

Syllabus

DEPARTMENT OF EDUCATION

Four-Year Integrated Teacher Education Programme (ITEP)

B.Sc.-B.Ed.- Regular Programme



"A" Grade by NAAC & "A" Category by MHRD

Jain Vishva Bharati Institute

(Deemed to be University under section 3 of UGC Act, 1956)

Ladnun-341306 (Raj.)

2025

Price: Rs.

DEPARTMENT OF EDUCATION
JAIN VISHVA BHARATI INSTITUTE, LADNUN
Four-Year Integrated Teacher Education Programme (ITEP)
B.Sc.-B.Ed.
Regular Programme

Jain Vishva Bharati Institute has launched a Bachelor of Education programme recognized by NCTE. The first session started from July 2005 and B.Sc.-B.Ed. programme has started from October 2016. The programme places specific emphasis on meditation as a tool to enhance learning skills and I.Q. This programme is also the first national teachers training programme to offer study in Education for Sustainable Development. Innovative syllabus and enthusiastic faculty work towards not only training the teachers but also assisting them with campus recruitment. Jain Vishva Bharati Institute is looking forward to train a new class of future generation teachers.

1. Introduction: Enlightened, emancipated and empowered teachers lead communities and nation towards better and higher quality of life. Teachers are expected to create social cohesion, national integration and learning society. They disseminate knowledge and also generate new knowledge therefore, it becomes essential for any nation to give necessary professional inputs to its teachers. Jain Vishva Bharti Institute pursues the curriculum for its pre-service teacher training programme for women candidates who are far behind but can lead the whole nation. This will be a special programme focussed with a strong foundation in Science of Living. The candidates are encouraged to flourish an environment that promotes value and technology-based society.

Duration: The B. Sc.-B. Ed. (ITEP) Programme is full time four years integrated Programme.

Eligibility: A candidate who has passed senior secondary from any recognized Board and qualified entrance test conducted as per guideline of State Government.

Objectives:

- ❖ To give the subject knowledge of graduation level.
- ❖ To develop professionalism in teacher Education Programme.
- ❖ To motivate creative thinking and work among teacher trainees.
- ❖ To foster moral, social character and spiritual values of trainees.
- ❖ To develop Inter-relationship among Department, School and Society.
- ❖ To develop cognitive, Affective and Psycho-motor domain of the teacher trainees
- ❖ To promote for future Prospective, Employability and Skill based Teacher Training
- ❖ To develop Self Evaluation, Positive Attitude and self confidence
- ❖ To apply educational innovation and new strategies of the Teacher Education and trainees.

NEP 2020: The 4-year integrated B.Ed. will be a dual-major holistic bachelor's degree, in Education as well as a specialised subject such as a language, history, music, mathematics, computer science, chemistry, economics, art, physical education, etc. Beyond the teaching of cutting-edge pedagogy, the teacher education will include grounding in sociology, history, science, psychology, early childhood care and education, foundational literacy and numeracy, knowledge of India and its values/ethos/art/traditions, and more”.

The National Education Policy 2020 highlights, “Teacher education is vital in creating a pool of school teachers that will shape the next generation. Teacher preparation is an activity that requires multidisciplinary perspectives and knowledge, formation of dispositions and values, and development of practice under the best mentors. Teachers must be grounded in Indian values, languages, knowledge, ethos, and traditions including tribal traditions, while also being well-versed in the latest advances in education and pedagogy” [Para 15.1, NEP 2020].

Four-Year Integrated Teacher Education Programme (ITEP): “Recognizing that the teachers will require training in high-quality content as well as pedagogy, teacher education will gradually be moved by 2030 into multidisciplinary colleges and universities” [Para 5.22, NEP 2020].

The 4-year integrated B.Ed. offered by such multidisciplinary HEIs will, by 2030, become the minimal degree qualification for school teachers. The 4-year integrated B.Ed. will be a dual-major holistic bachelor's degree, in Education as well as a specialised subject such as a language, history, music, mathematics, computer science, chemistry, economics, art, physical education, etc. Beyond the teaching of cutting-edge pedagogy, the teacher education will include grounding in sociology, history, science, psychology,

early childhoodcare and education, foundational literacy and numeracy, knowledge of India and its values/ethos/art/traditions, and more [Para 15.5, NEP 2020].

Multiple Entry and Exit, and Re-entry Options: As per Institute rule.

Nomenclature of Degree Awarded: As the ITEP being a Dual-Major programme with School Stage specialisation, it will lead to the award of one of the following Degrees, depending on the chosen discipline of study and Stage Specific specialisation.

B.Sc.B.Ed. (Secondary Stage with Major in)

Eligibility/Entry Requirements: A Certificate obtained after successful completion of Grade 12 (or equivalent stage of education such as Pre-University, Intermediate, etc.) with a minimum of 50% marks in aggregate or an equivalent grade from a recognised Board/University.

Semester System: The Stage-Specific ITEP will be organised on the semester pattern with two semesters in an academic year. Each semester will consist of 15 -16 weeks of teaching-learning activities, excluding end-semester examinations. A semester will consist of a minimum 96 working days, excluding end-semester examination days. Each working week will have a minimum of 40 hours of instructional/contact time.

Credit-hours for Courses of Study: Taught courses involving classroom teaching and structured interaction require a minimum of 15 hours of instructional/contact time per credit in a semester. Practicum requiring students to participate in an approved project or practical activity will require a minimum of 30 hours of student engagement per credit in a semester. This will be applicable to activities such as seminars, internships, lab-based activities, studio activity, workshop-based activity, field-based learning/project and practices, community engagement and service, etc.

Curricular Components

As indicated in the above Table, the ITEP comprises the following curricular components:

S. No	Curricular Components	Credits
1.	Student Induction Programme (Common to all student-teachers across stage specific specialization. To be organized during the first two weeks of Semester-1)	-
2.	Foundations of Education	30 Credits
3.	Disciplinary/Interdisciplinary Courses	64 Credits
4.	Stage-Specific Content - Cum - Pedagogy Courses	16 Credits
5.	Ability Enhancement and Value-Added Courses	28 Credits
6.	School Experience, including Internship in Teaching	20 Credits
7.	Community Engagement and Service	2 Credits
	Total Credits	160

Programme Outcomes (PO) -based approach of ITEP

- PO1. Focuses more on graduate attributes to be demonstrated by student-teachers.
- PO2. Achievement by student-teachers of Course Outcomes associated with each curricular component and courses of study related to these components.
- PO3. Knowledge, competencies and values and dispositions expected to be demonstrated by graduates of ITEP.
- PO4. Helps student-teachers to broaden their current knowledge base, acquire new knowledge and abilities, pursue further studies, perform well as teachers, and play a constructive role as a responsible citizen in society.
- PO5. Graduate attributes reflect Course Outcomes that are specific to each curricular component and courses of study, and general Course Outcomes.
- PO6. Graduate attributes are acquired and developed progressively through the process of overall learning experience, college/university experience, and critical and reflective thinking provided to the student-teacher.

Programme Specific Outcomes (PSO)

- PSO1. Students will be able to gain complete knowledge about the program from the Induction Programme.
- PSO2. Will be able to strengthen the foundation of subjects like Indian education, educational psychology, evaluation, inclusive education, management, planning and development, philosophical and social perspectives, educational policy analysis, mental health, adolescent education etc.
- PSO3. Disciplinary/interdisciplinary courses are expected to gain expertise in a particular subject.
- PSO4. Stage-specific content-co-teaching courses are expected to gain mastery in teaching a particular subject.
- PSO5. Capacity building and value-added courses will strengthen the trainees' work style.
- PSO6. .By gaining school experience including internship in teaching, they will be able to prove themselves useful in teaching.
- PSO7. Community engagement and service work will help in developing a sense of belongingness towards the society.

INTEGRATED TEACHER EDUCATION PROGRAMME (ITEP)

(B.Sc.-B.Ed.) Semester-I

Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
-	Student Induction Programme	Two Week Student Induction Programme					
BBSE101MJ	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25	
BBSE102MJ	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25	
BBSE103MJ	Disciplinary/Inter disciplinary Courses	Mathematics-I	CE	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25	
BBSE104MJ	Disciplinary/Inter disciplinary Courses	Botany-I		4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25	
BBSE105MJ	Disciplinary/Inter disciplinary Courses	Zoology-I		4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25	
BBSE106FD	Foundation of Education	Evolution of Indian Education	CC	4	30	70	100
BBSE107AV	Ability Enhancement & Value-Added Courses	Language-I (as per the 8 th schedule of constitution of India)	CC	4	30	70	100
BBSE108AV	Ability Enhancement & Value-Added Courses	Arts Education (Performing and Visual)	CC	2	15	35	50
BBSE109AV	Ability Enhancement & Value-Added Courses	Understanding India (India Ethos and Knowledge System)	CC	2	15	35	50
			Total	20	120	380	500

Note: Choice One Group (A/B /C)

Group 'A' Major Course 1. Physical Science (Physics, Chemistry)

Group 'B' Major Course 2. Biological Science (Any Two-Zoology, Botany, Chemistry)

Group 'C' Major Course 3. Mathematics (Mathematics, Physics)

❖ It is mandatory to study two courses from I to VI Semesters in the major course.

INTEGRATED TEACHER EDUCATION PROGRAMME (ITEP)

(B.Sc.-B.Ed.) Semester-II

Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE201MJ/MN	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25 Practical	
BBSE202MJ/MN	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25 Practical	
BBSE203MJ/MN	Disciplinary/Inter disciplinary Courses	Mathematics-I	CE	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25 Practical	
BBSE204MJ/MN	Disciplinary/Inter disciplinary Courses	Botany-I	Select Any One Minor Course	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25 Practical	
BBSE205MJ/MN	Disciplinary/Inter disciplinary Courses	Zoology-I	CE	4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	
BBSE206AV	Ability Enhancement & Value-Added Courses	Language-II (Other than Language-I)	CC	4	30	70	100
BBSE207AV	Ability Enhancement & Value-Added Courses	Understanding India (India Ethos and Knowledge System)	CC	2	15	35	50
BBSE208AV	Ability Enhancement & Value-Added Courses	Teacher and Society	CC	2	15	35	50
			Total	20	105	395	500

Note: Choice One Group (A/B /C)

Group 'A' Major Course 1. Physical Science (Physics, Chemistry) & Minor Course (Mathematics)

Group 'B' Major Course 2. Biological Science (Any Two-Zoology, Botany, Chemistry) & Minor Course (Any One-Zoology, Botany, Chemistry)

Group 'C' Major Course 3. Mathematics (Mathematics, Physics) & Minor Course (Chemistry)

❖ It is mandatory to study two courses from I to VI Semesters in the major course.

❖ It is mandatory to study one course of II to V Semesters in the minor course.

INTEGRATED TEACHER EDUCATION PROGRAMME (ITEP)

(B.Sc.-B.Ed.) Semester-III

Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE301MJ/MN	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25 Practical	
BBSE302MJ/MN	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25 Practical	
BBSE303MJ/MN	Disciplinary/Inter disciplinary Courses	Mathematics-I	CE	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25 Practical	
BBSE304MJ/MN	Disciplinary/Inter disciplinary Courses	Botany-I	Select Any One Minor Course	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25 Practical	
BBSE305MJ/MN	Disciplinary/Inter disciplinary Courses	Zoology-I	CE	4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	
BBSE306FD	Foundation of Education	Child Development & Education Psychology	CC	4	30	70	100
BBSE307OP	Stage-Specific Content-Cum Pedagogy General Pedagogy - For all curricular Areas	Basics of Pedagogy at Secondary Stage	CC	4	30	70	100
			Total	20	105	395	500

Note: Choice One Group (A/B /C)

Group 'A' Major Course 1. Physical Science (Physics, Chemistry) & Minor Course (Mathematics)

Group 'B' Major Course 2. Biological Science (Any Two-Zoology, Botany, Chemistry) & Minor Course (Any One-Zoology, Botany, Chemistry)

Group 'C' Major Course 3. Mathematics (Mathematics, Physics) & Minor Course (Chemistry)

❖ It is mandatory to study two courses from I to VI Semesters in the major course.

❖ It is mandatory to study one course of II to V Semesters in the minor course.

Compulsory Skill Enhancement Certificate Course (Chose Any One)

Course Code	Curricular Component	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE308CC	Skill Enhancement	Teaching Skill	CC	4	30	70	100
BBSE309CC	Skill Enhancement	Educational Psychology & Cognitive Development	CC	4	30	70	100

INTEGRATED TEACHER EDUCATION PROGRAMME (ITEP)

(B.Sc.-B.Ed) Semester-IV

Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE401MJ/MN	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25 Practical	
BBSE402MJ/MN	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25 Practical	
BBSE403MJ/MN	Disciplinary/Inter disciplinary Courses	Mathematics-I	Select Any One Minor Course	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25 Practical	
BBSE404MJ/MN	Disciplinary/Inter disciplinary Courses	Botany-I		4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25 Practical	
BBSE405MJ/MN	Disciplinary/Inter disciplinary Courses	Zoology-I	CE	4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	
BBSE406FD	Foundation of Education	Philosophical & Sociological Perspectives of Education-I	CC	4	30	70	100
BBSE407OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Mathematics at Secondary Stage - Course (I)	Content cum Pedagogy of at Secondary Stage Course (I)	2	15	35	50
BBSE408OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Physical Sciences at Secondary Stage – Course (I)	Any Two CE	2	15	35	50
BBSE409OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Biological Sciences at Secondary Stage – Course (I)	CE	2	15	35	50
			Total	20	105	395	500

Note: Choice One Group (A/B /C)

Group 'A' Major Course 1. Physical Science (Physics, Chemistry) & Minor Course (Mathematics)

Group 'B' Major Course 2. Biological Science (Any Two-Zoology, Botany, Chemistry) & Minor Course (Any One-Zoology, Botany, Chemistry)

Group 'C' Major Course 3. Mathematics (Mathematics, Physics) & Minor Course (Chemistry)

- ❖ It is mandatory to study two courses from I to VI Semesters in the major course.
- ❖ It is mandatory to study one course of II to V Semesters in the minor course.

INTEGRATED TEACHER EDUCATION PROGRAMME (ITEP)

(B.Sc.- B. Ed) Semester-V

Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A	Theory	Total
BBSE501MJ/MN	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25 Practical	
BBSE502MJ/MN	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25 Practical	
BBSE503MJ/MN	Disciplinary/Inter disciplinary Courses	Mathematics-I	Select Any One Minor Course	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25 Practical	
BBSE504MJ/MN	Disciplinary/Inter disciplinary Courses	Botany-I	CE	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25 Practical	
BBSE505MJ/MN	Disciplinary/Inter disciplinary Courses	Zoology-I	CE	4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	
BBSE506AV	Ability Enhancement & Value-Added Courses	ICT in Education	CC	2	15	35	50
BBSE507SI	School Experience)	Pre. Internship Practice (Demonstration lessons, Peer teaching)	CC	2	Pre. Internship Practice 50		50
BBSE508OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Mathematics at Secondary Stage – Course (II)	Content cum Pedagogy of at Secondary Stage – Course (II) Any Two CE	2	15	35	50
BBSE509OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Physical Sciences at Secondary		2	15	35	50

		Stage – Course (II)	CE				
BBSE510OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Biological Sciences at Secondary Stage – Course (II)		2	15	35	50
			Total	20	90	410	500

Note: Choice One Group (A/B /C)

Group ‘A’ Major Course 1. Physical Science (Physics, Chemistry) & Minor Course (Mathematics)

Group ‘B’ Major Course 2. Biological Science (Any Two-Zoology, Botany, Chemistry) & Minor Course (Any One-Zoology, Botany, Chemistry)

Group ‘C’ Major Course 3. Mathematics (Mathematics, Physics) & Minor Course (Chemistry)

- ❖ It is mandatory to study two courses from I to VI Semesters in the major course.
- ❖ It is mandatory to study one course of II to V Semesters in the minor course.

INTEGRATED TEACHER EDUCATION PROGRAMME (ITEP)

(B.Sc.-B. Ed) Semester-VI

Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE601MJ	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25 Practical	
BBSE602MJ	Disciplinary/Inter disciplinary Courses	Physics-I		4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25 Practical	
BBSE603MJ	Disciplinary/Inter disciplinary Courses	Mathematics-I		4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25 Practical	
BBSE604MJ	Disciplinary/Inter disciplinary Courses	Botany-I	CE	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25 Practical	
BBSE605MJ	Disciplinary/Inter disciplinary Courses	Zoology-I		4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	
BBSE606FD	Foundation of Education	Assessment & Evaluation	CC	2	15	35	50
BBSE607FD	Foundation of Education	Inclusive Education	CC	2	15	35	50
BBSE608AV	Ability Enhancement & Value-Added Courses	Mathematical & Quantitative Reasoning	CC	2	15	35	50
BBSE609SI	School Experience	School Observation (field Practice)	CC	2	School Observation (field Practice) 50		50
BBSE610OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Mathematics at Secondary Stage – Course (III)	Content cum Pedagogy of at Secondary Stage – Course (III) Any Two CE	2	15	35	50
BBSE611OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Physical Sciences at Secondary Stage – Course (III)		2	15	35	50

BBSE612OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Biological Sciences at Secondary Stage – Course (III)	CE	2	15	35	50
			Total	20	105	395	500

Note: Choice One Group (A/B /C) Major Course

Group ‘A’ Major Course 1. Physical Science (Physics, Chemistry)

Group ‘B’ Major Course 2. Biological Science (Any Two-Zoology, Botany, Chemistry)

Group ‘C’ Major Course 3. Mathematics (Mathematics, Physics)

❖ It is mandatory to study two courses from I to VI Semesters in the major course.

INTEGRATED TEACHER EDUCATION PROGRAMME (ITEP)**(B.Sc.-B.Ed) Semester-VII****Distribution of Papers, Marks and Credit**

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE701FD	Foundation of Education	Perspectives on School Leadership and Management	CC	2	15	35	50
BBSE702FD	Foundation of Education	Curriculum Planning & Development	CC	2	15	35	50
BBSE703AV	Ability Enhancement & Value-Added Courses	Arts Education (Performing and Visual)	CC	2	15	35	50
BBSE704AV	Ability Enhancement & Value-Added Courses	Sports, Nutrition and Fitness	CC	2	15	35	50
BBSE705SI	School Experience	School based – Research Project	CC	2	School based – Research Project 50		50
BBSE706SI	School Experience	Internship in Teaching	CC	10	150 Internship+100 Two Subject Final Lesson=250		250
			Total	20	60	440	500

INTEGRATED TEACHER EDUCATION PROGRAMME (ITEP)

(B.Sc.-B. Ed) Semester-VIII

Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE801FD	Foundation of Education	Philosophical & Sociological Perspectives of Education-II	CC	4	30	70	100
BBSE802FD	Foundation of Education	Education Policy Analysis	CC	2	15	35	50
BBSE803FD	Foundation of Education	Adolescence Education	Any One	4	30	70	100
BBSE804FD	Foundation of Education	Education for Mental Health	CE	4	30	70	100
BBSE805FD	Foundation of Education	Education for Sustainable Development		4	30	70	100
BBSE806FD	Foundation of Education	Emerging Technologies in Education		4	30	70	100
BBSE807FD	Foundation of Education	Gender Education		4	30	70	100
BBSE808FD	Foundation of Education	Guidance and Counselling		4	30	70	100
BBSE809FD	Foundation of Education	Human Right Education		4	30	70	100
BBSE810FD	Foundation of Education	Peace Education		4	30	70	100
BBSE811FD	Foundation of Education	Sport and Fitness Education		4	30	70	100
BBSE812FD	Foundation of Education	Tribal Education		4	30	70	100
BBSE813FD	Foundation of Education	Economics of Education		4	30	70	100
BBSE814FD	Foundation of Education	Jain Culture and Life Values		4	30	70	100
BBSE815AV	Ability Enhancement & Value-Added Courses	Yoga and Understanding Self	CC	2	15	35	50
BBSE816AV	Ability Enhancement & Value-Added Courses	Citizenship Education, Sustainability and Environment	CC	2	15	35	50
BBSE817SI	School Experience	Post Internship (Review and Analysis)	CC	2	Post Internship 50		50
BBSE818SI	School Experience	Creating Teaching Learning Material/ Work Experience	CC	2	Work Experience 50		50
BBSE819CE	Community Engagement and Service	Community Engagement and Service	CC	2	Community Engagement and Service 50		50

			Total	20	105	395	500
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Note: 1. ITEP (B.Sc.-B.Ed.) It is mandatory to undergo a skill course

1. Teaching Skill

2. Educational Psychology and Cognitive Development

2. Two related courses of MOOCs are to be done optional as per their time duration

(B.Sc.-B. Ed) Semester-I

Induction Programme (Two–Week Student Induction Programme)

S.No	Activity
1	Courses and Credit Orientation Program
2	Teacher and student introduction
3	Introduction of the institute and introduction of various departments
4	Introduction to Laboratories and Library
5	Campus Introduction
6	Physical Activities
7	Literary Activities
8	Cultural Activities
9	Creative Expression Activities
10	Motivational Lecture
11	Local areas and Institutions
12	Familiar with the Various features available

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE101MJ	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25	
BBSE102MJ	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25	
BBSE103MJ	Disciplinary/Inter disciplinary Courses	Mathematics-I	CE	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25	
BBSE104MJ	Disciplinary/Inter disciplinary Courses	Botany-I	CE	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25	
BBSE105MJ	Disciplinary/Inter disciplinary Courses	Zoology-I	CE	4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25	

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE101MJ	Chemistry-I	CE	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

Chemistry-Paper-I: Inorganic chemistry

Objectives:

- ❖ To understand about shape of s, p, d, f orbitals and atomic structure.
- ❖ To develop critical understanding about comparative study of different elements on the basis of periodicity.
- ❖ To promote awareness about principles related to atomic structure and chemical bonding.
- ❖ To know about molecular orbital theory of homo and heteronuclear compounds.

Unit 1: Atomic structure

Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, quantum number, radial and angular wave functions and probability distribution curves, shapes of s, p, d orbitals, Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configuration of the elements, effective nuclear charge.

Unit 2: Periodicity of p- block elements & Chemistry of noble gases

Comparative study of p-block elements: group trends, electronic configuration, atomic and ionic radii, ionization energy, electron affinity, electronegativity, oxidation states, inert pair effect.

Introduction of noble gases, Chemical properties of the noble gases, compounds of noble gases, chemistry of xenon, structure and bonding of xenon compounds.

Unit 3: Chemical Bonding Part I

Introduction of chemical bonding, properties of covalent bond, valence bond theory and its limitations, directional characteristics of covalent bond, hybridization, energetics of hybridization and shapes of different molecules and ions, Valence shell electron pair repulsion (VSEPR) theory to SnCl_2 , H_3O^+ , NH_3 , H_2O , TeCl_4 , ClF_3 , ICl_2^-

Unit 4: Chemical Bonding Part II

Linear combination of atomic orbitals, types of molecular orbitals, MO theory for homonuclear molecules and ions (H_2^+ to Ne_2), molecular orbital theory for heteronuclear molecules (CO , NO) multicenter bonding in electron deficient molecules, bond strength and bond energy, dipole moment, percentage ionic character from dipole moment and electronegativity difference.

Course Outcomes: After completion of the course student would able to:

- ❖ Explain the principles related to atomic structure, periodicity & chemical bonding.
- ❖ Plot and interpret probability distribution curves, electronic configuration, shapes of molecules and bonding structures.
- ❖ Identifies the relationship among periodicity of various elements and properties of chemical bonding.
- ❖ Classify the elements on the basis of atomic structure, periodicity and their basic properties.

Chemistry-Paper-II: Organic chemistry

Objectives:

- ❖ To understand about reaction mechanism of organic compounds.
- ❖ To provide information about nomenclature of alkane and cycloalkane.
- ❖ To know about synthesis of alkenes and cycloalkenes.
- ❖ To acquaint about nomenclature and classification of Dienes and alkynes.

Unit-I: Mechanism of organic reaction

Homolytic and heterolytic bond breaking, Types of reagents, electrophiles and nucleophiles. Types of organic reactions, energy considerations, reactive intermediates-Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes with examples. Assigning formal charges on intermediates and other ionic species. Method of determination of reaction mechanism (product analysis, intermediates, isotope effect, kinetic and stereo chemical studies)

Unit-II: Alkanes & Cycloalkanes

IUPAC nomenclature of branched and unbranched alkanes. The alkyl groups. Isomerism in alkanes sources, methods of formation (with special reference of Wurtz reaction, Kolbe reaction, Corey House reaction and decarboxylation of carboxylic acids.) Physical properties and chemical reactions of alkanes, Mechanism of free radical halogenations of alkanes, orientation, reactivity and selectivity.

Nomenclature, method of formation, chemical reactions, Baeyer strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings.

Unit-III: Alkenes & Cycloalkenes

Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydrations. The Saytzeff rule, Hofmann elimination. Physical properties and relative stabilities of alkenes. Chemical reactions of alkenes—mechanism involved in hydrogenations, Markownikoffs rule, hydroboration –oxidation, oxymercuration-reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO_4 , polymerization of alkenes. Substitution at the allylic and vinylic position of alkenes. Industrial applications of ethylene and propene.

Method of formation, conformation and chemical reactions of cycloalkenes.

Unit-IV Dienes & Alkynes

Nomenclature and classification of dienes, isolated, conjugated and cumulated dienes, Structure of allenes and butadiene, methods of formation, polymerization, chemical reactions, 1,2 and 1,4-additions, Diels-Alder reaction.

Nomenclature, structure and bonding in alkynes, methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, Hydroboration-oxidation, metal – ammonia reduction, oxidation and polymerization.

Course Outcomes: After completion of the course student would able to:

- ❖ Explain about reaction mechanism of organic compound.
- ❖ Know about synthesis of alkane and cycloalkanes.
- ❖ Classify various derivatives on the basis of isomerism, rules of reactivity and theories.
- ❖ Apply the mechanism of chemical reaction for explaining chemical bonding, nomenclature of various compounds.

Chemistry-Paper-III: Physical Chemistry

Objectives:

- ❖ To develop curiosity about mathematical concept and use of computer.
- ❖ To provide information about various laws and their implications.
- ❖ To aware about different states, Vander Waals equation and their derivations.
- ❖ To understand about liquid stage and classification of liquid crystals.

Unit I: Mathematical Concepts and Computer

Logarithmic relations, curve sketching, linear graphs and slopes, differentiations of functions like k^x , e^x , x^n , $\sin x$, $\log x$: maxima and minima, Integration of some useful relevant functions: Permutations and combinations, Factorials and Probability, Application of computers in physical chemistry

Unit II: Gaseous States 1

Gaseous laws and their derivations, postulate of kinetic theory of gases and its derivation, deviation from ideal behavior, (with respect to pressure and volume), Vander Waals equation of state

Unit-III: Gaseous States 2

Critical phenomenon: PV isotherm of real gases, continuity of state, the isotherms of Vander Waals equation, relationship between critical constant and Vander- Waals constant, the law of corresponding states, reduced equation of state.

Root mean square, average and most probable velocity. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquification of gases.

Unit-IV: Liquid state

Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solid, liquid and gases. Liquid crystals: difference between liquid crystal, solid and liquid. Classification, structure and application of liquid crystal.

Course Outcomes: After completion of the course student would able to:

- ❖ Plot and interpret various graphs, probability curves and structures of gaseous and liquid states.
- ❖ Explain logarithmic relations, root mean square and laws of corresponding liquid and gaseous states.
- ❖ Measure and calculate the differentiations of functions, collision number and probability to define various behavior of different states.
- ❖ Understand about liquid stage and classification of liquid crystals.

PRACTICALS

Inorganic chemistry

Qualitative Analysis: Semi microanalysis; separation and identification of three cations and three anions in the given inorganic mixture, specific tests for some typical combination of acid radicals.

Physical chemistry

Viscosity, Surface Tension

1. To determine the percentage composition of a given mixture (non-interacting systems) by viscosity method.
2. To determine the relative viscosity of given unknown organic liquid by viscometer.
3. To determine the relative surface tension of given unknown organic liquid by stalagmometer.
4. To determine the percentage composition of a given binary mixture by surface tension method.

Viva-Voce and Record

Suggested Readings:

1. Organic Chemistry, Suresh Ameta, H.K. Pandey, H.S. Sharma, Pinky B. Punjabi and Bhupendra Sharma Himanshu Publications, Udaipur
2. Inorganic Chemistry, Ojha, Bhojak, Kothari, Chaturvedi and V.K. Swamy, Ramesh Book Depot, Jaipur
3. Practical Chemistry, Bhargava, Lavania, Ojha, Ramesh Book Depot, Jaipur
4. Physical Chemistry, Sharma, Bhargava, Gupta, Ramesh Book Depot, Jaipur
5. Organic Chemistry, Vijayshree Manoj Changani, Alka Publication, Ajmer
6. Inorganic Chemistry, Vijayshree Kothari Changani, Alka Publication, Ajmer
7. Practical Chemistry, Changani, Vijayshree, Khandelwal, Alka Publication, Ajmer
8. Inorganic Chemistry, G.K. Rastogi, Yashpal Singh, College Book House, Jaipur
9. Physical Chemistry, V.K. Goyal, R.S. Peetaliya, College Book House, Jaipur
10. Experimental Chemistry, V.K. Goyal, R.S. Peetaliya, College Book House, Jaipur
11. Inorganic Chemistry, Lavania, Gupta, Ojha, Bansal, Ramesh Book Depot, Jaipur

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE102MJ	Physics-I	CE	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Practical				25 Practical	

Physics-Paper-I: MECHANICS – I

Objectives:

- ❖ To understand the physical laws and frames of reference.
- ❖ To aware the concept of special theory of relativity.
- ❖ To develop knowledge about conservation law.
- ❖ To give information about rigid body dynamics.

UNIT-I Physical Laws and Frames of Reference:

Inertial and non-inertial frames, examples. Transformation of displacement, velocity and acceleration between different frames of reference involving translation. Galilean transformation and invariance of Newton's law. Noninertial frames, fictitious or pseudo forces, Transformation of displacement, velocity and acceleration between rotating co-ordinate systems, centrifugal acceleration, Coriolis force and its applications, Motion relative to earth. Foucault's pendulum

UNIT-II Special Theory of Relativity:

Postulates of special theory of relativity. Lorentz transformations, Addition of velocities and acceleration, Time dilation and length contraction. Variation of mass with velocity, Relativistic energy and mass energy relation.

UNIT-III Conservation Laws:

Conservative forces. Potential energy. Potential energy in gravitational and electrostatic field. Rectilinear motion under conservation forces. Discussion of potential energy curves and motion of a particle. Conservation of angular momentum about an arbitrary point, Precessional motion of spinning top, Spin precession in constant magnetic field.

UNIT-IV Rigid Body Dynamics:

Equation of motion of a rotating body, inertial coefficients, case of J not parallel to w , kinetic energy of rotation and idea of principle axis. Calculation of moment of inertia of a disc, spherical shell, hollow and solid spheres and cylindrical objects (cylindrical shell, solid cylinder) about their symmetric axis through centre of mass.

Course Outcomes: On completion of the course students would able to:

- ❖ Applies relative motion Property.
- ❖ Discuss on the Parameters defining the motion of mechanical systems.
- ❖ Describe the rigid body dynamics.
- ❖ Calculate the moment of inertia about symmetric axis & CM.

Suggested Readings:

1. Kittel, Knight, Mechanics, 2007 Berkeley Physics, Vol.1, Tata McGraw-Hill.
2. R.P. Feynman, R.B. Ligton, M. Sands, The Feynman Lectures on Physics, Vol. 1, Pearson Education.
3. D. Kleppner, R.J. Kolenkow, An introduction to Mechanics, 1973, Tata McGraw-Hill.
4. D.S. Mathur, Mechanics, S. Chand and Company Limited, New Delhi.
5. R.S. Gambhir – Mechanics, CBS Publishers and Distributors, New Delhi.
6. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, 2015–16, यांत्रिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली

Physics-Paper-II: MECHANICS – II

Objectives:

- ❖ To understand the centre of mass frame.
- ❖ To aware the concept of motion under central forces.
- ❖ To develop knowledge about elasticity-I.
- ❖ To give information about elasticity-II and its examples.

UNIT-I Centre of mass frame:

Centre of mass, Two particle System, motion of centre of mass and concept of reduced mass, Conservation of energy and linear momentum, Collision of two particles in one and two dimensions (elastic and inelastic), Analysis of collision in centre of mass frame. Slowing down of neutrons in moderator. System with varying mass. Angular momentum and charged particle scattering by a nucleus as an example.

UNIT-II Motion under central forces:

Motion under central force, Gravitational interaction, Inertial and gravitational mass. General solution undern gravitational interaction. Rutherford scattering. Discussion of trajectories. Cases of elliptical and circular orbits. Kepler's laws,

UNIT-III Elasticity-I:

Elasticity, Small deformations, Young's modulus, Bulk modulus and Modulus of rigidity for an isotropic solid, Poisson's ratio, relation between elastic constants. Elastic theorems.

UNIT-IV Elasticity-II:

Theory of bending of beams and Cantilever, Torsion of a cylinder, bending moments and Shearing forces. Experimental determination of elastic constants by bending of beam.

Course Outcomes: After completion the course student would able to:

- ❖ Describe center of mass.
- ❖ Applies the vector theorems of mechanics.
- ❖ Classify the analytical mechanics.
- ❖ Use of theory of bending of beam & cantilever to determine the deformation. Differentiating various elastic coefficients.

Suggested Readings:

1. Kittel, Knight, Mechanics, 2007 Berkeley Physics, Vol.1, Tata McGraw-Hill.
2. R.P. Feynman, R.B. Ligton, M. Sands, The Feynman Lecures on Physics, Vol. 1, Pearson Education.
3. D. Kleppner, R.J. Kolenkow, An introduction to Mechanics, 1973, Tata McGraw-Hill.
4. D.S. Mathur, Mechanics, S. Chand and Company Limited, New Delhi.
5. R.S. Gambhir – Mechanics, CBS Publishers and Distributors, New Delhi.
6. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, 2015–16, यांत्रिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली

Physics-Paper-III: ELECTROMAGNETISM – I

Objectives:

- ❖ To understand the vector field and vector theory.
- ❖ To aware the concept of curl and the field of stationary charge.
- ❖ To develop knowledge about the field of moving charge.
- ❖ To give information about the magnetic field.

UNIT -I Vector Fields:

Partial derivative. Gradient of a scalar function. Line integral of a vector field. Divergence of a vector field. Divergence in the Cartesian coordinates, Concept of solid angle. Gauss divergence theorem, Gauss law in differential form, Gauss law from inverse square law, physical meaning of divergence of a vector, The Laplacian operator. Poisson's and Laplace equations.

UNIT -II Curl and the Field of Stationary Charge:

Curl of a vector field, curl in Cartesian coordinates, Stoke's theorem, physical meaning of curl. Potential difference and potential function. Potential energy of a system. Application: energy required to build a uniformly charged sphere. Classical radius of the electron, potential and field due to a short dipole, torque and force on a dipole in a external field.

UNIT -III The Field of Moving Charge:

Magnetic force, Measurement of charge in motion, Invariance of charge. Electric field measured in different frames of reference, Field of a point charge moving with constant velocity, Force on a moving charge, Interaction between a moving charge and other moving charges.

UNIT – IV The Magnetic Field:

The definition of magnetic field, properties of the magnetic field. Ampere's circuital law with applications. Ampere's Law in the differential form. Vector potential. Poisson's equation for vector potential. Field of any current carrying wire and deduction of Bio-Savart law.

Course Outcomes: After completion the course student would able to:

- ❖ Describe the basic mathematical concepts related to electromagnetic vector fields.
- ❖ Discuss about the principles of electrostatics.
- ❖ Applies the principles of magneto statics.
- ❖ Differentiation between electric field and electric potential.

Suggested Readings:

1. Edward M. Purcell, Electricity and Magnetism, Berkeley Physics, Vol.2, Tata McGraw-Hill.
2. Alonso, Finn, Fundamental University Physics, vol.2, Addison Wesley longmann.
3. Griffith, An Introduction to Electrodynamics Pearson Education.
4. R.P. Feynman, The Feynman Lectures on Physics, Vol. 2, Pearson Education.
5. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, 2015–16, विद्युत चुम्बकत्व, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली

Physics Practical: I

1. To study the variation of power transfer to different loads by a D.C. source and to verify maximum power transfer theorem.
2. To study the variation of charge and current in a RC Circuits with different time constant (using a DC source).
3. To study the behaviour of an RC Circuits with varying resistance and capacitance using AC mains as a Power source and also to determine the impedance and phase relations.
4. To study the rise the decay of current in an LR circuit with a source of constant emf.
5. To study the voltage and current behavior of an LR circuit with an AC power source. Also, determine power factor, impedance and phase relations.
6. To study the characteristics of a semiconductor junction diode and determine forward and reverse resistances.
7. To study the magnetic field along the axis of a current carrying circular coil. Plot the necessary graph and hence find the radius of the circular coil.
8. To determine the specific resistance of a materials and determine difference between two small resistance using Carey Foster's bridge.
9. To convert galvanometer into an ammeter of a given range.
10. To convert galvanometer into a voltmeter of a given range.
11. Any experiment according to theory paper.

Suggested Readings:

- 1 प्रभा दशोरा, 2015, प्रथम वर्ष प्रायोगिक भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE103MJ	Mathematics-I	CE	4	15	20	100
	Mathematics-II				20	
	Mathematics-III				20	
	Mathematics Practical				25 Practical	

Mathematics -Paper-I: Discrete Mathematics-I

Objectives:

- ❖ Discuss about the set, relation and function.
- ❖ To aware about the boolean algebra- lattices and algebraic structure.
- ❖ To discuss about duality.
- ❖ Understand the logic and propositional calculation.

Unit 1: Sets, cardinality, principal of inclusion and exclusion, mathematical induction principal, relations and functions - binary relations, equivalence relations and partitions.

Unit 2: Partial ordered relations and lattices, chains and antichains, pigeon hole principle.

Unit 3: Boolean Algebras- lattices and algebraic structure, duality, distributive and complemented lattices, boolean lattices, boolean functions and expressions.

Unit4: Logic and propositional calculus, propositions, simple and compound, basic logical operations, truth tables, tautoloies and contradictions propositional functions, quantifiers.

Course Outcomes: After complition the course student would able to:

- ❖ Classify the terms set, relation and function.
- ❖ Interpret the boolean algebra- lattices and algebraic structure.
- ❖ Describe the duality property.
- ❖ Calculate the logic problem.

Suggested Readings:

1. V.K. Balakrishnan, Introductory Discrete Mathematics, Prentice-Hall, 1996.
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill Book Co., 1995.
3. C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, 1986.
4. Kenneth H. Roson, Discrete Mathematics and Its Applications, Tata Mc-Graw Hiils, New Delhi, 2003.
5. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड़, जितेन्द्र सैनी, विविक्त गणित, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
6. जी.सी. गौखरू सैनी, विविक्त गणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics -Paper-II: Differential Calculus

Objectives:

- ❖ To understand the series and type of series.
- ❖ To aware the concept of curvature and length of arc.
- ❖ To develop knowledge about the partial differentiation.
- ❖ To give information about the maxima and minima, asymptotes.

Unit I: Series - Infinite series and convergent series, tests for convergence of a series - comparison test, d'alembert's ratio test, cauchy's n^{th} root test, raabe's test, de-morgan-bertrand's test, cauchy's condensation test, gauss's test, (derivation of tests is not required), alternating series, absolute convergence, taylor's theorem, maclaurin's theorem.

Unit 2: Derivative of the length of an arc, pedal equations, curvature - various formulae, centre of curvature and chord of curvature.

Unit 3: Partial differentiation, Euler's theorem for homogeneous functions, chain rule of partial differentiation, total differentiation, differentiation of implicit functions.

Unit 4: Envelopes and evolutes, maxima and minima of functions of two variables, lagrange's method of undetermined 'multipliers, asymptotes, multiple points, curve tracing of standard curves (cartesian and polar curves).

Course Outcomes: After completion the course student would able to:

- ❖ Identify the test of convergence of a series.
- ❖ Calculate the Derivative of the Length of an Arc, Pedal Equation.
- ❖ Classify the Partial Differentiation and Calculate the Euler Theorem for Homogeneous Functions.
- ❖ Use of theory of Envelopes and Evaluate Maxima & Minima of Functions of Two Variables.

Suggested Readings:

1. Chandrika Prasad and Gorakh Prasad, A Text Book on Differential Calculus, Pothishala Pvt. Ltd., Allahabad, 1992.
2. Slituiti Narayan and P.K. Mittal, Differential Calculus, S. Chand & Co., N. D., 2013.
3. H.S. Dhami, Differential Calculus, Age Int. Ltd., New Delhi, 2012.
4. M. J. Strauss, G. L. Bradley and K. J. Smith, Calculus (3rd Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
5. H. Anton, I. Bivens and S. Davis, Calculus (7th Edition), John Wiley and sons (Asia), Pt Ltd., Singapore, 2002.
6. G.B. Thomas, R. L. Finney, M. D. Weir, Calculus and Analytic Geometry, Pearson Education Ltd, 2003.
7. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड़, जितेन्द्र सैनी, अवकलन गणित, आर.बी. डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
8. जी. सी. गौखरू सैनी, अवकलन गणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics -Paper-III: Analytic Geometry I

Objectives:

- ❖ To understand the polar equation of conics.
- ❖ To aware the concept of circle of conics.
- ❖ To develop knowledge about the sphere and cone.
- ❖ To give information about the cylinder.

Unit 1: Polar equation of conics, polar equation of tangent, normal and asymptotes.

Unit 2 chord of contact, auxiliary circle, director circle of conics.

Unit 3: Sphere, Cone.

Unit 4: Cylinder.

Course Outcomes: After completion the course student would able to:

- ❖ Discuss on the concept of polar equation of conics.
- ❖ To identify the auxiliary circle and director circle of conics.
- ❖ To understand the 3-D geometry of sphere and cone.
- ❖ To understand the 3-D geometry of cylinder

Suggested Reading:

1. N. Saran and R.S. Gupta, Analytical geometry of Three Dimensions, Pothishala Pvt. Ltd., Allahabad, 1992.
2. P.K. Jain and Khalil Ahmed, A Text Book of Analytical geometry of Three Dimensions, Wiley-Eastern Ltd., 2000.
3. बी.एल. चौरसिया, संजीव त्यागी, अनिल शर्मा, बी. एल. जांगीड़, जितेन्द्र सैनी, एनालिटिक ज्यामिती, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
4. जी.सी. गौखरू सैनी,, एनालिटिक ज्यामिती, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE104MJ	Botany-I	CE	4	15	20	100
	Botany-II				20	
	Botany-III				20	
	Botany Practical				25 Practical	

Botany -Paper-I: MICROBIOLOGY

Objectives:

- ❖ To learn about the history, discovery, concept and applications of microbiology.
- ❖ To understand the ultra structures and classification of bacteria
- ❖ To know the structural component, cycle of life, reproduction of viruses with their diseases.
- ❖ To comprehend the basic concept of food spoilage and food preservation
- ❖ To aware the economic importance of bacteria and viruses

UNIT I: History and development of Microbiology

- a) History and development of Microbiology: contribution of eminent scientists (Antony Van Leeuwenhoek, Louis Pasteur, Robert Koch, Elie Metchnikoff, Paul Ehrlich, Alexander Flemming, Selman A. Waksman, Edward Jenner)
- b) Spontaneous generation, biogenesis, germ theory of disease
- c) Vaccination and discovery of antibiotics
- d) Concept of quorum sensing and biofilms, microbial nutrition
- e) Scope of microbiology

UNIT II: Bacteria

- a) Bacteria: General characteristics, occurrence, classification
- b) Ultra-structure of Bacterial cell: morphology (structure and shapes), flagella, capsule, nutritional types, chromatin material
- c) Reproduction in Bacteria-vegetative, asexual and sexual (transformation, conjugation and transduction)
- d) Comparison of Archaeobacteria and Eubacteria, Gram positive and Gram-negative Bacteria
- e) Cyanobacteria: Cell structure, reproduction and life history of Nostoc

UNIT III: Viruse and Mycoplasma

- a) Discovery, classification and structural component of Viruses, replication, lytic and lysogenic cycle
- b) Transmission of viruses
- c) Bacteriophages, Structure and reproductive cycle of TMV and Pox virus
- d) Mycoplasma: Occurrence, morphology, reproduction and importance

UNIT IV: Economic importance of bacteria and Viruses

- a) Economic importance of bacteria with special reference to their role in agriculture, industry, waste management and biocontrol
- b) Economic importance of viruses with special reference to vaccine production, role in research and medicine
- c) Basic concept of food spoilage and food preservation, Probiotics

Course Outcomes: After completion the course student would able to:

- ❖ Understand the ultra structures and classification of bacteria.
- ❖ Describe the structural component, cycle of life, reproduction of viruses with their diseases.
- ❖ Discuss the history, discovery, concept and applications of microbiology.
- ❖ Comprehend the basic concept of food spoilage and food preservation.
- ❖ Explain the economic importance of bacteria and viruses.

Suggested Readings:

1. Agrawal, K., & Sharma, J. (2014). A Text book of Mycology, Microbiology and Plant Pathology. CBH Publication, Jaipur.
2. Aneja, K. R. (2003). Experiment in Microbiology, Plant Pathology and Biotechnology. New age international (P) Ltd. Publishers, New Delhi.
3. Biswas, S. B. & Biswas, A. (2000). An introduction of Viruses. Vikas Publications, New Delhi.
4. Dubey, R. C. & Maheshwari, D. K., (2002). A Text Book of Microbiology. S. Chand and Co., New Delhi.
5. Kumar, H. D. & Kumar, S. (1998). Modern Concepts of Microbiology. Vikas publishing house Pvt.Ltd., New Delhi.
6. Madahar, C. L. (2001). Introduction of Bacteria. Mc Graw Hill Edu. Pvt. Ltd., London.
7. Mckane, L. & Judy, K. (1996). Microbiology: Essentials and Applications. McGraw Hill, New York.
8. Pandey, S. N. & and Trivedi, P. C. (2005). A text book of Fungi, Bacteria and Virus. Vikas PublishingHouse, New Delhi.
9. Prescott, L., & Harley, J. and Klein, D. (2005). Microbiology. (6thed.), Tata Mc Graw-Hill Co., New Delhi.
10. Purohit, S. S. (2002). Microbiology. Agro. Bot. Publication, Jodhpur.
11. Sharma, P. D. (2003). Microbiology and Pathology. Rastogi Publication, Meerut.
12. Singh, V. & and Srivastava, V. (1998). Introduction of Bacteria. Vikas Publication, New Delhi.
13. Singh, R. P. (2010). Microbiology. Kalyani Publishers, New Delhi.

Botany -Paper-II: ALGAE AND LICHENS

Objectives:

- ❖ To know the characteristics, structure, habitat, types and evolution of algae
- ❖ To understand various aspects of photosynthetic pigments with special reference to chlorophyll and xanthophylls.
- ❖ To learn about the characteristics with reference of examples of phaeophyceae and Rhodophyceae
- ❖ To get aware the economic importance of algae
- ❖ To get knowledge about the life cycle and economic importance of lichens.

UNIT I: Basics of algae

- a) General characters, classification of algae (Fritsch, Smith), diversity in habitat, range of vegetative thallus organization
- b) Algae: cell structure photosynthetic pigments and reserve food material
- c) Reproduction: vegetative, asexual and sexual, evolution of sex in algae, types of life cycles
- d) Economic importance of algae

UNIT II: Chlorophyceae and Xanthophyceae

- a) Chlorophyceae: General characteristics, thallus organization, cell structure, reproduction and life cycle of Chlamydomonas, Volvox, Chara
- b) Xanthophyceae: General characteristics, Vaucheria: Thallus organization, cell structure, reproduction and life cycle

UNIT III: Phaeophyceae and Rhodophyceae:

- a) Phaeophyceae: General characteristics, Ectocarpus: Thallus organisation, cell structure, reproduction and life cycle
- b) Rhodophyceae: General characteristics, Polysiphonia: Thallus organisation, cell structure, reproduction and life cycle
- c) Economic importance of algae, isolation and culture of algae

UNIT IV: Lichens

- a) Lichens: General characters, types, structure, multiplication, reproduction
- b) Economic importance, its importance as colonizers and indicators of environment.

Course Outcomes: After completion the course student would able to:

- ❖ Describe various aspects of photosynthetic pigments with special reference to chlorophyll and xanthophylls.
- ❖ Differentiate the characteristics of phaeophyceae and Rhodophyceae
- ❖ Explain characteristics, structure, habitat, types and evolution of algae
- ❖ Interpret the economic importance of algae
- ❖ Comprehend the life cycle and importance of lichens

Suggested Readings:

1. Bold, H. C. & Wayne, M. J. (1996). Introduction to Algae. (2nd ed). Prentice Hall, Inc. Englewood Cliffs, New Jersey.
2. Ghemawat, M. S., Kapoor, J. N. & Narayan, H. S. (1976). A Text book of Algae. Ramesh Book Depot. Jaipur.
3. Gilbert, M. S. (1985). Cryptogamic Botany. Vol. (2nd. ed.) Tata McGraw Hill Publishing Co. Ltd., New Delhi.
4. Kumar, H. D. (1998). Introductory Phycology. Affiliated East-West Press Ltd., New York.
5. Lee, R.E. (2008). Phycology. Fourth Edition, Cambridge University Press, USA.
6. Sambamurthy, A.V.S.S. (2006). A Textbook of Algae. I. K. International Pvt. Ltd., New Delhi.
7. Singh, V. Pandey, P. C. & Jain, D. K. (2001). A Text book of Botany. Rastogi Publication, Meerut.
8. Thakur, A. and Bassi, S., (2007). Diversity of microbes and Cryptogams. S. Chand and Co., New Delhi.
9. Van den Hoek, C., Mann, D.J. & Jahns, H.M. (1995). Algae: An introduction to Phycology. Cambridge Univ. Press., England.
10. Vashitha, B. R. (2002). Botany for degree students (Algae and Bryophytes). S. Chand and Co. Ltd., New Delhi.

