology and Modern Analysis, Tata McGraw Hill, India,2016
2. **Copson, E.T:** Metric Spaces**,** Cambridge tracts, 2010.
3. **Dieudonne ,J.:** Foundation of Modern Analysis**,** Academic Press, New York, 1960.
4. **Kasriel ,R. H.:** Metric Spaces**,** Dover Publications, New York, 2009

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

B.ED. FOURTH YEAR

2025-2026

MAA SHAKUMBHARI UNIVERSITY
SAHARANPUR

Evaluation Plan B.Ed Fourth Year

B.Ed.-Papers with External weightage of 80 Marks (3 hours duration)

1. **Internal weightage of 20 marks will be divided as under:**

Assessment in the papers with internal weight-age of 20 marks will be divided in following parts.

(i) Subject based presentation 05 marks

(ii) Subject based Assignment 05 marks

(iii) Internal Test 05 marks

(iv) Regularity and Punctuality 05 marks

For theory paper of **50 Marks** , the component of **internal assessment will be reduced to its half**.

S.N	Paper	Name of the Paper	External	Internal	Total
1	First	Knowledge & Curriculum	80	20	100
2	Second	Understanding Inclusive Education	80	20	100
3	Third	Pedagogy Course I (Part II)	40	10	50
4	Fourth	Pedagogy Course II (Part II)	40	10	50
	Total		240	60	300
		EPC, Practicum and Internship (16 weeks) 1. EPC- Scout and Guide 2. EPC- Work with Community 3. Teacher's Diary 4. Portfolio (A project report on the various aspects of school where internship was performed) 5. ICT Lessons (05 in each Pedagogy)		20 20 50 40 20	150
		Final Lesson	100		100
	Grand Total				550

1.In Fourth year, the total internship program will be spread in duration of 16 weeks. This rigorous internship in surrounding schools will enable the student-teacher to perform better as a teacher. For this, the student-teachers will go for 'School Placement', during which their role in the school is something like an apprentice and they shall work as a regular teacher & participate in all the school activities including planning, teaching and assessment, interacting with school-teachers & children.

2.EPC : Scouting and Guiding

This is a international programme to develop social-sensitivity and to make students dutiful towards the nation & the world so that they may serve the humanity.

Objectives: To enabler student-teachers to develop-

- the characteristics of good citizenship.
- and promote world Peace.
- the significance of dignity of labour.
- and make students self-reliant.
- the physical, mental & spiritual powers.

Activities:

This can be achieved through organizing a scouting camp of one week to impart trainingin First-aid for fracture, snake bite poison, electric current, etc.; safety-measures against fire, chemicals, electrical equipment etc.; Use of compass & maps; different types of knots; Constructing a bridge; different types of physical exercise etc.

3. EPC : Working with Community

This programme gives opportunity to attach with and to solve the problems of the community to make the student-teachers sensitive and aware about the society.

Objectives: To enable student-teachers to develop-

- social-sensitivity among student-teachers
- sympathy with the poor and the people below-poverty-line
- awareness about the environment
- the positive attitude toward the neglected class

Activities:

1. This can be achieved by organizing a number of programmes for the welfare of the community, like –

- To educate the dropouts and adults (Literate India)
- To educate the people of slum areas to take the nutritious diet (Quit Mal-nutritious)
- To make the people learn the importance of small family norm (chota pariwar sukhi pariwar)
- To make the people aware of the importance of the girls-child & its education for the Family and the society (Beti Bachao Beti Padhao)
- To motivate the people to grow more plants (Green India)
- To motivate the people to keep the city and the public places clean (Clean India)
- To motivate the people to save river and ponds (Clean Water).
-

2. Student-teachers will maintain a Diary of all the activities like-details of daily-teaching eg., topic, date, class, objectives of teaching, resources used, assessment tools, homework given etc.

5.Student-teachers will maintain a Portfolio in which he/she will keep the record on the various aspects of school, where internship was performed and one's experiences and observations etc. daily.