Botany -Paper-III: Mycology and Plant Pathology

Objectives:

- ❖ To understand general characteristics, classification, structure, reproduction of fungi.
- ❖ To learn about general diseases caused by fungi, bacteria, viruses in plants.
- ❖ To know general characteristics of Oomycetes, Zygomycetes.
- ❖ To gain knowledge about other classes i.e. Ascomycetes, Basidiomycetes and Deuteromycetes with examples.

UNIT I Fungi & Plant disease

- a) Fungi: General characteristics, classification (Alexopoulos and Mims's)
- b) Fungi: thallus, cell structure, nutrition, asexual, sexual reproduction, homothallism, heterothallism and heterokaryosis
- c) Plant diseases: Biotic and abiotic diseases, important symptoms caused by fungi, bacteria, virus and MLOs (Blight, mildew, Downy mildew and green ear, rust, smut, canker, mosaic, little leaf, gall) etc.

UNIT II Chytridiomycetes, Oomycetes and Zygomycetes

- a) General account of class chytridiomycetes, oomycetes and zygomycetes
- b) Structure and life cycles/disease cycles of members of chytridiomycetes, oomycetes and zygomycetes with special reference to the genera: Albugo (white rust disease), Sclerospora (Downy mildew/Green ear disease)

UNIT III Ascomycetes Basidiomycetes and Deuteromycetes

- a) General characteristics of Ascomycetes, Basidiomycetes and Deuteromycetes
- b) Structure and life history/disease cycle of class Ascomycetes Basidiomycetes and Deuteromycetes with special reference to the genera: Aspergillus, Claviceps (ergot disease), Peziza, Puccinia (rust disease) and Agaricus

UNIT IV: Deuteromycetes & Economic importance of fungi

- a) General characteristics and structure and life cycle of class Deuteromycetes with special reference to Alternaria (early blight of potato disease)
- b) Sex degeneration in fungi
- c) Economic importance of fungi

Course Outcomes: After completion the course student would be able to:

- ❖ Understand general characteristics, classification, structure, reproduction of fungi.
- ❖ Discuss general characteristics of oomycetes, zygomycetes
- ❖ Get knowledge about other classes i.e., ascomycetes, basidiomycetes and deuteromycetes.
- ❖ Learn about general diseases caused by fungi, bacteria, viruses in plants
- ❖ Classify the division Fungi.

Suggested Readings:

1. Alexopoulos, C.J. & Mims, C.V. (1988). Introductory Mycology. John Wiley and Sons, New York.
2. Dubey, H.C. (1989). Fungi. Rastogi publication, Meerut.
3. Pandey, S. N. & Trivedi, P. S. (1994). A text book of Fungi, Bacteria and Virus. Vikas Publishing House, New Delhi.
4. Sarabhai, R.C. & Saxena, R.C. 1990. A textbook of Botany. Rastogi publication, Meerut.
5. Sharma, O.P. 1992. Text Book of Thallophytes. McGraw Hill Pub. Co.
6. Sharma. P.D. 1991. The Fungi. Rastogi & Co. Meerut.
7. Smith, G.M. 1971. Cryptogamic Botany. Vol. 1 Algae & Fungi. Tata McGraw Hill Publishing Co, New Delhi.
8. Vashishta, B. R. 2001. Botany for degree student's Fungi. S. Chand and company, New Delhi.
9. Webster, J. & Weber, R. 2007. Introduction to Fungi. (3rd ed.), Cambridge University Press, Cambridge.

PRACTICAL I

1. Introduction of handling and maintenance of laboratory equipments.
2. The components, use and care of compound microscope.
3. Study of the types of bacteria from temporary/permanent slides.
4. Introduction of techniques of slide preparation, stain preparation and staining.
5. Gram's staining of bacteria from curd.
6. Preparation of microbiological culture media (potato dextrose agar, nutrient agar).
7. Isolation of bacteria from soil.
8. Study of vegetative and reproductive structures of: Nostoc, Chlamydomonas, Volvox, Chara, Voucheria, Ectocarpus, Polysiphonia.
9. Study of different types of lichens.
10. Nuclear staining of filamentous fungi.
11. Preparation of slides and study of following genera through temporary mounts and permanent slides:
 12. Albugo, Aspergillus, Claviceps, Peziza, Puccinia, Agaricus, Alternaria.
 13. Study of plant diseased specimens caused by fungi, viruses, bacteria and mycoplasma.
 14. Measurement of fungal extracellular enzymes.
 15. Collection, identification and submission of minimum 3 disease related specimens.

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE105MJ	Zoology-I	CE	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25 Practical	

Zoology- Paper-I: Life and Diversity of animals - Nonchordata-I

Objectives:

- ❖ To discuss the animal kingdom.
- ❖ To understand the general characteristics and Classification of Phylum protozoa.
- ❖ To develop the general characteristics and Classification of Phylum porifera.
- ❖ To understand the general characteristics and Classification of Phylum platy helminthes

Unit I: Principles of Taxonomy:

- a) Concept of Invertebrates
- b) Principle, rules and Basis of Taxonomy and Classification
- c) Nomenclature system, Binomial nomenclature, Trinomial nomenclature, Rules of nomenclature
- d) Concept of five kingdoms, Levels of Organisation, Basis of classification (Number of Cells, Symmetry, Coelom, Embryogeny, Segmentation)

Unit II: Protozoa and Porifera

- a) Salient features and classification of Protozoa up to Class
- b) Type study – Paramecium (Salient Features, Locomotion, Nutrition and Reproduction)
- c) Salient features and classification of Porifera up to Class
- d) Type study- Sycon Canal system of Sponges Skeletal System

Unit III Phylum Coelenterata

- a) Salient features
- b) Classification of Coelenterata up to Class
- c) Type study – Obelia (External Features, Nutrition, Excretion, Reproduction)
- d) Polymorphism in Coelenterates

UNIT IV Phylum Platy helminthes

- a) Salient features
- b) Classifications of Platy helminthes up to Class
- c) Type study- Taenia (External features and life cycle)
- d) Type study- Fasciola (External Features and Life Cycle)

Course Outcomes: After completion the course student would able to:

- ❖ Understand general taxonomic rules on animal classification, the principles and methods of taxonomy, the Levels of structural organization and the Basis of Classification -Coelom, symmetry, segmentation and its types.
- ❖ Classify the phylum Protozoa, Porifera & Coelenterata using examples, Understand the Locomotion in Protozoa, canal system of sponges, Coral and coral reefs & economical importance of Protozoa, Porifera.
- ❖ Clarify the external features and life cycle of fasciala.
- ❖ Discuss the sycom canal sysem of sponge's skeletal system.

Suggested Readings:

1. Agarwal V.K., (2023) Diversity and Biology of Non-Chordata, S Chand and Company Ltd, India.
2. Agarwal V.K. (2023) Diversity of Non-Chordates, Parasitology and Economic Zoology, S Chand and Company Ltd, India.
3. Agarwal V.K., Bobdey Atul, Masra S. Archana, Tijare Rajendra (2025) Life and Diversity of Animals-Nonchordates, S Chand Publishing, India.
4. Jayvardhan, Balkhande V. (2024) A Textbook of Biodiversity of Non-Chordates, Advent Publishing, India.
5. Kandpal Chandra Manoj, Rai Kumud (2023) Diversity of Non-Chordates and Economic Zoology, Thakur Publication, Pvt. Ltd.India.
6. Mandal Fatik Baran, (2024) Biology of Non-Chordates, PHI Learning, India.
7. Publications Gyaniversity (2024) BZYCT-131: Animal Diversity (IGNOU Study Guide Book), Gyaniversity Publications, India.
8. Sampath S. Karikalan (2022) Allied zoology: non-chordata & chordata, Dr. S. Karikalan, Ph. D, India.
9. Shah kumar Rajesh (2019) Invertebrate Zoology - 1: Non-Chordates, Mahaveer Publications, India.
10. Sheikh M. S. and Mishra Tripurari (2023) zoology-I: Diversity of Non-Chordates: Theory and Practical, Thakur Publication Pvt.Ltd., India

Zoology- Paper-II: Life& Diversity of Animals Nonchordata- II

Objectives:

- ❖ To discuss the general characteristics and Classification of Phylum Annelida.
- ❖ To understand the general characteristics and Classification of Phylum Arthropod.
- ❖ To understand the general characteristics and Classification of Phylum Echinodermata.
- ❖ To understand the general characteristics and Classification of Phylum Hemichordate.

Unit I: Annelida and Arthropoda:

- a) General characters and outline classification up to classes with examples of Annelida.
- b) Type-study: Morphology, Digestive, Excretory, & Reproductive systems of leech.
- c) General characters and outline classification up to classes with examples of Arthropoda.
- d) Type Study: Palemon: - Morphology, Digestive, Excretory, & Reproductive systems.

Unit II: Mollusca:

- a) General characters of Mollusca
- b) Outline classification up to classes with examples.
- c) Beneficial Mollusca
- d) Type Study: Pila: External characters, Skeletal, Digestive, Respiration, & Reproductive systems.

Unit III: Echinodermata:

- a) General characters of Echinodermata
- b) Outline classification up to classes with examples.
- c) Some other Echinoderms Pentaceros and Astropecten
- d) Type Study: Asterias (External characters, Digestive, Respiration, & Reproductive systems)

Unit IV: Hemichordata:

- a) General characters of Hemichordata.
- b) Hemichordata classification up to classes with examples.
- c) Salient features of Saccoglossus and Ptychodera.
- d) Salient features of Balanoglossus.

Course Outcomes: After completion the course student would able to:

- ❖ Classify Phylum Annelida with taxonomic keys, and a basic idea of parasitic adaptations.
- ❖ Write down the classification and characteristics of Phylum Arthropoda,
- ❖ Write down the classification and characteristics of Phylum Mollusca Echinodermata & Hemichordata and understand the process of pearl formation and water vascular system of star fish.
- ❖ Describe in the productive system of Leech.

Suggested Readings:

1. Agarwal V.K. (2023) Diversity and Biology of Non-Chordata, S Chand and Company Ltd, India.
2. Agarwal V.K. (2023) Diversity of Non-Chordates, Parasitology and Economic Zoology | Lab on Virtual Dissection, Anatomy, Economic Zoology and Parasitology, S Chand and Company Ltd, India.
3. Agarwal V.K. (2017) non-chordates I, Ecology, S Chand & Co Ltd, India.
4. Agarwal Dr. V.K., bobday Atul, Maaram S. Archana, Tijare Rajendra (2025) Life and Diversity of Animals-Nonchordates (Protozoa to Annelida) | Environmental Biology, S Chand Publishing, India.
5. Arora Dr. Mohan P. (2018) Non-Chordata – I, Himalaya Publishing House, India.
6. Lal S.S. Practical Zoology Invertebrates 9th edition, Rastogi Publication Meerut & Distributors, New Delh
7. Mandal Fatik Baran (2018) Biology of Non-Chordates, PHI Learning, India.
8. Parkash Gayatri (2023) Invertebrate Zoology, AKN Learning, India.
9. Rastogi Veer Bala (2020) KNRN Invertebrate Zoology, KNRN Publications, India.
10. R.L. Kotpal, 2007, Phylum Protozoa to Echinodermata (series), Rastogi and Publication, Meerut

Zoology- Paper-III: Cell Biology

Objectives

- ❖ To understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles
- ❖ To understand how these cellular components are used to generate and utilize energy in cells
- ❖ To understand the cellular components underlying mitotic cell division.
- ❖ To develop the structure a function of mitochondria

Unit – I Introduction to cell Biology

- a) Introduction to cell: Size, shape, ultra structure
- b) Difference in prokaryotic and eukaryotic cell,
- c) Endoplasmic reticulum: Types, Ultra structure and functions
- d) Golgi complex: Ultra structure and functions

Unit – II Intracellular Compartment

- a) Structure of mitochondria.
- b) Function of mitochondria;
- c) Structure of Lysosome
- d) polymorphism and functions of Lysosome

Unit – III Cell Interaction

- a) Centrosome, Cilia and Flagella
- b) General Principle of cell Communication
- c) Cell proliferation: Events in different phases of cell cycle

Unit – IV Different of phase of mitosis and meiosis

- a) Ribosome: Structure, Types,
- b) Lake's model and functions of Ribosome
- c) Mitosis (Different Phases and Significance)
- d) Meiosis (different phases and significance)

Course Outcomes: After completion the course student would able to:

- ❖ Develop an understanding of the cytoskeleton and cell membrane
- ❖ The cell cycle, structure of mitochondria and types of cell divisions.
- ❖ Students are able to discuss the cell, structure of ribosome, lysosome and Golgi complex.
- ❖ Students are able to discuss the endoplasmic recticulum structure.

Suggested Readings:

1. Gupta P.K. (2020) Cell Biology and Genetics Rastogi publication merrut
2. Genetics and Infectious Diseases (Zoology), Thakur Publication Pvt Ltd, India.
3. Kotpal R.L. (2019) Modern Textbook of Zoology: Invertebrates, Rastogi Publications, India.
4. Kumud Rai, Kumar Ajay, Kumar Tomar Dinesh, Khan Mahjabee (2023) Cytology,
5. K.C. Soni, 2008, Cell Biology and Genetics, College Book Center, Jaipur
6. Mahapatra Samapti Sinha (2024) Zoology: Med Easy, Physics Wallah, India.
7. Narendra Jain, Maya Singh, Shikha Patni, S.K. Singh, 2016, Cell Biology and Genetics, College Book Center, Jaipur
8. Rastogi Veer Bala (2021) CELL BIOLOGY Medtech, India.
9. Shome Dr. Saurav (2023) Fundamental Zoology (Cell Biology), Santra Publication, India.
10. Singh Prahalad (2023) Cell Biology for M.Sc. Zoology (NEW ERA), VNR Classes, India
11. Singh Shailendra, Katariya Singh Sher, Verma Kumar Rajan (2023) Zoology: Gene Technology, Immunology and Computational Biology, Thakur Publication Pvt. Ltd, India.
12. Verma P.S., Agarwal V.K. (2016) Cell Biology (Cytology, Biomolecules and Molecular Biology), S. Chand Publishing, India.
13. Verma P.S. (2020) Cell Biology, Genetics, Molecular Biology: Evolution and Ecology, S. Chand & Co Ltd, India.
14. Verma P.S. (2020) Cell Biology, Genetics, Molecular Biology, S. Chand Publishing, India.

Presentation Work (Any One)

1. Prepare a power point presentation of given course Content.
2. Prepare working model related content; prepare report and record video of its working.
3. Prepare a creative video presentation related to any Animal kingdom to issue or any topic related to Zoology.

Practical

Zoology: PRACTICAL Based on paper I, II and III

Notes:

1. With reference to whole mounts and museum specimens, in case of unavailability of certain animal types, diagrams, photographs, models and digital techniques etc. should be substituted. Study will include classification (up to orders) with diagnostic characters and comments.
2. Candidates will keep a record of all work done in the practical class.

Paper-I: Life and Diversity of Animals- Nonchordata – I (Protozoa to Aschelminthes)

I. Microscopic Techniques: Organisation and working of optical microscopes: Dissecting and Compound Microscope:

II. Study of museum specimens (Classification of animals up to orders)

- a) Protozoa: Euglena, Volvox, Elphidium (Polystomella), Foraminiferous shell, Monocystis, Opalina, Paramoecium, Paramoecium showing Binary fission, Paramecium Conjugation, Balantidium, Nyctotherus, Vorticella
- b) Porifera: Sycon, Leucosolenia, Hyalonema, Euplectella, Spongilla
- c) Coelenterata: Obelia Colony & Medusa, Millepora, Physalia, Vellela, Aurelia, Alcyonium, Gorgonia, Pennatula, Metridium, Stone Corals
- d) schelminthes: Ascaris, Drancunculus, Ancylostoma, Wuchereria

2. Study of Permanent Slides

- a) Porifera: Sponge gemmules, Sponge spicules, V.S. Sycon, T.S. Sycon,
- b) Coelenterata: Obelia medusa, Obelia Colony
- c) Platyhelminthes: Miracidium, Sporocyst, Redia and Cercaria, Metacercaria larvae of Fasciola, Hexacanth and Onchosphere larva of Taenia solium, Scolex of Taenia, Mature and gravid proglottids of Taenia solium.

3. External features and Anatomy through audio visual presentation

- a) Cockroach: External features, Mouth parts, Digestive, nervous and reproductive system
- b) Earthworm: External Features, Digestive, nervous and reproductive system

Paper-II: Life and Diversity of Animals – (Annelida to Hemichordata)

1. Study of museum specimens (Classification of animals up to orders)

- a) Annelida: Nereis, Heteronereis, Aphrodite, Chaetopterus, Arenicola,
- b) Arthropoda: Peripatus, Lepus, Palemon, Eupagurus (hermit Crab), Carcinus (Crab), Scolopendra, Julus, Scorpion, Spider, Limulus, Cysticera/Locust, Dragonfly, Queen Termite, Cymax, Moth/ Butterfly,
- c) Mollusca: Chiton, Dentalium, Cyprea, Pila, Aplysia, Mytilus, Pincteda, Loligo, Sepia, Octopus, Nautilus
- d) Echinodermata: Antedon, Asterias, Ophiothrix, Echinus, Holothuria
- e) Hemichordata: Balanoglossus

2. Study of permanent slides

- a) Annelida: Parapodia of Nereis, T.S. of Leech through Buccal Cavity and Crop
- b) Arthropoda: Crustacean Larvae- Nauplius, Zoea, Metazoea, Megalopa, Mysi
- c) Mollusca: Veliger and Glochidium larvae, T.S. of Unio Shell
- d) Echinodermata: T.S. of arm of star fish
- e) Hemichordata: Balanoglossus through collar and proboscis

3. Audiovisual demonstration

- a) Prawn: Appendages, digestive, Nervous and Reproductive system, Statocyst, Hastate Plate
- b) Pila: Nervous system, Osphradium, Gills, Radula

Paper III: Cell Biology

- a) Study of pictures of ultra structure of prokaryotic cell & eukaryotic cell
- b) Demonstration of mitosis cell division in onion root tips by squash method
- c) Demonstration of meiosis through audio visual Presentation
- d) Study of mitochondria in Buccal Epitheli

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE106FD	Evolution of Indian Education	CC	4	30	70	100

Objectives:

- ❖ To know the Education in ancient India.
- ❖ To provide an overview of the contribution of Indian thinkers
- ❖ To understand the various committee and commission.
- ❖ To educate about the recent policies of Education.

Course Contents:

Unit-I: Concept and Nature of Education

- a) Education: concept and nature
- b) Objectives of education
- c) Functions of education
- d) Role and problems of education
- e) Constitutional provisions of education in India

Unit-II: Education in ancient india

- a) Vedic period
- b) Post vedic period
- c) Mourya empire and Gupta period
- d) Medieval period
- e) British period

Unit-III: Contribution of Indian thinkers

- a) Savitri Bai
- b) Jyotiba Phule
- c) Bhimrao Ambedkar
- d) Mahatma Gandhi

Unit-IV: Contribution in educationst

- a) Ravindra Nath Tagore
- b) Swami Vivekananda
- c) Shri Arbindo
- d) Jiddu Krishnamurti

Assignment & Practical Works: (Any Two)

1. Write the educational contribution of Any one Indian Thinker.
2. Prepare an assignment Work on Education in ancient India
3. Prepare a structure of education since ancient period to present time.
4. Write an assignment on programmes on education

Course Outcomes: After completion of this course students will be able to:

- ❖ Know concept of education during ancient time.
- ❖ Understand the purpose, function and Role of education in nation building.
- ❖ Understand knowledge of the Indian education system as it has evolved from the past, as it is today.
- ❖ Understand the concept, principle of sustainable development and core concept of educational thinkers.
- ❖ Solve prevailing problems of education in India.

Suggested Readings:

1. Jadhav N. (2020). Future of The Indian Education System, Konark Publications PVt. Ltd. New Delhi
2. Singaravelu G. (2018). Education in Contemporary India, Neel Kamal Publications PVt. Ltd. New Delhi
3. त्रिपाठी जी डी चौधरी सुदेश (2022)– भारतीय शिक्षा प्रणाली ऑक्सब्रिज बुक कम्पनी जयपुर
4. पाठक एवं त्यागी (2021). शिक्षा के सिद्धान्त, विनोद पुस्तक मंदिर, आगरा
5. यादव आर– (2017)– भारती; शिक्षा का इतिहास क्रिसेंट पब्लिकेशन , नई दिल्ली
6. यादव आर– (2017)– शिक्षा के सिद्धान्त, क्रिसेंट पब्लिकेशन , नई दिल्ली

websites:

1. https://en.wikipedia.org/wiki/Savitribai_Phule
2. https://en.wikipedia.org/wiki/Jyotirao_Phule
3. https://en.wikiquote.org/wiki/Mahatma_Gandhi
4. [https://en.wikiquote.org/wiki/B.R. Ambedkar](https://en.wikiquote.org/wiki/B.R._Ambedkar)
5. [https://en.wikipedia.org/wiki/Bibliography of Swami Vivekananda](https://en.wikipedia.org/wiki/Bibliography_of_Swami_Vivekananda)

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE107AV	Language-I (as per the 8 th schedule of constitution of India)	CC	4	30	70	100

Objectives:

- ❖ Language has undeniable links with all kinds of learning.
- ❖ Language enables an individual to understand new concepts, exchange ideas and communicate thoughts with fellow beings.
- ❖ To appreciate fully the role of language in education, one must begin to develop a holistic perspective on language.
- ❖ Language needs to be examined in a multi-dimensional space, giving due importance to its structural, literary, sociological, cultural, psychological and aesthetic aspects.
- ❖ The National Education Policy 2020 envisages imparting language skills as part of holistic education.
- ❖ It lays thrust on the need to enhance linguistic skills for better cognitive development and the development of a rounded personality of the learners.
- ❖ This course aims at enabling student teachers to enhance their ability to listen, speak, read, write and demonstrate linguistic skills in an effective manner.
- ❖ Linguistic skills- listening, speaking, reading, writing, speaking effectively- are fundamental to constructing knowledge in all academic disciplines and participating effectively in the world of work and creating sense in the everyday life.
- ❖ Through this course, the students will be able to enhance proficiency in reading with comprehension, understanding, thinking and conceptualizing.
- ❖ The course seeks to enhance critical thinking abilities and effective communication skills of student teachers.
- ❖ The course involves hands-on activities and practical sessions that help student teachers develop and use linguistic skills in a variety of situations.

Course Contents:

Unit-I Understanding Language and Communication

- a) Language and communication; Definitions and functions of language and communication.
- b) Nature and process of communication, principles and types of Communication.
- c) The barriers to communication, written and oral Communication
- d) Context of communication

Unit-II Understanding Grammar

- a) Classification of speech sounds and letters
- b) Production of speech sounds in languages
- c) Identification of morphemes, word formation processes; Sentence formation, vocabulary formation; Pragmatics and speech acts.
- d) Sound production in the language; coining new words, Speech acts.

Unit-III Language Skills

- a) **Reading Skills-** Meaning and types of reading Skill, reading as an interactive process Strategies for making students active readers and developing critical reading skills.
- b) **Writing Skills-** Meaning and types of writing skill, writing for specific purposes (essays, letters and reports) dealing with New Words (Academic Vocabulary Building), Summarizing and Paraphrasing techniques.
- c) **Speaking skills-** Meaning and types of speaking skill, situational conversations and role plays; tasks/activities for developing speaking (speech, elocution, discussion, debate and storytelling).
- d) **Listening Skills-** Meaning and types of Listening Skill, importance and kinds of listening; listening strategies.

Unit-IV Academic writing & Critical thinking

- a) Academic writing components; development of academic language; Activities to develop academic writing skills.
- b) Developing Critical, analytical, and interpretive thinking skills.
- c) Learning to analyze.
- d) Enhancing Critical thinking abilities.
- e) Observing a problem, describing the problem, framing the problem, comparing and evaluating a problem.

Assignment & Practical Works: (Any Two)

1. How do you interpret every day and reflect what you read? Prepare a report.
2. Analyze a recorded video from the perspective of voice and pronunciation and write a report.
3. Observing, describing and frame a problem and evaluating it.

Course Outcomes: After completing the course, the student teachers will be able to:

- ❖ Demonstrate knowledge and capacity for effective listening, speaking, reading, writing and critical thinking.
- ❖ Recognize the link between language and cognition and using linguistic knowledge and skills for effective communication of ideas and thoughts.
- ❖ Build inter-personal relationships and enhance social skills

Suggested Readings:

1. कुशवाहा पुष्पलता सक्सेना कनक 2009 हिन्दी शिक्षण आस्था प्रकाशन जयपुर।
2. पाण्डेय रामशकल 2008 हिन्दी शिक्षण विनोद पुस्तक मंदिर आगरा।
3. पारीक सुधीर टेलर लाल गोपाल 2008 पद्यान्जलि माध्यमिक शिक्षा बोर्ड राजस्थान अजमेर।
4. भाई योगेन्द्रजीत 2008 हिन्दी भाषा शिक्षण विनोद पुस्तक मंदिर आगरा।
5. शर्मा मन्जु जैन बनवारी लाल 2007 हिन्दी शिक्षण शिक्षा प्रकाशन जयपुर।
6. सत्तिगेरी के आय 2006 नूतन हिन्दी शिक्षण विनोद पुस्तक मंदिर आगरा।
7. सिंह निरंजन कुमार 2008 माध्यमिक विद्यालयों में हिन्दी शिक्षण राजस्थान हिन्दी ग्रन्थ अकादमी जयपुर।

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE108AV	Arts Education (Performing and Visual)	CC	2	15	35	50

Objectives:

- ❖ To help Know about your own regional art forms
- ❖ To help understand the relationship between curricular experience and art activities
- ❖ To help explain the idea of performing art
- ❖ To help Know about regional dance form and music
- ❖ To help Apply the understanding of dance and music in pedagogy

Course Contents:

UNIT-1 Introduction to Art Education

- a) Art Education: Meaning, Scope and characterises
- b) Historical development of art education in school education.
- c) Perspective of NEP 2020 on Art Education.
- d) Indian perspective of art in life.

UNIT-2 Performing and Visual Arts: Dance and Music

- a) Enhancing Learning Through Dance and Music for Children
- b) Range of Art Activities in Visual Arts
- c) Experiencing, Responding and Appreciating Visual Art
- d) Performing Arts: Drama: Facilitating interest among students

Assignment & Practical Works: (Any One)

1. Preparing multimedia material for Art Education.
2. Preparation of instructional material for education in the arts for secondary school.
3. Organizing the Art Club.
4. Case studies of the children's work of art and their understanding of the concept of Art.

Course Outcomes: After completion of this course, student teachers will be able to:

- ❖ Know about your own regional art forms
- ❖ Understand the relationship between curricular experience and art activities
- ❖ Explain the idea of performing art
- ❖ Know about regional dance form and music
- ❖ Apply the understanding of dance and music in pedagogy

Suggested Reading:

1. Baniel, Anat. (2012). Kids beyond limits. Perigee Trade: New York
2. Country Report (2010). Art Education in India. Department of Education in Arts & Aesthetics.
3. Greene, S. & Hogan, D. (2005). Researching children's experience. Sage Publication: London
4. Harding, G (2016). The meaning of art-and art therapy
5. Kalidas, C. S. (20 14). Drama: A tool for learning.
6. Olsen, D. (20 14). Media arts education: an introduction.
7. Prum, R. O. (2013). Evolutionary aesthetics in human and biotic artworlds.
8. Tyler.C.W. & Likova, L. T. (2012). The role of the visual arts in enhancing the learning process.

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE109AV	Understanding India (India Ethos and Knowledge System)	CC	2	15	35	50

Objectives:

- ❖ To introduce about Indian ethos
- ❖ To introduce about Indian knowledge system
- ❖ To know the concept and nature of epistemic traditions
- ❖ To know the India's values and ethos.
- ❖ A to understand the Indian ethos and appreciate for it

Unit-I Indian epistemic traditions

- a) Meaning and Nature of Philosophy.
- b) Branches of Philosophy- Metaphysics, Epistemology, Axiology and their implication for Education.
- c) India's rich epistemic traditions and India's values and ethos
- d) National Values as enshrined in the Indian Constitution and their educational implication.

Unit-II Indian knowledge system across various fields

- a) Introduction to Indian knowledge system
- b) Literature and Arts
- c) Astronomy
- d) Agriculture
- e) Health and medicine

Assignment & Practical Works: (Any one)

1. Write the term paper on any above topic.
2. Prepare an assignment on Indian ethos
3. Prepare a structure of Indian knowledge system.
4. Write an assignment on Indian knowledge system

Course Outcomes: After completion of this course students would able to:

- ❖ To explain the concept and nature of epistemic traditions
- ❖ To understand the India's values and ethos.
- ❖ To Know the concept of Indian ethos.
- ❖ To Understand the purpose and Role Indian knowledge system.

Suggested Readings:

1. Nitonde R., (2024), Introduction to Indian Knowledge System, Notion Press, Mohali
2. Mishra P. and Shastri S.J., (2023), Value Education and NEP 2020, A G Publishing House, Bhopal
3. Wadhwa S., (2000), Modern Methods of Teaching Mathematics, Sarup and Sons, New Delhi.
4. मिश्रा एम के (2021) भारतीय दर्शन के पब्लिकेशन, नई दिल्ली

(B.Sc.-B.Ed.) Semester - II

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE201MJ/MN	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25 Practical	
BBSE202MJ/MN	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25 Practical	
BBSE203MJ/MN	Disciplinary/Inter disciplinary Courses	Mathematics-I	CE	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25 Practical	
BBSE204MJ/MN	Disciplinary/Inter disciplinary Courses	Botany-I	Select Any One Minor Course	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25 Practical	
BBSE205MJ/MN	Disciplinary/Inter disciplinary Courses	Zoology-I	CE	4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE201MJ/MN	Chemistry-I	CE	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

Chemistry-Paper-I: Inorganic chemistry

Objectives:

- ❖ To give knowledge about the mathematical concepts of ionic solid structure and packing.
- ❖ To aware about metallic bond and weak interactions among molecules.
- ❖ To provide information about various properties of s & p-block elements and their correlations.
- ❖ To develop their concept about structural principles of silicates and their applications.

Unit-I: Ionic Solids

Ionic structures (AB and AB₂ type), packing of ions, Radius ratio and coordination number, calculation of limiting radius ratio for tetrahedral, octahedral and cubic crystal structure, limitations of radius ratio rules, Polarizing power and polarisability of ions, Fajans rule, lattice energy and born lande equation, Born Haber cycle and its applications, solvation energy and solubility of ionic solids.

Unit-II: Metallic Bond & Weak interactions

Introduction of metallic bond, properties of metals, theories of Metallic bond- old electron free theory, valance bond theory, limitations of valence bond theory, molecular orbital or band theory, lattice defects in ionic solids, semiconductors.

Hydrogen bonding and Vander Waals forces.

Unit-III: s-Block Elements

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

Unit-IV: Some important compounds of p- block elements

Hydrides of boron, diborane and higher boranes, borazines, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.

Course Outcomes: After completion the course student would able to:

- ❖ Explain the mathematical concepts of ionic solid structure and packing.
- ❖ Plot and interpret shapes of ions and bonding structures.
- ❖ Identifies the relationship among properties of metals on the basis of various theories of bonding.
- ❖ Classify the s & p block elements like hydrides and halogens on the basis of atomic structure, periodicity and their basic properties.

Chemistry-Paper-II: Organic chemistry

Objectives:

- ❖ To understand isomerism in organic compounds
- ❖ To develop their knowledge about geometric isomerism, aromaticity and halogen compounds.
- ❖ To aware them about nomenclature, mechanism and application of organic compounds.
- ❖ To develop conceptual knowledge about various principles related to geometrical structure, reactions and configuration of various compounds.

Unit I: Stereochemistry of organic compounds

Concept of isomerism, type of isomerism. Optical isomerism; elements of symmetry, molecular chirality- allenes and biphenyl, Enantiomers, stereogenic centre, optical activity, properties of enantiomers. Chiral and achiral molecules with two stereogenic centres, diastereomers Threo, and erythro diastereomers, meso compounds. Resolution of enantiomers, inversion, retention and racemisation. Relative and absolute configuration, sequence rule, D&L and R&S system of nomenclature.

Unit-II: Geometrical, Conformational isomerism & Arenes

Determination of configuration of geometric isomers, E&Z- system of nomenclature, geometric isomerism in oximes and in cyclic compounds.

Conformational analysis of ethane and n-butane. Newman projection and Sawhorse formulae. Fischer and flying wedge formula. Difference between configuration and conformation

Nomenclature of benzene derivatives. The aryl group, aromatic nucleus and side chain. Structure of benzene, molecular formula and Kekule structure. Stability and carbon-carbon bond length of benzene, resonance structure, MO picture.

Unit-III: Aromaticity & Aromatic electrophilic substitution

The Huckel's rule, aromatic ions.

General pattern of the mechanism, role of sigma and pi complexes. Mechanism of nitration, halogenations, sulphonation, mercuration and Friedel Craft reaction with energy profile diagrams. Activating and deactivating substituents, orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Birch reduction.

Unit-IV: Alkyl and aryl halides & Poly halogen compounds

Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanism of nucleophilic substitution, reaction of alkyl halides, SN1 and SN2 reaction with energy profile diagram.

Chloroform, carbon tetra chloride. Methods of formation of aryl halides, nuclear and side chain reaction. The addition-elimination and the elimination addition mechanism of nucleophilic aromatic substitution reaction. Relative reactivities of alkyl halides v/s allyl, vinyl and aryl halides. Synthesis and uses of DDT and BHC.

Course Outcomes: After completion the course student would be able to:

- ❖ Explain about elements of symmetry, profile and methods of formation of organic compounds.
- ❖ Apply various mechanism rules to define chain reactions, configuration and formation of arenes, halogen compounds.
- ❖ Classify various derivatives on the basis of isomerism, configuration and energy profile.
- ❖ Describe various rules and reactions about stereochemistry, aromaticity and orientation related to chemical compounds.

Chemistry-Paper-III: Physical chemistry

Objectives:

- ❖ To develop curiosity about laws of crystallography and chemical kinetics. .
- ❖ To provide information about derivation of equations, order and preparation of energy profile.
- ❖ To aware about the scope, factors and theories of chemical kinetics.
- ❖ To give information about colloidal state, their preparation and determinants.

Unit I: Solid state

Definition of space lattice, Unit cell. Law 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 Braggs equation, Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).

Unit II: Colloidal state

Definition of colloids, classification of colloids. Solids in liquids (sols): properties- kinetics, optical and electrical. Stability of colloids, protective action, Hardy Schulze law. Gold number. Liquids in solids (gels): classification, preparation and properties, inhibition, general application of collides. Liquid in liquid (emulsions): types of emulsions, preparation, Emulsifiers.

Unit-III: Chemical Kinetics

Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction, Concentration dependence of rates, mathematical characteristics of simple chemical reaction- zero order, first order, second order, pseudo-order, half life and mean life.

Determinations of the order of reaction- differential method, method of integration, method of half-life period and isolation method. Theories of chemical kinetics, Effect of temperature on the rate reaction, Arrhenius concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant and thermodynamic aspects.

Unit-IV: Solutions, Dilute solutions & Colligative properties

Ideal and non ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure, Elevation of boiling point and depression of freezing point. Thermodynamic derivation of relation between molecular weight and elevation of boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass degree of dissociation and association of solutes.

Course Outcomes: After completion of the course student would able to:

- ❖ Draw and interpret symmetries and structures of crystals and colloids.
- ❖ Compare among various forms of crystals, order and transition state of compounds.
- ❖ Measure and calculate the mathematical characteristics simple chemical reactions and determinants.
- ❖ Aware about the scope, factors and theories of chemical kinetics.

Practical's

Inorganic chemistry:

Quantitative analysis: Volumetric analysis

- Determination of acetic acid in commercial vinegar using NaOH.
- Determination of alkali content ant acid tablet using HCl.
- Estimation of calcium content in chalk as calcium oxalate by permanganate.
- Estimation of hardness of water by EDTA.
- Estimation of ferrous and ferric by dichromate method.
- Estimation of copper using thiosulphate.

Organic chemistry:

(A) Laboratory techniques

- Determination of m. p. of naphthalene, benzoic acid, urea etc. OR
- Determination of b. p. of ethanol, methanol, cyclohexane, etc

(B) Qualitative analysis

- Detection of extra elements (N, S. and halogens) and functional groups e.g. (phenolic, alcoholic, carboxylic, carbonyl, ester, carbohydrate, amine, amide and nitro) in simple organic compounds

Viva voce and record**Suggested Readings:**

1. Organic Chemistry, Suresh Ameta, H.K. Pandey, H.S. Sharma, Himanshu Publications, Udaipur
2. Inorganic Chemistry, Ojha, Bhojak, Kothari, Chaturvedi, Ramesh Book Depot, Jaipur
3. Practical Chemistry, Bhargava, Lavania, Ojha, Ramesh Book Depot, Jaipur
4. Physical Chemistry, Sharma, Bhargava, Gupta, Ramesh Book Depot, Jaipur
5. Organic Chemistry, Vijayshree Manoj Changani, Alka Publication, Ajmer
6. Inorganic Chemistry, Vijayshree Kothari Changani, Alka Publication, Ajmer
7. Practical Chemistry, Changani, Vijayshree, Khandelwal, Alka Publication, Ajmer
8. Physical Chemistry, V.K. Goyal, R.S. Peetaliya, College Book House, Jaipur
9. Inorganic Chemistry, G.K. Rastogi, Yashpal Singh, College Book House, Jaipur
10. Experimental Chemistry, V.K. Goyal, R.S. Peetaliya, College Book House, Jaipur

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE202MJ/MN	Physics-I	CE	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Practical				25 Practical	

Physics-Paper-I: ELECTROMAGNETISM – II

Objectives:

- ❖ To aware about the of concepts related to Faraday 's law, induced emf.
- ❖ To give information about Maxwell 's equations to solutions of problems relating to transmission lines.
- ❖ To develop knowledge about the transient behavior of R-C circuit.
- ❖ To aware about the transient behavior of R-L circuit.

UNIT – I Magnetic Fields in Matter:

Electric current due to orbital electron, the field of current loop, Bohr magneton. Orbital gyro magnetic ratio Electron spin and magnetic moment. Magnetic susceptibility, magnetic field caused by magnetized matter. Magnetization current. Free current and the field H.

UNIT –II Electric Field in Matter:

The moment of a charge distribution. Atomic and molecular dipoles. Atomic polarizability. Permanent dipole moment, dielectrics. The Capacitor filled with a dielectric. The potential and field due to a polarized sphere.

UNIT –III Dielectric:

Dielectric. Dielectric sphere placed in a uniform field. The field of charge in dielectric medium and Gauss's law. The connection between electric susceptibility and atomic polarizability. Polarization in changing field. The bound charge (polarization) current.

UNIT -IV Transient behavior and Maxwell's Equations:

Transient behavior of an R-C circuit. Electromagnetic Induction and Maxwell's Equations, Faraday's law in differential form. Mutual inductance, Self inductance Transient behaviour of an L-R circuit, the displacement current, Maxwell's equations in differential and integral forms.

Course Outcomes: After completion the course student would able to:

- ❖ Understand the concepts related to Faraday 's law, induced emf, maxwell's equations, transit behavior, electric field in matter, atomic & molecular dipoles.
- ❖ Applies Maxwell 's equations to solutions of problems relating to transmission lines, uniform plane wave propagation, magnetic field in matter.
- ❖ Understand the transient behavior of R-C circuit & L-R circuit.
- ❖ Discuss on the magnetic susceptibility and free current.

Suggested Readings:

1. Edward M. Purell, Electricity and Magnetism, Berkeley Physics, Vol.2, Tata McGraw-Hill.
2. Alonso, Finn, Fundamental University Physics, vol.2, Addison Wesley longmann.
3. Griffith, An Introduction to Electrodynamics Pearson Education.
4. R.P. Feynman, The Feynman Lecures on Physics, Vol. 2, Pearson Education.
5. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, 2015–16, विद्युत चुम्बकत्व, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली

Physics-Paper-II: OSCILLATIONS AND WAVES –I

Objectives:

- ❖ To give information about physical characteristics of SHM
- ❖ To calculate logarithmic decrement relaxation factor and quality factor.
- ❖ To aware acoustics and the properties of matter.
- ❖ To develop knowledge about obtaining solution of the oscillator.

UNIT -I Oscillations:

Oscillations in an arbitrary potential well, Simple harmonic motion, examples-spring mass system, mass on a spring, torsional oscillator, LC circuit, energy of the oscillator,

UNIT -II Damped Oscillator:

Damping of oscillator, viscous and solid friction damping. Power dissipation. Anharmonic oscillator, simple pendulum as an example.

UNIT -III Driven Oscillator:

Driven harmonic oscillator with viscous damping. Frequency response, phase relations. Quality factor, Resonance. Introduction of j operator concept in Electrical oscillations, series and parallel LCR circuit. Electro-mechanical system-Ballistic Galvanometer Effect of damping.

UNIT – IV Coupled Oscillator:

Equation of motion of two coupled S.H Oscillators. Normal modes, motion in mixed modes. Transient behaviour. Effect of coupling in mechanical systems. Electrically coupled circuits, frequency response. Reflected impedance. Effect of coupling and resistive load.

Course Outcomes: After completion the course student would able to:

- ❖ Discuss on the simple harmonic motion and its equation.
- ❖ Differentiate between damped oscillator and driven oscillator.
- ❖ Interpret the term frequency response and phase relation.
- ❖ Identify the coupled oscillator and some electrically coupled oscillators.

Suggested Readings:

1. H. Pain, Physics of vibrations and waves, Thomson Press Limited, New Delhi.
2. Frank S. Crawford, Waves and Oscillation, Berkeley Physics, Vol.2, Tata McGraw-Hill.
3. Brijlal, N. Subhramanyam, Waves and Oscillation, Vikas Publishing House.
4. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, 2015–16, यांत्रिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली

Physics-Paper-III: OSCILLATIONS AND WAVES –II

Objectives:

- ❖ To aware about the concepts of lattice dynamics.
- ❖ To give information about electric transmission line.
- ❖ To calculate the wave equation and analysis the fourier series.
- ❖ To aware about the electromagnetic wave.

UNIT -I Lattice dynamics:

Dynamics of a number of oscillators with near-neighbour interactions. Equation of motion for one-dimensional mono-atomic and diatomic lattice, acoustic and optical modes, dispersion relations. Concept of group and phase velocities.

UNIT – II Electrical Transmission Line:

Electrical transmission line, propagation velocity, losses, characteristic impedance, standing waves, effect of termination.

UNIT –III Wave Motion:

Wave motion – Elastic waves in a solid rod. Pressure waves in a gas column. Transverse waves in a string, waves in three dimensions, spherical waves, Fourier series and Fourier analysis.

UNIT – IV Electromagnetic Wave:

Plane electromagnetic (EM) wave. Energy and momentum of EM wave. Radiation pressure. Radiation resistance of free space. EM waves in dispersive media (normal case). Spectrum of electromagnetic radiations.

Course Outcomes: After completion the course student would able to:

- ❖ Differentiate between 1-D mono atomic & diatomic lattice.
- ❖ Interpret the term propagation velocity and losses.
- ❖ Applies the concept of transverse wave in the string.
- ❖ Identify the spectrum of electromagnetic radiation.

Suggested Readings:

1. H. Pain, Physics of vibrations and waves, Thomson Press Limited, New Delhi.
2. Frank S. Crawford, Waves and Oscillation, Berkeley Physics, Vol.2, Tata McGraw-Hill.
3. Brijlal, N. Subhramanyam, Waves and Oscillation, Vikas Publishing House.
4. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, 2015–16, यांत्रिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली

Physics Practical: II

1. To study the random decay and determine the decay constant using the statistical board.
2. Using compound pendulum study the variation of time period with amplitude in large angle oscillations.
3. To Study damping using Compound pendulum study the damping.
4. To study the excitation of normal modes and measure frequency splitting using two coupled oscillators.
5. To study the frequency of energy transfer as a function of coupling strength using coupled oscillators.
6. (a) To study the viscous fluid damping of a compound pendulum and
(b) Determining damping coefficient and Q of the oscillator.
7. To find J by Callender and Barne's Method.
8. To determine Young's modulus by bending of beam.
9. To determine Y , σ and η Searle's method.
10. To measure Curie temperature of Monel alloy.
11. To determine modulus of rigidity of a wire using Maxwell's needle.
12. Study of normal modes of a Coupled pendulum system. Study of oscillations in mixed modes and find the period of energy exchange between the two oscillators.
13. To study Variation of surface tension with temperature using Jaegger's method.
14. Any experiment according to theory paper.

Suggested Readings:

- 1 प्रभा दशोरा, द्वितीय वर्ष प्रायोगिक भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015–16

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE203MJ/MN	Mathematics-I	CE	4	15	20	100
	Mathematics-II				20	
	Mathematics-III				20	
	Mathematics Practical				25 Practical	

Mathematics-Paper-I: Discrete Mathematics II

Objectives:

- ❖ To aware the discrete numeric functions and Generating Function.
- ❖ To Interpret the homogeneous solutions and particular solution.
- ❖ To give information about the Graph.
- ❖ To give information about Trees.

Unit 1: Discrete numeric functions and Generating functions, Recurrence relations and Recursive Algorithms - Linear Recurrence relations with constant coefficients.

Unit 2 Homogeneous solutions, Particular solution, Total solution, Solution by the method of generating functions.

Unit 3: Graphs - Basic terminology, Multigraphs, Weighted graphs, Paths and circuits, shortest paths, Introduction to Eulerian and Hamiltonian Graphs, Travelling SalesMan problem, Union, Join, Product and composition of graphs, Planar graphs and Geometric dual graphs.

Unit 4: Trees - Properties, Spanning tree, Binary and Rooted tree, Digraphs — Simple digraph, Asymmetric digraphs, Symmetric digraphs and complete digraphs, Digraph and Binary relations, Matrix representation of graphs and digraphs.

Course Outcomes: After completion the course student would able to:

- ❖ Applies the Particular Solutions of Generating Function.
- ❖ Calculate the homogeneous solutions and particular solution.
- ❖ Discuss about the Weighted Graph, Eulerian, Hamiltonian Graphs and Shortest Paths.
- ❖ Discuss about the Trees Properties.

Suggested Readings:

1. V.K. Balakrishnan, Introductory Discrete Mathematics, Prentice-Hall, 1996.
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill Book Co., 1995.
3. C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, 1986.
4. Kenneth H. Roson, Discrete Mathematics and Its Applications, Tata Mc-Graw Hiils, New Delhi, 2003.
5. बी. एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड़, जितेन्द्र सैनी, विविक्त गणित, आर.बी. डी. पब्लिशिंग हाउस, जयपुर—दिल्ली, 2015—16
6. जी.सी. गौखरू सैनी, विविक्त गणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics-Paper-II: Integral Calculus

Objectives:

- ❖ To develop knowledge about the concepts Beta and Gamma Function.
- ❖ To aware the Concept of Double Integrals in Cartesian and Polar Co-ordinates.
- ❖ Calculate Areas and Rectification.
- ❖ To give information about the Volumes and Surfaces of Solids of Revolution.

Unit 1: Beta and Gamma functions, Reduction formulae (simple standard formulae).

Unit 2: Double integrals in Cartesian and Polar Coordinates, Change of order of integration, Triple integrals, Dirichlet's integral.

Unit 3: Areas, Rectification.

Unit 4: Volumes and Surfaces of solids of revolution.

Course Outcomes: After completion the course student would able to:

- ❖ Calculate the concepts Beta and Gamma Function.
- ❖ Calculate of Double Integrals in Cartesian and Polar Co-ordinates.
- ❖ Calculate Areas and Rectification.
- ❖ Discuss the volumes and Surfaces of Solids of Revolution and Calculate the dirichlet's integral.

Suggested Readings:

1. Shanti Narain and P.K. Mittal, Integral Calculus, S. Chand, 2016.
2. Khalil Ahmad, Calculus, Real World Education, 2013.
3. M. J. Strauss, G. L. Bradley and K. J. Smith, Calculus (3rd Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
4. H. Anton, 1. Bivens and S. Davis, Calculus (7th Edition), John Wiley and sons (Asia), Pt Ltd., Singapore, 2002.
5. G.B. Thomas, R. L. Finney, M. D. Weir, Calculus and Analytic Geometry, Pearson Education Ltd, 2003.
6. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी,, समाकलन गणित, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
7. जी.सी. गौखरू सैनी, समाकलन गणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics-Paper-III: Analytic Geometry II

Objectives:

- ❖ To give information about the Central Conicoids.
- ❖ To aware tangent line and tangent plans.
- ❖ To develop concept generating Lines of Hyperboloid of One Sheet and its Properties.
- ❖ To give information about of a General Equation of Second degree in 3-D to Standard Forms.

Unit 1: Central Conicoids — Ellipsoid, Hyperboloid of one and two sheets.

Unit 2: Tangent lines and tangent planes, Direct sphere, Normals.

Unit 3: Generating lines of hyperboloid of one sheet and its properties.

Unit 4: Reduction of a general equation of second degree in three-dimensions to standard forms.

Course Outcomes: After completion the course student would able to:

- ❖ Classify the Central Conicoids.
- ❖ Discuss the tangent lines and tangent plans.
- ❖ Discuss the Generating Lines of Hyperboloid of One Sheet and its Properties.
- ❖ Reduction of a General Equation of Second Degree in 3-D to Standard Forms.

Suggested Readings:

1. N. Saran and R.S. Gupta, Analytical geometry of Three Dimensions, Pothishala Pvt. Ltd., Allahabad, 1992.
2. P.K. Jain and Khalil Ahmed, A Text Book of Analytical geometry of Three Dimensions, Wiley-Eastern Ltd., 2000.
3. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, एनालिटिक ज्यामिती, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
4. जी.सी. गौखरू सैनी,, एनालिटिक ज्यामिती, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE204MJ/MN	Botany-I	CE	4	15	20	100
	Botany-II				20	
	Botany-III				20	
	Botany Practical				25 Practical	

Botany-Paper-I: CELL BIOLOGY

Objectives:

- ❖ To distinguish between structure of cell, cell wall and plasma membrane.
- ❖ To understand the concept of cell organelles with their detailed information.
- ❖ To know the ultra structure of Nucleus and chromosome.
- ❖ To compare the different stages of cell division (mitosis and meiosis).
- ❖ To comprehend the structure and composition of chromosomes.

UNIT I: Structure of Cell, Cell wall and Plasma membrane

- a) History of cell and cell theory, microscopy, elementary idea on micrometry and cell fractionation
- b) Characteristics of prokaryotic and eukaryotic cell
- c) Chemistry, structure and function of cell wall and plasma membrane

UNIT II: Structure of Cell Organelles

- a) Ultra structure and function of Mitochondria, Chloroplast, Endoplasmic reticulum
- b) Ultra structure and function of Golgi complex, Peroxisome, Glyoxysome, Ribosome, Vacuoles

UNIT III: Structure of Nucleus and chromosome

- a) Detailed structure and function of Nucleus, nuclear envelope, nuclear pore complex and nucleolus
- b) Chromatin Structure, morphology and organization of chromosomes
- c) Special types of chromosomes - Sex chromosomes, polytene and lampbrush chromosomes

UNIT IV: Cell cycle and Cell division

- a) Cell cycle and Cell division: Amitosis, Mitosis: different stages, mitotic spindle and chromosome movement in detail
- b) Meiosis I and II: different stages and its significance, cytokinesis
- c) General account of chiasmata formation, crossing over, linkage and synaptonemal complex

Course Outcomes: After completion the course student would be able to:

- ❖ Know the ultra structure of Nucleus and chromosome.
- ❖ Distinguish between structure of cell, cell wall and plasma membrane.
- ❖ Understand the concept of cell organelles with their detailed information.
- ❖ Know the different stages of cell division (mitosis and meiosis).
- ❖ Discuss the structure and composition of chromosomes.

Suggested Readings:

- Alberts, B., Johnson, A., Lewis, J., Roff, M., Roberts, K. & Walter, P. (2008). Molecular Biology of the Cell. Garland Publishers, New York.
- De Robertis, E.D.P. & De Robertis, E.M.F. (2006). Cell and Molecular Biology. (8th ed.) Lippincott Williams and Wilkins, Philadelphia.
- Gupta, P.K. (2009). Cytology, Genetics, Evolution and Plant breeding, Rastogi publication, Meerut.
- Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley and Sons. Inc. New Jersey, USA.
- Lodish, H., Berk, A., Matsudaira, P., Kaiser, C. A., Krieger, M., Scott, P.M., Zipursky, L. & Darnell, J. (2008). Molecular Cell Biology. W. H. Freeman and company, Macmillan publishers, London.
- Powar C. B. (1991). Cell Biology. Himalaya Publishing House, New Delhi.

- Roy, S.C. & De, K.K. (1999). Cell biology. New central Book Agency (P) Ltd., Calcutta.
- Verma, P.S. and Agrawal, V.K. (2012). Cell Biology, Genetics, Evolution and Ecology. S. Chand and Co. Ltd., New Delhi.

Botany-Paper-II: GENETICS AND PLANT BREEDING

Objectives:

- ❖ To know the concept of genetic inheritance
- ❖ To study the laws of Mendel.
- ❖ To understand the chromosomal theory of inheritance.
- ❖ To learn about the concept of cytoplasmic inheritance.
- ❖ To understand different methods of plant breeding.

UNIT I: Genetic inheritance

- a) Mendel's laws of inheritance- Dominancy, law of segregation, law of independent assortment
- b) Deviations from Mendel's laws; interaction of genes, incomplete dominance, codominance, lethal alleles, epistasis, pleiotropy, polygenic inheritance (grain color in wheat, corolla length in *Nicotiana tabacum* and multiple allelism: ABO blood groups in human

UNIT II: Chromosomal inheritance

- a) Linkage, crossing over and chromosome mapping- interrelationships and importance. Linkage maps, chromosome theory of inheritance, sex determination and sex-linked inheritance
- b) Chromosomal aberrations: deletion, duplication, inversion, translocation, aneuploidy and polyploidy.
- c) Extra nuclear genome:mitochondrial and chloroplast

UNIT III: Genes and Mutations

- a) Concept of gene: Neurospora genetics- one gene one enzyme hypothesis. Brief account on fine structure of gene in eukaryotes and prokaryotes.
- b) Mutations- types of mutations, point mutation-transition, transversion and frame shift mutation. Physical and chemical mutagens.
- c) Cytoplasmic inheritance: Maternal influence, shell coiling in snail, Kappa particles in Paramecium.

UNIT IV: Plant breeding

- a) Introduction and objectives of plant breeding, general methods of breeding in-self-pollinated, cross pollinated and vegetative propagated crop plants: Introduction and acclimatization, selections and hybridizations
- b) Hybrid vigour and inbreeding depression, green revolution
- c) Role of mutation and polyploidy in plant breeding, national and international agriculture research institute, famous plant breeders and their contribution (Indian and international), Plant breeding work done on wheat and rice in India

Course Outcomes: After completion the course student would able to:

- ❖ Understand the concept of genetic inheritance.
- ❖ Study the laws of Mendel.
- ❖ Interpret the chromosomal theory of inheritance.
- ❖ Explain the concept of cytoplasmic inheritance.
- ❖ Discuss different methods of plant breeding.

Suggested Readings:

1. Atherely, G., Girton, J. R. & McDonald, J. F. (1999). The Science of Genetics Saunders College Publishing, Fort Worth, USA.
2. Brooker, R. J. (1999). Genetics: Analysis and Principles. Addison-Wesley, Boston.
3. Choudhary, H. K. (1989). Elementary Principle of Plant Breeding. Oxford and IBM Publishing Co., NewDelhi.
4. De Robertis, E.D.P. & De Robertis, E.M.F. (2006). Cell and Molecular Biology. (8thed.).Lippincott Williams and Wilkins, Philadelphia.
5. Dnyansagar, V. R. (1986). Cytology and Genetics, Tata Mc Graw - Hill Pub Co. Ltd., New Delhi.
6. Gardner, E. J., Simmons, M. J. & Snustad, D. P. (2008). Principles of Genetics. (8th ed.). Wiley India.
7. Gupta, P. K. (2009). Cytology, Genetics, Evolution and Plant Breeding, Rastogi Publication, Meerut.
8. Miglani, G. S. (2000). Advanced Genetics. Narosa Publishing House, New Delhi.
9. Russel, P. J. (1998). Genetics. The Benjamin/Cummings Publishing Co. Inc., USA.
10. Shukla, R. S. & Chandel, P. S. (2000). Cytogenetics, Evolution and Plant Breeding, S. Chand and Co.Ltd., New Delhi.
11. Singh, R. B. (1999). Text Book of Plant Breeding. Kalyani publishers, Ludhiana.
12. Snustad, D. P., & Simmons, M. J. (2011). Principles of Genetics. (5th ed.) John Wiley and Sons Inc. NewJersey, USA.

Botany-Paper-III: BRYOPHYTA

Objectives:

- ❖ To acquire knowledge on bryophytes with its classification, habitat and life cycle.
- ❖ To understand habitat, structure, reproduction with life cycle of Riccia and Marchantia.
- ❖ To learn about class anthocerotopsida.
- ❖ To know about the life cycle of Funaria.
- ❖ To apply the knowledge of bryophyta in daily life.

UNIT I: Bryophytes: General account & Economic importance

- a) Bryophytes: General characteristic, origin, evolution, classification (Eichler and Proskauer), habitat range, thallus structure
- b) Bryophytes: Reproduction, alternation of generation and economic importance
- c) Sterilisation of sporogenous tissues in Bryophytes

UNIT II: Hepaticopsida

- a) Hepaticopsida: General account, Habitat, structure, reproduction and life cycle
- b) Habitat, structure, reproduction and life cycle of the Riccia and Marchantia

UNIT III: Anthocerotopsida

- a) Anthocerotopsida: General account, Habitat, structure, reproduction and life cycle
- b) Habitat, structure, reproduction and life cycle of the Anthoceros

UNIT IV: Bryopsida

- a) Bryopsida: General account, Habitat, structure, reproduction and life cycle
- b) Habitat, structure, reproduction and life cycle of Funaria
- c) Phylogenetic relationship with hepaticopsida and Bryopsida

Course Outcomes: After completion the course student would be able to:

- ❖ Acquire knowledge on bryophytes with its classification, habitat and cycle.
- ❖ Understand habitat, structure, reproduction with life cycles of Riccia and Marchantia.
- ❖ Describe the class anthocerotopsida.
- ❖ Explain the concept of life cycle of Funaria.
- ❖ Interpret the importance of bryophyte.

Suggested Readings:

1. Chopra, R.N. & Kumar, P.K. (1988). Biology of Bryophytes. Wiley Eastern Ltd. New Delhi.
2. Pandey, S.N., Mishra, S.P. & Trivedi, P.S. (1981). A text book of Botany vol. II, Vikas publishing House Pvt. Ltd, New Delhi.
3. Puri, P. (1985). Bryophytes. Atmaram and Sons, Delhi.
4. Sharma, O.P. (1992). Text Book of Thallophytes. McGraw Hill Pub. Co.
5. Singh, V., Pandey, P.C. & Jain, D.K. (1999). Botany, Rastogi Publications, Meerut.
6. Sporne, K.R. (1967). The Morphology of Bryophytes. Hutchinson University Library, London.
7. Tyagi, A. & Saxena, M. (2014). Algae, Lichens and Bryophyta, CBH, Jaipur
8. Vashishta, B. R., Sinha, A. K. & Kumar, A. (2011). Botany for degree students, Bryophyta. S. Chand and Co. New Delhi.
9. Watson E.V. (1971). The structure and life of Bryophytes. Hutchinson University Library, London.

BOTANY PRACTICAL II

1. Demonstration of the phenomenon of protoplasmic streaming in leaf.
2. To study chloroplast, chromoplast and leucoplast in plant material.
3. Study of Mitosis in root tip and Meiosis in flower bud from temporary and permanent slides.
4. Study the prokaryotic, eukaryotic cell and cell organelles by electron micro photographs.
5. To study the effect of organic solvent on membrane permeability.
6. Genetic problems on monohybrid, dihybrid cross and test cross and back cross.
7. Karyotype preparation.
8. Identification of chromosomes on the basis of their size and centomere position.
9. Pedigree analysis for dormant and recessive autosomal and sex-linked traits.
10. Study of Barr body in epithelial cells of females.
11. Study of habit, habitat, vegetative thallus organization and structure, reproductive structures of the following taxa through temporary mounts and permanent slides:
12. Riccia, Marchantia, Anthocero and Funaria.

Semester-II

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE205MJ/MN	Zoology-I	CE	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25 Practical	

Zoology-Paper-I: Developmental Biology**Objectives**

- ❖ To describe how organisms maintain gametic population.
- ❖ To understand fertilization process.
- ❖ To understand way of cleavage and different patterns to form zygote.
- ❖ To understand the fundamental embryonic development.

UNIT-I Principles of Development in Biology

- a) History of embryology and Types
- b) Gametogenesis: Spermatogenesis, Structure of sperm,
- c) Oogenesis,
- d) Insect and frog eggs

UNIT-II Development process

- a) Fertilization-Type of Fertilization, Process of Fertilization
- b) Parthenogenesis
- c) Planes and Patterns of cleavage,
- d) Plans and patterns of Blastulation, Gastrulation,

UNIT-III Embryonic Development

- a) Concept of embryonic induction; and Extra Embryonic membrane
- b) Function and Types of placentas.
- c) Structure of hen's egg,
- d) Development of chick up to 96 hrs stage.

UNIT-IV New Concept of Embryology

- a) Stem cells: Sources, types and their use in human welfare.
- b) Cloning
- c) Elementary Idea of Teratogenesis
- d) Ageing and Sencescence, IVF, GIFT, ZIFT and Bioethics

Course Outcomes: After completion the course student would able to:

- ❖ Describe the process of: Gametogenesis, Fertilization and early development, Parthenogenesis
- ❖ Understand the concept of embryonic induction: primary organizer and competence, Developmental stages of chick (upto 96 hours).
- ❖ Discuss for the extra embryonic membranes.
- ❖ Discuss for the placenta

Suggested Readings:

1. Bhogal S. Balram (2021). Developmental Biology: A Molecular Approach, Narosa Publishing House, India.
2. Gilbert Scott F. And Barresi Michael J. F. (2020). Developmental Biology, Sinauer Associates (Indian Edition), India.
3. Kalthoff Klaus (2019). Developmental Biology: From a Cell to an Organism, CRC Press (Indian Edition), India.
4. Parija Chandra Subhash (2022). Developmental Biology: Concepts and Techniques, CBS Publishers & Distributors, India.
5. Slack Jonathan M. W. (2021). Essentials of Developmental Biology, Wiley (Indian Edition) India.
6. Tyler Mary S. (2020). Developmental Biology: A Guide for Experimental Study, Sinauer Associates (Indian Edition), India.

7. Wolpert Lewis (2019). Developmental Biology: A Very Short Introduction, Oxford University Press, India.
8. Wolpert Lewis, Tickle Cheryll and Arias Martinez Alfonso (2019). Principles of Development, Oxford University Press, India.

Zoology-Paper-II: Genetics

Objectives

- ❖ To describe how the behavior of chromosomes during meiosis can explain Mendel's law.
- ❖ To understand how inheritance patterns are affected by position on chromosomes.
- ❖ To understand the similarities and differences between how genetic information is passed on in prokaryotes and eukaryotes.
- ❖ To understand gene interactions.

Unit – I Transmission Genetics

- a) Mendelism: Brief history of Genetics.
- b) Mendel's work, Mendelian Laws, their significance and current status
- c) Genetic Interactions- Epistasis-dominant and recessive, codominance, incomplete dominance, complementary, supplementary, inhibitory, duplicate and Lethal genes
- d) Multiple Allelic interactions: Inheritance of blood group and Rh factor

Unit – II Chromosome Linkage and Crossing

- a) Linkage and crossing over: Basic concept, types and theories,
- b) Elementary idea of Chromosome mapping
- c) Sex determination – ZZ, XY, XO, ZW pattern,
- d) Sex determination in Human,

Unit – III Chromosome Genetics

- a) Chromosomes Number, size, shape, type structure,
- b) Giant chromosomes Lampbrush chromosomes,
- c) Giant chromosomes polytene chromosome
- d) Cytoplasm inheritance: Kappa particles in Paramecium,

Unit – IV Disease and Disorder

- a) Disorders related to chromosomal number- Turner syndrome, Klinefelter's syndrome and Down's syndrome
- b) Elementary idea of Thalassemia, Sickle Cell Anaemia,
- c) Diabetes mellitus
- d) Corona

Course Outcomes: After completion the course student would be able to:

- ❖ Understand the Mendelism & Multiple allelism.
- ❖ Understand the concept of gene & gene interaction, and Sex- linked Inheritance.
- ❖ Describe the Blood Group, Rh factor.
- ❖ Interpret the terms Chromosome, Thalassemia, Sickle cell anemia

Suggested Readings:

1. Mahapatra Sinha Samapti (2024). Zoology: Med Easy, Physics Wallah, India
2. Tomar Kumar Arun, Tomar Singi Sukhvair, Singh Rajbeer (2024). Animal Genetics and Breeding, Daya Publishing House, India.
3. Tomar (2021). Text Book on Animal Genetics and Breeding, Daya Publishing House, India
4. Pawar R. Kishore, Desai E. Ashok (2024). Genetics and Medical Zoology (T) Nirali Prakashan, India.
5. Rai Kumud, Kumar Ajay, Tomar Kumar Dinesh, Khan Mahjabe (2023). Cytology, Genetics and Infectious Diseases (Zoology), Thakur Publication Pvt Ltd India.
6. Singh Pahalad (2023). Genetics for M.Sc. Zoology (New Era), VNR Classes, India.
7. Verma P. S., Agarwal V. K. (2022). Cell Biology, Genetics, Molecular Biology: Evolution and Ecology, S. Chand Publishings, India.
8. Verma P. S., Agarwal V. K. (2022). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology (Library Editions), S. Chand and Company Ltd, India.
9. Verma P. S., Agarwal V. K. (2022). Genetics: Library Edition, S. Chand and Company Ltd, India.

Zoology-Paper-III: Molecular Biology

Objectives

- ❖ To understand about the genetic material (Nucleic acids) and DNA replication.
- ❖ To understand about various types of RNA and process of Transcription & Translation.
- ❖ To describe the Genetic Code, and protein synthesis.
- ❖ To describe the nucleolus structure and function

Unit – I Introduction of Nucleolus

- a) Interphase Nucleus: Organization, Ultrastructure and functions of Nucleus, Pore Complex, and Nuclear Membrane
- b) Nucleolus: Structure and functions
- c) Chromosome: Ultrastructure and types,
- d) Solenoid Model,

Unit – II DNA and RNA Structure

- a) DNA: Structure of DNA,
- b) Polymorphism of DNA (A, B, C, D and Z)
- c) RNA: Structure of RNA,
- d) Types of RNA, RNA as a genetic material

Unit – III Replication

- a) DNA replication: Mechanism of replication –origin of replication, Role of enzymes in replication
- b) Meselson and Stahl experiments,
- c) Bacterial DNA Structure
- d) Replication in Bacterial DNA

Unit IV Translation of Mechanism

- a) Genetic code: Characteristics of genetic code, Wobble hypothesis
- b) Wobble hypothesis
- c) Protein synthesis: Central Dogma; Transcription Mechanism in Prokaryotes, Transcription in Eukaryotes, Enzymes and factors of transcription;
- d) Protein Synthesis: Elementary idea of the mechanism of translation

Course Outcomes: After completion the course student would able to:

- ❖ Understand about the genetic material (Nucleic acids) and DNA replication.
- ❖ Interpret about various types of RNA and process of Transcription & Translation.
- ❖ Understand the Genetic Code, and protein synthesis.
- ❖ Describe the bacterial DNA structure

Suggested Readings:

1. Arora Himanshu, Arora P. Mohan, Qureshi Rehana (2018). Molecular Biology (Calcutta University), Himalaya Publishing House, India.
2. Arumugam N., (2019). Cell Biology and Molecular Biology, Saras Publication, India.
3. Agarwal V. K. (2017). Zoology for Degree Students B.Sc. 1st Semester, S. Chand & Co Ltd, India.
4. Bhogal S. Balram (2021). Developmental Biology: A Molecular Approach, Narosa Publishing House, India.
5. Gupta Kumar Sanjai, Singh Jaya, Singh Kumar Sunil, Singh Digvijay (2024). Molecular Biology and Bioinstrumentation and Biotechniques: Zoology Textbook, Astitva Prakashan, India.
6. Mahapatra Sinha Samapti (2024). Zoology: Med Easy, Physics Wallah, India.
7. Sehgal Anita (2023). M.Sc. Zoology, Unique Publishers India Pvt Ltd, India.
8. Vyas S. P., Mehta A. (2018). Cell and Molecular Biology, CBS Publishers & Distributors, India.
9. Verma P. S., Agarwal V. K. (2022). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S. Chand and Company Ltd, India.
10. Verma P. S. (2019). Cell Biology, Genetics, Molecular Biology, S. Chand Publishing, India.

Presentation Work (Any One)

1. Prepare a power point presentation of given course Content.

2. Prepare working model related content; prepare report and record video of its working.
3. Prepare a creative video presentation related to any Animal kingdom to issue or any topic related to Zoology.

Zoology --Practical Based on paper I, II and III

Paper-I: Developmental Biology

Study of development of chick with the help of

- a) Whole mounts: 18 Hours (Primitive streak stage), 21 hrs, 24 hours, 33 hrs, 48 hours 72 hours and 96 hours.
- b) Study of the embryo at various stages of incubation in vivo by making a window in egg shell.

Paper-II: Genetics

- a) Life cycle of Drosophila; Identification of male and female drosophila; Study of mutants in Drosophila (Bar eye, white eye, yellow body, sepia eye, curled wing, vestigial wing)
- b) Identification of blood groups & Rh. Factor

Paper-III: Molecular Biology

- a) Demonstration of salivary gland chromosome in Chironomous larva
- b) Use of colchicine in arresting anaphase movement (onion root tips)
- c) Study of cell permeability using mammalian RBCs.

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE206AV	Language II	CC	4	30	70	100

Objectives:

- ❖ The course aims to prepare the students to teach language at the school level.
- ❖ It focuses on training the students to the sounds systems of languages, word formation processes, sentence formation, semantic and pragmatic aspects of languages.
- ❖ The course intends to enable the learners to integrate all the four language skills using different genres.
- ❖ The major aim of this course is to empower the learners to contribute to the discourses on various issues and themes.
- ❖ The course also orients the students to the use of different technology and digital media for developing their own communicative skills as well as the school students they would teach in the future.
- ❖ The course helps improve basic communication skills such as listening, speaking, reading and writing skills among L2 language learners.
- ❖ The course is designed to enhance knowledge of grammar of L2 and enable the students to formulate grammatically correct and contextually appropriate sentences and words and empower the students with summarizing skills, oral presentations skills effectively.
- ❖ The course also seeks to enhance students' critical thinking capacities and demonstrate effective communication skills and provide hands-on activities to student teachers to develop their linguistic skills through practical sessions.

Course content:

UNIT - I Language, Society and learning

- ❖ Bi-/Multilingualism and scholastic achievements; need to promote multilingualism; Language variation and social variation; languages, dialects and varieties, cultural transmission of language, language, and gender; language and identity; language and power; constitutional provisions and National Education Policy 2020.
- ❖ Language acquisition and Language learning; language learning from mother tongues to other tongues; advantages of learning other languages; language and education; notion of first language, second language and others.

UNIT - II Speech and Writing

- a) Writing Systems: Speech and writing; arbitrariness in language; types of writing systems.
- b) **Classification** sessions of speech sounds:vowels,consonants, and others; suprasegmental: stress, pitch, tone, intonation, and juncture; Acoustic phonetics.

UNIT- III Understanding Grammar

- a) Word and meaning; parts of speech, grammatical categories; word formation: affixation, compounding, reduplication, vocabulary building.
- b) Sentence and its constituents: simple, complex, and compound sentences; Semantics and pragmatics: lexical meaning- synonymy, antonymy, meronymy, grammatical meaning, speech acts.

UNIT – IV Basic Communication Skills in L2

- a) Pronunciation and listening comprehension skills.
- b) Reading and reading comprehension skills.
- c) Effective writing skills; effective presentation and speaking skills; summarizing and paraphrasing skills.

Assignment & Practical Works: (Any two)

- a) Listen to a recorded speech and classify it based on sounds: vowels, consonants, and others; suprasegmental: stress, pitch, tone, intonation, and juncture; Acoustic phonetics.
- b) Analyze sentences and their constituents as simple, complex, and compound sentences from written work.
- c) Group work and projects.

Course Outcomes: After completing the course, student teachers will be able to:

- ❖ Demonstrate reading, writing, listening, speaking, and thinking abilities in L2,
- ❖ Recognize the link between language and mental skills and demonstrate their knowledge and skills effectively for all purposes,
- ❖ Build inter-personal relationships and enhance social skills.

Suggested Readings:

1. गौतम, शैलजा एवं गौतम, रजनी (2006), संस्कृत शिक्षण, विनोद पुस्तक मंदिर, आगरा-2।
2. जैन, बनवारी लाल, गोस्वामी, प्रभाकर, भारद्वाज रतन, सैनी, सत्येन्द्र (2007), संस्कृत शिक्षण, शिक्षा प्रकाशन, जयपुर।
3. मित्तल, सन्तोष (2004), संस्कृत शिक्षण, आर. लाल बुक डिपो, मेरठ।
4. पाण्डेय, रामषकल (2003) संस्कृत शिक्षण, विनोद पुस्तक मंदिर, आगरा-2।
5. शर्मा, रीटा, जैन, अमिता (2005), संस्कृत शिक्षण, आविष्कार पब्लिशर्स एण्ड डिस्ट्रीब्यूटर्स, जयपुर – 302003
6. शर्मा, प्रभा (2006), संस्कृत शिक्षण, आस्था प्रकाशन, जयपुर।
7. शास्त्री, आचार्य राम (1998), संस्कृत शिक्षण, सरणी आचार्य रामशास्त्री ज्ञानपीठ, संस्कृतनगर, रोहिणी, दिल्ली।
8. सफाया, रघुनाथ (1997), संस्कृत शिक्षण, हरियाणा साहित्य अकादमी, चण्डीगढ़।
9. साम्ब शिवमूर्तिः, कम्भभपाटि (2009), संस्कृत शिक्षणम्, दीपशिखा प्रकाशन, जयपुर।
10. सिंह, कर्ण (2004), हिन्दी शिक्षण, गोविन्द प्रकाशन, लखीमपुर खीरी।
11. सिंह, सत्यदेव एवं शर्मा, शशिकला (2004), संस्कृत शिक्षण, इण्टरनेशनल हाऊस, मेरठ।

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE207AV	Understanding India (India Ethos and Knowledge System)	CC	2	15	35	50

Objectives:

- ❖ To introduce depth knowledge about Indian ethos
- ❖ To understand about Indian knowledge system
- ❖ To know the concept and nature of epistemic traditions of India
- ❖ To know the India's values and ethos.

Course Contents:

Unit-I: Indian epistemic traditions

- a) Sankhya educational philosophy.
- b) Vedanta educational philosophy.
- c) Geeta educational philosophy.
- d) Upnishad educational philosophy.
- e) Buddhism and Jainism educational philosophy.

Unit-II: Indian knowledge system across various fields

- a) Science
- b) Mathematics
- c) Management and administration
- d) Economy and political
- e) Language and grammar

Assignment & Practical Works: (Any one)

1. Write the detailed educational contribution of any Indian Thinker on any above topic.
2. Prepare an assignment on Indian ethos
3. Prepare a structure Indian knowledge system.
4. Write an assignment on Indian knowledge system

Course Outcomes: After completion of this course students would able to:

- ❖ To explain the concept and nature of epistemic traditions
- ❖ To understand the India's values and ethos.
- ❖ To Know the concept of Indian ethos.
- ❖ To Understand the purpose and Role Indian knowledge system.

Suggested Readings:

1. Nitonde R., (2024). Introduction to Indian Knowledge System, Notion Press, Mohali
2. Latchamma G & others (2020). Philosophical Foundation of Education, Neel Kamal Publications Pvt. Ltd. New Delhi
3. Singaravelu G. (2018). Education in Contemporary India, Neel Kamal Publications Pvt. Ltd. New Delhi
4. मिश्रा एम के (2021). भारतीय दर्शन, के के पब्लिकेशन, नई दिल्ली
5. शर्मा एस (2016) शिक्षा दर्शन एवं शिक्षण प्रविधियां, उत्कर्ष प्रकाशन , मेरठ

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE208AV	Teacher and Society	CC	2	15	35	50

Objectives:

- ❖ To understand the meaning of Teacher.
- ❖ To develop basic understanding & familiarity with key concept, society, social problem, social relationship and new trends
- ❖ To develop the positive thinking Student and teacher Relationship.
- ❖ To develop Vital Role of Teacher in national Building.
- ❖ To Understand the Impact of the internet on society.

Unit-1: Teacher personality and role in national building.

- a) Definition of Teacher.
- b) Teacher – Merits, work, duties and leadership.
- c) Positive Relationship in Student-Teacher.
- d) Development of co-curricular activities students by teacher.
- e) Vital Role of Teacher in national Building.

Unit-II: present Society scenario.

- a) Meaning and types of society.
- b) Role of education in different Areas (Family, school, and society).
- c) Present Social Problems (unemployment, Students in discipline, Poverty, Illiteracy, Health & Nutrition) Concept, cause, and Solution.
- d) Role of Government and Social – worker in society
- e) Advantage and disadvantage of the internet on society.

Course Outcomes: After completion of this course students would able to:

- ❖ Utilize the knowledge of Teacher and society for school and college education.
- ❖ Apply the concept of positive thinking Student and teacher Relationship Development in teaching field.
- ❖ Plan various activities to Society and culture at school and college level.

Suggested Readings:

1. कुशवाहा, पुष्पलता एवं सक्सेना, कनक (2006). शैक्षिक प्रबंधन एवं संगठन, आस्था प्रकाशन, जयपुर
2. चौबे, सरयू प्रसाद (1990). शिक्षा के समाजशास्त्रीय आधार, विनोद पुस्तक मंदिर, आगरा
3. पाण्डेय, रामशकल (2008). उभरते हुए भारतीय समाज में शिक्षा, विनोद पुस्तक मंदिर, आगरा
4. बघेला, एच. एस. सिंह (2007). शैक्षिक प्रबंधन एवं संगठन, राजस्थान प्रकाशन, जयपुर
5. भटनागर, सुरेश (1996). शैक्षिक प्रबंध व शिक्षा की समस्याएं, सूर्या पब्लिकेशन, मेरठ
6. वशिष्ठ, के. के. (1985). विद्यालय संगठन एवं भारतीय समाज की शिक्षा की समस्याएं, लायक बुक डिपो, मेरठ
7. शर्मा, आर. ए. (1995). विद्यालय संगठन एवं शिक्षा प्रशासन, सूर्या पब्लिकेशन, मेरठ
8. शर्मा, ओ. पी., गुप्ता, शोभा (2008). उभरते हुए भारतीय समाज में शिक्षा, विनोद पुस्तक मंदिर, आगरा
9. सुखिया, एस. पी., (2008). विद्यालय प्रशासन एवं संगठन, विनोद पुस्तक मंदिर, आगरा
10. वास्तव अंजना (2016). महिला शिक्षा तथा कानून राखी प्रकाशन आगरा 2016

Website

1. www.gender.com.ac.uk.
2. www.genderstudies.org.
3. www.genderparadigm.com/publication/html

(B.Sc.-B.Ed.) Semester-III

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE301MJ/MN	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25 Practical	
BBSE302MJ/MN	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25 Practical	
BBSE303MJ/MN	Disciplinary/Inter disciplinary Courses	Mathematics-I	CE	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25 Practical	
BBSE304MJ/MN	Disciplinary/Inter disciplinary Courses	Botany-I	Select Any One Minor Course	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25 Practical	
BBSE305MJ/MN	Disciplinary/Inter disciplinary Courses	Zoology-I	CE	4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE301MJ/MN	Chemistry-I	CE	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

Chemistry-Paper-I: Inorganic chemistry

Objectives:

- ❖ To develop the conceptual knowledge of acid and bases.
- ❖ To aware about the classification of acids, non aqueous solvents and separation methods.
- ❖ To give information about various characteristics & laws related to hard and soft acid and bases.
- ❖ To acquaint the knowledge of principles and purifying process for various solvents.

Unit I: Acids and Bases

Arrhenius (Water- ion system), Bronsted- Lowry (The proton donor acceptor system), The Lux-Flood (oxide ion concept), Lewis concepts of acids and bases (The electron donor acceptor concept) and solvent system and solvolysis, ionic product of solvent, limitations of solvent system.

Unit II: Hard and soft acids and bases (HSAB)

Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid- base strength and hardness and softness, symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness, limitations of HSAB.

Unit III: Non-aqueous solvents:

Physical properties of solvent, types of solvent and their general characteristics, reactions in non-aqueous solvents with reference to liq. NH₃ and liq. SO₂

Unit IV: Separation methods and Analysis Process

Principles and process of solvent extraction, the distribution law and partition coefficient, batch extraction, continuous extraction and counter current distribution, Gravimetric methods, theory of precipitation, co-precipitation, post precipitation, theory of purifying the precipitates.

Course Outcomes: After completion of the course student would able to:

- ❖ Differentiate between the various types of acid and bases.
- ❖ Describe the rules and principles related to explain the properties of non aqueous solvents.
- ❖ Apply the rules of separation and purification to extract various impurities.
- ❖ Explain the general characteristics and types of solvents.

Chemistry-Paper-II: Organic chemistry

Objectives:

- ❖ To develop knowledge about classification & nomenclature of organic compounds.
- ❖ To aware about the chemical reactions, mechanism and properties of alcohol & ethers.
- ❖ To develop understanding the proper use of various laws related to synthesis and catalysing process.
- ❖ To explain the various reactions on the basis of their mechanism.

Unit I: Alcohols

Classification and nomenclature. Monohydric alcohols- Methods of formation by reduction of aldehyde, ketones, carboxylic acids and esters. Hydrogen bonding, acidic nature, reaction of alcohols. Dihydric alcohols- methods of formation, chemical reactions of vicinal glycols, oxidation cleavage [Pb (OAc)₄ and HIO₄] and pinacol- pinacolone rearrangement. Trihydric alcohols- methods of formation, chemical reactions of glycerol.

Unit II: Phenol

Nomenclature, structure and bonding, preparation of phenols, physical properties and acidic character. Comparative acidic strength of alcohols and phenols, resonance stabilization of phenoxide ion, reaction of phenols, electrophilic aromatic substitutions, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement. Gattermann synthesis, Hauben- Hoesch reaction, Lederer Manasse reaction and Reimer Tiemann reaction.

Unit III: Aldehyde and ketones

Nomenclature and structure of the carbonyl group. Synthesis of aldehyde and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehyde 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 aldehyde and ketones, Cannizzaro reaction, Bayer Villiger oxidation of ketones, MPV, Clemmensen's reduction, Wolf Kishner reduction, LiAlH₄ and NaBH₄ reduction, Halogenation of enolizable ketones.

Unit IV: Ethers and epoxides & Organic synthesis via Enolates

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

Acidity of α hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethylacetoacetate; The Claisen condensation. Keto- enol tautomerism of ethyl acetoacetate. Alkylation of 1,3- dithianes, alkylation and acylation of enamines.

Course Outcomes: After completion of the course student would able to:

- ❖ Classify the various organic compounds on the basis of mechanism and structure.
- ❖ Apply the knowledge of processing derivatives for synthesize various products.
- ❖ Describe and discuss about technical terminology related to alcohols, ketones & ethers ec.
- ❖ Explain different methods of formation according to chemical reactions.

Chemistry-Paper-III: Physical chemistry

Objectives:

- ❖ To develop the knowledge about laws of thermodynamics, electrochemistry & equilibrium.
- ❖ To aware about the behaviour of ideal gases, enthalpy and process of dissociation.
- ❖ To describe the relationship pressure and heat, conductivity & electrolytes etc.
- ❖ To develop understanding about the thermodynamics process and chemical equilibrium.

Unit I: Thermodynamics-I & First law of thermodynamics

Definition of thermodynamics terms: systems, surroundings etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamics process. Concept of heat and work. Statement, definition of internal energy and enthalpy. Heat capacity. Heat capacities at constant volume and pressure and their relationship. Joule law-Joule Thomsan co-efficient and inversion temperature. Calculation of w , q , dU & dH for the expansion of ideal gases under isothermal and adiabatic condition for reversible process.

Unit II: Thermochemistry

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

Unit III: Electrochemistry I

Electrical transport- conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution. Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes. Ostwald dilution law its uses and limitations.

Debye Huckel- Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method. Application 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.

Unit IV: Chemical equilibrium

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

Course Outcomes: After completion of the course student would able to:

- ❖ Calculate and measure equivalent conductance, bond energy and thermo chemical data.
- ❖ Differentiate among intensive and extensive properties of system according to thermodynamics.
- ❖ Plot and interpret graph, equations and interrelationship related to volume, pressure and heat energy.
- ❖ Describe various phenomenon of thermodynamics, thermochemistry and electrochemistry.

Practical's

Inorganic Chemistry

Preparation of standard solutions

Dilution 0.1M to 0.001M solutions

Gravimetric analysis:(Any One)

- i) Analysis of Cu as CuSCN,
- ii) Analysis of Ni as Ni (dimethylglyoxime) and
- iii) Analysis of Zn as Zn₃(PO₄)₂

Organic Chemistry

Qualitative Analysis: Identification of two organic compound through the functional group analysis, determination of melting point/boiling point and preparation of suitable derivatives of any one.

Suggested Readings:

1. Organic Chemistry, Suresh Ameta, H.K. Pandey, H.S. Sharma, Himanshu Publications, Udaipur
2. Inorganic Chemistry, Ojha, Bhojak, Kothari, Chaturvedi, Ramesh Book Depot, Jaipur
3. Practical Chemistry, Bhargava, Lavania, Ojha, Ramesh Book Depot, Jaipur
4. Physical Chemistry, Sharma, Bhargava, Gupta, Ramesh Book Depot, Jaipur
5. Organic Chemistry, Vijayshree Manoj Changani, Alka Publication, Ajmer
6. Inorganic Chemistry, Vijayshree Kothari Changani, Alka Publication, Ajmer
7. Practical Chemistry, Changani, Vijayshree, Khandelwal, Alka Publication, Ajmer
8. Inorganic Chemistry, Suresh Ameta, Uma Sharma, P.K. Sharma, Mukesh Mehta, Himanshu Publications, Udaipur
9. Inorganic Chemistry, G.K. Rastogi, Yashpal Singh, College Book House, Jaipur
10. Practical Chemistry, V.K. Goyal, R.S. Peetaliya, College Book House, Jaipur

BBSE302MJ/MN	Physics-I	CE	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Practical				25 Practical	

Physics-Paper-I: Statistical and Thermodynamical Physics-I

Objectives:

- ❖ To aware general thermo-dynamical interaction.
- ❖ To develop concept about carnot's engine and Maxwell relation.
- ❖ To apply the concepts production of low temperature.
- ❖ To apply the concepts of low temperature.

UNIT I General Thermo-dynamical Interaction:

Thermal interaction; Zeroth law of thermodynamics Helmholtz free energy; Adiabatic interaction and enthalpy; General interaction and first law of thermodynamics; Infinitesimal general interaction; Gibb's free energy and Phase transitions. Clausius-Clapeyron equation; Vapour pressure curve.

UNIT II Carnot's Engine and Maxwell Relation:

Heat engine and efficiency of engine, Carnot, s Cycle; Thermodynamic scale as an absolute scale; Maxwell relations and their applications.

UNIT III Production of Low Temperature:

Joule Thomson expansion and J.T. coefficients for ideal as well as Vander Waal's gas. Porous plug experiment, Temperature inversions. Regenerative cooling and cooling by adiabatic expansion and demagnetization.

UNIT IV Application of Low Temperature:

Liquid Helium, He I and He II, super fluidity, quest for absolute zero. Nernst heat theorem. Qualitative Discussion of Superconductivity.

Course Outcomes: After completion the course student would able to:

- ❖ Identify and describe the statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, chemical potential, Free energies, partition functions.
- ❖ Use the statistical physics methods, such as Boltzmann distribution, Gibbs distribution, Fermi-Dirac and Bose-Einstein distributions to solve problems in some physical systems.
- ❖ Apply the concepts and principles of black-body radiation to analyze radiation phenomena in thermodynamic systems.
- ❖ Apply the concepts and laws of thermodynamics to solve problems in thermodynamic systems such as gases, heat engines and refrigerators etc.

Suggested Readings:

1. Charles Kittel, Thermal Physics, Macmillan Learning.
2. Reif, Thermodynamics and Statistical Physics, Tata McGraw-Hill.
3. Lokanathan, Khandelwal, Thermodynamics and Statistical Physics, PHI Learning Private Limited New Delhi.
4. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, उष्मा गतिकी एवं सांख्यिकीय भौतिकी, आर.बी. डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015-16

Physics-Paper-II: Optics –I

Objective

- ❖ To give information about geometrical optics.
- ❖ To aware about the lenses and these properties.
- ❖ To develop concept about the interference.
- ❖ To give information about polarization and types of polarization.

UNIT-I Geometrical Optics:

Fermat's principle, Laws of reflection and refraction from Fermat's principle, refraction at a spherical surface. Axial, lateral, angular magnification and their interrelationship; Abbe's Sine condition for spherical surfaces;

UNIT-II Lenses:

Refraction through a thick and thin lenses and its Focal length, 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.

UNIT-III Interference:

Young's double slit experiment, temporal and spatial coherence, coherence length, Division of amplitude, Interference in thin films, colour in thin films. Wedge shaped film, Newton rings and determination of wavelength and refractive index by Newton ring. Michelson Interferometer, Measurement of wavelength and refractive index by Michelson Interferometer.

Unit-IV Polarization:

Polarization states of electromagnetic (EM) waves, reflection and refraction of plane EM wave at plane dielectric surface, boundary conditions, derivation of Fresnel's relations. Huygen's theory, Theory of double refraction using Fresnel's ellipsoidal surface (no mathematical derivation). Production and analysis of plane, circularly and elliptically polarized light, quarter and half wave plates.

Course Outcomes: After completion the course student would able to:

- ❖ Gain knowledge on various theories of light
- ❖ Acquire skills to identify and apply formulas of optics and wave physics
- ❖ Classify the properties of light like reflection, refraction, interference, diffraction etc
- ❖ Applies the diffraction and polarization.

Suggested Readings:

1. A.K. Ghatak, Optics, Tata Mc Graw Hill.
2. Brij Lal and N. Subrahmaniyam, Optics, S. Chand publication.
3. F.A. Jenkins and H.E. White, Fundamentals of Optics, Tata McGraw Hill.
4. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, प्रकाशिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली 2015–16

Physics-Paper-III: Electronics & Solid-State Devices –I

Objectives:

- ❖ To give information about circuit analysis.
- ❖ To aware about the network theorems.
- ❖ To develop concept about the semiconductor.
- ❖ To give information about rectifiers and voltage regulation.

UNIT-I Circuit Analysis:

Network-some important definitions, loop and nodal equation based on DC and AC circuits (Kirchhoff's Laws), Four terminal network parameters; Current volt conventions, Open circuit, short circuit and hybrid parameters of any four terminals network. Input, Output and mutual impedance for an active four terminal network.

UNIT – II Network Theorems:

Superposition, Thevenin, Norton, Reciprocity, Compensation and maximum power transfer and miller theorems.

UNIT – III Semiconductors:

Intrinsic and extrinsic semiconductors, charge densities in N and P materials, conduction by drift and diffusion of charge carriers. PN diode equation, capacitance effects. Nature of charge carriers by Hall effect and Hall coefficient. Zener Diode, tunnel diode, photovoltaic effect.

UNIT – IV Rectifiers and Voltage Regulation:

Half-wave, full wave and Bridge rectifiers, Calculation of ripple factor, efficiency and regulation. Filters: shunt inductors, shunt capacitor, L sections and π sections filters. Voltage regulation and voltage stabilization by Zener diode, Voltage multiplier circuits.

Course Outcomes: After completion the course student would able to:

- ❖ Applies the kirchhoff's law (first and second) and circuit analysis.
- ❖ Calculate the network theorem (superposition, thevenin, reciprocity, compensation, maximum power transfer and miller theorems).
- ❖ Discuss the concept of the semiconductor, type of semiconductor, zener diode and hall effect.
- ❖ Identify the concept of rectifiers, voltage regulation, various type of filter.

Suggested Readings:

1. Albert Malvino and David J. Bates, Electronic Principles, Tata McGraw Hill.
2. Donald A. Neamen, Semiconductor Physics and Devices, Tata McGraw Hill.
3. Donald P. Leach, Albert Paul Malvino, Goutam Saha, Digital Principles and Applications, Tata McGraw Hill.
4. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, इलेक्ट्रॉनिकी एवं ठोस प्रावस्था युक्तियां, आर.बी. डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2016

Physics Practical: III

1. Study of dependence of velocity of wave propagation on line parameter using torsional wave apparatus.
2. Study of variation of reflection coefficient on nature of termination using torsional wave apparatus.
3. Using Platinum resistance thermometers find the melting point of a given substance.
4. Using Newton's rings method find out the wave length of a monochromatic source and find the refractive index of liquid.
5. Using Michelson's interferometers find out the wavelength of given monochromatic source (Sodium light).
6. To determine dispersive power of prism.
7. To determine wave length by grating.
8. To determine wave length by Biprism.
9. Determine the thermodynamic constant using Clements & Desorme's method.
10. To determine thermal conductivity of a bad conductor by Lee's method.
11. Determination of ballistic constant of a ballistic galvanometer.
12. Study of variation of total thermal radiation with temperature
13. To study the Specific rotation of sugar solution by polarimeter.
14. Any experiment according to theory paper.

Suggested Readings:

- 1 प्रभा दशोरा, द्वितीय वर्ष, प्रायोगिक भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2016

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE303MJ/MN	Mathematics-I	CE	4	15	20	100
	Mathematics-II				20	
	Mathematics-III				20	
	Mathematics Practical				25 Practical	

Mathematics-Paper-I: Real Analysis

Objectives:

- ❖ To aware the Real Numbers as Complete Ordered Field, Closed & opened Sets.
- ❖ To gain knowledge about the Cauchy's Sequences.
- ❖ To develop concept about the properties of continuous function.
- ❖ To develop knowledge about the Notion of Limit & Continuity for Functions of Two Variables.

Unit 1: Real numbers as complete ordered field, Limit point, Bolzano-Weierstrass theorem, Closed and Open sets, Union and Intersection of such sets, Concept of compactness, Heine-Borel theorem, Connected sets, Real sequences- Limit and Convergence of a sequence, Monotonic sequences.

Unit 2: Cauchy's sequences, Subsequences, Cauchy's general principle of convergence.

Unit 3: Properties of continuous functions on closed intervals, Properties of derivable functions, Darboux's and Rolle's theorem.

Unit 4: Notion of limit and continuity for functions of two variables, Riemann integration — Lower and Upper Riemann integrals, Riemann integrability, Mean value theorem of integral calculus, Fundamental theorem of integral calculus.

Course Outcomes: After completion the course student would able to:

- ❖ Applies the Real Numbers as Complete Ordered Field, Closed & opened Sets.
- ❖ Determine the Cauchy's Sequences.
- ❖ Discuss the Properties of Continuous Functions.
- ❖ Classify the Notion of Limit & Continuity for Functions of Two Variables and Interprets the fundamental theorem.

Suggested Readings:

1. S.C. Malik, Principles of Real Analysis, New Age International Limited, 2022.
2. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड़. जांगीड़, जितेन्द्र सैनी, रियल एनालिसिस, आर.बी.डी. पब्लिशिंग हाउस, जयपुर—दिल्ली, 2016
3. जी.सी. गौखरू सैनी, रियल एनालिसिस, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics-Paper-II: Differential Equations I

Objectives

- ❖ To give information about Degree & Order of a Differential Equation.
- ❖ To aware Linear Equation & Exact Differential Equation.
- ❖ To develop concept of the first Order but Higher Degree Differential Equation Solve for x , y & p .
- ❖ To develop knowledge about the Homogeneous Linear Differential Equations.

Unit 1: Degree and order of a differential equation, Equations of first order and first degree, Equations in which the variables are separable, Homogeneous equations and equations reducible to homogeneous form.

Unit 2: Linear equations and equations reducible to linear form, Exact differential equations and equations which can be made exact.

Unit 3: First order but higher degree differential equations solvable for x , y and p , Clairaut's form and singular Solutions with Extraneous Loci, Linear differential equations with constant coefficients, Complimentary function and Particular integral.

Unit 4: Homogeneous linear differential equations, Simultaneous differential equations.

Course Outcomes: After completion the course student would able to:

- ❖ Calculate Degree & Order of a Differential Equation.
- ❖ Differentiate between Linear Equation & Exact Differential Equation.
- ❖ Calculate the first Order but Higher Degree Differential Equation Solve for x , y & p .
- ❖ Discuss on the Homogeneous Linear Differential Equations.

Suggested Readings:

1. Khalil Ahmad, Differential Equation, Real World Education, 2013.
2. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, अवकलन समीकरण, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2016
3. जी.सी. गौखरू सैनी, अवकलन समीकरण, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics-Paper-III: Numerical Analysis

Objectives:

- ❖ To aware Relation between Differences and Derivatives.
- ❖ To understand the Divided Differences.
- ❖ To give knowledge about the Stirling's and Bessel's Interpolation Formulae.
- ❖ To develop concept of Numerical Integration.

Unit 1: Differences, Relation between differences and derivatives, Differences of a polynomial, Newton's formulae for forward and backward interpolation.

Unit 2: Divided differences, Newton's divided difference, Lagrange's interpolation formula.