5.The student teacher will deliver at least 5 ICT based lessons in each Pedagogy while doing the internship of Which he/she will maintain the records.

6. Each candidate has to teach two lessons (One in each Pedagogy subject) at the final Practical Examination.

7. Lessons will be assessed by the Board of Examiners consisting of:

(a) one external examiner from of Science Pedagogy.

(b) Two internal examiners of Teacher Education Department from Govt. aided/Govt. colleges of M S University, Saharanpur. However, convener of the practical exam will be the senior one of the internal examiners. Marks will be awarded out of 100.

Paper Pattern:

1. The format for the marking scheme for question papers in theory courses (Maximum Marks=80) in external written examination shall be as follows:

Total =80 marks

Section A: Three Questions with internal choices

(Three Questions of Sixteen marks each, 3x16=48)

Section B: Four out of Eight Questions

(Four Questions of Four marks each, 4x4=16)

Section C: Eight out of Ten Questions

(Eight Questions of Two marks each, 8x2=16)

2. The format for the marking scheme for question papers in theory courses (Maximum Marks=40) in external written examination shall be as follows:

Total =40 marks

Section A: Two Questions with internal choices

(Two Questions of Twelve marks each, 2x12=24)

Section B: Two out of Four Questions

(Two Questions of Four marks each, 2x4=08)

Section C: Four out of Six Questions

(Four Questions of Two marks each, 4x2=08)

B.Ed

Paper I
Knowledge and Curriculum
Code-0458716

Objectives:

The student teacher will be able to:

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

COURSE CONTENT

Unit –I Knowledge Generation

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

Unit –II Paradigm Shift in Knowledge Transmission Process

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

Unit – III Process of knowing and forms of knowledge

1. Process of construction of knowledge, factors involved in construction of knowledge, role of knower & known in construction and transmission of knowledge, the role of culture in knowing
2. Categorisation of knowledge; basis of categorisation, the essential forms of knowledge, ways in which school knowledge gets reflected in the form of curriculum, syllabus & textbooks.

Unit –IV Curriculum & Its determinants

1. Meaning & need of curriculum, difference among curriculum, syllabus and text books; Core curriculum.

2. Curriculum at National level – NCF 2005 and NCFTE 2009 (General Introduction).
3. Determinants of curriculum: (a) Social-political-cultural-economic diversity(b) socio-political aspirations including ideologies (c) Economic necessities & technological possibilities. (d) National priorities and international Context.

Unit V Curriculum Development & Textbooks

1. Different approaches of curriculum development: Subject centered, learner centred and constructivist.
2. Operationalization of curriculum into learning situations: Selection & development of learning resources i.e. textbooks, teaching learning materials and resources outside the school-local environment, community & media.
3. Process of curriculum evaluation: Evolving assessment modes, continuous & comprehensive evaluation; feedback from learners, teachers, community and administrators.

Practicum/Field Work(Any two from the following)

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

Reference

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

5. Kelly, AV. (2009). The curriculum: theory and practice sage publication Singapore.
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10. Sternberg, R.J. (2013). intelligence, competence, and expertise, in A.J. Elliot & C.S. Dweck (Eds), handbook of competence and motivation (pp
11. Tagore, R. (2003) Civilization and progress. in crisis in civilization and other essays. New delhi: rupa&co.
12. Pathak, A (2013) Social implications of schooling: knowledge pedagogy and consciousness. Aakar books

Paper II
Understanding Inclusive Education

Code-0458717

Objectives:

The student teacher will be able to:

Understand concept, meaning and significance of inclusive education

Bring about an understanding of the culture, policies and practices that need to be addressed in order to create an inclusive school.

Appreciate the need for promoting inclusive practice and the roles and responsibilities of the teachers.

Develop critical understanding of the recommendations of various commissions and committees towards teacher preparation for inclusive education, understand the nature of difficulties encountered by children.

Prepare teachers for inclusive schools.

Analyze special education, integrated education, mainstream and inclusive education practices. Identify and utilize existing resources for promoting inclusive practice.