Unit 3: Central differences, Gauss's, Stirling's and Bessel's interpolation formulae, Numerical Differentiation, Derivatives from interpolation formulae.

Unit 4: Numerical integration, Derivations of general quadrature formulas, Trapezoidal rule, Simpson's one-third, Simpson's three-eighth and Gauss's quadrature formulae.

Course Outcomes: After completion the course student would able to:

- ❖ Calculate Relation between Differences and Derivatives.
- ❖ Discuss on the Divided Differences.
- ❖ Applies the Stirling's and Bessel's Interpolation Formulae.
- ❖ Identify the concept of Numerical Integration.

Suggested Readings:

- 1 बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, संख्यात्मक विश्लेषण, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2016
- 2 जी.सी. गौखरू सैनी, संख्यात्मक विश्लेषण, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE304MJ/MN	Botany-I	CE	4	15	20	100
	Botany-II				20	
	Botany-III				20	
	Botany Practical				25 Practical	

Botany-Paper-I : Molecular Biology

Objectives:

- ❖ To know the concept of genetic material
- ❖ To get knowledge about the concept, types and process of DNA replication
- ❖ To understand the concept of transcription and Translation
- ❖ To learn about the regulation of gene expression

UNIT- I Genetic Material

- a) Biological, Chemical and physical Nature of Heredity material.
- b) Structure of DNA, WATSON & Crick model of DNA, Nucleosome model.
- c) Forms of DNA (A, B and Z forms)
- d) Structure and types of RNAs (mRNA, tRNA and rRNA)

UNIT- II DNA Replication

- a) Concept and Types DNA Replication with Staht experiment
- b) Enzymes and Proteins involved in DNA replication (DNA Polymerases)
- c) Okazaki fragments, DNA protein interaction.
- d) Process of DNA replication
- e) Preliminary account of DNA damage and repair.

UNIT-III Transcription and Translation

- a) Concept of transcription and transcription unit in Eukaryotes.
- b) Role of Enzymes (RNA Polymerases) Promoters and Factors in Transcription
- c) Mechanism of Transcription
- d) Pre RNA Processing (capping, splicing and polyadenylation).
- e) Genetic code: Meaning, Discovery and Properties.
- f) Translation in Eukaryotes: Concept and Machenism.

UNIT-IV Regulation of Gene Expression

- a) Concept of Regulation of Gene Expression
- b) Regulation in Gene expression in prokaryotes (Operon Model)
- c) Negative and Positive control.
- d) Attenuation and Anti-termination.
- e) Regulation in Gene expression in Eukaryotes,
- f) Teminism (Reverse Transcription) and its application.

Course Outcomes: After completion the course student would able to:

- ❖ Explain the concept of genetic material
- ❖ Describe the concept, types and process of DNA replication
- ❖ Differentiate the transcription and Translation
- ❖ Interpret the regulation of gene expression

Suggested Readings:

1. Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. 2009. The World of the Cell. 7th Edition. Pearson Benjamin Cummings Publishing, San Francisco.
2. Brown, T. A. 2010. Gene cloning and DNA analysis: An Introduction. Blackwell Publication, USA.
3. Buchanan, B., Gruissem, W. and Jones, R. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists., USA.
4. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press and Sunderland, Washington, D.C. Sinauer Associates, MA.
5. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology 8th edition. Lippincott Williams and Wilkins, Philadelphia.
6. Glick, B.R. and Pasternak, J.J. 2003. Molecular Biotechnology: Principles and Applications of recombinant DNA. ASM Press, Washington.
7. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley and Sons. Inc. New jersey, USA.
8. Rana, S.V.S. 2012. Biotechnology theory and practice. (Third Ed.) Rastogi Publication, Meerut.
9. Rastogi, V.B. 2008. Fundamentals of Molecular Biology. Ane Books, Meerut, India.
10. Upadhyaya, A. and Upadhyaya, K. 2005. Basic Molecular Biology. Himalaya Publishers. New Delhi.

Botany-Paper-II: Biotechnology

Objectives:

- ❖ To know the concept of Biotechnology and plant tissue culture.
- ❖ To aware about the mechanism of Protoplast, Anther and Embryo culture
- ❖ To acquire knowledge about recombinant DNA technology and PCR technique.
- ❖ To understand the introduction, process of transgenic plants.

UNIT- I: Biotechnology and Plant tissue culture

- a) Biotechnology: Basic Concepts, principles and Scope.
- b) Basic aspects of Plant tissue culture and aseptic tissue culture technique.
- c) Applications of Plant tissue culture,
- d) Concept of cellular totipotency, Differentiation and morphogenesis.
- e) Micropropagation: Concept and Methods; Artificial Seed.

UNIT- II: Protoplast, Anther and Embryo culture

- a) Protoplast Culture: Concept, isolation, culture and Somatic cell hybridization.
- b) Anther culture, Androgenic Haploid plant and their use in crop improvement
- c) Embryo culture and Ovule culture

UNIT- III: Recombinant DNA technology

- a) Tools and Techniques used in rDNA technology. Restriction enzymes, Vectors, Plasmids and Cosmids.
- b) Genomic and c-DNA library,
- c) Polymerase Chain Reaction (PCR): concept, procedure, Variations and Applications.
- d) Scope and Achievements of recombinant DNA technology
- e) DNA Finger Printing.

UNIT- IV: Transgenic plants

- a) Introduction, Process of production of transgenic plants,
- b) Types of transgenic plants, GM crops
- c) Application of transgenic plants
- d) Application of Biotechnology

Course Outcomes: After completion the course student would able to:

- ❖ Comprehend the concept of Biotechnology and plant tissue culture.
- ❖ Describe the mechanism of Protoplast, Anther and Embryo culture
- ❖ Acquire knowledge about recombinant DNA technology and PCR technique.
- ❖ Interpret the transgenic plants.

Suggested Readings:

1. Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. 2009. The World of the Cell. 7th Edition. Pearson Benjamin Cummings Publishing, San Francisco.
2. Brown, T. A. 2010. Gene cloning and DNA analysis: An Introduction. Blackwell Publication, USA.
3. Buchanan, B., Gruissem, W. and Jones, R. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists., USA.
4. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press and Sunderland, Washington, D.C. Sinauer Associates, MA.
5. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology 8th edition. Lippincott Williams and Wilkins, Philadelphia.
6. Glick, B.R. and Pasternak, J.J. 2003. Molecular Biotechnology: Principles and Applications of recombinant DNA. ASM Press, Washington.
7. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley and Sons. Inc. New jersey, USA.
8. Metha, Varun (2023), Plant Biotechnology, Campus Books, New Delhi.
9. Rana, S.V.S. 2012. Biotechnology theory and practice. (Third Ed.) Rastogi Publication, Meerut.
10. Rastogi, V.B. 2008. Fundamentals of Molecular Biology. Ane Books, Meerut, India.
11. Upadhyaya, A. and Upadhyaya, K. 2005. Basic Molecular Biology. Himalaya Publishers. New Delhi.

Botany-Paper-III: Plant Physiology I

Objectives:

- ❖ To understand structure, properties, components and phenomenon of water
- ❖ To know about different theories related to water absorption.
- ❖ To learn about Nitrogen and phosphorous cycle
- ❖ To get knowledge about concept and process of photosynthesis and respiration.

UNIT- I: Water

- a) Structure and properties of water,
- b) Water relations of a Plant cell: osmosis, water potential and Plasmolysis,
- c) Absorption of water: Water absorbing system, pathway of water movement, Mechanism of water absorption;
- d) Ascent of sap: Concept and Theories
- e) Transpiration: Concept, Types, mechanism and significance, Stomatal apparatus, mechanism of stomatal movements, factor affecting transpiration,
- f) antitranspirants and guttation.

UNIT- II: Mineral Nutrition

- a) Essential and non- essential nutrients; role of essential nutrients in plant metabolism and their deficiency symptoms.
- b) Transport of ions across cell, mechanism of active and passive transport, affecting factors
- c) translocation of organic solutes: concept, path, mechanism and affecting factors.
- d) Outline of Nitrogen and phosphorus cycle.

UNIT- III: Photosynthesis

- a) Photosynthesis- Introduction and Significance.
- b) Discovery and structure of pigments (chlorophyll and accessory pigment) ,
- c) Light harvesting units, law of limiting factors. Light reaction- photophosphorylation- (cyclic and non cyclic),
- d) Dark Reaction- Calvin and Benson cycle, Hatch and Slack pathway, Crassulacean acid metabolism (CAM)
- e) Photorespiration: Concept, mechanism and Significance.

UNIT- IV: Respiration

- a) Respiration: Introduction, Respiratory substrate, R.Q.
- b) Types of respiration (Aerobic and anaerobic).
- c) Mechanism of respiration: glycolysis, tricarboxylic acid cycle (TCA), oxidative phosphorylation, and pentose phosphate pathway, fermentation.
- d) Factors affecting oxidative processes,

Course Outcomes: After completion the course student would able to:

- ❖ Understand structure, properties, components and phenomenon of water
- ❖ Point out different theories related to water absorption.
- ❖ Explain the Nitrogen and phosphorous cycle
- ❖ Get knowledge about concept and process of photosynthesis and respiration

Suggested Readings:

1. Grewal, R.C. (2023), Plant Physiology, campus Books International, New Delhi.
2. Hopkins, W.G. and Huner, P. A. 2008. Introduction to Plant Physiology. John Wiley and Sons, USA.
3. Jain, V.K. 2013. Fundamental of Plant Physiology. S. Chand and Company Ltd., New Delhi.
4. Mukherjee S., Ghosh A. K. 2006. Plant Physiology. New Central Book Agency, Calcutta.
5. Sinha, R. K. 2007. Modern Plant Physiology. 2nd Edition Tata McGraw, New Delhi.
6. Taiz, L. and Zeiger, E. 2006. Plant Physiology. 4th Edition, Sinauer Associates Inc. Publishers, Massachusetts, USA.
7. Verma, S. K. and Verma, M. 2000. A Text book of Plant Physiology, Biochemistry and Biotechnology. S. Chand and co. Ltd., New Delhi.
8. Verma, V. 2007. Text Book of Plant Physiology. ANE Books, India.

Presentation Work (Any One)

1. Prepare a power point presentation of given course content
2. Prepare a working model related to course content; prepare report and record video of its working
3. Prepare a creative video presentation related to any environmental issue or any topic related to botany

BOTANY PRACTICAL III

1. To determine the water potential of given plant material.
2. Demonstration of phenomenon of osmosis using potato osmometer.
3. Demonstration of phenomenon of plasmolysis.
4. To study the permeability of plasma membrane using different concentration of organic solvents.
5. To study the effect of temperature on permeability of plasma membrane.
6. To demonstrate root pressure.
7. Study of effect of temperature on rate of transpiration.
8. Study of transpiration rate in dorsiventral and isobilateral leaves by use of potometer.
9. Study of the mechanism of stomatal opening and closing.
10. Rate of photosynthesis under varying HCO_3 concentration in an aquatic plant using bicarbonate (Wilmott and Bubbler).
11. Demonstration of O_2 evolution during photosynthesis by inverted funnel method.
12. To study that light is necessary for photosynthesis by using ganong screen.
13. To demonstrate of anaerobic and aerobic respiration.
14. To study that CO_2 , light and chlorophyll is essential for photosynthesis (Moll's half experiment).
15. Study C_3 and C_4 plant with the kranz anatomy.
16. To study the R.Q. by Ganong's respirometer.

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE305MJ/MN	Zoology-I	CE	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25 Practical	

Zoology-Paper-I: Life and Diversity of animals – Chordata- I

Objectives:

- ❖ To explain what the vertebrates are.
- ❖ To understand the general characters of each class of vertebrates.
- ❖ To understand the origin and evolutionary relationship in different classes of vertebrates.
- ❖ To understand the classification of pisces

Unit I: Protochordates

- a) **Protochordata:** General characters and classification up to class.
- b) **Herdmania:** Morphology, digestive system, Nervous System and sense organs, Excretory System, Reproductive system,
- c) **Herdmania:** Ascidian tadpole larva
- d) **Amphioxus:** Structure, digestive system, respiratory system, circulatory system, sense Organs, excretory system

Unit – II Agnatha and Pisces

- a) **Agnatha:** General Features of Agnatha and classification up to classes
- b) Type study: General Features of Petromyzon, Ammocoete Larva
- c) **Pisces:** Classification of Pisces upto classes; Difference between Chondrichthyes and Osteichthyes
- d) Type Study: General Morphology and anatomy of Scoliodon

Unit-III Tetrapoda

- a) **Amphibia:** Classification and characters with suitable examples, adaptations for amphibious life
- b) **Reptilia:** Classification and characters with suitable examples,
- c) **Aves:** General classification and characters with important examples;
- d) **Mammalia-I:** Classification and characters with suitable examples

Unit – IV Miscellaneous

- a) **Pisces:** Fins (structure and origin).
- b) **Pisces:** Types of scales.
- c) **Pisces** Migration.
- d) **Pisces** Parental Care.

Course Outcomes: After completion the course student would able to:

- ❖ Discuss and study the classification of Protochordata, Ascidia & Amphioxus
- ❖ Understand the classification of Agnatha & Gnathostomata, Characters of Petromyzon, and Ammocoete larva.
- ❖ Learn about the classification of Pisces, and basics of pisciculture, Scales, Fins, migration in fishes.
- ❖ Understand the classification of Amphibia, Reptilia, and the General Topics like Adaptive radiation in Amphibian, Neoteny, Parental care in Amphibians,

Suggested Readings:

1. Arora P. Mohan (2018) Chordata-I, Himalaya Publishing House, India
2. Agarwal V.K. (2023) Diversity and Biology of Non-Chordata, S. Chand and Company Ltd, India
3. Singh B.D. (2020) a Text Book of Zoology Chordata, Kedar Nath Ram Nath, India.
4. Arumugam N., Thangamani A. Kumar Prasanna S., Narayanan L.M. (2020) Chordate Zoology, Saras Publication, India.
5. Jordan E.L. & Verma P.S. (2019) Chordate Zoology, S. Chand & Co. Ltd, India.
6. Pandey B.N. & Mathur Vartika (2018) Biology of Chordates, PHI Learning, India.
7. Verma P.S. (2020) Chordate Embryology, S. Chand & Co. Ltd, India.

Zoology-Paper-II: Microbiology & Parasitology

Objectives:

- ❖ To understand the classification Microorganisms.
- ❖ To Understand and study the Bacteria.
- ❖ To Understand the Parasite Protozoan's.
- ❖ To Understand the Virus, Hepatitis and HIV.

Unit –I: Microbiology

- a) Concept of microbiology
- b) The scope of Microbiology: Characterization, Classification and identification of Microorganisms.
- c) History and landmark events in Microbiology: Working of A.V. Leeuwenhock, Louis Pasteur, Robert Koch, Germ Theory of diseases.
- d) World of Microbes: General Morphology of Protozoa, fungi – Molds and Yeasts

Unit-II: Bacteria

- a) The World of Bacteria – Morphology of Bacteria;
- b) Difference between Gram-positive and Gram-negative Bacteria.
- c) Basic idea of Culture: Types of culture media, Maintenance of pure cultures.
- d) Growth & Reproduction: Bacterial division, growth curve, generation time, measurement of growth. Asepsis, sterilization with physical and chemical agents; Reproduction- Asexual and sexual.

Unit-III: Other Microbes

- a) Virus: Structure, Classification; Life Cycle- Lytic and Lysogeny; A Bacteriophage
- b) Hepatitis: Structure and types of causative agent, Precaution, Prevention and Control
- c) HIV and AIDS: Epidemiology, prevention, control and treatment
- d) Cancer –Cause and precaution and treatment

Unit-IV: Parasitology

- a) Parasitic Protozoans: life cycle, pathogenesis and disease caused by Entamoebae, Leishmania
- b) Parasitic Protozoans: life cycle, pathogenesis and disease caused by Plasmodium,
- c) Epidemiology of infectious diseases with reference of Human: Bacterial [Tuberculosis, Leprosy, Meningitis]
- d) Fungal (any one) Disease

Course Outcomes: After completion the course student would able to:

- ❖ Applies the classification Microorganisms.
- ❖ Understand and study the Bacteria.
- ❖ Explain the Parasite Protozoans.
- ❖ Classify the Virus, Hepatitis and HIV.

Suggested Readings:

1. Arora D.R. (2018) Medical Parasitology, CBS Publishers & Distributors, India.
2. A.I.T.B.S. Publishers (2019) Handbook of Microbiology & Parasitology, Panda, India.
3. Bhatia B.B. And Pathak K.M.L. (2016) Textbook of Veterinary Parasitology, Kalyani Publishers, India.
4. Chatterjee K.D. (2019) Parasitology: Protozoology and Helminthology, CBS Publishers & Distributors, India.
5. Gupte Satish (2020) the Short Textbook of Medical Microbiology (Including Parasitology and Entomology, Jaypee Brothers Medical Publishers, India.
6. Kumar Surinder (2021) Textbook of Microbiology for BSc Nursing, Jaypee Brothers Medical Publishers, India.
7. Rai Kumud, Kumar Ajay, Tomar Kumar Dinesh, Khan Mahjabe (2023) Cytology, Genetics and Infectious Diseases (Zoology), Thakur Publication Pvt Ltd, India.
8. Mahapatra Sinha Samapti (2024) Zoology: Med Easy, Physics Wallah, India.
9. Sukla Dipti and Devi Pooja (2023) Bio-Sciences (Anatomy, Physiology & Microbiology) for GNM Students, Kalyani Publishers, India.
10. Sood Ramnik (2020) Textbook of Human Parasitology: Protozoology and Helminthology, CBS Publishers & Distributors, India.

Zoology-Paper-III: Physiology- I

Objectives:

- ❖ To develop the metabolic activities in mammalian body.
- ❖ To understand the various Biomolecules in body.
- ❖ To understand the structural chemistry of proteins, carbohydrates, fats.
- ❖ To understand the functions of Biomolecules in body Secretion.

Unit I Respiration

- a) Mechanism and regulation of Respiration
- b) Transport of oxygen and carbon dioxide, Respiratory Pigments
- c) Respiratory quotient, Respiratory volumes and capacities
- d) Respiratory Disorders and effect of smoking

Unit II Circulation

- a) Body Fluid: Composition and functions of blood; Lymph composition & function; Blood Pressure, Regulation of Blood Pressure
- b) Mechanism of Blood clotting.
- c) Physiology of cardiac muscles, structure & function of heart; Human Cardiac Cycle; Cardiac Rhythm; Origin of Heart Beat; Regulation of Heart Beat
- d) Elementary idea of Haemostasis, ECG, factors contributing to heart problems; Angioplasty; Angiography

Unit III Nutrition and Digestion

- a) Balanced diet
- b) Digestion and absorption of carbohydrates, proteins and fats
- c) Hormonal regulation of gastrointestinal function
- d) Vitamins- Fat soluble and water-soluble vitamins; Sources, deficiency and diseases

Unit IV Excretion

- a) Types of Nitrogenous waste products (ammonotelic, uricotelic, ureotelic)
- b) Structure and function of kidney; Nephron; Renal blood supply
- c) Mechanism of Urine formation in mammals; Counter Current Principle
- d) Hormonal control of renal function; Rennin- Angiotensin System, Micturition, Regulation of Body Fluids & Acid Base balance

Course Outcomes: After completion the course student would be able to:

- ❖ Understand the Physiology of Digestion & Respiration.
- ❖ Discuss the Physiology of Circulation & nerve impulse and Reflex Action.
- ❖ Understand the Physiology of Excretion
- ❖ Describe in nitrogenous waste products.

Suggested Readings:

1. Bbarrett E. Kim (2022). Ganong's Review of Medical Physiology, McGraw Hill Education India, New Delhi.
2. Gupta S. K. (2023). Principles of Physiology, Elsevier India, New Delhi.
3. Jain A. K. (2023). Textbook of Physiology for Nurses, Jaypee Brothers Medical Publishers, New Delhi.
4. Jain A. K. (2022). Textbook of Physiology for Physiotherapy Students, Wiley India, New Delhi.
5. Jain A. K. (2021). Textbook of Physiology for Dental Students, CBS Publishers, New Delhi
6. Hall E. John (2021). Guyton and Hall Textbook of Medical Physiology, Elsevier India, New Delhi.
7. Sembulingam K. (2022). Essentials of Medical Physiology, CBS Publishers New Delhi.
8. Sharma Kumar Suresh (2021). Physiology for Paramedical Students, Suresh Kumar Sharma, New Delhi.
9. Sherwood Lauralee (2021). Human Physiology: From Cells to Systems, Cengage Learning India, and New Delhi.
10. Ward T. P. Jeremy (2022). Physiology at a Glance, Wiley India, New Delhi.

Presentation Work (Any One)

1. Prepare a power point presentation of given course Content.
2. Prepare working model related content; prepare report and record video of its working.
3. Prepare a creative video presentation related to any Animal kingdom to issue or any topic related to Zoology.

Zoology -----Practical Based on paper I, II and III

Paper-I: Study of Chordates:

- A. Study of Specimen.
 - a) **Protochordata:** Herdmania, Ciona, Salpa, Doliolum, Amphioxus
 - b) **Lower Chordates:** Petromyzon, Myxine/Bdellostoma, Ammocete larva,
 - c) **Pisces:** Sphyrna, Trygon (Sting ray), Pristis (Saw Fish), Raja (Skate), Torpedo, Chimaera (Rat Fish), Acipenser, Amia, Lepidosteus, Notopterus, Labeo, Clarius, Anguilla (eel), Exocoetus, Hippocampus, Echenesis Sucker Fish), Protopterus,
 - d) **Amphibia:** Ichthyophis, Cryptobranchus, Ambyostoma (Tiger Salamander), Axolotl Larva, Salamandra, Proteus, Siren, Alytes, Pipa, Hyla, Rhacophorous (Flying Frog)
- B. Study of Slides.
 - a) Tadpole larva of Herdmania, Herdmania Spicules, T.S. of Amphioxus (Through Oral hood, Pharyngeal, Intestinal and Caudal regions)
 - b) V.S. of Skin of Scoliodon, Amphibia
- C. Mounting.
 - a) Herdmania Spicules, Placiod Scale
- D. Dissection: [Through demonstration by chart/ CAL/ Video]
 - a) **Major:** Afferent branchial vessels; Efferent branchial vessels; Cranial nerves of Scoliodon.
 - b) **Minor:** Internal Ear; Eye Muscles; Ampulla of Lorrenzini

Paper-II: Microbiology and Parasitology

- a) Preparation and use of culture media for microbes
- b) Study of microbes in food material (milk, Curd etc.)
- c) Staining procedure for parasites
- d) Identification of Protozoan parasites from permanent slides.
 - Trypanosoma (epimastigote or trypomastigote form); Leishmania (promastigote and amastigote form); Plasmodium (sporozoites and signet ring); Giardia; Entamoeba (trophozoites);
- e) Identification and characterization of helminth parasites from permanent slides
 - Cercaria of Fasciola; Eggs of Schistosoma; Cyst of Echinococcus granulosus; Microfilariae of Wuchereria

Paper: III Physiology:

- a) Demonstration of ptyalin enzyme activity
- b) Estimation of haemoglobin content; RBC Counting, WBC Counting; Haematocrit value and ESR of given blood sample
- c) Histological Slides of mammalian T.S. of spinal Cord, stomach, duodenum, ileum, liver, lung, kidney

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE306FD	Child Development & Education Psychology	CC	4	30	70	100

Objectives:

- ❖ To explain the meaning, concept, characteristics, and factors affecting growth and development
- ❖ To explain the knowledge of Indian concept of self
- ❖ To Apply various problem solving and learning strategies in real classroom settings
- ❖ To Identify the various approaches of the process of learning
- ❖ To Explain group dynamics and apply strategies to facilitate group learning

UNIT-I Psychology and Educational Psychology

- a) Indian Psychology: Concept and its implication
- b) Psychology: Meaning and Definitions, Stage, Scope, Application
- c) Educational Psychology: Concept, Methods & Applications

UNIT-II Stage of Growth and Development

- a) Stage of Development: Pre-Natal Stage, Stage of Infancy, Childhood Stage, Adolescence
- b) Stage Specific Characteristics
- c) Developmental areas: Physical, Cognitive, Emotional, Moral, Social, Language
- d) Growth & Development: Meaning, Principles, Difference, Factors Affecting
- e) Role of Teacher in Facilitating Development

UNIT-III Various theories of learning, processes and their implications

- a) Trial and Error theory
- b) Classical conditioning theory
- c) Operant conditioning theory
- d) Insight theory of Learning
- e) Social Learning theory

UNIT-IV Learner: Psychological Dimensions

- a) Personality: Concept, Types & Measurement
- b) Intelligence & Multiple Intelligence: Meaning, Theories & Measurement
- c) Creativity: Meaning, Development & Measurement
- d) Adjustment: Concept, Process & Mechanism

Assignment & Practical Works: (Any Two)

1. Spending day with a child and preparing a report based on our observations of children for:
 - A day from different economic status (low and affluent)
 - Focus on various factors: Physical, emotional, social, language, cultural and religious influencing the child on daily basis.
2. Observing children to understand the styles of children learning process.
3. Identifying the Learning Difficulties of Students in Different learning areas and the Possible Reason for them- Case Study Report.
4. Preparing Personalized Intervention plan for Students with Learning Difficulties.
5. Plan to use advanced technology to encourage talented / gifted children.
6. Encouraging gifted / talented students beyond the general school curriculum.
7. Familiarization and Reporting of Individual Psychological Tests.

Course Outcomes: After completion of this course, student teachers will be able to:

- ❖ Describe the meaning, concept, characteristics, and factors affecting growth and development
- ❖ Use the knowledge of Indian concept of self
- ❖ Apply various problem solving and learning strategies in real classroom settings
- ❖ Identify the various approaches of the process of learning
- ❖ Explain group dynamics and apply strategies to facilitate group learning

Suggested Readings:

1. Hurlock, Elizabeth B. (2007). Child Development, Tata Mc Grow-Hill Publishing Company Ltd. New Delhi
2. Singh, Y.K. (2017). Advanced Educational Psychology, Uni-Tech Book Mart, 122, East Patel Nagar, Ganeshpura, Ratanda, Jodhpur
3. गुप्ता, एस.पी., गुप्ता, अलका (2007). उच्चतर शिक्षा मनोविज्ञान, शारदा पुस्तक भवन, इलाहाबाद
4. पाठक, पी.डी., (2007). शिक्षा मनोविज्ञान, विनोद पुस्तक मंदिर, आगरा
5. यादव, सियाराम, (2008). अधिगमकर्ता का विकास एवं शिक्षण अधिगम प्रक्रिया, शारदा पुस्तक भवन, इलाहाबाद
6. शर्मा, जे.डी., (2008). मनोविज्ञान की पद्धतियाँ एवं सिद्धान्त, विनोद पुस्तक मंदिर, आगरा
7. श्रीवास्तव, प्रमिला, (2008), बाल विकास एवं शिक्षा संदर्शिका, कनिष्क पब्लिशर्स, नई दिल्ली
8. अस्थाना, मधु एवं वर्षा, किरन बाला (2012). व्यवक्तित्व मनोविज्ञान, मोतीलाल बनारसीदास, वाराणसी, 221009
9. वर्मा, एल. एन. (2013). प्रायोगात्मक शिक्षा मनोविज्ञान, राजस्थान हिन्दी ग्रन्थ अकादमी, जयपुर
10. श्रीवास्तव, डी. एन. व वर्मा प्रीति संशोधित संस्करण (2014). बाल मनोविज्ञान : बाल विकास, श्री विनोद पुस्तक मंदिर, आगरा।
11. श्री वास्तव, डी. एन. एवं श्रीवास्तव, वी.एन. (2014 संशोधित संस्करण), बाल मनोविज्ञानरू बाल विकास, विनोद पुस्तक मंदिर, आगरा
12. श्रीवास्तव, डी. एन. , एवं श्री वास्तव, वी.एन (2015 संशोधित संस्करण), आधुनिक विकासात्मक मनोविज्ञान, विनोद पुस्तक मंदिर, आगरा
13. मंगल, एस. के. (2019). शिक्षा मनोविज्ञान, प्रिटिस हॉल ऑफ इण्डिया प्राइवेट लिमिटेड, नई दिल्ली
14. भास्कर, सुरेन्द्र (2021), बाल विकास एवं शिक्षा मनोविज्ञान, राजस्थान हिन्दी ग्रन्थ अकादमी, जयपुर

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE307OP	Basics of Pedagogy at Secondary Stage	CC	4	30	70	100

Objectives:

- ❖ To build comprehensive understanding of secondary stage learners
- ❖ To assess the physical, mental, social, and emotional growth of secondary stage learners
- ❖ To develop skills to observe and recognize the unique capabilities and strengths of secondary stage learner
- ❖ To discuss the necessary knowledge and skills to implement effective teaching and learning strategies
- ❖ To develop a deeper understanding of various pedagogical approaches & instructional practices and their impact on learners
- ❖ To determine the knowledge to make informed decisions about outline knowledge and skills necessary for continuous professional development
- ❖ To explain the crucial role of pedagogy in facilitating effective learning experiences for students

UNIT – I: Understanding Secondary Stage Learners

- a) Understanding the learner's development: Physical, Mental, Social, and Emotional
- b) Thought processes and cognitive skills of learners
- c) Social and academic lives of learners
- d) Conflicts and challenges of secondary learners
- e) Characteristics & unique capabilities of secondary stage learners

UNIT – II: Strategies of Teaching and Learning

- a) Teaching and Learning Strategies: Concept, characteristics and functions
- b) Relationship between aims and values of education, curriculum and pedagogy
- c) Making abstract concepts enjoyable through inclusive classrooms and joyful learning
- d) Promoting multidisciplinary learning through integration of different disciplines, Participation and engagement of learner
- e) Building values through art integrated activities, community engagement etc.
- f) Developing health and social sensitivities & cultural heritage

UNIT – III: Pedagogical Approaches

- a) Pedagogical approaches: constructivist approach; collaborative approach; reflective approach; integrative approach, inquiry- based approach; other contemporary approaches, art-integrated learning, sports- integrated learning
- b) Types of pedagogy: social pedagogy; critical pedagogy; culturally responsive pedagogy; Socratic pedagogy in inclusive setup
- c) Role of pedagogy in effective learning

UNIT – IV: Continuous Professional Development of Teacher

- a) Meaning and need, professional and ethical competencies and need for updating content and pedagogical competencies to develop their professional competencies
- b) Professional development activities: seminars, conferences, orientation workshops, online and offline courses, competitions, publications, development of teaching portfolio, capacity building programmes and teacher exchange programmes
- c) Development of professional competencies to deal with contemporary issues like gender equity and inclusion, human health and well-being, ethical, environmental, human rights etc. (emotional, mental, physical issues related to pandemic like covid-19)

Assignment & Practical (Any Two)

1. Prepare a term paper on any topic in above units with ppt
2. Analyze NEP 2020 with reference to pedagogical aspects of the concerned subject
3. Analyze and reflect on the qualities of an 'Innovative Teacher' in Context of National Professional Standards for Teachers (NPST) and National Mentoring Mission (NMM)
4. Explore different platforms such as National Teacher's Portal, NISHTHA, DIKSHA, and SWAYAM for an online course and prepare a report

5. Develop teaching learning strategies to address the needs of diverse learners in context of gender, equity and inclusion and prepare a PowerPoint presentation.
6. Raise awareness on the ethical and social challenges in education through field trip and create an e-portfolio

Course Outcomes: After completion of this course, student teachers will be able to:

- ❖ Build comprehensive understanding of secondary stage learners
- ❖ Assess the physical, mental, social, and emotional growth of secondary stage learners
- ❖ Develop skills to observe and recognize the unique capabilities and strengths of secondary stage learner
- ❖ Discuss the necessary knowledge and skills to implement effective teaching and learning strategies
- ❖ Create enriching and inclusive learning environments to foster values-based education
- ❖ Develop a deeper understanding of various pedagogical approaches and their impact on learners
- ❖ Determine the knowledge to make informed decisions about instructional practices,
- ❖ Explain the crucial role of pedagogy in facilitating effective learning experiences for students
- ❖ Outline knowledge and skills necessary for continuous professional development

Suggested Readings:

1. Eade, Deborah (2006). Development methods and approaches, Rawat Publications, Jaipur
2. Hurlock, Elizabeth B. (2007). Child Development, Tata Mc Grow-Hill Publishing Company Ltd., New Delhi
3. Joyce, Bruce; Weil, Marsha (1996). Models of teaching, 5th Ed. Prentice-Hall International Inc, London
4. Murty, K Satchidananda (1991). Philosophy in India: traditions, teaching and research, Motilal Banarsidass Publishers Pvt. Ltd, Delhi
5. Nanda, R.T. (1997). Contemporary approaches to value education in India Regency Publications, New Delhi
6. National Education Policy 2020, MoE, Government of India (English and Hindi)
7. National Steering Committee for National Curriculum Frameworks (2023) Draft National Curriculum Framework for School Education
8. Venkataiah, S. (2000). Encyclopedia of education for 21st century: Secondary Education, (1st ed.) Vol. 38 Anmol Publications Pvt. Ltd., New Delhi
9. गुप्ता, एस. पी., गुप्ता, अलका (2007) उच्चतर शिक्षा मनोविज्ञान, शारदा पुस्तक भवन, इलाहाबाद
10. पाठक, पी.डी. (2007) शिक्षा मनोविज्ञान, विनोद पुस्तक मंदिर, आगरा
11. मंगल, एस. के. (2019) शिक्षा मनोविज्ञान, प्रिंटिस हॉल ऑफ इण्डिया प्राइवेट लिमिटेड, नई दिल्ली
12. मिश्रा, एल. एन. (2005). शिक्षा एवं शिक्षण के सिद्धांत, विनोद पुस्तक मंदिर, आगरा यादव, सियाराम (2008) अधिगमकर्ता का विकास एवं शिक्षण अधिगम प्रक्रिया, शारदा पुस्तक भवन, इलाहाबाद

Skill Development Course

Course Code	Course Title	Course Category	Credit	Assignment	Theory	Total
BBSE308CC	Teaching Skill	CC	4	30	70	100

Objectives:

- ❖ To develop the understanding of the concept of Teaching Skill
- ❖ To identify and address diverse needs of all learners
- ❖ To familiarize with the issues in Teaching Skill
- ❖ To develop and understanding of the role of facilitators in Teaching Skill
- ❖ To practice of the Teaching Skill

Course Contents:

Unit- I Concept of Teaching Skill

- Meaning, Objective, Need and Types of Teaching Skill
- Principles of Teaching Skill
- Problems and Solutions of Teaching Skill
- ICT Material for Teaching Skill

Unit- II Writing Objectives and Skills

- Writing Instructional Objectives skill
- Introduction Skill
- Blackboard Writing Skill

Unit- III Question and Blackboard Skill

- Reinforcement of Student Participation Skill
- Fluency in asking questions Skill
- Probing questions Skill
- Divergent questions Skill

Unit- IV Various Skills

- Recognizing and Attending Behavior
- Illustrating and use of examples
- Lecturing
- Stimulus Variation Skill
- Communication Skill

Assignment & Practical Works: (Any Two)

- One Term paper on any topic of the course
- Plan for the Practice of Teaching Skill
- Prepare ICT Material for Teaching Skill.

Course Outcomes: After completion of this course students would able to:

- ❖ Understand of the concept of Teaching Skill
- ❖ Practice different Teaching Skills
- ❖ Identify and address diverse needs of all learners
- ❖ Describe the issues in Teaching Skill
- ❖ Prepare teachers for School education

Suggested Readings:

- Roy P.K. (2023). Master the Art of Teaching: Notion Press, India.
- Dobhal R.P. (2021). A Guide to Effective Teaching, Notion Press Media Pvt. Ltd., India.
- Yadav HK, (2021). Micro Teaching and Teaching Skills, Redshine Publication.
- Golati G. (2016). Shukshma Shiksha Evm Shiksha Kaushal, Rakhi Prakshan, Agra.
- Babu AR and Dandapani S. (2016). Essentials of Micro Teaching, Neel Kamal Publisher, New Delhi.

Skill Development Course

Course Code	Course Title	Course Category	Credit	Assignment	Theory	Total
BBSE309CC	Educational psychology & cognitive development	CC	4	30	70	100

Objectives:

- ❖ Understand the Fundamentals of Educational Psychology.
- ❖ Grasp the Neuroscience of Learning.
- ❖ Develop Techniques for Memory Enhancement.
- ❖ Enhance Student Motivation.

Unit-1 Introduction to Educational Psychology

- a) Overview of educational psychology.
- b) Cognitive and developmental theories relevant to education.
- c) The role of psychological principles in classroom settings.
- d) Learning styles and their impact on teaching methods.

Unit-2 The Neuroscience of Learning

- a) How the brain learns: The neural processes of learning and memory.
- b) The role of neurons, synapses, and neurotransmitters in cognitive functions.
- c) Brain-based learning strategies (e.g., how emotions and environment affect learning).

Unit-3 Memory Enhancement Techniques

- a) Understanding memory processes: Encoding, storage and retrieval.
- b) Techniques to enhance memory retention (e.g., retrieval practice, spaced learning, elaboration, and visual imagery).
- c) Memory aids: Mnemonics, mind mapping and chunking.

Unit-4 Motivation in Education

- a) Understanding motivation and its relationship with learning.
- b) Theories of motivation: Self-Determination Theory, Goal Setting Theory, and Expectancy Theory.
- c) Applying motivation techniques: Rewards, praise, and self-regulation.

Course outcomes: At the end of the program participants will be able to:

- ❖ Acceptance of the basic principles of educational ideology
- ❖ Gain insights into the neuroscience of learning
- ❖ Master memory enhancement techniques
- ❖ Explore Cognitive Development Across the Lifespan
- ❖ Understand and Implement Student Motivation Techniques
- ❖ Apply Effective Strategies for Enhancing Student Learning
- ❖ Integrate Neuroscience and Cognitive Strategies into Classroom Practices

Suggested Readings:

1. Backett Chris (2004). Human Growth & Development, Sage Publication
2. Das, J. P. (1998). The Working Mind: An Introduction to Psychology, Sage Publication.
3. Chomsky, N. (1968). Language and Mind, Harcourt Brace, Jovanovich.
4. Singh Indramani & Parasuraman, Raja (1998). Human Cognition- A Multi Disciplinary Perspective, Sage Publication.
5. Baddeley, A. D. (1996). Human Memory: Theory and Practice, Washington, DC: Psychology Press.
6. Gruneberg, M. M.; Marris, P.E. & Skyes, R.N. (1998). (Eds) Practical aspects of memory; Current research and issues (Vol.2) John Wiley, New York.
7. Brown J. (1976). Recall and recognition, London.
8. Hurlock, Elizabeth B. (2007). Child Development, Tata Mc Grow-Hill Publishing Company Ltd. New Delhi
9. गुप्ता, एस. पी., गुप्ता, अलका, (2007). उच्चतर शिक्षा मनोविज्ञान, शारदा पुस्तक भवन, इलाहाबाद

10. पाठक, पी.डी., (2007). शिक्षा मनोविज्ञान, विनोद पुस्तक मंदिर, आगरा
11. मंगल, एस. के, (2008). शिक्षा मनोविज्ञान, प्रिटिस हॉल ऑफ इण्डिया प्राइवेट लिमिटेड, नई दिल्ली
12. यादव, सियाराम, (2008). अधिगमकर्ता का विकास एवं शिक्षण अधिगम प्रक्रिया, शारदा पुस्तक भवन, इलाहाबाद
13. शर्मा, जे. डी., (2008). मनोविज्ञान की पद्धतियाँ एवं सिद्धान्त, विनोद पुस्तक मंदिर, आगरा
14. श्रीवास्तव, प्रमिला, (2008). बाल विकास एवं शिक्षा संदर्शिका, कनिष्क पब्लिशर्स, नई दिल्ली
15. श्रीवास्तव, डी. एन. व वर्मा प्रीति संशोधित संस्करण (2014). बाल मनोविज्ञान : बाल विकास, श्री विनोद पुस्तक मंदिर, आगरा।
16. समणी ऋजु प्रज्ञा, नवीन संस्करण (2011). व्यक्तित्व विकास और योग, जैन विश्व भारती विश्वविद्यालय, लाडनूँ-341306 (राजस्थान)
17. अस्थाना, मधु एवं वर्षा, किरन बाला (2012). व्यवक्तित्व मनोविज्ञान, मोतीलाल बनारसीदास, वाराणसी, 221009
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(B.Sc.-B. Ed) Semester-IV

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE401MJ/MN	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25 Practical	
BBSE402MJ/MN	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25 Practical	
BBSE403MJ/MN	Disciplinary/Inter disciplinary Courses	Mathematics-I	Select Any One Minor Course	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25 Practical	
BBSE404MJ/MN	Disciplinary/Inter disciplinary Courses	Botany-I	CE	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25 Practical	
BBSE405MJ/MN	Disciplinary/Inter disciplinary Courses	Zoology-I	CE	4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE401MJ/MN	Chemistry-I	CE	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

Chemistry-Paper -I: Inorganic chemistry

Objectives:

- ❖ To develop the knowledge about chromatography, oxidation reduction and polymerization.
- ❖ To aware about the conceptual knowledge of chromatography, polymer chemistry and bioinorganic chemistry.
- ❖ To give information about solvent systems, diagrams and preparation methods.
- ❖ To develop understanding about silicones, phosphazenes, trace elements and nitrogen fixation.

Unit I: Chromatography

Types of chromatographic methods and their applications, principle of differential migration, Adsorption phenomenon, nature of the adsorbent, solvent systems, R_f values.

Unit II: Oxidation and Reduction

Use of redox potential data, analysis of redox cycle, redox stability in water, disproportionation, Frost, the diagrammatic representation of potential data, Latimer and Pourbaix diagrams, principles involved in the extraction of the elements.

Unit III: Polymer chemistry of Silicones & Phosphazenes

Classification, Preparation and Structure of silicones, silicon resin, silicon rubber, silicon fluid, industrial application of silicones.

Preparation, properties, substitution reaction and structure of Phosphazenes

Unit IV: Bioinorganic chemistry

Essential and trace elements in biological processes, metalloporphyrin's with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with reference to Na⁺, K⁺, Ca²⁺ and Mg²⁺, nitrogen fixation.

Course Outcomes: After completion of the course student would able to:

- ❖ Differentiate between oxidation & reduction and structures of silicones.
- ❖ Describe the principles related to differential migration, substitution and biochemistry.
- ❖ Apply the methods of chromatography, industrial uses of silicon and biochemistry to solve different issues.
- ❖ Interpret the diagrams related to redox reaction, structure and processes of polymerization.

Chemistry-Paper -II: Organic chemistry

Objectives:

- ❖ To develop knowledge about classification & nomenclature of carboxylic acid and dicarboxylic acid.
- ❖ To aware about the chemical reactions, mechanism and properties of polymers, halonitroarenes and amines.
- ❖ To develop concept of various laws related to synthesis and catalysing process.
- ❖ To acquaint the various reactions on the basis of their mechanism.

Unit I : Carboxylic acids & Dicarboxylic acids

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 Zelinisky reaction, synthesis of acid chlorides, esters and amides, reduction of carboxylic acids, mechanism of decarboxylation. Method of formation and chemical reaction of haloacids, hydroxyl acids, malic tartaric and citric acids. Methods of formation and chemical reactions of α , β -unsaturated monocarboxylic acids. methods of formation and effect of heat and dehydrating agents (succinic, glutaric and adipic acids).

Unit II: Carboxylic acids derivatives & Synthetic polymers

Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides, relative stability of acyl derivatives. Physical properties, inter conversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives, chemical reactions, mechanism of esterification and hydrolysis (acidic and basic).

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 resin, urea-formaldehyde resin, epoxy resins and polyurethanes. Natural and synthetic rubbers.

Unit III: Alkyl nitrates, Nitroarenes & Halonitroarenes

Preparation of nitroalkanes and nitroarenes. chemical reactions of nitro alkanes, mechanism of nucleophilic substitution in nitro arenes and their reduction in acidic, neutral and alkaline medium, picric acid.

Reactivity, structure and nomenclature of amines, physical properties, stereochemistry of amines. Separation of mixture of primary, secondary and tertiary amines, structural features effecting basicity of amines.

Unit IV: Amines

Amines salts as phase transfer catalyst, preparation of alkyls and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel- Pthalamide reaction, Hofmann bromamide reaction.

Reaction of amines, electrophilic aromatic substitution in aryl amines, reaction of amines with nitrous acids. Diazotization, mechanism, synthetic transformation of aryl diazonium salts, azocoupling.

Course Outcomes: After completion of the course student would able to:

- ❖ Classify the various organic compounds on the basis of mechanism and structure.
- ❖ Apply the knowledge of processing derivatives for synthesize various products.
- ❖ Describe and discuss about technical terminology related to acids, alkyl nitrates and amines.
- ❖ Discuss about the methods of formation, structural features and mechanism of various compounds.

Chemistry-Paper - III: Physical Chemistry

Objectives:

- ❖ To aware about laws of thermodynamics, pH, polarization of molecular structure.
- ❖ To develop conceptual knowledge about entropy, electrolytes dipole moment etc.
- ❖ To develop analytical view about evaluation of absolute entropy, activity coefficient and magnetic properties of compounds.
- ❖ To give information about Carnot theorem, mixing of gases, overvoltage and refractivity.

Unit I: Second and Third law of thermodynamics & Concept of entropy

Need for the law, different statements of the law, Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature.

Entropy as a state function, entropy as a function of Volume and temperature, entropy as a function of pressure and temperature, entropy change in physical change, Clausius inequality, entropy as a criterion of spontaneity and equilibrium, Entropy change in ideal gases and mixing of gases

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

Unit II: Electrochemistry II

Types of reversible electrodes, gas metal ion, metal-metal ion, metal insoluble salt-anion and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode, reference electrodes, standard electrode potential, sign convention, electrochemical series and its significance.

Electrolytic and Galvanic cells-reversible and irreversible cells, conventional representation of electrochemical cells.

EMF of a cell and its measurements, computation of cell EMF, calculation of thermodynamic quantities of cell reactions (ΔG , ΔH and K), polarization, over potential and overvoltage.

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

Unit III: pH & Corrosion

Definition of pH and pKa determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods. Buffers- mechanism of buffer action. Henderson- Hazel equation. Hydrolysis of salts. Fundamental of electrolytic corrosion: theories and kinetics, corrosion prevention. Batteries, fuel cells

Unit IV: Physical properties and molecular structure

Optical activity, polarization (Clausius-Mosotti equation) orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment temperature method and refractivity method, dipole moment and structure of molecular magnetic properties-paramagnetism, diamagnetism and ferromagnetics.

Course Outcomes: After completion the course student would able to:

- ❖ Classify the electrodes, cells and properties of organic compounds.
- ❖ Determine and interpret the function of volumes, equations, coefficients related to entropy, corrosion and molecular structures.
- ❖ Describes various properties of compounds on the basis of energy, potential and dipole moment etc.
- ❖ Measure the entropy change, pH and polarization and magnetic properties of compounds.

Practicals

Organic Chemistry

TLC/ Paper chromatography

- a) Separation of fluorescein and methylene blue
- b) Separation of leaf pigments from spinach leaves

Synthesis of organic compounds (Any Four)

- a) Acetylation of salicylic acid aniline glucose and hydroquinone
- b) Aliphatic electrophilic substitution - Preparation of iodoform from ethanol and acetone
- c) Aromatic electrophilic substitution
 - Nitration
 - Preparation of m-dinitrobenzene Preparation of p-nitroacetanilide Halogenations
 - Preparation of p-bromoacetanilide
 - Preparation of 2,4,6-tribromophenol
- d) Diazotization/Coupling
 - Preparation of methyl orange and methyl red
- e) Oxidation
 - Preparation of benzoic acid from toluene
- f) Reduction
 - Preparation of aniline from nitrobenzene
 - Preparation of m-nitroaniline from m-dinitrobenzene
 - Physical Chemistry

Phase Equilibrium:

1. To study the effect of a solute (e.g. NaCl, succinic acid) on the critical solution temperature of two partially
2. miscible liquids (e.g. Phenol-Water system) and to determine the concentration of that solute in the given phenol-water system.
3. To construct the phase diagram of two component (e.g. diphenylamine-benzophenone) system by cooling curve method.

Transition Temperature:

1. Determination of the transition temperature of the given substance by thermometric/dilatometric method (e.g. $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$ / $\text{SrCl}_2 \cdot 2\text{H}_2\text{O}$).

Thermochemistry:

1. To determine the solubility of benzoic acid at different temperature and to determine H of the dissolution process.
2. To determine the enthalpy of neutralization of a weak acid/weak base versus strong base/strong acid and determine the enthalpy of ionization of the weak acid /weak base.
3. To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber cycle.

Viva-Voce and Record

Suggested Readings:

1. Organic Chemistry, Suresh Ameta, H.K. Pandey, H.S. Sharma, Himanshu Publications, Udaipur
2. Inorganic Chemistry, Ojha, Bhojak, Kothari, Chaturvedi, Ramesh Book Depot, Jaipur
3. Practical Chemistry, Bhargava, Lavania, Ojha, Ramesh Book Depot, Jaipur
4. Physical Chemistry, Sharma, Bhargava, Gupta, Ramesh Book Depot, Jaipur
5. Organic Chemistry, Vijayshree Manoj Changani, Alka Publication, Ajmer
6. Inorganic Chemistry, Vijayshree Kothari Changani, Alka Publication, Ajmer
7. Practical Chemistry, Changani, Vijayshree, Khandelwal, Alka Publication, Ajmer
8. Physical Chemistry, V.K. Goyal, R.S. Peetaliya, College Book House, Jaipur

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE402MJ/MN	Physics-I	CE	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Prcatical				25 Practical	

Physics-Paper -I: Statistical and Thermodynamical Physics-II

Objectives:

- ❖ To aware kinetic theory of gases.
- ❖ To Understand the transport phenomenon of gases.
- ❖ To give knowledge about the classical statistics.
- ❖ To develop concept of quantum statistics.