Develop a positive attitude and sense of commitment towards actualizing the right to education of all learners.

Prepare a conducive teaching learning environment in varied school settings. Develop the ability to conduct and supervise action research activities.

COURSE CONTENT

Unit I: Introduction, Issues & perspectives of Inclusive Education

1. Definitions, concept and importance of inclusion.
2. Historical perspectives of inclusive education for children with diverse needs.
3. Difference between special education, integrated education and inclusive education.
4. Advantages of inclusive education for education for all children in the context of right to education.

Unit II: Policy Perspective

1. Recommendations of the Indian Education Commission (1964-66).
2. Scheme of Integrated Education for Disabled Children
3. National Policy on Education (NPE, 1986-92).
4. National Curriculum Framework, 2005 NCERT.
5. Inclusive Education:National Education Policy 2020
6. The Convention on the Rights of the Child (specific reference to inclusive education).
7. UNESCO Conventions, declaration and recommendations related to Rights of persons with Disabilities.

UNIT III: Diversity in the classroom

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

UNIT IV: Curriculum, Pedagogy and assessment in Inclusive School

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

Unit V: Teacher Preparation and Inclusive Education

1. Review of existing educational programmes offered in secondary school (general and special education).
2. Skills and competencies of secondary school teachers in inclusive settings.
3. N.C.F 2005 and curriculum for teacher preparation and transaction modes.
4. Roles, responsibilities and professional ethics of an inclusive education teacher and teacher educators according to NEP 2020.

Practicum/Field Work(Any two from the following)

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

References

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

9.Carini, P.F. (2001). Valuing the immeasurable. In starting strong: A different look at children, schools, and standards (pp. 165-181). New York: Teachers College Press.
10. Delpit, L.D. (2012) Multiplication is for white people: raising experctations for other people's children, the new press.
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14. Govinda R. (2011). Who goes to school? Exploring exclusion in Indian education. Oxford University Press.
15. Parekh, B.C. (2000). Rethinking multiculturalism: Cultural diversity and political theory (pp 213-230) Palgrave.
16. UNESCO. (1989) UN convention on the rishts of the child. UNESCO.
17. UNESCO. (2006). United Nations convention on the rights of persons with disabilities.
18. UNESCO. (2009) Policy guidelines on inclusion in education UNESCO

Paper-III& IV
Pedagogy of Mathematics
(Part II)
Code-0458718

OBJECTIVES:

Students-teachers will be able to-

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

COURSE CONTENTS

Unit: 1 Mathematics as a Discipline

1. Historical development of mathematics as a discipline.
2. Contribution of Mathematicians like Ramanujan, Aryabhatt, Bhaskarcharya, Pythogorous and Euclid.
3. Correlation of mathematics with other school subjects.

Unit: 2 Mathematics curriculum at Secondary Level

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

Unit: 3 Learning resources in mathematics

1. Recreational Activities
   a. Mathematics club
   b. Mathematics Fairs
   c. Mathematical Games
   d. Mathematical Quiz
   e. Mathematical Puzzles
   f. Mathematical Project
   g. Mathematical Model
2. Importance and setting up of Mathematics Laboratory.
3. Importance of Support Material: On-line and off-line Resources.
   a. Text books of Mathematics.

b. References Material-Journals, Reference books, Encyclopedia, News Letters and on line resources.

c. Using community resources for mathematical teaching e.g. interviewing local persons to know the indigenous knowledge of Mathematics etc.

Unit: 4 Professional Development of Mathematics Teacher

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

Practicum/Field Work-Any one of the following-

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

References

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Paper-VI & VII
Pedagogy of Physical Science
(Part II)
Code-0458719

Objectives-

Student-teachers will be able to:-

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

COURSE CONTENT

Unit 1: Physical Sciences as a Discipline

1. Historical Background Physical Sciences with special reference to India.
2. Contribution of C.V. Raman, M.N. Saha, K.S.Krishnan, J.C. Bose, H.J. Bhabha, S. Chandra Shekhar and A.P.J. Abdul Kalam in the field of Physics.
3. Correlation of Physical Scienceswith other School Subjects.