UNIT I Kinetic Theory of Gases:

Distribution law of molecular velocities, most probable, average and RMS velocities, Energy distribution function; Experimental verification of the Maxwell velocity distribution the principle of equipartition of energy.

UNIT II Transport Phenomenon of Gases:

Transport Phenomenon: Mean free path, distribution of free paths, coefficients of viscosity, thermal conductivity, diffusion and their interrelation.

UNIT III Classical Statistics:

Validity of classical approximation, Phase space, micro and macro states; Thermodynamical probability, entropy and thermodynamic probability; Monoatomic ideal gas; Barometric equation; Specific heat capacity of diatomic gas; Heat capacity of solids.

UNIT IV Quantum Statistics:

Black body radiation and failure of classical statistics, Postulates of quantum statistics, indistinguishability, wave function and exchange degeneracy, a priori-probability; Bose Einstein statistics and its distribution function; Plank distribution function and radiation formula; Fermi Dirac statistics and its distribution function, contact potential, thermionic emission; Specific heat anomaly of metals; Nuclear spin statistics (para and ortho hydrogen)

Course Outcomes: After completion the course student would able to:

- ❖ Analyze phase equilibrium condition and identify types of phase transitions of physical systems.
- ❖ Make connections between applications of general statistical theory in various branches of physics.
- ❖ Design, set up, and carry out experiments, analyze data recognising and accounting for errors and compare with theoretical predictions.
- ❖ Differentiate between B-E statistics & F-D statistics

Suggested Readings:

1. Charles Kittel, Thermal Physics, Macmillan Learning.
2. Reif, Thermodynamics and Statistical Physics, Tata McGraw-Hill.
3. Lokanathan, Khandelwal, Thermodynamics and Statistical Physics, PHI Learning Private Limited New Delhi.
4. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, उष्मा गतिकी एवं सांख्यिकीय भौतिकी, आर. बी. डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015-16

Physics-Paper -II: Optics –II

Objectives:

- ❖ To aware fraunhofer diffraction.
- ❖ To Understand the Fresnel class of diffraction and resolving power.
- ❖ To give knowledge about the optical activity and holography.
- ❖ To develop concept of lasers.

UNIT-I Fraunhofer Diffraction:

Fraunhofer diffraction at single slit and a circular aperture, intensity distribution and width of central maxima, and determination of slit size, two slit diffraction and its intensity distribution with missing orders. Diffraction due to N slits with intensity distributions. Plane transmission grating its formation and intensity distribution.

UNIT-II Fresnel class of Diffraction & Resolving Power:

Fresnel class of diffraction, half period zones, zone plate, diffraction due to circular aperture. Diffraction at straight edge, thin and thick wire, rectangular slit. Rayleigh's criterion, resolving power of prism, telescope, microscope and plane transmission grating.

Unit-III Optical Activity and Holography:

Optical activity, Specific rotation, biquartz and half shade polarimeters. Basic concepts of holography, construction of a hologram and reconstruction of the image, important features of hologram and uses of holography.

Unit-IV Lasers:

Difference between ordinary and laser source, stimulated and spontaneous emission, stimulated absorption.

Einstein's A and B coefficients, population inversion, conditions for laser action, meta-stable states, pumping. Types of lasers, construction, working and energy level schemes of He-Ne and Ruby laser. Properties and uses of lasers.

Course Outcomes: After completion the course student would able to:

- ❖ Applies interference in design and working of interferometers.
- ❖ Discuss on the resolving power of different optical instruments.
- ❖ Identify the working of holography and their applications in various fields.
- ❖ Differentiate between simple light source and laser

Suggested Readings:

1. A.K. Ghatak, Optics, Tata Mc Graw Hill.
2. Brij Lal and N. Subrahmaniyam, Optics, S. Chand publication.
3. F.A. Jenkins and H.E. White, Fundamentals of Optics, Tata McGraw Hill.
4. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, प्रकाशिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2016

Physics-Paper -III: Electronics & Solid-State Devices –II

Objectives:

- ❖ To aware about transistor.
- ❖ To Understand the amplifiers with feedback.
- ❖ To give knowledge about the amplifiers and oscillators.
- ❖ To develop concept of field effect transistor and digital circuits.

UNIT-I Transistor:

Notations and volt -ampere characteristics for bipolar junction transistor, concept of load line and operating point, hybrid parameters. Transistor as Amplifiers: CB, CE, CC configurations, its characteristic curves and their equivalent circuits. Analysis of transistor amplifiers using hybrid parameters and its frequency response. Fixed and emitter biasing, bias stability in transistor circuits.

UNIT-II Amplifiers with Feedback:

Concept of feedback, positive and negative feedback, voltage and current feedback circuits, Advantages of negative feedback- stabilization of gain by negative feedback, Effect of feedback on output and input resistance. Reduction of nonlinear distortion by negative feedback. Effect on gain- frequency response.

UNIT-III Operational Amplifier & Oscillators:

Differential amplifier, DC levels shifter, operational amplifier, input and Output impedances, input offset current. Application: Unity gain buffer, Adder, Subtractor, Integrator and Differentiator. Feedback requirements for oscillations, circuit requirement for oscillation, basic oscillator analysis. Colpitt and Hartley oscillators. R-C oscillators, piezoelectric frequency control.

UNIT-IV Field Effect Transistor and Digital Circuits:

Field Effect Transistor (FET) and its characteristic biasing JFET, ac operation of JFET and MOSFET.

Binary, Hexadecimal and Octal number systems. Binary arithmetic. Logic fundamentals AND, OR, NOT, NOR., NAND, XOR gates, Boolean theorems, transistor as a switch, logic gates: circuit realization of logic functions. Analog to digital and digital to analog analysis. DDL, RTL, TTL circuits.

Course Outcomes: After completion the course student would able to:

- ❖ Identify characteristics of transistor (common base configuration, common emitter configuration, common collector configuration).
- ❖ Discuss on the amplifiers with feedback.
- ❖ Discuss on the concept of operational amplifier & oscillators.
- ❖ Classify the field effect transistor and digital circuits.

Suggested Readings:

1. Albert Malvino and David J. Bates, Electronic Principles, Tata McGraw Hill.
2. Donald A. Neamen, Semiconductor Physics and Devices, Tata McGraw Hill.
3. Donald P. Leach, Albert Paul Malvino, Goutam Saha, Digital Principles and Applications, Tata McGraw Hill.
4. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, इलेक्ट्रॉनिक्स एवं ठोस प्रावस्था युक्तियां, आर.बी. डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2016

Physics Practical: IV

1. Plot thermo emf versus temperature graph and find the neutral temperature (Use sand bath)
2. Study of power supply using two diodes/bridge rectifiers with various filter circuits.
3. Study of half wave rectifier using single diode and application of L and π section filters.
4. To study characteristics of a given transistor PNP/NPN (Common emitter, common base and common collector configurations)
5. Determination of band gap using a junction diode.
6. Determination of power factor ($\cos \phi$) of a given coil using CRO.
7. Study of single stage transistor audio amplifier (Variation of gain with frequency).
8. To determine e/m by Thomson's method.
9. Determination of velocity of sound in air by standing wave method using speaker, microphone and CRO
10. Measurement of inductance of a coil by Anderson's bridge.
11. Measurement of capacitance and dielectric constant of a liquid and gang condenser by de-Sauty Bridge.
12. Any experiment according to theory paper.

Suggested Readings:

- 1 प्रभा दशोरा,, द्वितीय वर्ष प्रायोगिक भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2016

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE403MJ/MN	Mathematics-I	CE	4	15	20	100
	Mathematics-II				20	
	Mathematics-III				20	
	Mathematics Practical				25 Practical	

Mathematics-Paper-I: Real analysis and matrix space

Objectives:

- ❖ To give information about the Sequence and Series of Functions.
- ❖ To aware about the Term-by-Term Differentiation and Integration.
- ❖ To develop knowledge about the Metric Space
- ❖ To develop knowledge about the Subspace.

Unit 1: Sequence and series of functions — Pointwise and Uniform convergence, Cauchy's criterion, Weierstrass M-test, Abel's test, Dirichlet's test for uniform convergence of series of functions, Uniform convergence.

Unit 2: Continuity of series and functions, term by term differentiation and integration, Metric space - Definition and examples, Open and Closed sets, Interior and Closure of a set, Limit point of a set.

Unit 3: Subspace of a metric space, Product space, Continuous mappings, Sequence in a metric space, Cauchy sequence, Complete metric space.

Unit 4: Baire's theorem, Compact sets and Compact spaces, Connected metric spaces.

Course Outcomes: After completion the course student would able to:

- ❖ Discuss on the Sequence and Series of Functions.
- ❖ Calculate the Term-by-Term Differentiation and Integration.
- ❖ Classify the Metric Space, Subspace.
- ❖ Applies the Compact Sets and Compact Space.

Suggested Readings:

1. S.C. Malik, Principles of Real Analysis, New Age International Limited, 2022.
2. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड, जितेन्द्र सैनी रियल एनालिसिस एण्ड मैट्रिक स्पेस, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2016
3. जी.सी. गौखरु सैनी, रियल एनालिसिस एण्ड मैट्रिक स्पेस, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics-Paper-II: Differential Equations II

Objectives:

- ❖ To give knowledge about the exact linear differential equations of n^{th} order.
- ❖ To aware about the linear differential equations of second order.
- ❖ To know the partial differential equations of first order.
- ❖ To Understand the homogeneous and non-homogenous linear partial differential equation.

Unit 1: Exact linear differential equations of n^{th} order, Existence and uniqueness theorem.

Unit 2: Linear differential equations of second order, Linear independence of solutions, Solution by transformation of the equation by changing the dependent variable/the independent variable, Factorization of operators, Method of variation of parameters, Method of undetermined coefficients.

Unit 3: Partial differential equations of the first order, Lagrange's linear equation, Charpit's general method of solution.

Unit 4: Homogeneous and non-homogeneous linear partial differential equations with constant coefficients, Equations reducible to equations with constant coefficients.

Course Outcomes: After completion the course student would able to:

- ❖ Calculate the exact linear differential equations of n^{th} order.
- ❖ Classify the linear differential equations of second order.
- ❖ Discuss the partial differential equations of first order.
- ❖ Identify the homogeneous and non-homogenous linear partial differential equation.

Suggested Readings:

1. Khalil Ahmad, Differential Equation, Real World Education, 2013.
2. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड़. जांगीड़, जितेन्द्र सैनी रियल एनालिसिस एण्ड मैट्रिक स्पेस, आर.बी.डी. पब्लिशिंग हाउस, जयपुर—दिल्ली, 2016
3. जी.सी. गौखरू सैनी, रियल एनालिसिस एण्ड मैट्रिक स्पेस, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics- Paper-III: Optimization Theory vector calculus

Objectives:

- ❖ To aware about the Linear Programming Problem.
- ❖ To develop knowledge of properties and Elementary Theorems on Duality Only.
- ❖ To understand the Differentiation & Integration of vector Point functions.
- ❖ To conceptualize the gradient, divergence & curls.

Unit 1: The linear programming problem, Basic solution, Some basic properties and theorems on convex sets, Fundamental theorem of L.P.P.

Unit 2: Theory of simplex method only Duality, Fundamental theorem of duality, properties and elementary theorems on duality only.

Unit 3: Scalar and Vector point functions, Differentiation and integration of vector point functions, Directional derivative, Differential operators.

Unit 4: Gradient, Divergence and Curl, Theorems of Gauss, Green, Stokes (without proof) and problems based on these theorems.

Course Outcomes: After completion the course student would able to:

- ❖ Applies Linear Programming Problem.
- ❖ Classify the Properties and Elementary Theorems on Duality Only.
- ❖ Discuss on the Differentiation & Integration of vector Point functions.
- ❖ Identify the the gradient, divergence & curls.

Suggested Readings:

1. Madan Pal, Vector Analysis, Wave Books, 2023.
2. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी रियल एनालिसिस एण्ड मैट्रिक स्पेस, आर.बी.डी. पब्लिशिंग हाउस, जयपुर–दिल्ली, 2016
3. जी.सी. गौखरू सैनी, रियल एनालिसिस एण्ड मैट्रिक स्पेस, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE404MJ/MN	Botany-I	CE	4	15	20	100
	Botany-II				20	
	Botany-III				20	
	Botany Practical				25 Practical	

Botany-Paper-I: Pteridophytes

Objectives:

- ❖ To develop knowledge on pteridophytes with its origin and classification
- ❖ To know general characteristics of psilophyta.
- ❖ To understand the life cycle of class lycophyta and sphenophyta.
- ❖ To discuss economic importance of pteridophytes.

UNIT-I: General account of Pteridophytes

- a) Pteridophytes: characteristics, origin, classification (G.M. Smith), structure, development of sporangia (eusporangiate and leptosporangiate),
- b) Evolution of stele in Pteridophytes. Types of steles.
- c) Life cycle patterns of homosporus and heterosporus pteridophytes.

UNIT-II: Heterosporous, seed habit and Psilotum

- a) Heterosporous and seed habit,
- b) Aposporous and Apogamy.
- c) General characteristics of Psilotophyta:
- d) Morphology, anatomy and reproduction of *Psilotum*

UNIT-III: Lycophyta and Sphenophyta

- a) General characteristic of Lycophyta and Sphenophyta.
- b) Morphology, anatomy and reproduction of *Seleginella*
- c) Morphology, anatomy and reproduction of *Equisetum*

UNIT-IV: Pteridium and Marsilea

- a) General characteristics of Filicophyta.
- b) Morphology, anatomy and reproduction of *Pteridium*.
- c) Morphology, anatomy and reproduction of *Marsilea*.
- d) Economic importance of Pteridophytes.

Course Outcomes: After completion the course student would able to:

- ❖ Develop knowledge on pteridophytes with its origin and classification
- ❖ Explain general characteristics of psilophyta.
- ❖ Understand the concept of lycophyta and sphenophyta.
- ❖ Discuss concept of filicophyta and their economic importance

Suggested Readings:

1. Agarwal, V. K. (2020). Pteridophytes of India: A Comprehensive Study Discovery, Publishing House, New Delhi, India.
2. Bir, S. S. (2019). Pteridophytes: Evolution and Classification Bishen Singh Mahendra Pal Singh, Dehradun, India
3. Chopra, R. N. (2020). Pteridophytes: Morphology, Anatomy, and Reproduction, CBS Publishers & Distributors New Delhi, India.
4. Dixit, B. K. (2021). Ferns and Fern Allies of India: A Field Guide Botanical, Survey of India Kolkata, India.
5. Goswami, H. K. (2022). Ferns of the Western Himalayas, Himalayan Books, Shimla, India.
6. Jain, A.K. (2019). Pteridophytes: Biodiversity and Ecological Significance, Daya Publishing House, New Delhi, India.
7. Nayar, M. P. (2019). Pteridophytes: Diversity and Conservation, Scientific Publishers, Jodhpur, India.

8. Pande, P. C. Bhandari, S. S. (2020). Pteridophytes: A Textbook for Students, Rastogi Publications Meerut, India.
9. Rajesh, K. P. (2021). Ferns and Fern Allies of Western Ghat *Kerala Forest*, Research Institute, Peechi, Kerala, India.
10. Singh, P., Gupta R. K. (2022). Ferns of Northeast India: A Pictorial Guide, NIPA (New India Publishing Agency), New Delhi, India.

Botany- Paper-II: Gymnosperms and Paleobotany

Objectives:

- ❖ To know the general characteristics, distribution, classification of gymnosperms
- ❖ To understand the morphology anatomy, reproduction of the cycadales.
- ❖ To acquire knowledge about Ephedrales and Palaeobotany.
- ❖ To discuss the dominant fossils flora of different ages.

UNIT- I General Account of Gymnosperms

- a) Gymnosperm: General characteristics, distribution, classification (K. R. Sporne, 1965)
- b) Brief account of morphology, anatomy and reproduction of gymnosperms.
- c) Affinities of Gymnosperms with Pteridophytes and Angiosperms.
- d) Economic importance of Gymnosperms

UNIT- II Cycadales and Coniferales

- a) General characteristics of Cycadales, Coniferales.
- b) Morphology, anatomy, reproduction and life cycle with special reference to the genera *Cycas*.
- c) Morphology, anatomy, reproduction and life cycle with special reference to the *Pinus*.

UNIT- III Ephedrales and Palaeobotany

- a) General characteristics of Ephedrales.
- b) Morphology, anatomy, reproduction and life cycle of *Ephedra*.
- c) Palaeobotany: Introduction and Principles.
- d) fossil types and their formation, technique of study of fossils. Geological time scale

UNIT- IV Fossil Pteridophytes and Gymnosperms

- a) General account of dominant fossils flora of different ages,
- b) Palaeobotany in relation to exploration of fossil fuels. Primitive land plant: *Rhynia*,
- c) Fossil pteridophytes: reconstructed plant-*Lepidodendron* and *Calamites*,
- d) Fossil gymnosperm-*Williamsonia*.

Course Outcomes: After completion the course student would able to:

- ❖ Interpret the general characteristics, distribution, classification of gymnosperms
- ❖ Discuss the morphology anatomy, reproduction of the cycadales.
- ❖ Acquire knowledge about Ephedrales and Palaeobotany.
- ❖ Explain the dominant fossils flora of different ages.

Suggested Readings:

1. Bose, M.N. (2022). Fossil Plants and Their Role in Understanding Earth's History, Narosa Publishing House, New Delhi
2. Jain, A.K. (2022). Fossil Plants and Their Significance in Palaeobotany, CBS Publishers & Distributors, New Delhi
3. Mishra, S.R. (2019), Palaeobotany: An Introduction to the Study of Fossil Plants, Scientific Publishers, Jodhpur
4. Pandey, B.P. (2020). Gymnosperms: Diversity and Classification, S. Chand Publishing, New Delhi
5. Pandey, S.N. (2021). Palaeobotany: Principles and Applications, PHI Learning Pvt. Ltd., New Delhi
6. Shivanna, K.R. (2020). Gymnosperms: Ecology and Adaptation, Oxford University Press India, New Delhi
7. Shukla, R.S. (2021). Gymnosperms: Structure and Evolution, Rastogi Publications, Meerut, India
8. Singh, S.K. (2022) Gymnosperm and Paleobotany, Campus Books, New Delhi.
9. Singh, V. (2019). Gymnosperms: A Comprehensive Study, Kalyani Publishers, Ludhiana, India
10. Srivastava, H.S. (2021). Palaeobotany and the Evolution of Plants, New Age International Publishers, New Delhi

11. Trivedi, P.C. (2020). Gymnosperms: Morphology, Anatomy, and Reproduction, Discovery Publishing House, New Delhi

Botany- Paper-III: Plant Physiology II and Biochemistry

Objectives:

- ❖ To know structure, biosynthesis and physiological role of plant hormones
- ❖ To provide knowledge of vernalization and photoperiodism.
- ❖ To comprehend the introduction, importance, nomenclature and classification of carbohydrates lipids, proteins.
- ❖ To acquire knowledge about enzymes.

UNIT- I: Physiology of Growth and Development

- a) Seed dormancy and germination,
- b) Phases of growth and development;
- c) Plant movement and biological clock and their regulatory factor.
- d) Growth hormones: Structure, biosynthesis, and physiological role of Auxins, gibberellins.

UNIT- II: Physiology of Flowering

- a) Structure, biosynthesis and physiological role of Cytokinin, Ethylene and Growth inhibitors: Absciseic acid.
- b) Physiology of Flowering: Photoperiodism, flowering stimulus, florigen concept, vernalization.
- c) Discovery, chemical nature and role of phytochrome in photomorphogenesis
- d) Senescence: levels, significance and affecting factors, leaf senescence.

UNIT -III: Carbohydrates and Lipids

Carbohydrates:

- a) Introduction, Importance, Nomenclature and Classification of Carbohydrates.
- b) Molecular Structure and Function of monosaccharides, oligosaccharides and polysaccharides.
- c) Glycosidic linkage and Glycoprotein.

Lipids–

- a) Structure and classification of lipids,
- b) Fatty acids- saturated and unsaturated,
- c) Oxidation of fatty acids- Alpha Oxidation, Beta oxidation and Glyoxalate Cycle,

UNIT- IV: Proteins and enzymes

Proteins-

- a) Amino acids as basic units, classification and properties
- b) Structure and classification of proteins (primary, secondary, tertiary and quaternary), Physical and Chemical Properties of proteins.

Enzymes:

- a) Structure, Nomenclature and classification of enzymes,
- b) Characteristics of Enzymes,
- c) Mechanism of enzyme action,
- d) Regulation of Enzyme Activity, Activators and Inhibitors.

Course Outcomes: After completion the course student would able to:

- ❖ Get knowledge about structure, biosynthesis and physiological role of plant hormones
- ❖ Discuss the concept of vernalization and photoperiodism.
- ❖ Describe the importance, nomenclature and classification of carbohydrates lipids, proteins.
- ❖ Acquire knowledge about enzymes

Suggested Readings:

1. Berg, J.M., Tymoczko, J.L., Stryer, L. 2006. Biochemistry. 6th Edition, W.H. Freeman and Company, New York.
2. Conn, E.E., Stumpf, P.K. and Bruening, G. 2006. Outlines of Biochemistry. 4th Edition, John Wiley and Sons Inc. New Jersey, USA.
3. Elliot, W.H. and Elliot, D.C. 2009. Biochemistry and Molecular Biology. Oxford Publishers, India.
4. Grewal, R.C. (2023), Plant Physiology, campus Books International, New Delhi.
5. Hopkins, W.G. and Huner, P.A. 2008. Introduction to Plant Physiology. John Wiley and Sons, USA.
6. Mukherjee, S., Ghosh, A.K. 2006. Plant Physiology. New Central Book Agency, Calcutta.
7. Nelson, D.L. and Cox, M.M. 2004. Lehninger Principles of Biochemistry, 4th edition, W.H. Freeman and Company, New York, USA.

8. Ranjit, K. 2008. Research methodology: A step-by-step guide for beginners. Pearson, India.
9. Sinha R. K., 2007. Modern Plant Physiology. 2nd Edition Tata McGraw, New Delhi.
10. Taiz, L. and Zeiger, E. 2006. Plant Physiology. 4th Edition Sinauer Associates Inc. Publishers, Massachusetts, USA.
11. Wilson, K. and Walker, J. 2008. Principles and techniques of Biochemistry and Molecular Biology, Cambridge University Press.

Presentation Work (Any One)

1. Prepare a power point presentation of given course content
2. Prepare a working model related to course content; prepare report and record video of its working
3. Prepare a creative video presentation related to any environmental issue or any topic related to botany

BOTANY PRACTICAL IV

1. Double staining technique and technique for preparation of permanent slides.
2. Study of following with the temporary slide preparation and specimens:
Pteridophytes: Psilotum, Selaginella, Equisetum, Pteridium and Marselia (Vegetative and reproductive).
3. **Gymnosperm:** Cycas (coralloid root, T.S. of coralloid root, T.S. of leaflet, petiole, male cone and L.S. of male cone, microsporophyll, megasporophyll, T.S. of microsporophyll, ovule, L.S. of ovule and seed).
4. Pinus (T.S. of stem and needle, male cone and female cone, L.S. of male cone and female cone, seed).
5. Ephedra (Stem T.S., leaf T.S., male and female cones, L.S. of ovule, seed).
6. Study of fossil specimens.
7. Principle, working and use of colorimeter and spectrophotometer.
8. Principle, types and application of centrifuges.
9. Principle and types of Chromatography.
10. Separation of amino acids by paper chromatography and thin layer chromatography.
11. Microchemical tests for carbohydrates (Fehling's test, Benedicts test) and proteins (Ninhydrin test, Xanthoproteic test).
12. Separation of chlorophyll and carotenoid pigments by solvent method
13. Separation of chlorophyll and carotenoid pigments by paper chromatography
14. Estimate chlorophyll and carotenoid content in C3 and C4 plant.
15. To test the presence of ascorbic acid in different plant juices.
16. Bioassay of plant growth hormone (auxin, gibberellins and cytokinin).
17. Measurement of growth using auxanometer.

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE405MJ/MN	Zoology-I	CE	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25 Practical	

Zoology-Paper-I: Life and Diversity of animals – Chordata II

Objectives:

- ❖ To learn about the comparative study scoliodon and Rana of Integumentary system i.e. Structure of skin.
- ❖ To understand and study the comparative study scoliodon and Rana of Heart and brain.
- ❖ To understand and study the comparative study scoliodon and Rana of Bones.
- ❖ To understand and study the Poisonous and nonpoisonous snakes.

UNIT-I: Comparative Anatomy of Vertebrates-I

Comparative anatomy of the following organ systems of Scoliodon, Rana,

- a) Integument and its derivatives.
- b) Alimentary canal
- c) Digestive glands.
- d) Respiratory organs.

UNIT-II Comparative Anatomy of Vertebrates-II

Comparative anatomy of the organ systems of Scoliodon, Rana,

- a) Respiratory Organ
- b) Heart, aortic arches and their evolution.
- c) Brain and cranial nerves,
- d) Comparative structure and evolution of urinogenital system (pro, meso and metanephric kidney and genital ducts in males and females).

Unit III: Comparative Anatomy of Vertebrates-III

Comparative anatomy of the organ systems of Scoliodon, Rana,

- a) Osteology: Skulls
- b) Osteology: pectoral and pelvic girdle
- c) Osteology: Fore limbs and Hind limbs
- d) Sense Organ: Comparative anatomy of eye

Unit IV: Miscellaneous

- a) Reptila: Poisonous Snakes of India.
- b) Reptila: Non-Poisonous Snakes of India
- c) Aves: Flight Adaptation; Flight Muscles; Perching Mechanism
- d) Mammals-I: Dentition; Adaptive radiation

Course Outcomes: After completion the course student would able to:

- ❖ Understand and study the comparative study scoliodon and Rana of Integumentary system i.e. Structure of skin.
- ❖ Study the comparative study scoliodon and Rana of Heart and brain.
- ❖ Comparative study scoliodon and Rana of Bones.
- ❖ Interpret Poisonous and nonpoisonous snakes.

Suggested Readings:

1. Agarwal V.K. (2023). Diversity and Biology of Non-Chordata, S Chand and Company Ltd, India.
2. Agarwal V.K. (2023). non-chordates I, Ecology, S Chand & Co Ltd, India.
3. Arora P. Mohan (2018). Chordata-I, Himalaya Publishing House, India.
4. Arumugam N., Thangamani A., Prasanna KumarS., Narayanan L.M. (2018) Chordate Zoology, Saras Publication, India.
5. Dhami P.S. (2006). Chordate Zoology, R Chand & Co-New Delhi, India
6. Jordan E.L. and Verma P.S. (2018). Chordate Zoology, S Chand Publishing India
7. Kotpal R.L. (2022). Modern Textbook of Zoology: Vertebrates, RASTOGI, India.

8. Mandal Baran Fatik (2022). Biology of Non-Chordates, PHI Learning, India.
9. Pandey B.N. and Mathur Vartika (2018). Biology of Chordates, PHI Learning, India.
10. Singh B.D. (2020). A Text Book of Zoology Chordata, KEDAR NATH RAM NATH, India.

Zoology-Paper-II: Biochemistry and Endocrinology

Objectives

- ❖ To explain the function of Carbohydrates and other metabolism.
- ❖ To aware the function of Lipids and metabolism
- ❖ To understand the importance of Bio molecules
- ❖ To learn about the function of Proteins and metabolism

Unit I: Carbohydrates and their metabolism

- a) Biomolecule: Structure, types, function and properties of Carbohydrate
- b) Metabolism: Glycolysis (EMP)
- c) Citric acid (Krebs cycle) cycle; gluconeogenesis;
- d) Glycogen metabolism (glycogenesis and glycogenolysis).

Unit II: Lipids and their metabolism

- a) Biomolecule: Structure, types, function and properties of Lipid
- b) Fatty acid; Triglycerides and Steroids
- c) Metabolism: Biosynthesis and β -oxidation of saturated fatty acids, ketogenesis
- d) Lipid Disorders: Ketosis, Lipidosis

Unit III: Proteins and their metabolism

- a) Biomolecule: Amino acids; essential and non-essential amino acids
- b) significance of proteins
- c) Biomolecule: Structure, types, function and general properties of Proteins;
- d) Enzymes: Major classes, Basic mechanism of action, kinetics and factors affecting enzyme activities

Unit IV: Endocrine Glands and Disorders

Structure, biological actions and regulation of following endocrine glands:

- a) Pituitary
- b) Thyroid; Thymus
- c) Adrenal; Pineal; Pancreas
- d) Testes and Ovary

Course Outcomes: After completion the course student would able to:

- ❖ Interprets the function of Carbohydrates and other metabolism.
- ❖ Explain the function of Lipids and metabolism
- ❖ Interpret the importance of Bio molecules
- ❖ Understand the function of Proteins and metabolism

Suggested Readings:

1. Gaud R.S. (2019). Textbook of Biochemistry and Endocrinology, Career Publications, India.
2. Gupta S.K. (2021). Advanced Biochemistry and Endocrinology, Academic Press, India.
3. Gupta R.K. (2022). Biochemistry and Endocrinology: A Zoological Perspective, New Age International, India.
4. Jain N.K. (2020). Fundamentals of Biochemistry and Endocrinology, Laxmi Publications, India.
5. Mehta V.K. (2021). Biochemistry and Endocrinology for Zoology Students, PHI Learning, India.
6. Sharma M.L. (2019). Essentials of Biochemistry and Endocrinology, McGraw Hill Education, India.
7. Singh A.K. (2022). Comprehensive Biochemistry and Endocrinology, Pearson Education, India.
8. Singh S.P. (2019). Introduction to Biochemistry and Endocrinology, Vikas Publishing, India.
9. Verma P.S. (2020). Principles of Biochemistry and Endocrinology, S. Chand Publishing, India.
10. Yadav H.S. (2020). Applied Biochemistry and Endocrinology in Zoology, CBS Publishers, India.

Zoology-Paper-III: Physiology- II

Objectives:

- ❖ To Understand the Nerve and Muscles.
- ❖ To explain the Sensory Physiology.
- ❖ To Understand the Reproduction.
- ❖ To understand the hormones action.

Unit –I: Nerve and Muscle Physiology

- a) Nerves: Types of neurons, Structure of Neuron E.M. structure of neuron;
- b) Transmission of Nerve Impulse across Synaptic Junction
- c) Muscles: Ultra structure of striated muscle, Physiology of Muscle Contraction; sliding filament theory of muscle contraction
- d) Neuromuscular Junction

Unit II: Sensory Physiology

- a) Structure of human eye; image formation and colour vision
- b) Function of sensory organs concerned with sound perception, taste, smell and touch.
- c) Elementary idea of EEG, MRI, and CT-scan
- d) Mental health (epilepsy, neurosis, psychosis)

Unit III Reproduction

- a) Concept of Oviparous, Ovoviviparous, and Viviparous
- b) Oestrous and menstrual cycle
- c) Male and female sex hormones
- d) Causes of infertility in male and female

Unit IV Hormones

- a) General mechanism of hormone action: Peptide hormone; Steroid hormone
- b) Neurohypophyseal hormones – Oxytocin and Vasopressin
- c) Hormones of the Adenohypophysis; Hypothalamic control of Adenohypophysis;
- d) Dwarfism; Acromegaly

Course Outcomes: After completion the course student would be able to:

- ❖ Interprets the Nerve and Muscles.
- ❖ Understand the Sensory Physiology.
- ❖ Understand the Reproduction.
- ❖ Classify the hormones action.

Suggested Readings:

1. Jain A.K. (2021). Textbook of Physiology - Volumes I and II, APC Books, India.
2. Agarwal V.K. (2023). Diversity of Chordates and Comparative Anatomy, S Chand and Company Ltd, India.
3. Paul Ajoy (2020). Zoology (Vol. 2), Books & Allied Pvt. Ltd., India.
4. Lal S.S. (2018). Practical Zoology C.B.C.S., Rastogi Publications, India.
5. Agarwal V.K. (2020). Zoology for Degree Students (Comparative Anatomy of Vertebrates Physiology -2, Biochemistry - 2), S. Chand Publishing, India.
6. Agarwal V.K. (2023). Diversity and Biology of Non-Chordata, S Chand and Company Ltd, India.
7. Agarwal V.K. (2018). Zoology for Degree Students, S Chand Publishing, India.
8. Jain A.K. (2017). Textbook of Physiology - Vol. 1 & 2, Avichal Publishing Company, India.
9. Agarwal V.K. (2017). Zoology for Degree Students B.Sc. 1st Semester, S Chand & Co Ltd, India.
10. Mahapatra Sinha Samapti (2024). Zoology: Med Easy, Physics Wallah, India.

Presentation Work (Any One)

1. Prepare a power point presentation of given course Content.
2. Prepare working model related content; prepare report and record video of its working.
3. Prepare a creative video presentation related to any Animal kingdom to issue or any topic related to Zoology.

Zoology Practical- IV

Paper-I: Study of Chordates:

A. Study of Specimen.

- a) **Reptilia:** Chelone, Trionyx, Testudo, Sphenodon, Hemidactylus, Draco, Phrynosoma, Chamaeleon, Typhlops, Python, Eryx (Sand Boa), Bungarus, Naja, Vipera, Hydrophis, Crocodylus, Alligator, Gavials
- b) **Aves:** Archeopteryx, Pavo cristatus, Psittacula (parrot), Great Indian Bustard, Saras crane
- c) **Mammals:** Echidna (Tachyglossus/ Spiny Anteater), Ornithorhynchus (Duck-billed Platypus), Macropus (Kangaroo), Bat, Loris, Manis, Herpestes (Mongoose)

B. Study of Permanent Slides.

- a. V.S. of Skin of Reptiles, Aves and Mammals.

C. Osteology (Comparative study of amphibia to mammals articulated and disarticulated)

- a) Vertebrae.
- b) Limb bones.
- c) Girdles.
- d) Ribs.

D. Dissection:

- a) A Rat: External Feature, General anatomy, General Viscera [through chart/ video/ CAL]

Paper-II: Biochemistry

- a) Biochemical detection of carbohydrates, proteins and lipids in a given sample
- b) Calorimetric estimation of glucose / Protein in a given solution

Paper-III: Physiology II

I. Study of Permanent Slides

- a) Histological Slides: Bone, Cartilage, Striated Muscle Fibre
- b) Endocrine Glands: Pituitary, Thyroid, Parathyroid, Thymus, Adrenal cortex, Adrenal Medulla, ovary, testis
- c) To study the knee jerk reflex in man

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE406FD	Philosophical & Sociological Perspectives of Education-I	CC	4	30	70	100

Objectives

- ❖ To acquaint with the knowledge, understanding and application of the concept, objective, nature and scope, implications and branches of philosophy of education philosophy.
- ❖ To impart understanding of various Indian philosophies like Sankhya, Yoga, Nyaya, Vaisheshika, Mimamsa, Vedanta philosophy and their educational implications.
- ❖ Relationship between sociology and education, educational sociology, education as a social sub-system, to impart analytical knowledge, understanding and application of subtle elements of education in the present emerging Indian society.
- ❖ To provide detailed information about various agencies of education like – family, community, modernization, culture and democracy.

Course Contents:

Unit- I Philosophical Foundation of Education

- a) Philosophy: concept, nature, and scope.
- b) Educational Philosophy: concept, aims, implication
- c) Relationship of Education and Philosophy.
- d) Branches of Philosophy - Metaphysics, Epistemology, Axiology and their implication for Education.

Unit- II Indian Schools of Philosophy and their Educational implications

- a) Sankhya Educational Philosophy.
- b) Yoga Educational Philosophy
- c) Nyaya Educational Philosophy
- d) Vaisheshik Educational Philosophy.
- e) Mimamsa Educational Philosophy
- f) Vedanta Educational Philosophy

Unit-III Sociology and Education.

- a) Education and Sociology
- b) Educational Sociology: Meaning and Nature of
- c) Sociology of Education
- d) Education as a Social Sub-system
- e) Education in present Emerging Indian Society

Unit-IV Sociological Impact/Agencies of Education.

- a) Education and the Family
- b) Education and the Community
- c) Education and Modernization
- d) Education and Culture
- e) Education and Democracy

Assignment: (Any Two)

1. Solve old question papers.
2. Prepare a research paper on related subject matter.
3. Prepare project work on any one topic.
4. Preparation of one term paper with PPT.

Course Outcomes: After completion of this course students would able to:

- ❖ To acquire knowledge of the concept, objective, nature and scope, implications and branches of philosophy of education philosophy.
- ❖ Have deep insight into various Indian philosophies like- Sankhya, Yoga, Nyaya, Vaisheshika, Mimamsa, Vedanta philosophy and their educational implications.
- ❖ Relationship between sociology and education, educational sociology, education as a social sub-system, getting the micro elements of education in the present emerging Indian society.
- ❖ To strengthen the understanding of various agencies of education like – family, community, modernization, culture and democracy.

Suggested Readings:

1. Brigge, Morris-L. Educational Philosophies for Teachers, Charles E Merrill Publishing Co., Columbus
2. Brubacher, John S, Modern Philosophies of Education, Mc Grawkill Book company Inc, New York
3. पाठक, पी. डी., त्यागी जी. एस. डी. (2005). शिक्षा के दार्शनिक सिद्धान्त, विनोद पुस्तक मंदिर, आगरा
4. भाटिया, के. के. (2006). शिक्षा का दर्शनशास्त्रीय स्वरूप, कल्याणी पब्लिशर्स, लुधियाना
5. त्यागी, जी.एस.डी. (2007). शिक्षा के दार्शनिक एवं सामाजिक आधार, विनोद पुस्तक मंदिर, आगरा
6. पाण्डेय, रामशकल, कपूर बीना (2007). शिक्षा के दार्शनिक आधार, प्रकाशन विनोद पुस्तक मंदिर, आगरा
7. ओड, के. लक्ष्मीलाल (2008). शिक्षा की दार्शनिक पृष्ठभूमि, राजस्थान हिन्दी ग्रन्थ अकादमी, जयपुर
8. पाण्डेय, रामशकल (2008). शिक्षा दर्शन, अग्रवाल पब्लिकेशन्स, निर्भय नगर, गैलाना रोड, आगरा
9. जैन, बी.एल. (2023)– शैक्षिक समाजशास्त्र, अनिता कॉलोनी, 30 ए, बजाज नगर एनक्लेव, जयपुर

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE407OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Mathematics at Secondary Stage - Course (I)	Content cum Pedagogy of at Secondary Stage Course (I)	2	15	35	50
BBSE408OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Physical Sciences at Secondary Stage – Course (I)	Any Two CE	2	15	35	50
BBSE409OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Biological Sciences at Secondary Stage – Course (I)	CE	2	15	35	50

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE407OP	Content cum Pedagogy of Mathematics at Secondary Stage - Course (I)	CE	2	15	35	50

Objectives:

- ❖ To appreciate the contribution of Mathematicians in connection with the development of the subject.
- ❖ To familiar with the aims and objective of the mathematics in relation to the present need of the society and educational policies of India.
- ❖ To plan curriculum at the secondary and senior secondary level and analyze the syllabus of the mathematics in relation to its applicability to practical situation.
- ❖ To write objectives in behavioral term.

Course Contents:

UNIT-I: Nature Scope & Curriculum

- a) Concept and meaning of mathematics
- b) Nature and scope of mathematics
- c) History of mathematics
- d) Contribution of indian and western mathematician
- e) Aims, objectives and values of teaching Mathematics at secondary and senior secondary level

UNIT-II: Curriculum Construction

- a) Concept of principle of curriculum construction, selection and organization of content
- b) Correlation of Mathematics with other school subjects and its role in daily life
- c) Critical appraisal of the prescribed syllabus of Mathematics (at senior secondary, secondary level of Rajasthan and CBSE board)
- d) Writing of objectives in behavioural terms, content analysis.
- e) Developing yearly, unit and daily lesson plan.

Assignment & Practical Works: (Any one)

1. Write the term paper on any above topic.
2. Writing objectives in behavioural terms for mathematics teaching
3. Make a critical appraisal of secondary level Mathematics syllabus.
4. Prepare a daily lesson plan on any topic of mathematics at secondary level.

Course Outcomes: After completion of this course students would able to:

- ❖ Appreciate the contribution of eminent Mathematicians in connection with the development of the subject.
- ❖ Familiar with the aims and objective of the subject in relation to the present need of the society and educational policies of India.
- ❖ Plan curriculum at the secondary and senior secondary level and analyze the syllabus of the subject in relation to its applicability to practical situation.
- ❖ Write objectives in behavioral term.

Suggested Readings:

1. Mishra D. D. Chauhan R.S. (2024) Ganit Shikshan, Agrawal publications, Agra
2. Pandey P. (2020) Pedagogy of Mathematics Teaching, Supernova Publishers and Dist. Pvt. Ltd., Kolkata
3. Dak S. (2018) Ganit shikshan, kalpna Publication, Jaipur
4. Rawat M.S., Agrawal M.B.L. Shrivastava D.N. (2016) Ganit shikshan, Shri Vinod Pustak Mandir Agra
5. James A. (2014) Teaching of Mathematics, Neelkanth Prakashan, New Delhi

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE408OP	Content cum Pedagogy of Physical Sciences at Secondary Stage - Course (I)	CE	2	15	35	50

Objectives:

- ❖ To appreciate the contribution of eminent physicist in connection with the development of the subject.
- ❖ To familiar with the aims and objective of the subject in relation to the present need of the society and educational policies of India.
- ❖ To plan curriculum at the secondary and senior secondary level and analyze the syllabus of the subject in relation to its applicability to practical situation.
- ❖ To write objectives in behavioural term.

Course Contents:

UNIT-I Nature Scope & Curriculum

- a) Nature of science and physics
- b) Major milestones in the development of physics
- c) Life sketch of physicist
- d) Aims, objectives and values of teaching physics at secondary and senior secondary level

UNIT-II curriculum construction

- a) Concept of principle of curriculum construction, selection and organization of content
- b) Correlation of physics with other school subjects and its role in daily life
- c) Critical appraisal of the prescribed syllabus of physics (at senior secondary, secondary level of Rajasthan and CBSE board)
- d) Writing of objectives in behavioural terms, content analysis.
- e) Developing yearly, unit and daily lesson plan.

Assignment & Practical Works: (Any one)

1. Write the term paper on any above topic.
2. Develop a detailed lesson plan for physics teaching at secondary stage.
3. Make a critical appraisal of secondary level physics syllabus.

Course Outcomes: After completion of this course students would able to:

- ❖ Appreciate the contribution of eminent physicist in connection with the development of the subject.
- ❖ Familiar with the aims and objective of the subject in relation to the present need of the society and educational policies of India.
- ❖ Plan curriculum at the secondary and senior secondary level and analyze the syllabus of the subject in relation to its applicability to practical situation.
- ❖ Write objectives in behavioural term.

Suggested Readings:

1. Harison C. (2021) Teaching secondary physics, Hoober publication, UK
2. Negi J.S. (2020) Bhotik vigyan shikshan, vinod pustak mandir, Agra
3. Sood J.K. (2017) Bhotik vigyan shikshan, Agrawal publications, Agra
4. Verma D.K. (2016) Bhotik vigyan shikshan, Ocean publication Hyderabad.
5. Nayak R.S., Chaturvedi A. (2016) Bhotik vigyan shikshan, Thakur Publications pvt Ltd. Bhopal

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE409OP	Content cum Pedagogy of Biological Sciences at Secondary Stage – Course (I)	CE	2	15	35	50

Objectives

- ❖ To explain nature, scope, and importance of Biological Sciences.
- ❖ Teacher trainees will aware illustrate aims and objectives of teaching Biological Sciences for sustainable development of society.
- ❖ To know about categorization of approaches and methods of teaching learning Biological Sciences.
- ❖ To realize the importance of studying Biological Sciences as part of the school curriculum.

UNIT - I Nature, Scope and Historical Perspective of Biological Sciences

- a) Nature, scope, and importance of Biological Sciences
- b) Historical perspective of Biological Sciences
- c) Contributions of Indian (ancient and modern) and other scientists
- d) Aims and objectives of teaching biological science as a component of multidisciplinary science
- e) Recommendations/suggestions of various committees, commissions and policies in reference to Biological Sciences

UNIT - II Pedagogical Aspects of Biological Sciences

- a) Course Outcomes and competencies of teaching Biological Sciences at secondary stage
- b) Linkages of Biological Sciences with other school subjects and place & Values of the Biological Sciences in school curriculum
- c) Implication of various approaches– inductive deductive, constructivist, experiential, blended learning, interdisciplinary and multidisciplinary
- d) Learner-centric methods of teaching learning: Lecture cum Demonstration, Activity based, Problem-solving, Laboratory and hands on activity based, project based, Experimentation, Concept Mapping
- e) Group-centric Methods of teaching learning: Discussion, sports- integrated, collaborative and cooperative learning approaches

Assignment & Practical (Any one)

1. Prepare a term paper with ppt on any above topic in units

Course Outcomes

After completion of this course, student teachers will be able to:

- ❖ Explain nature, scope, and importance of Biological Sciences,
- ❖ Identify the values and importance of Biological Sciences and alternative knowledge systems
- ❖ Categorize approaches and methods of teaching learning Biological Sciences
- ❖ Apply proper pedagogy in teaching learning the concepts of Biological Sciences
- ❖ Realize the importance of studying Biological Sciences as part of the school curriculum
- ❖ Identify the values and significance of Biological Sciences in School curricula
- ❖ Apply appropriate method/s in teaching concepts of Biological Sciences

Suggested Readings:

1. Choudhary, S. (2010). Teaching of Biology, APH Publishing Corporation, New Delhi.
2. Joshi, S.R. (2005). Teaching of Science, A.P.H. Publishing Corporation, New Delhi.
3. Lakshmi, Gade & Bhuvneswara, Rao Digumarti Bhaskara (2004). Methods of Teaching Life Science, Discovery Publishing House, New Delhi.
4. Mohan, Radha (2007). Innovative Science Teaching, Prentice Hall of India (p) Ltd., New Delhi.
5. National Education Policy 2020, MoE, Government of India.
6. National Steering Committee for National Curriculum Frameworks (2023). Draft National Curriculum Framework for School Education.
7. NCERT, Textbooks of Biological Sciences at Secondary Stage.

8. Singh, Yogesh Kumar & Nath, Ruchika (2005). Teaching of General Science, A.P.H. Publishing Publishing Corporation, New Delhi.
9. Sood, J. K. (1987). Teaching of Life Science, Kohali Publishers, Chandigarh.
10. Yadav, M. S. (2000). Modern methods of Teaching Science, Anmol Publishers, Delhi.
11. कुलश्रेष्ठ, प्रदीप कुमार (2006). विज्ञान शिक्षण, विनोद पुस्तक मंदिर, आगरा
12. भूषण, शैलेन्द्र (2008). जीव विज्ञान शिक्षण, विनोद पुस्तक मंदिर, आगरा
13. मंगल, एस. के. (2010). जैविक विज्ञान शिक्षण, लॉयल बुक डिपो, मेरठ
14. माहेश्वरी, बी. के. (2003). जीव विज्ञान शिक्षण, सूर्या पब्लिकेशन, मेरठ
15. शर्मा, एस.आर. (2008). विज्ञान शिक्षण, अर्जुन पब्लिशिंग हाउस, नई दिल्ली
16. सक्सेना, इनिड (2007). विज्ञान शिक्षण, यूनिवर्सिटी बुक हाउस (प्रा.) लि., जयपुर
17. सूद, जे. के. (2007). विज्ञान शिक्षण, विनोद पुस्तक मंदिर, आगरा
18. श्रीमाली, नंदकिशोर (2007). विज्ञान शिक्षण, राजस्थान हिन्दी ग्रन्थ अकादमी, जयपुर

(B.Sc.-B. Ed) Semester-V

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE501MJ/MN	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25 Practical	
BBSE502MJ/MN	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25 Practical	
BBSE503MJ/MN	Disciplinary/Inter disciplinary Courses	Mathematics-I	Select Any One Minor Course	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25 Practical	
BBSE504MJ/MN	Disciplinary/Inter disciplinary Courses	Botany-I	CE	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25 Practical	
BBSE505MJ/MN	Disciplinary/Inter disciplinary Courses	Zoology-I		4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE501MJ/MN	Chemistry-I	CE	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

Chemistry-Paper-I: Inorganic Chemistry

Objectives:

- ❖ To develop the knowledge about coordination compound, lanthanides and actinides.
- ❖ To aware about the conceptual knowledge of valence bond theory, nomenclature, spectral properties of elements of transition series.
- ❖ To give information about coordination theory, magnetic moments, spectral properties and electronic configuration of various elements of transition series.
- ❖ To develop understanding about correlation between periodicity and general features of various elements.

Unit I: Coordination Compounds

Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, Valence bond theory of transition metal complexes with reference to tetrahedral, octahedral and cubic complexes, back bonding, Limitations of valence bond theory.

Unit II: Chemistry of elements of first transition series

Characteristic properties of d block elements, properties of the elements of the first transition series, complexes illustrating relative stability of their oxidation states, coordination number and geometry, Types of magnetic behaviour, magnetic and molar susceptibility, determination of magnetic susceptibility, orbital contribution of magnetic moments, spin-only formula, correlation of μ_s and μ_{eff} values, applications of magnetic moment.

Unit III: Chemistry of lanthanide elements

Position in periodic table, occurrence and isolation, electronic structure, oxidation states and ionic radii, lanthanide contraction and its consequences, complex formation, spectral properties, magnetic properties, Separation of lanthanides Application of lanthanides.

Unit IV: Chemistry of actinides

Occurrence, electronic configuration, General features and chemistry of actinides, oxidation states and stereochemistry, spectral properties, magnetic properties, chemistry of separation of Np, Pu and Am from U, comparison of lanthanide and actinide.

Course Outcomes: After completion of the course student would able to:

- ❖ Differentiate between lanthanides and actinides on the basis of their properties.
- ❖ Measure the correlation of various values, complex formation and spectral properties of elements of transition series.
- ❖ Classify the coordination compounds, magnetic behaviour and stereochemistry of lanthanides and actinides.
- ❖ Define the separation process, structural properties and electronic configuration of compounds

Chemistry- Paper-II: Organic Chemistry

Objectives:

- ❖ To develop conceptual knowledge about infrared absorption spectroscopy, nomenclature of organometallic compounds.
- ❖ To acquaint about various laws of spectroscopy and methods of synthesis related to organometallic and heterocyclic compounds.
- ❖ To aware about laws related to IR spectrum, types of transitions and preparation of heterocyclic compounds.
- ❖ To develop understanding about effects of solvents, structural features and basicity of pyridine, piperidine and pyrrole.

Unit I Electromagnetic spectrum: Absorption spectra (UV) & Infrared IR absorption spectroscopy

Ultraviolet absorption spectroscopy- absorption laws (Beer- Lambert Law) molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of solvents on transitions, effect of conjugation, concept of chromophore and auxochrome. Bathochromic, hypsochromic and hyperchromic and hypochromic shifts, UV spectra of conjugated enes and enones. Molecular vibrations, Hookes law, selection rules, intensity and position of IR bands, measurement of IR spectrum, finger print region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds

Unit II: Organometallic compounds

The Grignard reagent- formation, structure and chemical reaction, organozinc compound: formation and chemical reactions. Organolithium compounds- Formation and chemical reactions.

Nomenclature, structural features, methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamide and sulpha guanidine.

Unit III: Heterocyclic compounds- I

Introduction, molecular orbital picture and aromatic characteristic of pyrrole, furane, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reaction in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole

Unit IV: Heterocyclic compounds- II:

Introduction to condensed five and six membered hetrocycles. Preparation and reaction of indole, quinoline and isoquinoline with special reference to fischer indole synthesis, skraup synthesis and Bischler- Napieralski synthesis, mechanism of electrophilic substitution reaction of indole, quinoline and iso quinoline.

Course Outcomes: After completion the course student would able to:

- ❖ Classify the various organic compounds on the basis of UV spectra and transition.
- ❖ Describe and discuss about formation, structure and chemical reactions of heterocyclic compounds.
- ❖ Draw and interpret the molecular orbit picture and aromatic characteristics of organometallic and heterocyclic compounds.
- ❖ Define various devivatives and reaction mechanism of synthesis and substitution related to heterocyclic compounds.

Chemistry- Paper- III: Physical Chemistry

Objectives:

- ❖ To aware about degree of freedom, phase equilibria and quantum mechanism.
- ❖ To develop conceptual knowledge about entropy, electrolytes dipole moment etc.
- ❖ To develop analytical view about evaluation of absolute entropy, activity coefficient and magnetic properties of compounds.
- ❖ To give information about carnt theorem, mixing of gases, overvoltage and referectivity.

Unit I: Phase Equilibrium I

Statement and meaning of the terms-phase, component and degree of freedom, thermodynamic derivation of Gibbs phase rule, phase equilibria of one component system-water, CO₂ and S systems. Phase equilibria of two component system: Solid-liquid equilibria, simple eutectic Bi-Cd, Pb-Ag systems, desilverisation of lead.

Solid solutions: Compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl-H₂O), (FeCl₃-H₂O) and CuSO₄-H₂O) system. Freezing mixtures, acetone-dry ice.

Unit II: Phase Equilibrium II

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

Partially miscible liquids- Phenol- water, trimethylamine-water, nicotine- water systems. Lower and upper consolute temperature. Effect of impurity on consulat temperature.

Immiscible liquids, steam distillation. Nernst distribution law- Thermodynamic derivation, applications.

Unit III: Quantum Mechanics I

Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Behr's model of hydrogen atom (no derivation) and its defects. Compton Effect. De Broglie hypothesis, Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one-dimensional box.

Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions.

Unit IV: 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 adsorptions, types of adsorption isotherms, Freundlich and Langmuir adsorption isotherms.

Course Outcomes: After complition the course student would able to:

- ❖ Classify the electrodes, cells and properties of organic compounds.
- ❖ Determine and interpret the function of volumes, equations, coefficients related to entrophy, corrosion and molecular structures.
- ❖ Describes various properties of compounds on the basis of energy, potential and dipole moment etc.
- ❖ Measure the entropy change, pH and polarization and magnetic properties of compounds.

Term paper/ practicals

Inorganic chemistry:

Preparation:

1. Preparation of sodium trioxalato ferrate (III), Na₃ [Fe(C₂O₄)₃] (b) preparation of Ni-DMG complex [Ni (DMG)₂]
2. Preparation of copper tetraammine complex [Cu (NH₃)₄]SO₄
3. Preparation of cis- and trans- bisoxalato diaqua chromates (III) ion
4. Preparation of sodium tetrathionate

Organic Chemistry

Qualitative analysis: Analysis of an organic mixture containing two solid components using water, NaHCO₃, and NaOH for separation and preparation of suitable derivatives.

Suggested Readings:

1. A New Concise Inorganic Chemistry; Fifth Edition; J.D. Lee; Blackwell Science, London, 1989.
2. Inorganic Chemistry; Third Edition; D.F. Shriver and P.W. Atkins; Oxford University Press, New York, 1999.
3. Inorganic Chemistry; Third Edition; Gary L. Miessler and Donald A. Tarr; Pearson Education Inc. Singapore, 2005.
4. Organic Chemistry; Seventh Edition; T.W. Graham Solomons & Craig B. Fryhle; John Wiley and Sons, 1998.
5. Organic Chemistry; Sixth Edition; Robert Thornton Morrison & Robert Neilson Boyd; PHI Pvt. Ltd, 2004.
6. Organic Chemistry Vol. I; Fifth Edition; I.L. Finar; Longman Scientific and Technical, Singapore, 1975.
7. Organic Chemistry: Vol 1, Mukerjee and Singh
8. Organic Chemistry: Vol 2, Mukerjee and Singh
9. Organic Chemistry: Vol 3, Mukerjee and Singh
10. A Text Book of Physical Chemistry; A.S. Negi, S.C. Anand; New Age International (P) Limited, New Delhi, 2002.
11. The Elements of Physical Chemistry; P.W. Atkins; Oxford University Press, 1996.
12. University General Chemistry; C.N.R. Rao; Macmillan India Ltd., New Delhi, 1998.
13. Physical Chemistry: Puri Sharma and Pathania
14. Physical Chemistry: J. Moore

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE502MJ/MN	Physics-I	CE	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Practical				25 Practical	

Physics-Paper-I: Mathematical Physics and Special Theory of Relativity – I

Objectives:

- ❖ To understand the concept of co-ordinate transformation.
- ❖ To know the concept of tensor analysis and dirac delta function.
- ❖ To understand the Special functions (Legendre, Bessel, hermite and laguerre).
- ❖ To aware the techniques of variables and its application to boundary value problems

UNIT I Coordinate Transformation:

Orthogonal curvilinear coordinate system, scale factors, expression for gradient, divergence, curl and their application to Cartesian, circular cylindrical and spherical polar coordinate. Coordinate transformation and Jacobian.

UNIT II Tensor analysis & Dirac Delta function:

Transformation of covariant, contravariant and mixed tensor; Addition, multiplication and contraction of tensors; Metric tensor and its use in transformation of tensors. Dirac delta function and its properties.

UNIT III Special functions:

The second order linear differential equation with variable coefficient and singular points, series solution method and its application to the Hermite, Lagendre and Laguerre differential equations: basic properties like orthogonality, recurrence relation, graphical representation and generating function of Hermite, agendre, Leguerre functions (simple applications)

UNIT IV Boundary Value Problems:

Techniques of separation of variables and its application to following boundary value problems

- (i) Laplace equation in three-dimensional Cartesian coordinate system- line charge between two earthed parallel plates
- (ii) Helmholtz equation in circular cylindrical coordinates– cylindrical resonant cavity,
- (iii) Wave equation in spherical polar coordinates – the vibrations of a circular membrane,
- (iv) Diffusion equation in two-dimensional Cartesian coordinate system – leat conduction in a thin rectangular plate,
- (v) Laplace equation in spherical coordinate system – electric potential around a spherical surface.

Course Outcomes: After complition the course student would able to:

- ❖ Discuss the concept of co-ordinate transformation.
- ❖ Classify the concept of tensor analysis and dirac delta function.
- ❖ Differentiate the Special functions (Legendre, Bessel, hermite and laguerre) .
- ❖ Applies the techniques of variables and its application to boundary value problems.

Suggested Reading:

1. G.B. Arfken and H.J. Weber, Mathematical Methods for Physicists, Elesiver Publisher.
2. A.K. Ghatak, L.C. Goyal, S.J. Chua Mathematical Physics: A.K. Ghatak, L.C. Goyal and S.J. Chua, Macmillan, New Delhi.
3. Pipes and Harvili, Applied Mathematics for Engineers and Physicists, McGraw Hill Book Co.
4. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, गणितीय भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2016

Physics- Paper-II: Quantum Mechanics – I

Objectives:

- ❖ To Understand the Origin and Experimental Evidence of Quantum theory.
- ❖ To aware the Uncertainty Principles and Schrodinger's Wave Mechanics.
- ❖ To develop concept the Postulates and Operators of Quantum Mechanics.
- ❖ To understand the Simple Solutions of Schrodinger Equation.

UNIT I Origin and Experimental Evidence of Quantum Theory:

Development of quantum theory –Historical development and experimental evidence for quantum theory Electromagnetic Radiation: Black Body Radiation, qualitative discussion of spectral distribution of energy, limitation of classical theory, Planck's radiation law, photoelectric effect, Compton effect, Matter Waves: De Broglie hypothesis, Davison Germer experiment.

UNIT–II Uncertainty Principles and Schrodinger's Wave Mechanics:

Uncertainty principle and its consequences gamma ray microscope, diffraction at a single slit, its application such as (i) Non existence of electron in nucleus, (ii) Ground state energy of H-atom, (iii) Ground state energy of harmonic oscillator (iv) Natural width of spectral lines. Schrodinger's equation: Its need and justification, time dependent and time independent forms, physical significance of the wave function and its interpretation, probability current density.

UNIT–III Postulate's and Operators of Quantum Mechanics:

Operators in quantum mechanics, definition of a linear operator. Linear and Hermitian operator, state function. Expectation value of dynamical variable-position, momentum and energy, Fundamental postulates of quantum mechanics, Eigen function and eigen values, Degeneracy. Orthogonality of eigen function, Commutation relations, Ehrenfest's theorem and complementarily wave packet, group and phase velocities, Principle of superposition, Gaussian wave packet.

UNIT IV Simple Solutions of Schrodinger equation:

Time independent Schrodinger equation and stationary state solution, Boundary and continuity conditions on the wave function, particle in one-dimensional box, eigen function and eigen values, discrete energy levels, extension of results for three-dimensional case and degeneracy of levels.

Course Outcomes: After completion the course student would able to::

- ❖ Discuss the Origin and Experimental Evidence of Quantum theory.
- ❖ Apply the Uncertainty Principles and Schrodinger's Wave Mechanics.
- ❖ Identify the Postulates and Operators of Quantum Mechanics.
- ❖ Calculate the Simple Solutions of Schrodinger Equation

Suggested Readings:

1. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Springer Publisher.
2. Arthur Beiser, Perspectives of Modern Physics, 6th Edition, Medtech Science.
3. Griffiths, Introduction to Quantum Mechanics, 2nd Edition, Cambridge University Press.
4. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, क्वांटम यांत्रिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2016

Physics- Paper-III: Solid State Physics

Objectives:

- ❖ To know the concept of Crystal Binding and crystal Structure.
- ❖ To understand the Thermal and Electrical Properties of the Solids.
- ❖ To aware the concept of Band Theory of Solids.
- ❖ To develop concept the Magnetic Property of materials.

UNIT-I Crystal Binding and Crystal Structure:

Various types of Bindings: Cohesive energy and compressibility of ionic crystals, Space Lattice and Crystal Structure, Bravis Lattice, Miller Indices and Crystal Structure, Spacing of Planes in Crystal Lattice, Determination of different crystal properties for SC, FCC, BCC, HCP and perovskite structure, X-ray Diffraction and Bragg's Law, Laue equation of X-ray diffraction, Debye Scherer and Laue Camera.

UNIT-II Thermal and Electrical Properties of the Solids:

Concepts of Thermal Energy and Phonons, Internal Energy and Specific Heat, the Various Theories of Lattice Specific Heat of Solids: The Einstein Model, Debye Model, Electronic Contribution of the internal Energy hence to the Specific Heat of Metals, Thermal Conductivity of the lattice. Electrical Conductivity: Drude-Lorentz Theory of Electrical Conductivity, Boltzmann Transport Equation, Sommerfield Theory of Electrical Conductivity, Mathiessen's Rule, Thermal Conductivity and Wildemann-Franz's Law, The Hall Effect.

UNIT-III Band Theory of Solids:

Formation of Bands, Periodic Potential of a Solid, Wave Function in a Periodic Lattice and Bloch Theorem, Density of states, Kronig Penny Model, Velocity of the Bloch electrons and Dynamical Effective Mass, Momentum, Crystal Momentum and Physical Origin of the Effective Mass, Negative Effective Mass and concept of Holes, The distinction between metals, insulators, and semiconductors.

UNIT-IV Magnetic Properties:

Classification of Magnetic Materials, Origin of Atomic Magnetism, Dynamics of Classical Dipole In Magnetic Field, Magnetic Susceptibility, phenomenon of Diamagnetic, Para magnetic susceptibility of Ionic Crystal, Ferromagnetism, Temperature Dependence of Saturation of Spontaneous Magnetization, The Paramagnetic Region, the Nature of Ferromagnetism, Nature and Origin of Weiss Molecular Field, Heisenberg's Exchange Interaction, (Quantum Theory of Ferromagnetism), Relation between Exchange

Integral and Weiss Constant, Ferromagnetism Domains, Magnetostriction

Course Outcomes: After completion the course student would able to:

- ❖ Identify the concept of Crystal Binding and crystal Structure.
- ❖ Study the Thermal and Electrical Properties of the Solids.
- ❖ Classify the concept of Band Theory of Solids.
- ❖ Discuss the Magnetic Property of materials.

Suggested Readings:

1. S.O. Pillai, Solid State Electronic Engineering Materials, Wiley Eastern Ltd
2. C. Kittel, Solid state Physics V. Edition, Wiley Publication.
3. L. Azaroff, Introduction to Solid, Tata McGraw Hill.
4. N.W. Aschroft, N.D. Mermin, Solid State Physics, CBS Publishing Asia Ltd
5. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, ठोस अवस्था भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2016

Physics Practical: V

1. Study of a RC transmission line at 50 Hz
2. Study of a RC transmission line
 - at fixed frequency
 - at variable frequency
3. Study of resonance in a LCR circuit 9 (Using air core inductance and damping by metal plate)
 - At fixed frequency by varying C, and
 - by varying frequency
4. Study of characteristics of junction diode and zener diode
5. Study of
 - Recovery time of junction diode and point contact diode
 - Recovery time as function of frequency of operation and switching current
6. To design zener regulated power supply and study the regulation with various loads.
7. To study the characteristics of a field effect transistor (FET) and design/study amplifier of finite gain
8. To study the frequency response of a transistor amplifier and obtain the input and output impedance of the amplifier.
9. To Design and study of an R-C phase shift oscillator and measure output impedance (frequency response with change of component of R and C).
10. To study a voltage multiplier circuit to generate high voltage D.C. from A.C.
11. Using discrete components, study OR, AND, NOT logic gates, compare with TTL integrated circuits (I.C.'s).
12. Application of operational amplifier (OP-AMP) as: Minimum two of the following exercises-
 - (a) Buffer (for accurate voltage measurement)
 - (b) Inverting amplifier
 - (c) Non inverting amplifier
 - (d) Summing amplifier.

Suggested Readings:

- 1 प्रो. प्रभा दशोरा, तृतीय वर्ष प्रायोगिकी भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, नई दिल्ली, 2015

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE503MJ/MN	Mathematics-I	CE	4	15	20	100
	Mathematics-II				20	
	Mathematics-III				20	
	Mathematics Practical				25 Practical	

Mathematics-Paper-I: Algebra - I

Objectives:

- ❖ To Understand the definition and Simple Properties of Group & Subgroup.
- ❖ To aware the Cayley's Theorem and Fundamental Theorem of Isomorphism.
- ❖ To gain knowledge of morphism of group and quotient groups.
- ❖ To know the Definition of Ring and Subrings.

Unit 1: Definition and simple properties of Groups and Subgroups, Permutation group.

Unit 2: Cyclic group, Cosets, Lagrange's theorem on the order of subgroups of a finite order group.

Unit 3: Morphism of groups, Cayley's theorem, Normal, subgroups and Quotient groups, Fundamental theorems of Isomorphism.

Unit 4: Definition and simple properties of Rings and Subrings, Morphism of rings, Embedding of a ring.

Course Outcomes: After completion the course student would able to:

- ❖ Discuss on definition and Simple Properties of Group & Subgroup.
- ❖ Apply the Lagrange's Theorem on the Order of Subgroups.
- ❖ Calculate the Cayley's Theorem and Fundamental Theorem of Isomorphism.
- ❖ Discuss the definition of Ring, Subrings, differentiate group, subgroup and quotient group.

Suggested Readings:

1. Joseph A. Gallin, Contemporary Abstract Algebra, Cengage, 2021.
2. बी. एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, बीजगणित, आर. बी. डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2016
3. जी. सी. गौखरू सैनी, बीजगणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics- Paper-II: Complex Analysis -I

Objectives:

- ❖ To understand the Complex Plane, Connected & Compact Set.
- ❖ To aware the Complex Valued function.
- ❖ To know the Complex Integral.
- ❖ To study Taylor's theorem and Laurent's theorem.

Unit 1: Complex plane, Connected and Compact sets, Curves and Regions in complex plane, Jordan curve Theorem (statement only), Extended complex plane, Stereographic projection.

Unit 2: Complex valued function — Limits, Continuity and Differentiability, Analytic functions, Cauchy-Riemann equations (Cartesian and polar form), Harmonic functions, construction of an analytic function.

Unit 3: Complex integration, Complex line integrals, Cauchy integral theorem, Indefinite integral, Fundamental theorem of integral calculus for complex functions, Cauchy integral formula, Analyticity of the derivative of an analytic function.

Unit 4: Morera's theorem, Poisson integral formula, Liouville's theorem, Taylor's theorem, Laurent's theorem, Maximum modulus theorem.

Course Outcomes After completion the course student would able to:

- ❖ Discuss the Complex Plane, Connected & Compact Set.
- ❖ Identify the Complex Valued function.
- ❖ Classify the Complex Integral and Discuss on the fundamental theorem of integral calculus for complex functions
- ❖ Solve the Taylor's Theorem and Maximum Modulus Theorem.

Suggested Readings:

1. Lars V. Ahlfors, Complex Analysis, McGraw Hill Education, 2013.
2. H.S. Kasana, Complex Variables Theory and Application, PHI Learning Private Limited, 2019.
3. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, बीजगणित, आर. बी.डी. पब्लिशिंग हाउस, जयपुर—दिल्ली, 2015—16
4. जी.सी. गौखरु सैनी, बीजगणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics- Paper-III: Dynamics

Objectives:

- ❖ To Understand the Velocity and Acceleration.
- ❖ To know about simple harmonic motion and Hooke's Law
- ❖ To Study the Motion along Horizontal & Vertical Elastic String.
- ❖ To aware the Motion in Resisting medium.

Unit 1: Velocity and acceleration — along radial and transverse directions, along tangential and normal directions.

Unit 2: S.H.M., Hooke's law, motion along horizontal and vertical elastic strings.

Unit 3: Motion in resisting medium- Resistance varies as velocity and square of velocity.

Unit 4: Work and Energy, Motion on a smooth curve in a vertical plane, Motion on the inside and outside of a smooth vertical circle.

Course Outcomes: After completion the course student would able to:

- ❖ Discuss the Velocity and Acceleration.
- ❖ Classify the Motion along Horizontal & Vertical Elastic String.
- ❖ Identify the Motion in Resisting medium.
- ❖ Calculate Work and Energy and calculate the motion on the inside and outside of a smooth vertical circle.

Suggested Readings:

- 1 बी. एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, बीजगणित, आर. बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
- 2 जी.सी. गौखरू सैनी, बीजगणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE504MJ/MN	Botany-I	CE	4	15	20	100
	Botany-II				20	
	Botany-III				20	
	Botany Practical				25 Practical	

Botany-Paper-I: Morphology of Angiosperms

Objectives:

- ❖ To get knowledge about the morphology of root system and shoot system.
- ❖ To learn the origin, development and types of leaves
- ❖ To study the detailed structure of flower.
- ❖ To aware students with the concept and significance of seed.

UNIT- 1: Plant habit

- a) The basic plan of flowering plants: Introduction, general structure and development of a flowering plant.
- b) Modular types of growth.
- c) Monocotyledon and dicotyledon Plant,
- d) Diversity of plant form in Size, Lonevity, Habit and Nutrition.

UNIT- II Morphology of Root and Shoot System Root:

- a) Characteristics, Structure and types of roots.
- b) Modification of roots for storage, physiological and mechanical.
- c) Interaction of root with other microorganisms.

Stem:

- a) Structure, types and modification (storage and mechanical),
- b) Branching pattern, monopodial and sympodial growth,
- c) Canopy architecture: Introduction, types and Significance.

UNIT- III: Morphology of Leaves and Flower

Leaves:

- a) Origin, development and types of Leaves.
- b) Diversity in leaf shape in Leaf base, petiole and lamina.
- c) Phyllotaxy, venation, and modifications of Leaves.

Flower:

- a) Flower as a modified shoot.
- b) Detailed structure of flower.
- c) Types of inflorescences and specialized inflorescence,

UNIT- IV: Morphology of fruit and Seed

fruit

- a) Structure and development of fruits.
- b) Types and classification of fruits.
- c) Fruit maturation /Ripening

Seed:

- a) Detail structure of seed (monocot and dicot), significance of seed,
- b) Suspended animation:
- c) Dispersal strategies of Fruits and Seeds.

Course Outcomes: After complition the course student would able to:

- ❖ Carry out the comparative morphology of root system and shoot system.
- ❖ Discuss the origin, development, types of leaves
- ❖ Get knowledge about the detailed structure of flower
- ❖ Interpret the concept of seed with its significance.

Suggested Readings:

1. Jain, S.K. (2021). Angiosperm Morphology and Reproductive Biology, Scientific Publishers, Jodhpur
2. Mishra, S.R. (2019). Morphology of Angiosperms, S. Chand Publishing, New Delhi
3. Mukerji, K.G. (2020). Morphology of Angiosperms: Principles and Applications, Narosa Publishing House, New Delhi
4. Pandey, B.P. (2021). Textbook of Angiosperm Morphology, S. Chand Publishing, New Delhi
5. Shukla, R.N. (2020). Morphology of Angiosperms: An Introduction, Vikas Publishing House, Noida, India
6. Singh, A.K. (2019). Morphology of Angiosperms: Structure and Development, Kalyani Publishers, Ludhiana, India
7. Singh, M.P. (2022). Angiosperm Morphology and Systematics, New Age International Publishers, New Delhi
8. Singh, V. (2022). Angiosperm Morphology and Taxonomy, Medtech (Scientific International), New Delhi
9. Singh, V.P., Pandey, P.C. and Jain, D.K. (2011). A Text book of Botany- Angiosperms. Rastogi Publication, Merrut.
10. Srivastava, H.S. (2019). Morphology of Angiosperms: A Comprehensive Study, CBS Publishers & Distributors, New Delhi
11. Trivedi, P.C. (2020). Angiosperm Morphology and Anatomy, Rastogi Publications, Meerut, India
12. Trivedi, P.C., Sharma, N. and Dhankad, R. S. (2009). Plant Morphology and Anatomy. Ramesh Book Depot. Jaipur.

Botany- Paper-II: Anatomy of Flowering Plants

Objectives:

- ❖ To understand the structure and classification of tissues and tissue systems
- ❖ To know about the definition, classification, types and function of meristem.
- ❖ To study the anatomy of stem, root and leaf.
- ❖ To analyze different types of wood with secondary growth

UNIT- I: Tissues and Tissue Systems

- a) Simple tissue: Structure occurrence and function (parenchyma, collenchyma, sclerenchyma).
- b) Complex tissues: Structure, origin and function (xylem and phloem), tissue systems,
- c) Secretory tissues: Glandular hairs, hydathodes, nectarines, Glands, Secretory cells and laticifers.
- d) Types of Tissue Systems: Dermal Tissue System,
- e) Ground Tissue System and Vascular Tissue System.

UNIT- II: Meristem

- a) Meristem definition, classification, types and function.
- b) Organisation of Root and Shoot meristem.
- c) Shoot apical meristem theories: Apical cell theory, histogen theory, tunica-corpus theory, continuing meristematic residue, cytohistological zonation.
- d) Root apical meristem theories: Apical cell theories, histogen theory, korper-kappe theory, quiescent cell theory.

UNIT- III: Anatomy of Stem, Root and Leaf

- a) **Stem:** Primary structure in dicotyledonous and monocotyledonous, primary anomalous structures.
- b) **Root:** Primary structure in dicotyledonous and monocotyledonous, development of lateral roots and adventitious root.
- c) **Leaf-** Internal structure of dorsiventral, isobilateral leaves.

UNIT- IV: Secondary growth

- a) Secondary growth in dicot and monocot stem.
- b) Secondary structures: Wood structure, types and formation of wood,
- c) Annual rings, tyloses, dendrochronolgy, periderm, bark and lenticels.
- d) Anomalous secondary growth in dicot stem, in monocot stem, in dicot roots.

Course Outcomes: After completion the course student would able to:

- ❖ Understand the structure and classification of tissues and tissue systems
- ❖ Explain the definition, classification, types and function of meristem.
- ❖ Discuss the anatomy of stem, root and leaf.
- ❖ Analyze different types of woods with secondary growth.

Suggested Readings:

1. Crang, Richard, Lyons-Sobaski, Sheila, and Wise, Robert (2021). Plant Anatomy and Development, McGraw Hill Education, New Delhi
2. Cutler, David F., Ted Botha, and Stevenson, Dennis Wm. (2019). Plant Anatomy: An Applied Approach, CBS Publishers & Distributors, New Delhi
3. Mishra, S.R. (2020). Plant Anatomy and Embryology: Theory and Practical, Scientific Publishers, Hyderabad
4. Pandey, B.P. (2019). Plant Anatomy and Embryology, S. Chand Publishing, New Delhi
5. Pandey, S.N. (2019). Plant Anatomy and Embryology: A Comprehensive Guide, Eastern Book Company, Lucknow
6. Pandey, S.N.; Chadha, A. (2014). A text book of Botany- Plant anatomy and Economic Botany. Vikas publishing house Pvt. Ltd, New Delhi.
7. Rajan, S. Sundara (2021). Plant Anatomy and Embryology: A Practical Approach, MJP Publishers, Chennai
8. Rudall, Paula J. (2020). Anatomy of Flowering Plants: An Introduction to Structure and Development, Cambridge University Press, Chennai
9. Sharma, A.K. (2019). Plant Anatomy and Embryology: Concepts and Applications, Discovery Publishing House, New Delhi
10. Sharma, P.C. (2024). Anatomy of Angiosperms, Wave Books, New Delhi.

11. Singh, V.P., Pandey, P.C. and Jain, D.K. (2011). A Text book of Botany- plant Morphology and anatomy. Rastogi Publication, Merrut.
12. Trivedi, P.C. (2020). Plant Anatomy and Embryology: A Textbook for Students, Aavishkar Publishers, Jaipur
13. Trivedi, P.C., Sharma, N. and Dhankad, R. S. (2009). Plant Morphology and Anatomy. Ramesh Book Depot. Jaipur.

Botany- Paper-III: Plant Systematics

Objectives:

- ❖ To understand the scope and importance of plant systematics.
- ❖ To study the different taxonomical tools.
- ❖ To get knowledge about the principle and rules of botanical nomenclature.
- ❖ To aware students with different families with Bentham and hooker classification.

UNIT- I: Basics of Plant Taxonomy

- Scope and importance of taxonomy.
- History and classification of angiosperm (Linneaus, Bentham and Hooker, Hutchinson and Engler and Prantle),
- Concept of species, genus and family.
- Taxonomic tools: Herbarium, Botanical Garden, E-Flora, monograph, library index, journals, key and icons.

UNIT -II: Botanical Nomenclature

- International code of botanical nomenclature: Principles, Rules and Recommendations.
- Rank of Taxa, Type method, principle of priority and its limitations,
- Rules of Validity, Rules of Effectivity,
- Names of Family, Genus and Species.
- Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, paraphyly and polyphyly)

UNIT- III: Families of Dicot Plants

- Taxonomic studies of the following families (Bentham and Hooker).
- Ranunculaceae, Brassicaceae, Malvaceae.
- Rubiaceae, Fabaceae, Apiaceae.
- Asteraceae, Apocynaceae and Asclepidaceae.

UNIT -IV: Families of Monocot Plants

- Taxonomic studies of the following families (Bentham and Hooker):
- Solanaceae, Convolvulaceae, Acanthaceae,
- Lamiaceae, Amaranthaceae, Euphorbiaceae,
- Liliaceae, Orchidaceae and Poaceae.

Course Outcomes: After completion the course student would able to:

- ❖ Understand the scope and importance of angiosperms.
- ❖ Enhance knowledge about the taxonomical tools.
- ❖ Discuss the principle and rules of botanical nomenclature.
- ❖ Compare different families with Bentham and hooker classification

Suggested Readings:

- Gautam, Ashindra (2024). Systematic Botany, Wave Books, New Delhi.
- Jain, S.K. (2019). Plant Taxonomy and Systematics, Scientific Publishers, Jaipur
- Mukerji, K.G. (2021). Advanced Plant Systematics, Daya Publishing House, Delhi
- Naik, V.N. (2011). Taxonomy of Angiosperms. TATA McGraw Hill, New Delhi.
- Pandey, S.N. and Misra, S.P. (2008). Taxonomy of Angiosperms. Ane Books India, New Delhi.
- Sambamurty, A.V.S.S. (2021). Modern Plant Systematics, I.K. International Publishing House, Hyderabad
- Saxena, N.B., Saxena, S. (2011). Plant Taxonomy. Pragati Prakashan, New Delhi.
- Sharma, O.P. (2019). Plant Systematics: Theory and Practice, Rastogi Publications, Lucknow
- Simpson, M.C. (2006). Plant Systematics. Elsevier, Amsterdam.
- Singh, G. (2020). Plant Systematics: An Integrated Approach, CRC Press (Taylor & Francis Group), New Delhi
- Singh, G. (2001). Plant systematics. Oxford and IBH, New Delhi.
- Singh, M.P. (2021). Principles of Plant Systematics, Nirali Prakashan, Pune
- Sinha, R.K. (2022). Plant Systematics and Evolution, New Central Book Agency, Kolkata
- Trivedi, P.C. (2019). Plant Systematics and Biodiversity, Himanshu Publications, Udaipur
- Verma, B.K. (2020). Systematics of Angiosperms, MJP Publishers, Chennai
- Yadav, S.R. (2020). Plant Systematics: Concepts and Applications, CBS Publishers & Distributors, Bengaluru

Presentation Work (Any One)

1. Prepare a power point presentation of given course content
2. Prepare a working model related to course content; prepare report and record video of its working
3. Prepare a creative video presentation related to any environmental issue or any topic related to botany

BOTANY PRACTICAL V

1. Study of different modifications of root, stem, leaf by using specimens.
2. Study of different epidermal appendages (trichome etc.) by making slides.
3. Study of floral apex.
4. Survey and study of dispersal mechanism of seeds.
5. Microscopic studies on types and anatomy of stomata (monocotyledons and dicotyledons).
6. Study of apical and lateral meristem using plant material and slides
7. Anatomical study of root, stem and leaf (dicotyledons and monocotyledons) by making double stained temporary and permanent slides.
8. Anatomical studies of anomalous secondary structure in stem by making temporary and permanent slides.
9. Anatomical study of dicot and monocot seed (Cicer, Maize and cotton)
10. Study of vegetative and floral characters of species of the families studied in theory.
11. Identification of selected taxa up to genus using taxonomic keys.
12. Herbarium technique.
13. Familiarity with local flora and preparation of herbarium sheet.

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE505MJ/MN	Zoology-I	CE	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25 Practical	

Zoology-Paper-I: Ethology

Objectives:

- ❖ To understand Concepts of Ethology- Motivation, Fixed Action Patterns (FAP), Sign Stimulus; Innate Releasing Mechanism (IRM); Action Specific Energy (ASE); Learning; Imprinting.
- ❖ To understand Methods of Studying Behaviour: Studies in Laboratory- Neurotransmitter, physiological and Neurochemical techniques. Brief account on Pheromones,
- ❖ To explain the social organization.
- ❖ To learn about the Biological Rhythms

Unit I: Concept of Ethology

- a) Introduction and history of Ethology
- b) Concepts and patterns of Behaviour: FAP, Sign Stimulus, Innate Releasing Mechanism, Action Specific Energy,
- c) Concept of motivation
- d) Learned Behaviour and types of learning

Unit II: Study of Behaviour

- a) Methods of studying Brain Behaviour: Neurotransmitter, Physiological and Neurochemical Technique
- b) Genetic basis of Behaviour
- c) Control of Behaviour: Neural control, Hormonal control
- d) Elementary idea of role of Pheromones

Unit III: Social Organization

- a) Elements of Social Behavior
- b) Living in groups: Characteristics and advantages with respect to Honey bee, Deer, monkey
- c) Migration in Birds; Causes of migration
- d) Navigation in Birds; Causes of Navigation

Unit IV Biological Rhythms

- a) Faunal diversity in India and World; Endangered Mammals and Birds of India
- b) Wild life Conservation with reference to India & Rajasthan
- c) National Parks of India.
- d) National Sanctuaries of India.

Course Outcomes: After completion the course student would able to:

- ❖ Concepts of Ethology- Motivation, Fixed Action Patterns (FAP), Sign Stimulus; Innate Releasing Mechanism (IRM); Action Specific Energy (ASE); Learning; Imprinting.
- ❖ Methods of Studying Behaviour: Studies in Laboratory- Neurotransmitter, physiological and Neurochemical techniques. Brief account on Pheromones,
- ❖ Understand the Social organization.
- ❖ Interprets the Biological Rhythms

Suggested Readings:

1. Agrawal, V.K. (2019). Animal Behaviour (Ethology), S Chand & Company, India.
2. Agarwal, V.K. (2023). Animal Behaviour, S Chand & Company, India.
3. Chandelkar, P.R. (2020). A Text Book of Ethology and Wildlife, India.
4. Chandelkar, P.R., Punekar, Sushant (2021). A Text Book of Ethology and Wild life, Crescent Publishing Corporation, India.

5. Campagna, Claudio (2021). Ethology and Behavioral Ecology of Otariids and the Odobenid, Springer, India.
6. Kumar, Ashok (2023). Strategic Bio-Intelligence: Economic Ethology, Business Model Generator, and Behavioral Biology in Decision Making, India.
7. Kumar, Arvind (2020). Ecology and Ethology of Aquatic Biota (2 Volumes), Daya Publishing House, India.
8. Mathur, Reena (2021). Animal Behaviour, Rastogi Publications, India.
9. Pawar, Kishore Prin (2016). Ecology, Ethology, Evolution & Applied Zoology, Educational Publishers, India.
10. Verma, Kumar Vivek, Kumar, Umesh, Gupta, Archana (2024). Ecology, Ethology, Environmental Science and Wild life, thakur publication, India.

Zoology-Paper-II: Biotechniques, Instrumentation and Bioinformatics

Objectives:

- ❖ To learn about the term Electrophoresis, Radioactivity.
- ❖ To understand the working principle of Centrifuge, Incubator, pH meter.
- ❖ To understand the cell culture techniques and separation techniques in biology.
- ❖ To Understand the Principle, parts, and its application of microscopic techniques. Understand the working principle of UV-Vi's principle, Colorimeter.

Unit –I: Biotechniques

- a) Concepts of sterilization: Filtration, autoclaving, dry heat sterilization, wet sterilization and radiation
- b) Concept of Centrifugation, Mechanism and Types.
- c) Chromatography, Paper Chromatography –Thin layer Chromatography, gel filtration Chromatography, and ion exchange- Chromatography Principles and applications)
- d) Component of Electrophoresis: -Paper Electrophoresis, Gel Electrophoresis,

Unit-II: Micro Technique

- a) Fixation, dehydration, clearing, embedding & section cutting
- b) Difficulties encountered during section cutting (causes and remedies)
- c) Double staining with Haematoxylin and Eosin
- d) Histochemical staining techniques for carbohydrates (Periodic acid Schiff), proteins (Mercury-Bromophenol blue) and lipids (Sudan black-B)

Unit-III: Instrumentation

- a) Microscope: Principle of Microscope
- b) Microscopetypes
- c) Principles of colorimeter
- d) Principles of spectrophotometers

Unit-IV: Bioinformatics

- a) Bioinformatics: Definition, Scope, Basic concepts in bioinformatics, importance and role of bioinformatics in life sciences
- b) Bioinformatics databases- introduction, types of databases
- c) Nucleotide sequence databases, Elementary idea of protein databases
- d) BLASTA, FASTA,

Course Outcomes: After completion the course student would able to:

- ❖ Discuss the term Electrophoresis, Radioactivity.
- ❖ Understand the working principle of Centrifuge, Incubator, pH meter.
- ❖ Understand the cell culture techniques and separation techniques in biology.
- ❖ Understand the Principle, parts, and its application of microscopic techniques. Understand the working principle of UV-Vi's principle, Colorimeter.

Suggested Readings:

1. Ghosh, Zhumar (2021). Bioinformatics, Oxford University Press, India.
2. Jain, Aakanchha, Jain, Richa, Jain, Sourabh (2023). Basic Techniques in Biochemistry, Microbiology, and Molecular Biology, springer, India.
3. Satyanarayana, U. (2018). Fundamentals of Bioanalytical Techniques and Instrumentation, 2nd Edition, PHI Learning Pvt. Ltd., India.
4. Singh. Indu, Singh, M.P., Rathore, Singh, Vir Samar (2023). Molecular Biology, Bioinstrumentation & Biotechniques, Thakur Publication Pvt. Ltd., India.
5. Shakya, Shilpy (2023). Molecular Biology Bio-Instrumentation and Bio-Techniques, Ram Prasad Publication, India
6. Suar, Mrutyunjay, Misra, Namrata and Bhavesh, Sarovar Neel (2022). Biomedical Imaging Instrumentation: Applications in Tissue, Cellular, and Diagnostic Imaging, Elsevier, India.

Zoology-Paper-III: Immunology & Biotechnology

Objectives:

- ❖ To understand Distinguish Innate immunity and Acquired Immunity
- ❖ To understand the importance of Immune system
- ❖ To understand Study and understand the DNA Recombinant technology
- ❖ To Understand the Scope and Significance of Biotechnology

Unit –I: (Basics of Immunology)

- a) Characteristics of Immune System; Types of immunity: Active, passive, innate and acquired immunity
- b) Antigen: Antigenicity of Molecules Haptens
- c) Types of antibodies and their structure and function.
- d) Mechanism of Antigen Antibody reactions: Precipitation, Agglutination, Neutralization, Opsonization,

Unit –II: (Cells and Organs in Immunity)

- a) Immune Cells & Organs: B and T Lymphocytes, Plasma Cell, Null Cell, Primary and Secondary Lymphoid Organs; tonsils, adenoids, thymus, bone marrow, bursa Fabricus, macrophages
- b) Mechanism: Humoral and Cell- Mediated Immunity.
- c) Corona Vaccine
- d) production of Interferon's and types

Unit –III: (Biotechnology)

- a) History, Areas and application of recombinant DNA technology;
- b) Genetic Engineering
- c) Basic concepts in recombinant DNA technology, cDNA Library; DNA manipulation enzymes (Nucleases, Ligases, Polymerases)
- d) Vectors for Gene Transfer (Plasmids and Phages)

Unit –IV: (Applications of Biotechnology)

- a) Monoclonal antibodies and their production and applications
- b) Protoplast Fusion and their Application
- c) Environmental Biotechnology: Metal recovery; Petroleum recovery; Waste Water Treatment
- d) Food, Drink and Biotechnology.

Course Outcomes: After completion the course student would be able to:

- ❖ Distinguish innate immunity and Acquired Immunity.
- ❖ Understand the importance of Immune system.
- ❖ Study and understand the DNA Recombinant technology.
- ❖ Understand the Scope and Significance of Biotechnology.

Suggested Readings:

1. Anton Laurence (2023) Textbook of Animal Cell Biotechnology and Immunology, IGI Global, India.
2. Bhatia Latika (2021) Textbook of Immunology, Daya Publishing House, India.
3. Fatima Dulsy and Arumugam N. (2021) Immunology, Saras Publication, India.
4. Gupta P.K. (2022) Biotechnology, Immunology, Biotechniques & Biostatistics, Medtech Science Press, India.
5. Gupta P. K. (2023) Biotechnology and Immunology, Rastogi Publication, India.
6. John George (2024) Biotechnology in India - Reworking a Strategy, Springer, India.
7. Kumar Deepak (2020) Immunology and Immunological Biotechnology, Oxford University Press, India.
8. Paul Ajoy (2018) Textbook of Immunology Including Immunotechnology & Immunotherapy, Books and Allied, India.
9. Starks Marqués (2019) Immunology and Animal Biotechnology), Osmania University, India.

Presentation Work (Any One)

1. Prepare a power point presentation of given course Content.
2. Prepare working model related content; prepare report and record video of its working.
3. Prepare a creative video presentation related to any Animal kingdom to issue or any topic related to Zoology.

Zoology Practical

Paper-I: Ethology

1. Locomotory behaviour of (Tribolium):
 - Effects of light intensity and light quality on the rate of locomotion
2. Study of individual and social behavioural patterns of a troop of monkey through visual aids
3. Antenal Grooming in Cockroach

Paper-II: Biotechniques, Instrumentation & Bioinformatics

1. Separation of amino acids by paper chromatography and TLC
2. Separation of proteins by electrophoresis technique
3. Double staining method
4. Demonstration of carbohydrates, proteins and lipids by histochemical methods
5. Introduction to basic laboratory instruments and equipments- Autoclave,
 - Centrifuge, pH meter, Micropipettes, Digital balance, Homogenizer, Electrophoresis apparatus; Molar and normal solutions calculations
6. Use of internet for survey of literature using protein and nucleotide databases (NCBI)
7. Use of softwares like Microsoft offices, BLASTA, FASTA

Paper-III: Immunology & Biotechnology

1. Antigen – Antibody interaction by double diffusion method (Ouchterlony)
2. Study of histological slides of organs of immune system – Thymus, Lymph nodes and Spleen
3. Isolation of DNA/ Plasmid (Genomic DNA from any available source) by phenol extraction method.

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE506AV	ICT in Education	CC	2	15	35	50

Objectives:

- ❖ To help student teachers interpret and adapt ICTs in line with educational aims and principles.
- ❖ The paper will orient the learners about the need for and importance of ICT in education
- ❖ It will describe the importance of opensource software in education.
- ❖ Students will be given exposure to the various approaches and stages towards the use of ICT in education

Course Contents:

UNIT – I: Introduction to (ICT) in Education

- a) Meaning, Nature, importance of Information and Communication Technology (ICT)
- b) Technology & Engagement: Internet, Collaborative learning through Online Discussion Forums
- c) Flanders' Interaction Analysis Category System (FIACS),
- d) Challenges relating to Educational Technology.

UNIT – II: Emerging Technologies in Education

- a) Importance of Massive Open Online Course (MOOCs) in Education.
- b) Role of Open Education Resources (OER) in Education.
- c) Meaning and Importance of Virtual reality and Artificial intelligence.
- d) Ethical issues & safety in ICT- (Teaching, Learning and Research, Cyber bullying, Cyber security literacy.
- e) ICT applications for Continuous and Comprehensive Evaluation (CCE).

Assignment Work: (Any One):

1. Prepare power point presentation on Any one topic related to School content/ B.Ed. Syllabus.
2. Project-based assessments involving projects that require student teachers to create an instructional/learning resource that incorporates ICT tools and then assess the quality of the resource.
3. Peer assessment helps students develop their critical thinking and evaluative capacities through group tasks requiring assessment by a group of the work of another group.
4. Reflective journals requiring student teachers to maintain a reflective journal and to reflect on their learning experience involving the use of ICT tools in education.
5. Online quizzes and tests involving online quizzes and tests that can assess students' knowledge of the theoretical aspects of ICT in education.
6. Observation and feedback involving observation of performance of student teachers during classroom activities and providing feedback that help assess their practical skills in using ICT tools for improving teaching-learning-assessment processes.

Course Outcomes: After completion of this course students would able to:

- ❖ Explain the concept, nature, and scope of ICT in education,
- ❖ Describe the importance of open-source software in education,
- ❖ List and explain various approaches to the adoption and use of ICT in education,
- ❖ Describe the importance of various emerging technologies in education,
- ❖ See relationship between the social, economic, and ethical issues associated with the use of ICT,
- ❖ List out the challenges of educational technology in India,
- ❖ Use various technological tools for improving teaching-learning-assessment processes.

Suggested Readings:

1. Baral, Hemanta (2015). Computer fundamental, Stratford college Landon.
2. Dhiman, A.K. and Rani, Yashoda (2005). Learn-computer basics and its application in libraries Ess Publications, News Delhi.
3. Sinha, P.K. and Sinha P. (2005). Fundamentals of computers, BPB Publication, News Delhi.
4. Kapoor, Jagdish (2005). IT and good Governance, IJPA.
5. Wamala, C. (2012). Empowering Women through ICT Spider.

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE507SI	Pre. Internship Practice (Demonstration lessons, Peer teaching)	CC	2	50 Internship		50

Pre-internship distribution (4 Weeks)

Objectives:

- ❖ To acquire the knowledge of internship.
- ❖ To understand skill focused teaching.
- ❖ To develop ability of comprehensive school teaching.
- ❖ To understand and organize various school activities.

Course Contents:

UNIT-I Understanding the Internship School and the community around

- a) Introduction with school environment
- b) connect with children and schools
- c) Interacting with children and teachers in schools.
- d) Interacting parents, and the community
- e) Educational judgement
- f) Observations
- g) Relationships

UNIT-II Skill development

- a) Introduction
- b) Questioning
- c) Black Board
- d) Reinforcement
- e) Stimulus Variation
- f) Communication
- g) Class management

UNIT-III Comprehensive School Teaching

- a) Understanding the Internship School and the community around.
- b) Analysis of school syllabus and textbooks.
- c) Observing the classroom teaching of regular teachers.
- d) Observation of classroom teaching of peer student-teachers.
- e) Preparation of case study of the internship school and the innovative activities that the school undertakes.
- f) Teaching the units of the prescribed syllabus in two subjects currently being taught in the school.

UNIT-IV School Activities

- a) Games and sports
- b) Cultural
- c) Literary
- d) Yoga Exercises
- e) Class meetings

Course Outcomes: After completion of this course students would able to:

- ❖ Acquire the knowledge of internship.
- ❖ Understand skill focused teaching.
- ❖ Develop ability of comprehensive school teaching.
- ❖ Understand and organize various school activities

(B.Sc.-B. Ed) Semester-V
Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE508OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Mathematics at Secondary Stage – Course (II)	Content cum Pedagogy of at Secondary Stage – Course (II) Any Two CE CE	2	15	35	50
BBSE509OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Physical Sciences at Secondary Stage – Course (II)		2	15	35	50
BBSE510OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Biological Sciences at Secondary Stage – Course (II)		2	15	35	50

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE508OP	Content cum Pedagogy of Mathematics at Secondary Stage - Course (II)	CE	2	15	35	50

Objectives:

- ❖ To appreciate the contribution of teachers in development of Mathematical attitude.
- ❖ To understand the Qualities, responsibilities Mathematics teacher.
- ❖ To develop lesson plan for teaching Mathematics.
- ❖ To use various methods with appropriateness of content, level and classroom situation.
- ❖ To organize co-curricular activities among students

Course Contents:

UNIT-I Teachers role and development

- a) Teacher's role in training students in Mathematics method
- b) Teacher's role in development of Mathematical attitude.
- c) Qualities, responsibilities Mathematics teacher.
- d) Professional growth of Mathematics teacher.
- e) Creativity among students.