Unit 2: Physical Sciences curriculum

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

Unit 3: Learning resources and teaching learning material in Physical Science

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

Unit 4: Professional Development of Teachers

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

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

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

References-

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2. Thurber W. and A. Collette: Teaching Science in Today's Secondary schools, Boston Allyan and Bacon Inc., New York, 1959.
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Paper-VI & VII
Pedagogy of
Chemistry (Part II)
Code-0458720

Objectives-

Student-teachers will be able to:-

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

COURSE CONTENT

Unit 1: Nature of Chemistry as a Discipline

1. Historical Background of Chemistry with special reference to India.
2. Contribution of famous scientists to the field of Chemistry: C N Ramachandra Rao, Asima Chatterjee, Yellapragada Subbarow, Alfred Bernhard Nobel, J. J. Thomson, Antonie Lavoisier, Ernest Rutherford, Marie Curie.
3. Correlation of Chemistry with other School Subjects.

Unit 2: Chemistry curriculum at Secondary level

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

Unit 3: Learning resources and teaching learning material in

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

Unit 4: Professional Development of Teachers

1. Professional competencies of Chemistry teacher
2. Professional development programmes for Chemistry teachers; planning, organization&

evaluation.

3. Professional Ethics of Chemistry teacher.
4. Reflective & Innovative practices in professional development of Chemistry teachers.

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

1. Write a reflective noe on 'Developing Scientific Creativity'
2. Prepare ICT based lesson plan in Chemistry.
3. Read any Article /book on Professional Development of teachers and prepare an abstract.

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Paper-VI & VII Pedagogy of Biological Science

(Part II)

Code-0458721

Objectives: -

Student-teachers will be able to:-

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

COURSE CONTENT

Unit 1: Biological Science as a Discipline

1. Historical development of Biological science as a discipline.
2. Contribution of Biologists like HargobindKhurana, Mohinder Singh Randhawa, Salim Ali, Mendel, Darwin, and Lamark in the field of Biology.
3. Correlation of Biological Science with other School Subjects.

Unit 2: Biological Science curriculum

1. Principles and approaches of curriculum construction.
2. New trends in Biological science curriculum.
3. A critical appraisal of existing Biological science curriculum at Secondary stage prescribed by board of Secondary Education .
4. Biological Science Curriculum- Vision, Main goals of teaching Biological Science, curricular choices at different stages of school Biological Science education.

Unit 3: Learning resources and teaching learning material in Biological Science

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

Unit 4: Professional Development of Teachers

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

Practicum/Field Work (Any one of the following)

1. Plan and Organize a Quiz Competition in a school, on the themes of Biology. Report entire activity

2. Write a note on ‘Professional Ethics of Biological Science teacher’. Write your conclusions.
3. Prepare an ICT based lesson plan on a Biological Science topic.

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Paper-VI & VII Pedagogy of General Science

(Part II)

Code-0458722

Objectives: -

Student-teachers will be able to:-

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

COURSE CONTENT

Unit 1: General Science as a Discipline

1. Main discoveries and development of science (special reference to ancient India); Science as a domain of enquiry, as a dynamic and expanding body of knowledge, science as a process of constructing knowledge.
2. Science as an interdisciplinary area of learning (Physics, chemistry, biology etc.); science for environment, health, peace & equity, science and society.
3. Fact, concept, principles, laws and theories- their characteristics in context of general science.
4. Correlation of General Science with other School Subjects.

Unit 2: General Science curriculum at secondary level

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

Unit 3: Learning resources and teaching learning material in General Science

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

Unit 4: Professional Development of Teachers

1. Professional competencies of General Science teacher

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

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

1. Analyse General Science Curriculum of upper primary classes (VI-VIII) and Give your Suggestions.
2. Writ a note on 'Reflective & Innovative practices in professional development of teachers' and summarize your conclusions.
3. Prepare an ICT based lesson plan on a General Science topic.

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