UNIT-II Methods and Approaches of Teaching Mathematics

- a) Inductive vs. Deductive, Analytical vs. synthesis method.
- b) Heuristic, drill, assignment and supervised study, Laboratory method.
- c) Project method, Problem solving method.
- d) Multi sensory aids in teaching of Mathematics like chart, model, technology use LCD, OHP, ICT and Eresources
- e) Co-curricular activities like Maths club, Recreation activities in mathematics.

Assignment & Practical Works: (Any one)

1. Write the term paper on any above topic.
2. Planning of recreational activities in mathematics.
3. Prepare teaching aids for mathematics teaching.

Course Outcomes: After completion of this course students would able to:

- ❖ Appreciate the contribution of teachers in development of Mathematical attitude.
- ❖ Understand the Qualities, responsibilities Mathematics teacher.
- ❖ Develop lesson plan for teaching Mathematics.
- ❖ Use various methods with appropriateness of content, level and classroom situation.
- ❖ To organize co-curricular activities among students

Suggested Readings:

1. Mishra D. D. Chauhan R.S. (2024) Ganit Shikshan, Agrawal publications, Agra
2. Pandey P. (2020) Pedagogy of Mathematics Teaching, Supernova Publishers and Dist. Pvt. Ltd., Kolkata
3. Dak S. (2018) Ganit shikshan, kalpna Publication, Jaipur
4. Rawat M.S., Agrawal M.B.L. Shrivastava D.N. (2016) Ganit shikshan, Shri Vinod Pustak Mandir Agra
5. James A. (2014) Teaching of Mathematics, Neelkanth Prakashan, New Delhi

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE509OP	Content cum Pedagogy of Physical Sciences at Secondary Stage - Course (II)	CE	2	15	35	50

Objectives:

- ❖ To appreciate the contribution of teachers in development of scientific attitude.
- ❖ To understand the Qualities, responsibilities physics teacher.
- ❖ To develop lesson plan for teaching physics.
- ❖ To use various methods with appropriateness of content, level and classroom situation.
- ❖ To organize co-curricular activities among students

Course Contents:

UNIT-I Teachers role and development

- a) Teacher's role in training students in scientific method
- b) Teacher's role in development of scientific attitude.
- c) Qualities, responsibilities physics teacher.
- d) Professional growth of physics teacher.
- e) Creativity among students.

UNIT-II Methods and Approaches of Teaching Physics

- a) Demonstration method, Heuristic method, Inductive-Deductive method.
- b) Laboratory method, Project method, problem solving method, assignment method.
- c) Multi sensory aids in teaching of physics like chart, model, technology use LCD, OHP, ICT and Resources
- d) Co-curricular activities like science club, science fairs and field trip.
- e) Role of state and national level institutes and laboratories (DST, ISRO, Solar observatories etc.) in promoting science education.

Assignment & Practical Works: (Any one)

1. Write the term paper on any above topic.
2. Prepare teaching aids for physics teaching.
3. Planning of co curricular activities for physics teaching.

Course Outcomes: After completion of this course students would able to:

- ❖ Appreciate the contribution of teachers in development of scientific attitude.
- ❖ Understand the Qualities, responsibilities physics teacher.
- ❖ Develop lesson plan for teaching physics.
- ❖ Use various methods with appropriateness of content, level and classroom situation.
- ❖ To organize co-curricular activities among students

Suggested Readings:

1. Harison C. (2021) Teaching secondary physics, Hooder publication, UK
2. Negi J.S. (2020) Bhotik vigyan shikshan, vinod pustak mandir, Agra
3. Sood J.K. (2017) Bhotik vigyan shikshan, Agrawal publications , Agra
4. Verma D.K. (2016) Bhotik vigyan shikshan, Ocean publication Hyderabad.
5. Nayak R.S., Chaturvedi A. (2016) Bhotik vigyan shikshan, Thakur Publications pvt Ltd. Bhopal

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE510OP	Content cum Pedagogy of Biological Sciences at Secondary Stage – Course (II)	CE	2	15	35	50

Objectives

- ❖ To explain nature, scope, and importance of Biological Sciences
- ❖ Teacher trainees will aware illustrate aims and objectives of teaching Biological Sciences for sustainable development of society
- ❖ To know about categorization of approaches and methods of teaching learning Biological Sciences
- ❖ To realize the importance of studying Biological Sciences as part of the school curriculum
- ❖ To use latest ICT resources in teaching learning process effectively

UNIT – I: Teaching Learning Resources for Biological Sciences

- a) Teaching learning aids/materials: concept, definition, role, and importance in classroom teaching learning
- b) Types of teaching learning aids/ materials: print media, non-print and digital media such as museum, aquarium, terrarium, games, toys, radio, TV, websites, animations, audios, videos
- c) Scope and benefits of using IT images, simulations; Biological Sciences mobile apps, digital repository, Augmented Reality (AR), Virtual Reality (VR) and Artificial Intelligence (AI) based digital resources and Open Educational Resources (OERs) for offline/ online classroom teaching learning
- d) Identification and use of learning resources in Biological Sciences from the local environment - using nature as a laboratory; biology laboratory; virtual laboratories and museums
- e) Resource room/ library, teaching learning kits, Biological Sciences clubs, fairs, exhibitions, excursions community resources

UNIT – II: Planning and ICT Integration for Teaching Biological Sciences

- a) Pedagogical analysis of content at secondary stage identification of concepts, listing Course Outcomes and competencies, planning, and evaluating learning experiences in an inclusive setup
- b) Concept, types and importance of unit and lesson planning.
- c) Developing unit plans and lesson plans based on Course Outcomes and experiential learning at secondary stage
- d) Open Educational Resources in Biological Sciences – BIOIDAC, MOOC, National Teachers Portal, DIKSHA, SWAYAM
- e) Technological Pedagogical Content Knowledge (TPCK) for classroom and online teaching

Assignment & Practical (Any One)

1. Prepare a term paper with ppt on any above topic in units
2. Analyze the content of textbooks of Biological Sciences (Classes 9-12)
3. Develop e-content for the concepts of Biological Sciences at Secondary Stage
4. Develop unit plans of selected chapters of Textbooks of Biological Sciences
5. Prepare Course Outcomes and experiential learning-based lesson plan for the concepts of Biological Sciences
6. Developing ICT integrated lesson plans for offline and online classes.
7. Explore a course of Biological Sciences of MOOC and prepare a write up

Course Outcomes: After completion of this course, Student teachers will be able to:

- ❖ Categorize different teaching learning resources and plan their appropriate usage in teaching learning of concepts of Biological Science
- ❖ Develop simple teaching learning materials using easily available/local materials
- ❖ Analyze the content of Biological Science textbooks at secondary stage
- ❖ Review various methods and strategies for teaching Biological Sciences

- ❖ Develop learning outcome-based lesson plan to promote experiential learning and higher order thinking skills
- ❖ Develop unit plans and lesson plans on different chapters in biology (Grades IX to XII)

Suggested Readings:

1. Choudhary, S. (2010). Teaching of Biology, APH Publishing Corporation, New Delhi.
2. Joshi, S.R. (2005). Teaching of Science, A.P.H. Publishing Corporation, New Delhi.
3. Lakshmi, Gade & Bhuvneswara, Rao Digumarti Bhaskara, (2004). Methods of Teaching Life Science, Discovery Publishing House, New Delhi.
4. Mohan, Radha (2007). Innovative Science Teaching, Prentice Hall of India (p) Ltd., New Delhi.
5. National Education Policy 2020, MoE, Government of India.
6. National Steering Committee for National Curriculum Frameworks, (2023). Draft National Curriculum Framework for School Education.
7. NCERT, Textbooks of Biological Sciences at Secondary Stage.
8. Singh, Yogesh Kumar & Nath, Ruchika (2005). Teaching of General Science, A.P.H. Publishing Corporation, New Delhi.
9. Sood, J. K. (1987). Teaching of Life Science, Kohali Publishers, Chandigarh.
10. Yadav, M. S. (2000). Modern methods of Teaching Science, Anmol Publishers, Delhi.
11. कुलश्रेष्ठ, प्रदीप कुमार (2006). विज्ञान शिक्षण, विनोद पुस्तक मंदिर, आगरा
12. भूषण, शैलेन्द्र (2008). जीव विज्ञान शिक्षण, विनोद पुस्तक मंदिर, आगरा
13. मंगल, एस. के. (2010). जैविक विज्ञान शिक्षण, लॉयल बुक डिपो, मेरठ
14. माहेश्वरी, बी. के. (2003). जीव विज्ञान शिक्षण, सूर्या पब्लिकेशन, मेरठ
15. शर्मा, एस.आर. (2008). विज्ञान शिक्षण, अर्जुन पब्लिशिंग हाउस, नई दिल्ली
16. सक्सेना, इनिड (2007). विज्ञान शिक्षण, यूनिवर्सिटी बुक हाउस (प्रा.) लि., जयपुर
17. सूद, जे. के. (2007). विज्ञान शिक्षण, विनोद पुस्तक मंदिर, आगरा
18. श्रीमाली, नंदकिशोर (2007). विज्ञान शिक्षण, राजस्थान हिन्दी ग्रन्थ अकादमी, जयपुर

(B.Sc.-B.Ed) Semester-VI

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE601MJ	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25 Practical	
BBSE602MJ	Disciplinary/Inter disciplinary Courses	Physics-I		4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25 Practical	
BBSE603MJ	Disciplinary/Inter disciplinary Courses	Mathematics-I		4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25 Practical	
BBSE604MJ	Disciplinary/Inter disciplinary Courses	Botany-I	CE	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25 Practical	
BBSE605MJ	Disciplinary/Inter disciplinary Courses	Zoology-I		4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE601MJ	Chemistry-I	CE	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

Chemistry-Paper-I: Inorganic chemistry**Objectives:**

- ❖ To develop understanding about metal ligand bonding, metal complexes and organometallic.
- ❖ To aware about the conceptual knowledge of spectral properties and kinetic aspects of metal complexes.
- ❖ To develop conceptual knowledge about selection rules, trans effect and substitution reactions.
- ❖ To give information about spectrochemical series, kinetic stability and bonding application of alkyls and aryls.

Unit I: Metal – ligand bonding in transition metal complexes

An elementary idea of crystal-field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal – field parameters, colour of transition metal ions, limitations of crystal field theory.

Unit II: Spectral properties of transition metal complexes

Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states and Spectroscopic terms (L-S Coupling), spectrochemical series, Orgel- energy level diagram for d^1 and d^9 states, the electronic spectrum of $[Ti(H_2O)_6]^{+3}$ complex ion.

Unit III: Thermodynamic and kinetic aspects of metal complexes

Thermodynamic and kinetic stability, thermodynamic stability and factors affecting the stability, substitution reactions of square planar complexes, types of substitution reactions and trans effect.

Unit IV: Organometallic chemistry

Definition, nomenclature and classification of organometallic compounds, preparation, properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn and Ti, a brief account of metal – ethylenic complexes and homogenous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

Course Outcomes: After completion the course student would be able to:

- ❖ Classify the organometallic compounds and metal complexes on the basis of transition, stability and bonding structures.
- ❖ Measure the correlation among structural & kinetic properties of metal complexes.
- ❖ Apply the knowledge of bonding, spectral properties and structures to define basic properties of compounds.
- ❖ Draw and interpret the energy level diagram and spectroscopic series for various states

Chemistry-Paper-II: Organic Chemistry

Objectives:

- ❖ To develop conceptual knowledge about nuclear magnetic resonance, industrial uses and structures of compounds.
- ❖ To be aware about classification, nomenclature and properties of carbohydrates, amino acids, fats and detergents.
- ❖ To develop understanding about synthesis, group analysis and industrial uses of fat, oil and detergents.
- ❖ To gain knowledge about spectroscopy techniques.

Unit I: Nuclear magnetic resonance (NMR) spectroscopy

Proton magnetic resonance ¹H-NMR spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin spin splitting and coupling constant, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2 tri bromo ethane, ethyl acetate, toluene and acetophenone. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

Unit II: Carbohydrates:

Classification and nomenclature, monosaccharides, mechanism of osazone formation, inter conversion of glucose and fructose, chain lengthening and chain shortening of aldose. Configuration of monosaccharide. erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glucosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D (+) -glucose. Mechanism of mutarotation. Structure of ribose and deoxy ribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

Unit III: Amino acids, peptides, proteins and nucleic acid

Classification, structure and stereochemistry of amino acids. Acid base behaviour of isoelectric point and electrophoresis. Preparation and reaction of α amino acid. Structure and nomenclature of peptides and proteins. Classification of proteins, peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptides synthesis, solid phase peptide synthesis. Structure of peptides and proteins, levels of protein structure. Protein denaturation / renaturation.

Introduction. Constituents of nucleic acid ribo and ribonucleosides, nucleotides. The double helical structure of DNA/RNA

Unit IV: Fats, oils and detergents

Natural fats edible and industrial oils of vegetable resin common fatty acids, glycerides, hydrogenation of unsaturated oils. saponification value, iodine value, acid value, soaps, synthetic detergents, alkyl and aryl sulphonate.

Course Outcomes: After completion the course student would be able to:

- ❖ Classify the various compounds on the basis of structure, stereochemistry and formation process.
- ❖ Describe and discuss about formation, structure and chemical reactions of carbohydrates, peptides and nucleic acids.
- ❖ Apply the knowledge of industrial uses of fats, oils and detergents to produce some useful products.
- ❖ knowledge about spectroscopy techniques.

Chemistry-Paper-III: Physical chemistry

Objectives:

- ❖ To aware about conceptual knowledge of photochemistry, spectroscopy and mechanics.
- ❖ To develop understanding about qualitative and quantitative description of fluorescence, selection rules and isotopes.
- ❖ To develop analytical view about laws of photochemistry, degree of freedom and energy levels.
- ❖ To give information about transfer process, Raman spectrum and atomic orbitals.

Unit I: Photochemistry:

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

Unit II: Spectroscopy I

Introduction: Electromagnetic radiation of the spectrum, basic features of different spectrometers, statement of the Born Oppenheimer approximation, degree of freedom.

Rotational spectrum: Diatomic molecules, Energy levels of rigid rotator, (semiclassical principles) selection rules, spectral intensity, distribution using population distribution (Maxwell Boltzmann distribution), determination of bond length, qualitative description of non rigid rotator, isotope effect. Electronic spectrum: Concept of potential energy curves for bonding and anti bonding molecular orbital's, qualitative description of selection rules and Frank –Condon principle.

Unit III: Spectroscopy II

Vibrational spectrum: Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity., determination of force constant, qualitative relations of force constants and bond energy, effect of anharmonic motion and isotopes on the spectrum, idea of vibrational frequencies of different functional groups.

Raman spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

Unit IV: Quantum Mechanics II:

Molecular orbital theory: Basic ideas criteria for forming M.O. from A.O. construction of M.O.'s by LCAO-H₂⁺ ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ , σ^* and π , π^* orbitals and their characteristics. Hybrid orbitals sp, sp², sp³, calculation of coefficients of atomic orbitals used in these hybrid orbitals.

Course Outcomes: After completion the course student would able to:

- ❖ To measure the calculation of energy levels, coefficients and spectral intensity of compounds.
- ❖ To plot and interpret the bond energy, force constant, potential energy curves of compounds.
- ❖ To describes various properties of compounds on the basis of energy, potential and dipole moment etc.
- ❖ To analyze the various structures of compounds on the basis of quantum mechanics.

Term paper / Practicals

Inorganic chemistry

Calorimetry

- Jobs
- Mole ratio method
Adulteration –food stuffs
Effluent analysis water analysis.

Physical Chemistry

Electrochemistry

- To determine the strength of the given acid conductometrically using standard alkali solution
- To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically
- To study the saponification of ethyl acetate acetate conductometrically
- To determine the ionization constant of a weak acid conductometrically
- To titrate potentiometrically the given ferrous ammonium sulphate solution using KMnO₄/K₂Cr₂O₇ as titrant and calculate the redox potential of Fe⁺⁺/Fe⁺⁺⁺ system on the hydrogen scale.

Molecular weight determination:

1. Determination of molecular weight of a non-volatile solute by Rast method/Beckmann freezing point method.
2. Determination of the apparent degree of dissociation of an electrolyte (e.g. NaCl) in aqueous solution at different concentrations by ebullioscopy.

Colorimetry:

To verify Beer- Lambert law $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ and determine the concentration of the given solution of the substance.

Viva-Voce & Record**Suggested Readings:**

1. A New Concise Inorganic Chemistry; Fifth Edition; J.D. Lee; Blackwell Science, London, 1989.
2. Inorganic Chemistry; Third Edition; D.F. Shriver and P.W. Atkins; Oxford University Press, New York, 1999.
3. Inorganic Chemistry; Third Edition; Gary L. Miessler and Donald A. Tarr; Pearson Education Inc. Singapore, 2005.
4. Organic Chemistry; Seventh Edition; T.W. Graham Solomons & Craig B. Fryhle; John Wiley and Sons, 1998.
5. Organic Chemistry; Sixth Edition; Robert Thornton Morrison & Robert Neilson Boyd; PHI Pvt. Ltd, 2004.
6. Organic Chemistry Vol. I ; Fifth Edition; I.L. Finar; Longman Scientific and Technical, Singapore, 1975.
7. Organic Chemistry: Vol 1, Mukerjee and Singh
8. Organic Chemistry: Vol 2, Mukerjee and Singh
9. Organic Chemistry: Vol 3, Mukerjee and Singh
10. A Text Book of Physical Chemistry; A.S. Negi, S.C. Anand; New Age International (P) Limited, New Delhi, 2002.
11. The Elements of Physical Chemistry; P.W. Atkins; Oxford University Press, 1996.
12. University General Chemistry; C.N.R. Rao; Macmillan India Ltd., New Delhi, 1998.
13. Physical Chemistry: Puri Sharma and Pathania
14. Physical Chemistry: J. Moore

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE602MJ	Physics-I	CE	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Practical				25 Practical	

Physics- Paper-I: Mathematical Physics and Special Theory of Relativity – II

Objectives:

- ❖ To Understand the Lorentz Transformation.
- ❖ To know the concepts of Four Vector Formulation, longitudinal and Transverse Doppler's Effect.
- ❖ To aware the Transformation between Laboratory and Centre of mass.
- ❖ To develop concept about the Transformation Electric and Magnetic Field.

UNIT – I Lorentz Transformation:

Lorentz transformation and rotation in space-time, time like and space like vector, world line, macro-causality

UNIT – II Four vector Formulation:

Four vector formulation, energy momentum four vector, relativistic equation of motion, invariance of rest mass, orthogonality of four force and four velocity, Lorentz force as an example of four force, transformation of four frequency vector, longitudinal and transverse Doppler's effect.

UNIT – III Transformation between Lab and CM:

Transformation between laboratory and center of mass system. Four momentum conservation, kinematics of decay products of unstable particles and reaction thresholds: Pair production, inelastic collision of two particles, Compton effect.

UNIT – IV Transformation electric and Magnetic field:

Transformation electric and Magnetic fields between two inertial frames.

Course Outcomes: After completion the course student would able to:

- ❖ Discuss the Lorentz Transformation.
- ❖ Classify the concepts of Four Vector Formulation, Longitudinal and Transverse Doppler's Effect.
- ❖ Identify the Transformation between Laboratory and Centre of mass.
- ❖ Calculate the Transformation Electric and Magnetic Field.

Suggested Readings:

1. G.B. Arfken and H.J. Weber, Mathematical Methods for Physicists, Elsevier Publisher.
2. A.K. Ghatak, L.C. Goyal, S.J. Chua Mathematical Physics: A.K. Ghatak, L.C. Goyal and S.J. Chua, Macmillan, New Delhi.
3. Pipes and Harvili, Applied Mathematics for Engineers and Physicists, McGraw Hill Book Co.
4. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, गणितीय भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2016

Physics- Paper-II: Quantum Mechanics – II

Objectives:

- ❖ To Know the Bound State Problem-I
- ❖ To Understand the Bound State Problem-II
- ❖ To aware Application of Quantum Theory.
- ❖ Gain knowledge about molecular spectroscopy.

UNIT I Bound State Problems - I:

Potential step and rectangular potential barrier, calculation of reflection and transmission coefficient, Qualitative discussion of the application to alpha decay (tunnel effect), square well potential problem, calculation of transmission coefficient.

UNIT II Bound State Problems- II:

Particle in one-dimensional infinite potential well and finite depth potential well, energy value and eigen functions. Simple harmonic oscillator (one dimensional) eigen function, energy eigen values, zero-point energy.

UNIT – III Applications of Quantum Theory to Atomic Spectroscopy:

Quantum features of spectra of one electron atoms. Frank–Hertz experiment and discrete energy states. Schrodinger equation for a spherically symmetric potential, Schrodinger equation for a one electron atom in spherically coordinates, separation of variables, Orbital angular momentum and quantization spherical harmonics, energy levels of H–atom, Shapes of $n = 1$ and $n = 2$ wave functions, Average value of radius of H–atom, Comparison with Bohr Model and Bohr Correspondence Principle. Stern and Gerlach experiment, spin and magnetic moment. Spin orbit coupling and qualitative explanation of fine structure. Atoms in magnetic field Zeeman splitting.

UNIT – IV Molecular Spectroscopy:

Qualitative features of molecular spectra: Rigid rotator discussion of energy, eigen values and eigen function, rotational energy levels of diatomic molecules, Rotational spectra, vibrational energy levels of diatomic molecules, vibrational spectra, vibrational rotational spectra.

Course Outcomes: After completion the course student would able to:

- ❖ Discuss on the Bound State Problem-I (Potential Step, Potential Barrier, Square Well Potential) and Tunnel Effect.
- ❖ Classify the Bound State Problem-II (One-Dimensional Potential Box, Eigen Value, Eigen Function).
- ❖ Applies Quantum Theory to Atomic Spectroscopy.
- ❖ Identify the Concept of Molecular Spectroscopy.

Suggested Readings:

1. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Springer Publisher.
2. Arthur Beiser, Perspectives of Modern Physics, 6th Edition, Medtech Science.
3. Griffiths, Introduction to Quantum Mechanics, 2nd Edition, Cambridge University Press.
4. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, क्वांटम यांत्रिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2016

Physics- Paper-III: Nuclear Physics

Objectives:

- ❖ To Understand the Concept of Nuclear Properties like Quadrupole Moment, Nuclear Spin, Nuclear Energy, Mass spectroscopy and Theory of Nuclear Forces.
- ❖ To know the Concept of Nuclear Fission.
- ❖ To Aware the Concept of Elementary Particles.
- ❖ To develop knowledge about the Concept of Detector and Accelerator.

UNIT-I Nuclear Properties:

Rutherford's theory of a particle scattering, Properties of Nuclei: Quadrupole Moment and Nuclear Ellipticity, Quadrupole Moment and Nuclear spin, Parity and Orbital angular momentum, Parity and its conservation, Nuclear Mass and Mass Spectroscopy, Nuclear Energy, Discovery of neutron and proton-neutron hypothesis, Neutron to proton Ratio (n/z), The nuclear potential, Nuclear mass, Mass Defect and Binding energy, Theory of Nuclear forces.

UNIT-II Nuclear Fission:

The Discovery of Nuclear Fission, The Energy Release in Fission, The Fission products mass distribution of fission products, Charge distribution of fission products, ionic charge of fission products, Fission cross Section and threshold, Neutron emission in fission, The prompt neutron and delayed neutrons, Mechanism for the emission of delayed neutrons. Energy of fission Neutrons, Theory of nuclear fission and Liquid Drop Model, Barrier Penetration-Theory of Spontaneous fission, Nuclear Energy Sources, Nuclear Fission as a source of Energy, The Nuclear Chain Reaction, condition of controlled chain Reaction, Nuclear Reactors.

UNIT-III Elementary particles:

Classification of Elementary Particles, Fundamental Interactions, Unified approach (Basic ideas), The conservation Laws, Quarks (Basic ideas), Charmed and color Quarks. Nuclear Fusion: The sources of stellar Energy.

UNIT-IV Detector and Accelerators:

Particle and Radiation Detectors: Ionization Chamber, Region of Multiplicative Operation, Proportional Counter, Geiger-Muller Counter, Cloud Chamber, BF₃ and Scintillation detector. Ion sources, Cock-Craft-Walten High Voltage Generators, Van De-Graff Generators, Drift Tube Linear Accelerators, Wave Guide Accelerator, Magnetic Focussing In cyclotron, Synchrocyclotron, Betatron, The Electromagnetic Induction Accelerator, Electron Synchrotron, Proton Synchrotron.

Course Outcomes: After completion the course student would able to:

- ❖ Discuss the Concept of Nuclear Properties like Quadrupole Moment, Nuclear Spin, Nuclear Energy, Mass spectroscopy and Theory of Nuclear Forces.
- ❖ Classify the Concept of Nuclear Fission.
- ❖ Identify the Concept of Elementary Particles.
- ❖ Applies the Concept of Detector and Accelerator.

Suggested Readings:

1. V.K. Mittal, R.C. Verma, Introduction to Nuclear and Particle Physics, S.C. Gupta, PHI.
2. Kenneth S. Krane, Introductory Nuclear Physics, John Wiley & Sons.
3. Walter E. Meyerhof, Elements of Nuclear Physics, McGraw-Hill Book Company.
4. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, नाभिकीय भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2016

Physics Practical: VI

1. Determination of Planck's constant by photo cell (retarding potential method using optical filters, preferably five wave length)
2. Determination of Planck's constant using solar cell.
3. Determination of Stefan's constant (Black body method)
4. Study of the temperature dependence of resistance of a semiconductor (four probe method).
5. Study of Iodine spectrum with the help of grating and spectrometer and ordinary bulb light.
6. Study of characteristics of a GM counter and verification of inverse square law for the same strength of a radioactive source.
7. Study of β -absorption in Al foil using GM counter.
8. To find the magnetic susceptibility of a paramagnetic solution using Quinck's method. Also find the ionic molecular susceptibility of the ion and magnetic moment of the ion in and magnetic moment of the ion in terms of both magnetons.
9. Determination of coefficient of rigidity as a function of temperature using torsional oscillator (resonance method).
10. Study of polarization by reflection from a glass plate with the help of Nicol's prism and photo cell and verification of Brewster law and law of Malus.
11. e/m measurement of magnetic field using ballistic galvanometers and search coil study of variation of magnetic field of an electromagnet with current.
12. Measurement of electric charge by Millikan's oil drop method.

Suggested Readings:

- 1 प्रो. प्रभा दशोरा, तृतीय वर्ष प्रायोगिकी भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE603MJ	Mathematics-I	CE	4	15	20	100
	Mathematics-II				20	
	Mathematics-III				20	
	Mathematics Practical				25 Practical	

Mathematics- Paper-I: Algebra - II

Objectives:

- ❖ To aware the Integral domain and Field.
- ❖ To Understand the Ideals and Quotient Ring.
- ❖ To develop knowledge the Linear Dependence and Linear Independence of Vectors.
- ❖ To know sum of subspaces.

Unit 1: Integral domain and field, Characteristics of a Ring and Field.

Unit 2: Ideals and Quotient Ring, Maximal ideal and Prime ideal, Principal Ideal domain, Field of quotients of an integral domain, Prime fields, Definition, Examples and Simple properties of Vector spaces and Subspaces.

Unit 3: Linear combination, Linear dependence and Linear independence of vectors, Basis and Dimension.

Unit 4: Generation of subspaces, Sum of subspaces, Direct sum and complement of subspaces, Quotient space and its dimension.

Course Outcomes: After completion the course student would able to:

- ❖ Discuss about integral domain and field.
- ❖ Identify the Ideals and Quotient Ring.
- ❖ Classify the Linear Dependence and Linear Independence of Vectors.
- ❖ Applies the Sum of Subspace and discuss about quotient space

Suggested Readings:

1. Joseph A. Gallin, Contemporary Abstract Algebra, Cengage, 2021.
2. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड, जितेन्द्र सैनी, बीजगणित, आर. बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2016
3. जी.सी. गौखरू सैनी, बीजगणित जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics- Paper-II: Complex Analysis -II

Objectives:

- ❖ To understand the Power Series.
- ❖ To develop knowledge about the Singularities and Branch Point.
- ❖ To give information about Cauchy's residue theorem.
- ❖ To develop concept about the Conformal Mapping.

Unit 1: Power series — Absolute convergence, Abel's theorem, Cauchy-Hadamard theorem, Circle and Radius of convergence, Analyticity of the sum function of a power series.

Unit 2: Singularities of an analytic function, Branch point, Meromorphic and Entire functions, Rouché's theorem, Casorati - Weierstrass theorem.

Unit 3: Residue at a singularity, Cauchy's residue theorem, Argument principle, Rouché's theorem, Fundamental theorem of Algebra.

Unit 4: Conformal mapping. Bilinear transformation and its properties. Elementary mappings: $w(z) = \frac{1}{z}$, $(z + \frac{1}{z})$, z^2 , e^z , $\sin(z)$, $\cos(z)$ and $\log(z)$, Evaluation of a real definite integral by contour integration, Analytic continuation, Power series method of analytic continuation.

Course Outcomes: After completion the course student would be able to:

- ❖ Discuss on the Power Series.
- ❖ Identify the Singularities and Branch Point.
- ❖ Applies Fundamental Theorem of Algebra.
- ❖ Analyze the Conformal Mapping and discuss on the circle and radius of convergence

Suggested Readings:

1. Lars V. Ahlfors, Complex Analysis, McGraw Hill Education, 2013.
2. H.S. Kasana, Complex Variables Theory and Application, PHI Learning Private Limited, 2019.
3. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड़, जांगीड़, जितेन्द्र सैनी, बीजगणित, आर. बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2016
4. जी.सी. गौखरू सैनी, बीजगणित जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics- Paper-III: Statics

Objectives:

- ❖ To understand the Resultant and Equilibrium Coplanar Force Acting on a Rigid Body.
- ❖ To know the Friction.
- ❖ To aware the Virtual Work.
- ❖ To develop knowledge about the Common Catenary Force in the 3-D.

Unit 1: Resultant and equilibrium coplanar force acting on a rigid body.

Unit 2: Friction

Unit 3: Virtual work,

Unit 4: common catenary force in the three dimensions.

Course Outcomes: After completion the course student would able to:

- ❖ Discuss on the Resultant and Equilibrium Coplanar Force Acting on a Rigid Body.
- ❖ Classify about the Friction.
- ❖ Calculate the Virtual Work.
- ❖ Identify the Common Catenary Force in the 3-D.

Suggested Readings:

- 1 बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, बीजगणित, आर. बी.डी. पब्लिशिंग हाउस, जयपुर–दिल्ली, 2016
- 2 जी.सी. गौखरू सैनी, बीजगणित जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE604MJ	Botany-I	CE	4	15	20	100
	Botany-II				20	
	Botany-III				20	
	Botany Practical				25 Practical	

Botany- Paper-I: Reproductive Biology of Angiosperms

Objectives:

- ❖ To know the detailed structure of flower and male gametophyte.
- ❖ To learn about the structure of pistil and female gametophyte.
- ❖ To get knowledge about the process of pollination and fertilization
- ❖ To study the development of embryo and endosperm

UNIT- I: Structure of Flower and Male Gametophyte

- a) Ontogeny of Flower parts- development and variations,
- b) Structure and development of anther and microsporangium.
- c) Teptum Types and Functions, microsporogenesis,
- d) Microgametogenesis, Development of Male Gametophyte, Structure of Pollen Grains.

UNIT- II: Structure of Pistil and Female Gametophyte

- a) Structure and types of ovules, special structures- aril, oburator etc.,
- b) Megasporogenesis, megagametogenesis,
- c) Structure and development of typical embryo sac.
- d) Types of Embryosec (monosporic, bisporic and tetrasporic types).

UNIT- III: Pollination and Fertilization

- a) Pollination types, significance, adaptations.
- b) Compatibility and incompatibility;
- c) Fertilization basic concepts. Pollen tube entry, Pollen-Pistil interaction, syngamy and triple fusion, double fertilization,
- d) Development, type and function of endosperm.

UNIT- IV: Development of Embryo and Endosperm

- a) Embryogenesis, Six types of Embryogeny;
- b) General pattern of development of dicot and monocot embryo, suspensor structure and function.
- c) embryo- endosperm relationship; nutrition of Embryo,
- d) Apomixis and polyembryony,

Course Outcomes: After completion the course student would able to:

- ❖ Explain the detailed structure of flower and male gametophyte.
- ❖ Interpret the structure of pistil and female gametophyte.
- ❖ Describe the process of pollination and fertilization
- ❖ Understand the development of embryo and endosperm

Suggested Readings:

1. Bhojwani, S.S., Bhatnagar, S.P. (2004). The Embryology of Angiosperms. Vikas Publishing House, New Delhi.
2. Das, Bijaya Kumar, Mishra, Nirupama (2022). Reproduction Biology of Angiosperms, OSR Publishers, Odisha
3. Das, Kalyan (2022). Reproductive biology of angiosperms with practical, Mahaveer Publications
4. Mangla, Yash. Kothari, Priyanka and Gupta, Charu Khosla (2022). Reproductive Biology of Angiosperms: Concepts and laboratory methods, Cambridge Univercity Press, New Delhi
5. Nayar, T.S., Beegam, A. Rasiya and Sibi, M. (2014). Flowering plants of western Ghats, India Tropical Botanic Garden and research institute, Thiruvananthapuram
6. Panday, Arun K. (2022). Reproductive Biology of Angiosperms, CRC Press, New Delhi

7. Raghavan, V. (2000). Developmental Biology of Flowering plants. Springer, Netherlands.
8. Sharma, Manoj kumar (2012). Reproduction Biology of Angiosperms, Yahu Education of India
9. Sing, V., Pande, P.C. and Jain, D.K. (2021). Reproductive Biology of Angiosperms, Rastogi Publications, Meerut
10. Trivedi, P.C. Sharma, N. and Sharma, J. L. (2003). Structure, Development and reproduction in Flowering Plants. Ramesh Book Depot., Jaipur.

Botany- Paper-II: Economic Botany and Ethnobotany

Objectives:

- ❖ To acquire knowledge of food plants, vegetables and fruits.
- ❖ To analyze the spices, oil yielding plants and Beverages.
- ❖ To understand medicinal plants, fibers and woods.
- ❖ To get aware about ethical aspects of Ethnobotany

UNIT- I: Food Plants, Vegetables and Fruits

- a) Basics of Economic Botany, Centre of origin of cultivated plants,
- b) **Food plants:** rice, wheate, maize, potato, **Vegetables:** General account with a note on radish, garlic, cabbage, spinach, cauliflower, cucumber and pea.
- c) **Fruits:** General account with a note on apple, banana, mango, watermelon and orange.

UNIT- II: Spices, Oil yeilding Plants, and Beverages

- a) **Spices:** General account with an emphasis on those cultivated in Rajasthan (Cumin, Capsicum, Coriender).
- b) **Beverages:** Characteristics and uses Beverages (Tea and Coffee),
- c) **Oil yielding plants:** General account of *Brassica*, *Soyabean*, *Groundnut* and *Cocus*.

UNIT- III: Medional Plants, Fibers and Woods

- a) **Medional Plants:** General account with an emphasis on those cultivated in Rajasthan (Senna, Isabgol, SAfed musli, Cinchona and Rauvolfia)
- b) **Fibers:** General account with a note on Cotten and Jute.
- c) **Woods:** General account of sources of fire wood: timbers and bamboos.

UNIT- IV: Ethnobotany

- a) Ethnobotany - its concepts and relevance.
- b) Ethanobotanical areas of Rajasthan, ethnic groups in India and ethanobotanical study of any tribal area of Rajasthan.
- c) Ethical aspect of ethnobotany.

Course Outcomes: After complition the course student would able to:

- ❖ Interpret different food plants, vegetables and fruits.
- ❖ Eenhance knowledge about spices, oil yielding plants and Beverages.
- ❖ Comprehend about medicinal plants, fibers and woods.
- ❖ Acquire knowledge about ethical aspects of Ethnobotany

Suggested Readings:

1. Kochhar, S.L. (2020). Economic Botany and Biotechnology, McGraw Hill Education (India), Chennai
2. Kumar, N. Anil (2019). Plants and People: Economic Botany in the Tropics, BS Publications, Hyderabad
3. Pullaiah, T., Krishnamurthy, K.V. (2021). Ethnobotany of India: Western Ghats and West Coast of Peninsular India, Apple Academic Press, New Delhi
4. Pullaiah, T., Krishnamurthy, K.V. (2019). Ethnobotany of India: Eastern Ghats and Deccan, Apple Academic Press, New Delhi
5. Pullaiah, T., Krishnamurthy, K.V., Bahadur, Bir (2018). Ethnobotany of India (Volume 5): The Indo-Gangetic Region and Central India, Apple Academic Press, New Delhi
6. Rai, M.K., Dhiman, R. C. (2021). Ethnobotany of the Mountain Regions of India, Scientific Publishers, New Delhi
7. Ratnam, K. Raveender, Martin. (2006). Ethnomedicinal Plants, Agrobios (India).
8. Singh, S.K.; Srivastava, Seema (2023). Economic Botany, Campus, Books.
9. Simpson, Beryl, Ogorzaly, Molly Conner (2020). Economic Botany: Plants in Our World, CBS Publishers & Distributors, New Delhi
10. Singh, V., Jain, N.K. (2021). Ethnobotany and Medicinal Plants of India and Nepal, Pointer Publishers, Jaipur
11. Sinha, R.K. (2022). Economic Botany and Sustainable Development, International Book Distributing Co., Lucknow
12. Wickens, G.E. (2019). Economic Botany: Principles and Practices, Springer Nature India, New Delhi

Botany- Paper-III: ECOLOGY

Objectives:

- ❖ To acquire knowledge of community, ecosystem and phytogeography
- ❖ To know about structure, components, food chains, hub, energy flows.
- ❖ To understand about vegetation and environmental pollution
- ❖ To get aware about environmental management

UNIT- I: Ecological factors and Adaptations

- a) Basic concepts of Ecology,
- b) **Ecological factors**; Atmosphere (four distinct zone),
- c) **light**: Photosynthetically active radiation, zonation in water bodies, photoperiodism, heliophytes and sciophytes),
- d) **Temperature**: Raunkier's classification, thermoperiodicity and effect on distribution of vegetation.
- e) **Soil**: Development, soil profile, properties.
- f) **Ecological adaptations** of hydrophytes, xerophytes, epiphytes and halophytes.

UNIT- II: Population, Community and Ecosystem

- a) **Population ecology**: Concept, ecotypes, ecads. Population interaction among organisms - Positive (Commensalism, Mutualism & Proto-cooperation) and Negative (Exploitation, Antibiosis & Competition).
- b) **Community Ecology**: Characteristics, frequency, density, cover, life forms, biological spectrum,
- c) **Ecological succession**: Causes, types and steps.
- d) **Ecosystem**: Structure, components, food chain, food web, energy flow, trophic levels and ecological pyramids, primary and secondary productivity, biogeochemical cycle of carbon and phosphorus.

UNIT- III: vegetation and Environmental pollution

- a) Biogeographic regions and vegetation types of India;
- b) Ecology, Vegetation and Endangered plants of Rajasthan.
- c) **Environmental pollution**- Air, water and soil.
- d) WWF, Chipko movement, green house effect, ozone depletion, Alnino effect, Loss of Biodiversity and extinction of species, red data book.

UNIT- IV: Environmental management

- a) Concept and principles of environmental management,
- b) Principle of optimized use and sustainable development, threats to sustainable development.
- c) Environmental Laws, National Environmental Policy, management of forest and degraded lands,
- d) Measures for Environmental Conservation: Vienna Convention, Montreal Protocol, Earth summit, Kyoto Protocol, World Summit on sustainable development, 2002 Carbon trade, IPCC.

Course Outcomes: After completion the course student would able to:

- ❖ Acquire complete knowledge of community, ecosystem and phytogeography
- ❖ Explain the structure, components, food chains and energy flows.
- ❖ Understand about vegetation and environmental pollution
- ❖ Interpret about environmental management

Suggested Readings:

1. Agarwal, S. K. (2020), Principles of Ecology and Environmental Science, S. Chand Publishing, New Delhi
2. Banerjee, P.K. (2006), Introduction to Biostatistics. S. Chand and Co., New Delhi.
3. Chaudhary, B. L. (2019), Ecology and Environmental Studies, Scientific Publishers, Jodhpur
4. Frivedi, P.R. (2017), Environmental Education, A.P.H. Publishing, Corporation, New Delhi.
5. Ghose, M. K. (2022), Ecology and Environmental Conservation, The Energy and Resources Institute (TERI), New Delhi
6. Husain, Majid (2020), Environmental Ecology, Biodiversity, and Climate Change, McGraw Hill Education, New Delhi

7. Joshi, P. C. (2020), Ecology and Environmental Sustainability, Pointer Publishers, Jaipur
8. Maiti, S. K. (2021), Ecology and Environmental Science: Theory and Practice, PHI Learning Pvt. Ltd., New Delhi
9. Odum, E.P. 2008. Ecology. Oxford and IBH Publisher.
10. Reddy, M. Anji (2019), Ecology and Sustainable Development, BS Publications, Hyderabad
11. Santra, S. C. (2021), Ecology and Environmental Biology, Books and Allied (P) Ltd., Kolkata
12. Sharma, P. D. (2019), Ecology and Environment, Rastogi Publications, New Delhi
13. Sharma, Raj Kumar (2022), Environmental Science, K.K. Publication, New Delhi.
14. Singh, A. K. (2019), Ecology and Environmental Management, International Book Distributing Co., Lucknow
15. Upadhyay, Pradeep Kumar (2021), Environmental Education, K.K. Publication, New Delhi.
16. Vashisht, Aashish (2018), Environmental Nama, Kalpana Publication, Delhi.
17. उपाध्याय, प्रदीप कुमार(2022), पर्यावरण अध्ययन, के. के. पब्लिकेशन, नई दिल्ली।
18. वशिष्ट, आशीष (2018), पर्यावरणनामा, कल्पना प्रकाशन, नई दिल्ली।

Presentation Work (Any One)

1. Prepare a power point presentation of given course content
2. Prepare a working model related to course content; prepare report and record video of its working
3. Prepare a creative video presentation related to any environmental issue or any topic related to botany

BOTANY PRACTICAL VI

1. Study different types of placentation, ovules and special structures of ovule through permanent slides, specimens or photographs.
2. Study of female gametophyte through permanent slides/ photographs: types and ultra structure of mature embryo sac.
3. Study of pollen grains: fresh and acetolyzed showing ornamentation and aperture, pseudomonads, pollinia (slides/photographs/ fresh materials).
4. Study of the different stages of anther development.
5. Study of pollen morphology of available plants.
6. Study of monocotyledons and dicotyledons embryo of angiosperms through slides/ photographs.
7. Submission of economically important plants and plant products (cereals, pulses, spices, fibers, condiments, fat and oils, tea, coffee, wood, dyes, tobacco).
8. Study following specimens with special reference to:
 - Botany of the economically important part.
 - Processing if any involved.
 - Specimens of cereals, pulses, fibres, spices, beverage (tea, coffee), sugar, oil yielding plants and medicinal plants (mentioned in theory).
9. Microchemical test for starch, sugar, oils, proteins, fat, carbohydrate, lignin using wheat, maize, soyabean. Chana, sweet potato, clove, ground nut, mustard and match sticks.
10. Study of starch grains in potato.
11. Field trip to economically important place.
12. Collection, description and submission of at least 5 plants of ethnobotanical importance.
13. Study of adaptive anatomical and morphological features of Hydrophytes, Epiphytes and Xerophytes using plant material.
14. To study different statistical methods: mean, median and mode, standard error, standard deviation.
15. Regression analysis and application of statistical tests in environmental problems.
16. Determine the dissolved oxygen content in polluted and unpolluted water samples.
17. Field trip to a National Park/Biosphere reserve/Wild life Sanctuary (Student should submit a detailed project report based on the field trip. Evaluation of the project will be based on the detailed report and presentation).
18. Project work on a particular ecosystem/Polluted Site/ Level of Pollution in the City or Town/Land use site.

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE605MJ	Zoology-I	CE	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25 Practical	

Zoology-Paper-I: Evolution and Biostatistics

Objectives:

- ❖ To understand the process of evolution.
- ❖ To discuss concept the Lamarkism, Neo-Lamarkism and Darwinism.
- ❖ To classify and draws the Geological time scale.
- ❖ To understand aware the students for Palaentology Fossils and its significance

Unit –I: Evolution

- a) Basics and origin of life: Definition, pre-Darwinian theories of evolution;
- b) Miller- Urey experiment
- c) Micro-evolution: Lamarckism; Darwinism; Neo-Darwinism
- d) Evidences of evolution: Various evidences favoring evolution: Homology, analogy, vestigial organs; paleontological, embryological, biogeographically and biochemical evidences

UNIT II: Evolution II

- a) Macro-evolution: Geological time scale,
- b) Genetic basis of evolution: Hardy-Weinberg law,
- c) Variation, Adaptations and Isolation, Mimicry
- d) Formation of fossils and Important

UNIT III: Biostatistics Concept

- a) Biostatistics: Definition and Scope, Census and sampling methods
- b) Collection and Tabular Presentation of Data: Tabulation of data; Frequency
- c) Distribution Table; Continuous and Discontinuous Series
- d) Graphical Presentation of Data: Bar, Histogram, Line graph, Polygon, Pie Diagrams
Ogives

UNIT IV: Biostatistical Tools

- a) Measures of Central tendency: mean, median mode
- b) Measures of Dispersion, Mean deviation & Standard deviation, and Standard error.
- c) Concept of t Test
- d) Probability

Course Outcomes: After completion the course student would able to:

- ❖ Understand the process of evolution.
- ❖ Understand the Lamarkism, Darwinism and Neo-Darwinism.
- ❖ Interpret Geological time scale.
- ❖ Explain Palaentology Fossils and its significance.

Suggested readings:

1. Arumugam, N. (2011). Evolution, Biostatistics and Computer Application, Biology Books, India.
2. Arumugam, N. (2020). Genetics Evolution Biostatistics, Biology Books, India.
3. Banerjee, Kumar, Pranab (2020). Introduction to Biostatistics, S Chand & Co Ltd, India.
4. Ghoshai, Sanjib (2021). Problem Solving Approach on Molecular Biology, Genetics, Evolution, Biodiversity, Taxonomy & Biostatistics, Techno World Publication, India.
5. Kulkarni, A.P. (2020). Basics of Biostatistics, CBS Publishers and Distributors Pvt Ltd in India.
6. Rastogi, Bala Veer (2018). Biostatistics, Medtech Publishers, India.
7. Shukla, R S. and Chandel P.S. (2021). Cytogenetics, Evolution and Biostatistics, S chand · Publication, India.

Zoology-Paper-II: Economic Zoology

Objectives:

- ❖ To Understand the Various concepts in Sericulture, Lac culture and Apiculture.
- ❖ To interpret the various concepts in Chemical Control.
- ❖ To Understand aware the students and provides the economical importance of Vermiculture
- ❖ To Understand the Various concepts in Vector borne diseases, Animal husbandry.

Unit I: Economic Entomology- Insects of economic importance

- a) Sericulture: Types of Silkworms. Life cycle and rearing of Bombyx Mori-Production of silk, chemical Composition of Silk,
- b) Apiculture –Habits and Habitat, species of Honey Bees, method of Bee-keeping Honey Bee Product.
- c) Lac culture – Lac insect, Laccifer lacca - Life cycle, Cultivation of Lac , Lac products and Economic Importance

Unit-II: Economic Entomology

- a) Hazards of insecticides
- b) Insect pest Management
- c) Animal pest: Life cycle, damage and control of
 - I. House fly – Musca Domestica
 - II. Stable fly – Stomoxys calcitrans
- d) principle of poultry keeping

Unit III: Economics of aquaculture

- a) Pisciculture – Steps of Fish culture, Fish Product,
- b) Prawn culture -Culture techniques of fresh water Prawn,
- c) Pearl culture: Habit, Habitat, General characters, mantle & Shell, Formation & culture.

Unit IV: Economic importance of other animals

- a) Vector borne diseases. A brief account of insect vectors affecting the health of man and domestic Animals
- b) Animal husbandry: Introduction to common dairy animals; Techniques of dairy management
- c) Vermiculture, Vermi technology, Bio-Fertilizers

Course Outcomes: After completion the course student would able to:

- ❖ Discuss the various concepts in Sericulture, Lac culture and and Apiculture.
- ❖ Understand the various concepts in Chemical Control.
- ❖ Provide the economical importance of Apiculture.
- ❖ Understand the various concepts in Vector borne diseases, and Animal husbandry.

Suggested Readings:

1. Bhute, Kishore (2018). Applied and Economic Zoology, Economic Zoology, India.
2. Gupta, Kumar Sanjai and Dubey, Kumar Rajesh (2020) Parasitology & Applied Economic Zoology, Weser Books, India.
3. Islam, Aminul (2020). Textbook of Economic Zoology, International Publishing House Pvt. Ltd, India.
4. Jaiswal, Vinita (2019). Economic Zoology, PHI Learning, India.
5. Singh, B.D. and Mishra Tripurari (2023). Diversity of Non-Chordates and Economic Zoology, Thakur Publication Pvt. Ltd., India.
6. Shukla, G.S. (2018). Economic Zoology, Rastogi Publications, India.
7. Shukla, G.S. (2018). Economic Zoology, Chaukhamba Auriyantalaya, India.
8. Shukla, Kumar et al. Ashok (2020). Applied and Economic Zoology, Daya Publishing House, India.

Zoology-Paper-III: Ecology and Environmental Biology

Objectives:

- ❖ To differentiate current environmental issues based on Atmosphere.
- ❖ To understand Gain critical understanding on human influence on environment.
- ❖ To understand Positive attitude towards Biodiversity conservation.
- ❖ To describe the various concepts in Pollution.

Unit I: Atmosphere

- a) Atmosphere: Major zones and its importance, Composition of air
- b) Hydrosphere: Global distribution of water, Physico-chemical characteristics of water
- c) Lithosphere: Soil Layer; formation of soil
- d) Light: As A biotic factor; Physico-chemical characteristics of Light; Photoperiodism

Unit II: Ecosystem

- a) Ecosystem: Definition, Structure and functions; Types of Ecosystems; Food chain, Food web and ecological pyramids
- b) Ecosystem: Biogeochemical Cycle (O_2 , CO_2 , N,); Energy flow in an ecosystem,
- c) Population Introduction: Population characteristics, Population growth patterns: (exponential/ Malthusian and sigmoid growth patterns)
- d) Community Characteristics, Structure and method (Quadrant method Transit method, plotless method:

Unit III: Biodiversity & Conservation

- a) Various Aspects of Biodiversity, Degree of Diversity,
- b) Ex situ and in situ Conservation; Alpha, Beta and Gamma Diversity,
- c) Causes of reduction of Biodiversity
- d) Conservation measures of Animals.

Unit IV: Pollution

- a) Sources, effect and control measures of air pollution, e-pollution, Acid rain, green house effect, Ozone depletion and global warming
- b) Sources, effect and control measures of water pollution
- c) Sources effect and control measures of noise pollution
- d) Environmental law

Course Outcomes: After completion the course student would able to:

- ❖ Describe the current environmental issues based on ecological principles.
- ❖ Gain critical understanding on human influence on environment.
- ❖ Aware about the positive attitude towards Biodiversity conservation.
- ❖ Understand the various concepts in Pollution.

Suggested Readings:

1. Ahluwalia, V.K. (2020). Environmental Pollution and HealthEnergy and Resources Institute, India.
2. Gupta, Meetu (2018). Fundamentals of Environmental Biology, Dreamtech Press, India.
3. Kumar, Arvind (2020). Fresh-water Plankton and Macrophytes of India, Daya Publishing House in New Delhi, India.
4. Pandit, Vivek (2022). Taxonomy and Ecology of Climbers: Climbing Plants of India, springer, India.
5. Tripathi, Vijay (2020). Climate Change and Livestock Production, Dehradun, India.
6. Tripathi, Vijay (2019). Microbial Genomics in Sustainable Agroecosystems: Volume 2, Springer, India.
7. Verma, P.S. (2020). Environmental Biology (Principles of Ecology), Daya Publishing House in New Delhi, India.

Presentation Work (Any One)

1. Prepare a power point presentation of given course Content.
2. Prepare working model related content; prepare report and record video of its working.
3. Prepare a creative video presentation related to any Animal kingdom to issue or any topic related to Zoology.

Semester VI
Zoology Practical

Paper-I: Evolution and Biostatistics

1. Construction of frequency table, histograms, Polygons, Pie Charts
2. Exercise on Mean, Mode, Median, Std. Deviation, Std. error, Probability

Paper-II: Economic Zoology

1. Study of the following prepared slides/specimens: Honey Bee, Silk Worm, Termite, Earthworm types (any two)- (*Drawida modesta*, *Pheretima posthuma*; Fish parasites, Larvivorous fishes (*Guppy*, *Gambusia*)
2. Economic importance of commonly occurring insect pests and preparation of life cycle of these pests.
3. Study of Beneficial insects and their life stages.

Paper-III: Ecology & Environmental Biology

1. Determination of population density in a terrestrial community or hypothetical community by quadrat method.
2. Study of life table and fecundity table, plotting of the three types of survivorship curves from the hypothetical data.
3. Estimation of pH, chlorides and water vapour quantity in soil
4. Estimation of Dissolved oxygen, Salinity, pH, free CO₂ in water samples
5. Plankton study in Fresh water
6. Study of natural ecosystem and field report; Visit to a National park and Sanctuary (candidates are required to submit the report of the visit)

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE606FD	Assessment and Evaluation	CC	2	15	35	50

Objectives:

- ❖ To equip student-teachers with the knowledge and abilities required to develop and apply assessment methods
- ❖ Suitable for assessing curriculum outcomes relating to all areas of learning
- ❖ Suitable not only for subject-related learning but also for assessing general curriculum outcomes
- ❖ It is also suitable for testing problem solving, critical thinking, creative thinking, communication skills, judgement and decision making, moral and ethical reasoning, etc.

UNIT-I: Assessment and Education & Process of Assessment and Evaluation

- a) Assessment and Evaluation:
 - Meaning and significance of assessment and evaluation in educational field.
 - Conceptual Clarity and purpose of Measurement, Assessment, Examination, Appraisal and Evaluation in Education.
 - Course Outcomes across the stages and assessment.
 - Taxonomy of Objectives (Revised in 2001) and Implications.
- b) Forms of Assessment
 - Formative, Summative, diagnostic, prognostic.
 - Internal and External assessment.
 - Assessment For learning, of learning and as learning.
 - Authentic Assessment; Online Assessment.
- c) Improving Assessment and Evaluation in Schools: Brief Historical Review (1975, 1988, 2000, 2005, 2020)
- d) Formative and Summative Assessment: Concept and Characteristics.
- e) Approaches to assess and evaluate student performance such as time-constrained examinations; closed/open-book tests; problem-based assignments; practical assignment reports; observation of practical skills; individual and group project reports; oral presentations; viva-voce interviews; computerized adaptive testing; peer and self- assessment etc.
- f) Assessing Higher Order Thinking Abilities: Problem solving, critical thinking, creative thinking, communication skills, judgement and decision making, ethical and moral reasoning.
- g) Tools and Techniques
 - Observation, rating scale, check list, anecdotes, interviews.
 - Assessment of attitudes and interests.
 - Socio-metric techniques.
 - Criteria for assessment of social and personal behavior.
 - Self-assessment and Peer Assessment.

UNIT-II: Analysis and Interpretation

- a) Analysis of students' performance and scores: credit and grading
- b) Graphical representation (Histogram, Frequency Curves)
- c) Interpretation of student's performance based on the analysis and their further uses in improving learner's performance: credit and grading, constructive feedback.
- d) Reporting student's performance: 360-degree progress reports, cumulative records and their uses, portfolios, PTA meetings, qualitative reporting based on the observations, descriptive indicators in report-cards.

Assignment & Practical Work (Any One)

1. Review of various education commission, Policies and reports and NCF 2005 to get a brief view of the recommendations on Assessment and Evaluation.
2. Constructing a unit test using table of specifications.

3. Construction of any one of the tools (rating scale, check list, observation schedule, etc.) and administering it to group of students or using it to observe the school and classroom environment and interpreting it.
4. Analysis of question papers of various Boards.
5. Analysis of report cards - State and Central (CBSE)
6. Preparing format of 360-degree report Card.
7. Review of Course Outcomes by NCERT in different subject areas.
8. Interviews with teachers and students to study the assessment practices, issues and problems related to it followed by presentation.
9. Reviewing Assessment Discussions in NPE (2020).

Course Outcomes: After completion of this course, student teachers will be able to:

- ❖ Use different approaches to assess and evaluate of student performance such as time-constrained examinations; closed/open-book tests; problem-based assignments; practical assignment reports; observation of practical skills; individual and group project reports; oral presentations; viva voce interviews; computerized adaptive testing; peer and self- assessment etc.,
- ❖ Develop and use informal and formal diagnostic, formative, and summative assessment strategies to monitor student learning levels and help the teacher continuously revise teaching-learning processes to optimize learning and development for all students,
- ❖ Develop an understanding among student teachers of the approaches to provide timely, effective, and appropriate feedback to students about their performance relative to the expected course outcomes and organizing learning enhancement initiatives that are required to bridge the gap in student learning levels,
- ❖ Present report on student achievement, making use of accurate and reliable records etc.
- ❖ Develop assessment “as”, “of”, and “for” learning that are aligned to the expected course outcomes,
- ❖ Design the progress card of students based on school-based assessment to make it a holistic, 360-degree, multidimensional report that reflects the progress as well as the performance of learners assessed through self-assessment and peer assessment, project- based and inquiry-based learning, quizzes, role plays, group work, portfolios, etc., along with teacher assessment that would provide students with valuable information on their strengths, areas of interest, and needed areas of improvement.

Suggested Readings:

1. Agrawal, J C. (1997). *Essential of Examination System, Evaluation, Test and Measurement*. New Delhi: Vikas Publishing House Pvt. Lt.
2. Banks, S.R. (2005). *Classroom Assessment: Issues and Practices*. Boston: Allyn & Bacon.
3. Blooms, B.S. (1956). *Taxonomy of Educational Objective*. New York: Longman Green and Company.
4. Cooper, D. (2007). *Talk About Assessment, Strategy and Tools to Improve Learning*. Toronto: Thomson Nelson.
5. Earl, L.M. (2006). *Assessment of Learning: Using Classroom Assessment to Maximize Student Learning*. Thousand Oaks, Clifornia: Corwin Press.
6. Gronlund, N.E. (2003). *Assessment of Student Achievement*. Boston: Allyn & Bacon.
7. Kaplan, R.M. & Saccuzzo D.P. (2000). *Psychological Testing, Principles, Application & Issues*. California: Wordsworth.
8. Linn, R.L. & Gronlund, N.E. (2000). *Measurement and Assessment in Teaching*. London: Merrill Prentice Hall.
9. Noll, N.H. S cannell, D.P. & Craig, RC. (1979). *Introduction to Educational Measurement*. Boston: Houghton Mifflin.
10. Macmillan, J.H. (1997). *Classroom Assessment, Principles and Practice for Effective Instruction*. Boston: Allyn and Bacon.
11. Hopkins, KD. (1998). *Educational and Psychological Measurement and Evolution*. Boston: Allyn and Bacon.
12. Chohen, R.J., Swerdlik, M.E., & Phillips, S.M. (1996). *Psychological testing and Assessment. An Introduction to the Test and Measurement*. California: Mayfield Publishing Co.

13. National Council of Educational Research and Training (2005). National Curriculum Framework, New Delhi: NCERT
14. National Council of Educational Research and Training (2006). Position paper: Examination Reform. New Delhi: NCERT
15. National Council of Educational Research and Training (2008). Source Book on Assessment for class I-V: Social Science. New Delhi: NCERT
16. मिश्रा, महेन्द्र कुमार (2007). शैक्षिक प्रौद्योगिकी एवं कक्षा-कक्ष प्रबन्ध, युनिवर्सिटी बुक हाउस, जयपुर.
17. सिंह, मया शंकर (2007). शिक्षण तकनीक एवं शिक्षा के नूतन आयाम, अध्ययन पब्लिशर्स एण्ड डिस्ट्रीब्यूटर्स, नई दिल्ली-110002

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE607FD	Inclusive Education	CC	2	15	35	50

Objectives:

- ❖ This course seeks to orient student teachers to the approaches to bridging gender and social category gaps in terms of participation rates and student learning levels at all levels of school education.
- ❖ To improve participation and learning levels of children from socio-economically disadvantaged groups (SEDGs).
- ❖ To provide orientation to necessary strategies.
- ❖ Classifying categories, especially women and transgender persons, broadly based on socio-cultural identities (such as Scheduled Caste, Scheduled Tribe, OBC and Minority).
- ❖ Broadly categorizing students based on geographical identity (such as students from remote locations, villages, small towns and aspiring districts), disability (including learning disability), linguistic identity and socio-economic status (such as migrant communities, children in vulnerable situations including low-income families, orphans and urban poor).

Course Contents:

UNIT – I: Inclusion and Education

- a) Conceptual Clarity, relation, and significance with special reference to: UNCRPD 2006, RPWD Act, 2016 with special reference to Indian Context.
- b) Clarity of various terms and phrases associated with Inclusive Education: Integrated Education, Special Education, Impairment and Disability, Assessment and Evaluation, Curriculum, adaptation, modification and differentiation, universal design of learning
- c) Shifting from Disability to the Inclusive view.
- d) Introductory reference of Policies/Acts with reference to educational implications for Children with Disabilities: Right to Education Act, 2009/ 2012, National Educational Policy, 2020

UNIT–II: Children with Disabilities and Marginalized Groups

- a) Nature and needs of children with sensory impairments: cognitive impairments and intellectual disability, physical disabilities, cerebral palsy, multiple disabilities.
- b) Specific needs of children with behavioral, emotional learning disabilities
- c) Language-appropriate teaching-learning materials (e.g., textbooks in accessible formats such as large print and Braille)
- d) Educational needs of children belonging to Marginalized Groups.

Assignment & Practical Works: (Any one)

1. Developing a checklist for identifying the various needs of children with disabilities.
2. Visiting schools of different categories and talking to parents, teachers, and Children with and without disabilities and listing the problems faced by these children and the families at the local level in gaining access to education.
3. Analyzing RPWD Act 2016 and list its implications for CWD in inclusive settings.
4. Outlining the problems faced by children with Visual Disabilities while learning mathematics and EVS.
5. Giving a few exemplary adaptations based on the Preparatory Level textbooks.
6. Outlining the problems faced by children with hearing impairments while learning language. Give a few exemplar adaptations based on the primary level textbooks.
7. Students work in small groups of 10 or so to prepare a street play highlighting the meaning and provisions of inclusive education.
8. Analyzing the Context of NEP 2020 in the light of Inclusive Education

Course Outcomes: After completion of this course, student teachers will be able to:

- ❖ Able to orient student teachers to the approaches to bridging gender and social category gaps in terms of participation rates and student learning levels at all levels of school education.
- ❖ Will provide the participation and learning levels of children from socio-economically disadvantaged groups (SEDGs).
- ❖ Will provide orientation to necessary strategies.

- ❖ Will Classifying categories, especially women and transgender persons, broadly based on socio-cultural identities (such as Scheduled Caste, Scheduled Tribe, OBC and Minority).
- ❖ Will categorizing students based on geographical identity (such as students from remote locations, villages, small towns and aspiring districts), disability (including learning disability), linguistic identity and socio-economic status (such as migrant communities, children in vulnerable situations including low-income families, orphans and urban poor).

Suggested Readings:

1. Ainscow, M. (2020). Promoting Equity in Schools: Collaboration, Inquiry, and Ethical Leadership. Routledge.
2. Booth, T., & Ainscow, M. (2011). The Index for Inclusion: Developing Learning and Participation in Schools (3rd ed.). CSIE.
3. Florian, L. (2014). The Sage Handbook of Special Education (2nd ed.). SAGE Publications.
4. Mittler, P. (2012). Working Towards Inclusive Education: Social Contexts. Routledge.
5. कुशवाहा, पुष्पलता एवं सक्सेना, कनक (2006). शैक्षिक प्रबन्धन एवं विद्यालय संगठन, आस्था प्रकाशन, जयपुर
6. परवीन, आबिदा (2013). शिक्षण एवं अधिगम के मनो-सामाजिक आधार, आस्था प्रकाशन, जयपुर
7. बघेला, एच. एस. (2007). शैक्षिक प्रबन्धन एवं विद्यालय संगठन, राजस्थान प्रकाशन, जयपुर
8. बिन्दु, आभारानी, सक्सेना, स्वाति (2008). विशिष्ट बालक, अग्रवाल पब्लिकेशन्स, आगरा
9. योगेन्द्रजीत, भाई (2008). शिक्षा मे नवाचार और नवीन प्रवृत्तियाँ, विनोद पुस्तक मंदिर, आगरा
10. सुखिया, एस.पी. (2008). विद्यालय प्रशासन एवं संगठन, विनोद पुस्तक मंदिर, आगरा
11. हन्फी, ऐम. ए. एवं हन्फी एस.ए. (2009). अधिगमकर्ता का विकास एवं शिक्षण अधिगम प्रक्रिया, विनोद पुस्तक मंदिर, आगरा, जयपुर

12.

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE608AV	Mathematical and Quantitative Reasoning	CC	2	15	35	50

Objectives

- ❖ Understand the analysis and interpretation of quantitative data
- ❖ Draw correct conclusions from numerical representations such as formulas, explanations, graphs or tables
- ❖ Develop critical thinking and problem-solving skills using mathematical and quantitative reasoning methods
- ❖ Learn to analyze educational data and build educational models
- ❖ Analyze mathematical and quantitative reasoning problems and solutions

Unit – I: Introduction to mathematical and quantitative reasoning

- a) Meaning, nature and scope of mathematical and quantitative reasoning.
- b) Importance of mathematical and quantitative reasoning in various fields.
- c) Types of quantitative reasoning.
- d) Usage of mathematical and quantitative reasoning.
- e) Concept of mathematization.

Unit – II: Data Analysis & Interpretation

- a) Data requirement, different sources of data.
- b) Concept of data interpretation (equation, diagram, graph, tables)
- c) Statistical analysis of data in educational context and its applications (measures of central tendency, measures of variability, percentile)
- d) Visual and numerical representation of data and its application (bar diagram, histogram, pie charts)
- e) Learning analytics: concept, significance, types, levels, and its applications in educational context.

Course Outcomes: After completion of this course, student will be able to:

- ❖ Adapt mathematical reasoning to solve problems in the real world and explain some fundamental ideas and tenets in this field
- ❖ Analyze and interpret quantitative data
- ❖ Interpret & deduce the right conclusions from numerical representations like formulas, interpret, graphs, or tables
- ❖ Demonstrate critical thinking and problem-solving skills using mathematical and quantitative reasoning methods
- ❖ Evaluate operational matrix
- ❖ Analyze educational data and create educational model & use them in decision making
- ❖ Analyze and evaluate mathematical and quantitative reasoning problems and solutions

Assessment and Practical (Any One)

1. Meaning, nature and scope of mathematical and quantitative reasoning.
2. Concept of data interpretation (equation, diagram, graph, tables)
3. Visual and numerical representation of data and its application (bar diagram, histogram, pie charts)

Suggested Readings:

1. NCERT (2019). Mathematics: Textbook for class IX -X.

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE609SI	School Observation (field Practice)	CC	2	School Observation (field Practice) 50		50

Objectives:

- ❖ To understand the classroom teaching
- ❖ To able to take classes in schools.
- ❖ To understand the units and teaching lessons.
- ❖ To conduct various school activities.

Course Contents:

UNIT-I School Observation

- a) Schools and classroom teaching across schools in different contexts
- b) Practice Teaching in School by assisting the classroom Teacher in a series of individual lessons
- c) 'Block or Unit' Teaching in School by teaching a logical set of lessons or a complete unit
- d) Acquaint the various schooling systems

UNIT-II School experience and activities

- a) Experience the processes, practices, and overall environment of the school
- b) Establish a rapport with all the stakeholders of the school system
- c) Process of conducting different activities in the school
- d) Study availability and the work of human resources

Assignment & Practical Works: (Any one)

1. Write the term paper on any above topic.
2. Prepare a report on conducting different activities in school
3. Write a report on availability and the work of human resources
4. Make a plan for teaching lessons of a complete unit

Course Outcomes: After completion of this course students would able to:

- ❖ To understand the school environment
- ❖ To able to Acquaint the schooling systems
- ❖ To understand the units and teaching lessons.
- ❖ To conduct various school activities.

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE610OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Mathematics at Secondary Stage – Course (III)	Content cum Pedagogy of at Secondary Stage – Course (III) Any Two CE CE	2	15	35	50
BBSE611OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Physical Sciences at Secondary Stage – Course (III)		2	15	35	50
BBSE612OP	Stage-Specific Content-Cum Pedagogy	Content cum Pedagogy of Biological Sciences at Secondary Stage – Course (III)		2	15	35	50

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE610OP	Content cum Pedagogy of Mathematics at Secondary Stage - Course (III)	CE	2	15	35	50

Objectives:

- ❖ To appreciate the concept of evaluation.
- ❖ To understand various types of test items.
- ❖ To prepare blue print for conducting a test.
- ❖ To prepare test paper for Mathematics class.
- ❖ To develop enrichment material in Mathematics teaching.
- ❖ To develop capability of evaluation of practical work in Mathematics.
- ❖ To use various methods with appropriateness of content, level and classroom situation

Course Contents:

UNIT-I Evaluation

- a) Concept of evaluation
- b) Types of test items.
- c) Construction of various test items.
- d) Preparation of blue print

UNIT-II: Diagnostic and remedial teaching

- a) Preparation of achievement test in Mathematics.
- b) Diagnosis and remedial teaching in Mathematics.
- c) Preparations of standardized vs. teacher made test in mathematics.
- d) Enrichment material in Mathematics teaching.
- e) Evaluation and practical work in Mathematics.

Assignment & Practical Works: (Any one)

1. Write the term paper on any above topic.
2. Prepare a blue print for secondary level mathematics.
3. Make a plan for diagnostic and remedial teaching of mathematics

Course Outcomes: After completion of this course students would able to:

- ❖ Appreciate the concept of evaluation.
- ❖ Understand various types of test items.
- ❖ Prepare blue print for conducting a test.
- ❖ Prepare test paper for Mathematics class.
- ❖ Develop enrichment material in Mathematics teaching.
- ❖ Develop capability of evaluation of practical work in Mathematics.
- ❖ Use various methods with appropriateness of content, level and classroom situation.

Suggested Readings:

1. Mishra, D. D. Chauhan R.S. (2024). Ganit Shikshan, Agrawal publications, Agra
2. Pandey, P. (2020). Pedagogy of Mathematics Teaching, Supernova Publishers and Dist. Pvt. Ltd., Kolkata
3. Dak, S. (2018). Ganit shikshan, kalpna Publication, Jaipur
4. Rawat, M.S., Agrawal, M.B.L. Shrivastava, D.N. (2016). Ganit shikshan, Shri Vinod Pustak
5. Mandir Agra
6. James, A. (2014). Teaching of Mathematics, Neelkanth Prakashan, New Delhi

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE611OP	Content cum Pedagogy of Physical Sciences at Secondary Stage – Course (III)	CE	2	15	35	50

Objectives:

- ❖ To appreciate the concept of evaluation.
- ❖ To understand various types of test items.
- ❖ To prepare blue print for conducting a test.
- ❖ To prepare test paper for physics class.
- ❖ To develop enrichment material in physics teaching.
- ❖ To develop capability of evaluation of practical work in physics.
- ❖ To plan, equip and organize physics practical in the laboratory.
- ❖ To use various methods with appropriateness of content, level and classroom situation.

Course Contents:

UNIT-I Evaluation

- a) Concept of evaluation
- b) Types of test items.
- c) Construction of various test items.
- d) Preparation of blue print

UNIT-II Dignostic and remedial teaching

- a) Preparation of achievement test.
- b) Diagnostic test in physics.
- c) Remedial teaching in physics
- d) Enrichment material in physics teaching.
- e) Evaluation and practical work in physics.

Assignment & Practical Works: (Any one)

1. Write the term paper on any above topic.
2. Prepare a blue print for secondary level Physics.
3. Make a plan for diagnostic and remedial teaching of physics
4. Plan for organize physics practical in the laboratory.

Course Outcomes: After completion of this course students would able to:

- ❖ Appreciate the concept of evaluation.
- ❖ Understand various types of test items.
- ❖ Prepare blue print for conducting a test.
- ❖ Prepare test paper for physics class.
- ❖ Develop enrichment material in physics teaching.
- ❖ Develop capability of evaluation of practical work in physics.
- ❖ Plan, equip and organize physics practical in the laboratory.
- ❖ Use various methods with appropriateness of content, level and classroom situation.

Suggested Readings:

1. Harison, C. (2021). Teaching secondary physics, Hooder publication, UK
2. Negi, J.S. (2020). Bhotik vigyan shikshan, vinod pustak mandir, Agra
3. Sood, J.K. (2017). Bhotik vigyan shikshan, Agrawal publications, Agra
4. Verma, D.K. (2016). Bhotik vigyan shikshan, Ocean publication Hyderabad.
5. Nayak, R.S., Chaturvedi, A. (2016). Bhotik vigyan shikshan, Thakur Publications pvt Ltd. Bhopal

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE612OP	Content cum Pedagogy of Biological Sciences at Secondary Stage – Course (III)	CE	2	15	35	50

Objectives

- ❖ To appraise different types of assessment and strategies for continuous assessment,
- ❖ To distinguish between assessment and evaluation,
- ❖ To compare merits and demerits of different types of assessment,
- ❖ To develop unit test item based on TOS and develop different type of test items,
- ❖ To construct and administer the achievement test,
- ❖ To familiarize with basic statistical methods for analyzing performance in tests,
- ❖ To plan offline and online activity for testing higher order thinking skills,
- ❖ To recognize challenges in modern day classrooms and plan appropriate strategies, related ICT integration and elaborate its use in classroom situations

UNIT-I 21st Century Skills for Learning, Research and Innovation

- a) Need for and importance of 21st century skills for learners and teachers
- b) Psychological, sociological, and philosophical perspective of teaching and learning Biological Sciences
- c) Qualities & Role of a teacher of a Biological Sciences teacher as professional for enhancing teaching learning skills
- d) Action research: meaning, significance, steps, and planning.
- e) Evidence-based practices and reflection, Recent trends in school-based research in Biological Sciences

UNIT – II Assessment and Evaluation & Research and Innovative Practices in Biological Sciences

- a) Assessment and evaluation: concept, need for and importance
- b) Assessment based on Course Outcomes, strategies for continuous assessment, school-based assessment, qualitative assessment; formative and summative assessment, formal, informal, and 360-degree assessment
- c) Performance assessment: assessment of group activities, field observations, recording and reporting, creating platform and portfolio management, assessment of lab skills, assignments, projects, and presentations based on the concepts of Biological Sciences
- d) Unit test based on Table of Specification (TOS) and its importance; basic steps of question paper setting
- e) Assessment and feedback mechanism in teaching learning the concepts of physical science at secondary stage

Assignment & Practical (Any One)

1. Prepare a term paper with ppt on any above topic in units
2. Prepare, administer, and analyze scores of an achievement test
3. Explore AI based assessment tools and prepare an E-Portfolio for a student of secondary stage
4. Identify a topic and Plan action research at secondary stage
5. Conduct Simulated Teaching session for the concepts of Biological Sciences and observation by self, peer, and teacher
6. Apply innovative practices in classroom teaching learning of Biological Sciences

Course Course Outcomes

After completion of this course, Student teachers will be able to:

- ❖ Appraise different types of assessment and strategies for continuous assessment,
- ❖ Distinguish between assessment and evaluation,
- ❖ Compare merits and demerits of different types of assessment,
- ❖ Develop unit test item based on tos and develop different type of test items,
- ❖ Construct and administer the achievement test,
- ❖ Familiarize with basic statistical methods for analyzing performance in tests,

- ❖ Plan offline and online activity for testing higher order thinking skills,
- ❖ Recognize challenges in modern day classrooms and plan appropriate strategies,
- ❖ Relate ict integration and elaborate its use in classroom situations.

Suggested Readings:

1. Choudhary, S. (2010). Teaching of Biology, APH Publishing Corporation, New Delhi.
2. Joshi, S.R. (2005). Teaching of Science, A.P.H. Publishing Corporation, New Delhi.
3. Lakshmi, Gade & Bhuvneswara, Rao Digumarti Bhaskara, (2004). Methods of Teaching Life Science, Discovery Publishing House, New Delhi.
4. Mohan, Radha (2007). Innovative Science Teaching, Prentice Hall of India (p) Ltd., New Delhi.
5. National Education Policy 2020, MoE, Government of India.
6. National Steering Committee for National Curriculum Frameworks, (2023). Draft National Curriculum Framework for School Education.
7. NCERT, Textbooks of Biological Sciences at Secondary Stage.
8. Singh, Yogesh Kumar & Nath, Ruchika (2005). Teaching of General Science, A.P.H. Publishing Publishing Corporation, New Delhi.
9. Sood, J. K. (1987). Teaching of Life Science, Kohali Publishers, Chandigarh.
10. Yadav, M. S. (2000). Modern methods of Teaching Science, Anmol Publishers, Delhi.
11. कुलश्रेष्ठ, प्रदीप कुमार (2006). विज्ञान शिक्षण, विनोद पुस्तक मंदिर, आगरा
12. भूषण, शैलेन्द्र (2008). जीव विज्ञान शिक्षण, विनोद पुस्तक मंदिर, आगरा
13. मंगल, एस. के. (2010). जैविक विज्ञान शिक्षण, लॉयल बुक डिपो, मेरठ
14. माहेश्वरी, बी. के. (2003). जीव विज्ञान शिक्षण, सूर्या पब्लिकेशन, मेरठ
15. शर्मा, एस. आर. (2008). विज्ञान शिक्षण, अर्जुन पब्लिशिंग हाउस, नई दिल्ली
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(B.Sc.-B.Ed) Semester-VII

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE701FD	Perspectives on School Leadership and Management	CC	2	15	35	50

Objectives:

- ❖ To develop the fundamental perspective of the theoretical tenants of administration and management.
- ❖ To understand the relationship between educational administration and human relations to enhance the effectiveness of organization.
- ❖ To know and analyze the causes and types of role conflicts in organization and resolve them.
- ❖ To be acquainted with the procedure of decision making and scientific management.
- ❖ To make the students with new trends and techniques of educational management.

Course Contents:

Unit -I: School and Management

- a) Concept, Nature, Scope, and type of school Management.
- b) understanding the Structure of school management at India.
- c) Management at different levels - Elementary, Secondary and Higher Education
- d) Educational planning: Concept, Types and Approches
- e) Challenges in school management

Unit -II: Educational Leadership and Decision Process

- a) Concept, Types and Styles of Educational Leadership.
- b) Concept, Types and styles of Decision making.
- c) Educational planning: Concept, Types and Approches
- d) Head-Master– Merits, work, duties and leadership
- e) Role of NCERT in school education

Assignment: (Any one)

1. Prepare a report on recent state/central level schemes related to education and their administration.
2. Prepare a report on any agency related to educational administration at state/National level and its major functions.
3. Prepare ppts on historical development and important contribution related to principles of educational administration and management.
4. Prepare ppts on survey report related to organizational climate of any school and their related remedies.

Course Outcomes: After completion of this course students would able to:

- ❖ Develop the fundamental perspective of the theoretical tenants of administration and management.
- ❖ Understand the relationship between educational administration and human relations to enhance the effectiveness of organization.
- ❖ Know and analyze the causes and types of role conflicts in organization and resolve them.
- ❖ Acquainted with the procedure of decision making and scientific management.

References:

- 1 मिश्रा, महेन्द्र कुमार (2008). शैक्षिक प्रबन्धन एवं विद्यालय संगठन, यूनिवर्सिटी बुक हाऊस (प्रा.) लि, जयपुर
- 2 सुखिया, उस. पी. (2008). विद्यालय प्रशासन, संगठन एवं स्वास्थ्य शिक्षा, विनोद पुस्तक मंदिर आगरा
- 3 प्रसाद, केषव (2008). विद्यालय व्यवस्था, विनोद पुस्तक मंदिर आगरा
- 4 वर्मा, जे. पी. (2007). शैक्षिक प्रबन्धन, राजस्थान हिन्दी ग्रन्थ अकादमी, जयपुर।
- 5 ओड, एल. के. (2007). शैक्षिक प्रशासन, राजस्थान हिन्दी ग्रन्थ अकादमी, जयपुर।
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- 7 सिडाना, अशोक, शर्मा, अंजलि (2007). शैक्षिक प्रबन्धन एवं विद्यालय संगठन, शिक्षा प्रकाशन, जयपुर
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Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE702FD	Curriculum Planning & Development	CC	2	15	35	50

Objectives:

- ❖ To know the concept objective and principles of curriculum.
- ❖ To develop the idea and bases of curriculum.
- ❖ To understand various types of curriculum.

Course Contents:

Unit- I Curriculum Concept

- a) Curriculum: Meaning, Definition, Characteristics, Aims, Importance
- b) Principle of curriculum construction
- c) Components of curriculum; objective, content, learning experiences and evaluation
- d) Bases of curriculum development, philosophical, psychological, sociological
- e) Difference between curriculum and syllabus.

Unit- II Types of curriculums

- a) Activity centered and child centered
- b) Subject centered and core centered
- c) Experience centred and community centered
- d) Spiral curriculum and Hidden Curriculum
- e) NEFT 2005
- f) National Education Policy 2020 (NEP 2020)

Assignment (Anyone)

- 1 One term paper on the topic related with the unit.
- 2 Preparation of any one article on curriculum.
- 3 Review of present curriculum (Optional subject related)
- 4 Curriculum framework for 10th class.

Course Outcomes: After completion of this course students would able to:

- ❖ Understand the concept, objective and principles of curriculum.
- ❖ Develop the idea and bases of curriculum.
- ❖ Evaluate the relevancy of curriculum.
- ❖ Describe various approaches to curriculum construction

Referances:

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Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE703AV	Art in Education	CC	2	15	35	50

Objectives:

- ❖ The course seeks to develop an understanding of Art with special reference to its relevance in human life in general and Education in particular.
- ❖ It will further develop imagination and sense of appreciation and aesthetic of art.
- ❖ The theoretical considerations of Art Education are highlighted from Indian and western perspectives of art in Life.
- ❖ The course talks about the fundamental principles of Art Education at school level.
- ❖ The pedagogical issues of art education and approaches to teaching-learning process are also discussed.

Course Contents:

UNIT-I: Art and Education

- a) Conceptual clarity, relationship and significance of studying art education in Human life.
- b) Historical development of art education in school education.
- c) Goals of studying art education in school curriculum at different stages.
- d) Perspective of NEP 2020 on Art Education

UNIT-II: Theoretical Consideration of Art Education

- a) Philosophical, psychological and sociological perspective of Art Education.
- b) Formal and informal theories of art.
- c) Indian and Western perspective of art in life.
- d) Critical analysis of theories of Art Education.

Assignment & Practical Works: (Any One)

1. Preparing multimedia material for Art Education in senior secondary schools.
2. Preparation of instructional material for education in the arts for secondary school.
3. Organizing the Art Club.
4. Case studies of the children's work of art and they're understanding of the concept of Art.

Course Outcomes: After completion of this course, student teachers will be able to:

- ❖ Develop art appreciation with special reference to relevance and place of Art in human life,
- ❖ Acquaint with conceptual understanding of the key ideas of Art Education,
- ❖ Discuss critically the value development in Art Education.
- ❖ Understand the implications of Art in Education,
- ❖ Sensitize towards the problems and issues in Art Education,
- ❖ Sensitize towards pedagogical issues of Art Education,

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7. Prum, R. O. (2013). Evolutionary aesthetics in human and biotic artworlds.
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Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE704AV	Sports, Nutrition and Fitness	CC	2	15	35	50

Objectives:

- ❖ To develop the organic system of the body.
- ❖ Development of understanding and appreciation of the techniques and strategies of sports
- ❖ To develop correct health habits.
- ❖ Attainment of knowledge of proper health procedure as related with physical exercise.
- ❖ The physical education program will allow the students to participate in developmentally appropriate activities.

Course Contents:

Unit- I Role of sports in healthy life

- a) Role of Individual in improvement of sports environment.
- b) Physical and physiological benefits of Sports on children.
- c) Environmental factor which promotes and affects In Health.
- d) Importance and objective of Health education.

Unit- II Balanced Diet and fitness

- a) Balanced Diet and Nutrition: Macro and Micro Nutrients
- b) Need and importance of nutrition
- c) Diseases caused by lack of nutrition
- d) Role of aasan and meditation in health.

Assignment & Practical Works: (Any One)

- a) Write a Term paper on a topic given in the course
- b) Prepare a diet chart individually for kids, growing kids and elderly person.

Course Outcomes: After completion of this course students would be able to:

- ❖ Develop the organic system of the body.
- ❖ Understand and appreciation of the techniques and strategies of sports
- ❖ Aware about correct health habits.
- ❖ Attain knowledge of proper health procedure as related with physical exercise.

References:

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Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE705SI	School based – Research Project	CC	2	50	School based –Research Project	50

Objectives:

- ❖ To develop and understanding about the concept of research.
- ❖ To develop skill in preparing a good research project.
- ❖ To impart the sense of scientific attitude in research.
- ❖ To understand about the use of different types of research tools and techniques.
- ❖ To appraise critically about research work in school.

Course Contents:

Unit-I Concept of Research

- a) Meaning, Nature, Scope, Needs & Purpose of Educational Research
- b) Types of Research: Fundamental/ Basic, Applied and Action Research
- c) Formulation of Research Problems and questions
- d) Framing Hypothesis
- e) Tools of data collection
- f) Literature study

Unit- II Action research

- a) School based action research
- b) Case study
- c) Solutions to contextual problems/challenges
- d) Formulation of appropriate design
- e) Classification Analysis and interpretation of data
- f) Writing and sharing project report

Course Outcomes: After completion of this course students would able to:

- ❖ Understand action research and formulation of research problems.
- ❖ Prepare tool for action research.
- ❖ Can make data collection and analysis
- ❖ Write project report

References:

1. Gaulam, V. (2022). Methodology of Social Research, K K Publications, New Delhi
2. Best, J. & others (2017). Research in Education, Peaterson India Education Service pvt. Ltd. Noida
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Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE706SI	Internship in Teaching	CC	10	150 Internship+Practical 100 (Two Subject Final Lesson)		250

Objectives:

- ❖ To acquire the knowledge of internship.
- ❖ To understand skill focused teaching.
- ❖ To develop ability of comprehensive school teaching.
- ❖ To understand and organize various school activities.

Course Contents:

Unit-I: Undertaking the activities, the student-teachers 50 Marks

- a) Teaching as a substitute teacher.
- b) Mobilisation and development of teaching-learning resources.
- c) Preparation of a question papers and other assessment tools.
- d) Preparation of a diagnostic tests and organisation of remedial teaching.
- e) Undertake case study of a child.
- f) Undertake action research project on at least one problem area of schooling.
- g) Community work, community survey etc.
- h) Maintenance of a reflective diary or journal to record day to day happenings and reflections thereon.
- i) Writing a term paper on a selected theme.

Unit-II: Competencies and skills Lesson Plan 50 Marks

Lesson based on Various Approaches (40 each subject) Method, such as --

- a) Co-operative Learning
- b) Activities Based Approach
- c) Team Teaching
- d) Project Method
- e) Brain Storming
- f) Task Based
- g) Programme Instructions etc.

Unit-III: Plan, Blue Print, Achievement Test and Use of Teaching Aids 25 Marks

- a) Preparation of a question papers and other assessment tools.
- b) Preparation of a diagnostic tests and organisation of remedial teaching.
- c) Parent teacher association
- d) School management committee
- e) Teaching learning material

Unit-IV-School Activities 25 Marks

- a) Physical
- b) Cultural
- c) Literary
- d) Yoga Exercises

Practical

Final Lesson (Two teaching subject) 100Marks

Course Outcomes: After completion of this course students would able to:

- ❖ Acquire the knowledge of internship.
- ❖ Understand skill focused teaching.
- ❖ Develop ability of comprehensive school teaching.
- ❖ Understand and organize various school activities
- ❖ Ready to take up a teacher's responsibility independently.
- ❖ During internship, student-teachers would also gain an understanding of the community
- ❖ Understand the teaching community within the school.
- ❖ Avail opportunities to develop relationships with the children whom they are going to teach.

(B.Sc.-B. Ed) Semester-VIII

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE801FD	Philosophical & Sociological Perspectives of Education-II	CC	4	30	70	100

Objectives

- ❖ To acquaint philosophical & educational contribution of Indian educational thinkers
- ❖ To impart understanding of various Indian philosophies like Jainism, Buddhist, geet, Upanishad philosophy and their educational implications.
- ❖ To know socialization of the child, social change, social stratification, social mobility, social control
- ❖ To provide detailed issue related to socialization of education.

Unit- I: Philosophical & Educational Contribution of Indian Educational thinkers

- a) Swami Vivekanand
- b) Ravindra Nath Tagore
- c) Mahatma Gandhi
- d) Maharshi Arvind
- e) J. Krishana Murti

Unit- II: Indian Schools of Philosophy and their educational implications

- a) Jainism
- b) Buddhist
- c) Geeta
- d) Upanishad

Unit-III: Social Change and Mobility

- a) Socialization of the Child
- b) Social Change
- c) Social Stratification
- d) Social Mobility
- e) Social Control

Unit-IV: Issue Related to Socialization of Education

- a) Education as related to social equity and equality of educational opportunities
- b) Education of socially and economically disadvantaged section of the society with special reference to scheduled castes and scheduled tribes, women and rural population
- c) Solutions of social problems in modern India (Unemployment cultural pollution and indiscipline through survey method)

Assignment: (Any Two)

1. Solve old question papers.
2. Prepare a research paper on related subject matter.
3. Prepare project work on any one topic.
4. Preparation of one term paper with PPT

Course Outcomes: After completion of this course students would be able to:

- ❖ Acquaint philosophical & educational contribution of Indian educational thinkers
- ❖ Understand of various Indian philosophies like Jainism, Buddhist, geet, Upanishad philosophy and their educational implications.
- ❖ Understand socialization of the child, social change, social stratification, social mobility, social control
- ❖ Provided detailed issue related to socialization of education

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Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE802FD	Education Policy Analysis	CC	2	15	35	50

Objectives:

- ❖ To understand the theoretical frameworks and methodology of Policy Analysis
- ❖ To assess and evaluate the effectiveness of education policies at the national, state and programme levels.
- ❖ To equip with the knowledge and capacity to engage in education policy analysis and evaluate their effectiveness
- ❖ To acquaint with the processes involved in policy analysis for identifying, describing and comparing the policy options.

Course Contents:

UNIT-I: Analyses of Education Policies

- a) Meaning and significance of 'Policy on Education'
- b) Constitutional provision for Policy on Education
- c) Meaning, Types and Importance of Policy Analysis
- d) Fundamental principles for analyzing an Educational Policy
- e) Processes involved in Policy analysis.
- f) Critical analysis of Policies on Education since Independence: 1968, 1986 (Modified in 1992) and NEP 2020

UNIT-II: Implementation of an Educational Policy

- a) Meaning, need and significance of Policy Implementation
- b) Mechanism of Policy Implementation
- c) Strategies to Implement an Educational Policy
- d) Programme of action and implementation: Conceptual clarification and Significance.
- e) Role of different Organization/Groups: Legislature/Judiciary/Political Will and Parties/Voluntary Organizations/ Non-governmental organizations (NGOs)/Pressure Groups/Public.
- f) Challenges for implementation.

Assignment & Practical Works: (Any One)

1. Critical analysis of Policies on Education in India (1968 Or 1986 (Modified in 1992)
2. Critical analysis of NEP 2020 of India
3. Discuss the role of different Organization/Groups: Legislature/Judiciary/Political Will and Parties/Voluntary Organizations/Non-governmental organizations (NGOs)/ Pressure Groups/Public I Implement an Educational Policies

Course Outcomes: After completion of this course students would able to:

- ❖ Understand the theoretical frameworks and methodology of Policy Analysis
- ❖ Evaluate the effectiveness of education policies at the national, state and programme levels.
- ❖ Apply the knowledge of policy analysis in selection of most effective option that could address issues and problems confronting school education.;
- ❖ Point out their role in becoming active promoters of New Education Policy 2020 of India

References:

1. Mandal, Ajit; Dutta, Indrajeet; preetam, bhanu Pratap (2024). National Education Policy 2020: Policy reforms and Perspectives, Atlantic publishers & Distributors (P) Ltd.
2. Sharma, R.N.; Sharma, R.K. (2023). History of Education in India, Atlantic publishers & Distributors (P) Ltd.
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6. त्रिपाठी, जी. डी., चौधरी, सुरेश (2022), भारतीय शिक्षा प्रणालीदृ भाग 1 व 2 ऑक्सफोर्ड बुक कम्पनी, मुम्बई
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Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE803FD	Foundation of Education	Adolescence Education	Any One	4	30	70	100
BBSE804FD	Foundation of Education	Education for Mental Health	CE	4	30	70	100
BBSE805FD	Foundation of Education	Education for Sustainable Development		4	30	70	100
BBSE806FD	Foundation of Education	Emerging Technologies in Education		4	30	70	100
BBSE807FD	Foundation of Education	Gender Education		4	30	70	100
BBSE808FD	Foundation of Education	Guidance and Counselling		4	30	70	100
BBSE809FD	Foundation of Education	Human Right Education		4	30	70	100
BBSE810FD	Foundation of Education	Peace Education		4	30	70	100
BBSE811FD	Foundation of Education	Sport and Fitness Education		4	30	70	100
BBSE812FD	Foundation of Education	Tribal Education		4	30	70	100
BBSE813FD	Foundation of Education	Economics of Education		4	30	70	100
BBSE814FD	Foundation of Education	Jain Culture and Life Values		4	30	70	100

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE803FD	Adolescence Education	CE	4	30	70	100

Objectives:

- ❖ Teacher trainees can aware about concept & applications of Life Skills and Adolescence Education
- ❖ To aware the trainees about concept and developmental dimensions of Adolescence
- ❖ Trainees got informed about Thinking, Reasoning & Problem- solving abilities
- ❖ To know the related problems of Adolescence & remedies through Adolescence Education Programme
- ❖ To aware about the process of human development in context of Adolescence
- ❖ To build sensitivity towards Adolescent's needs and capabilities within their socio-cultural context

UNIT-I: Adolescence and Its Development

- a) Adolescence: Meaning & Characteristics
- b) Adolescence: Physical, Emotional, Social, Spiritual & Moral Development
- c) Adolescence: Fostering Thinking, Reasoning & Problem- solving abilities
- d) Adolescence: Related Problems & Remedies

UNIT-II: Life Skills and Adolescence Education

- a) Adolescence Education: concept, nature, challenges and significance
- b) Role of school, family, media, and community as social agencies in Adolescence Education
- c) Life Skills: Concept, nature and significance of core life skills for Adolescence Education
- d) Understanding sexual and reproductive health

UNIT-III: Adolescence Education Programme

- a) Adolescence Education Programme: Concept & Characteristics
- b) Historical Development of Adolescence Education Programme in India
- c) Goals and Significance of Adolescence Education Programme in India
- d) Adolescence Education Programme: Role of Teachers & Challenges in India

UNIT-IV: Pedagogical Issues

- a) Adolescence Pedagogy: Meaning, goals and significance
- b) Challenges of teaching adolescence education: understanding student's behavior, dealing with personal self-constraints, socio- cultural issues, class-room issues and challenges, methodology
- c) Preparation of teachers in context of Adolescence education
- d) Approaches to adolescence education: case studies and critical incidents, brainstorming, role-playing, gaming, value clarifications, question box, discussions and debates, video shows

Assignment & Practical Work: (Any Two)

1. Prepare a term paper with ppt on any above topic in units
2. Study of organizations (NGO) at National and International level
3. A research study or detailed case study: Adolescents' behavior in different socio- economic settings
4. A study on child abuse victims, adolescents in drug rehabilitation centers
5. Organize Adolescence Education sessions in Schools

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

- ❖ Develop sensitivity, understanding and knowledge about Adolescence and Adolescence Education
- ❖ Know the historical development of Adolescent Educational programme in India
- ❖ develop a positive attitude towards the importance of Adolescence Education programmes at the school level
- ❖ Inculcate a healthy attitude towards sex and sexuality, respect for the opposite gender and an understanding of responsible sexual behavior
- ❖ Develop an understanding about the desired life skills
- ❖ Acquire pedagogical knowledge related to skills for Adolescence Education programmes

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Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE804FD	Education for Mental Health	CE	4	30	70	100

Objectives:

- ❖ To understand the concept and process of Mental Health.
- ❖ To understand relationship between Education and Mental Health.
- ❖ To understand Grow mentally.
- ❖ To understand **Concept of Behavior**.
- ❖ To acquaint **Various Disorders**

Course Contents:

Unit –I Education for Mental Health

- a) Education for Mental Health: Concept, causes, affect,
- b) Steps to positive mental health
- c) Signs of mental health
- d) Adjustment: Concept, hygiene-process of adjustment
- e) Conflicts and Defense mechanism

Unit-II Grow mentally

- a) How to grow mentally?
- b) How to do self-care?
- c) How to feel better mentally?

Unit -III Concept of Behavior

- a) Behavior: Concept, Types
- b) Normal behavior
- c) Abnormal behavior

Unit-IV Various Disorders

- a) Disorders: Concept, Types of mental disorders
- b) Mood disorder
- c) Common mental disorders
- d) Emotional disorder
- e) Anxiety disorder

Assignment & Practical Works: (Any Two)

1. Administer any one standardized Psychological Test
2. Prepare any two-term paper based on the Mental Health content in the syllabus
3. Prepare a psychological test
4. Prepare a report on contribution of any two psychologists
5. Solve Examination Paper

Learning Outcomes: After completion of this course students would able to:

- ❖ Describe the concept and process of Mental Health.
- ❖ Understand Cognition and Learning.
- ❖ Explain relationship between Education and Mental Health
- ❖ Understand about the mental health and hygiene-process of adjustment, conflicts and defense mechanism.

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Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE805FD	Education for Sustainable Development	CE	4	30	70	100

Objectives:

- ❖ To clarify the meaning and significance of sustainable development.
- ❖ To describe the characteristics of ESD.
- ❖ To explain the role of education in sustainable development.
- ❖ To critically analyze the education in the context of sustainable development.
- ❖ To explain the role of education to achieve sustainable development.

Course Contents:

UNIT-I: Education and Sustainable Development

- a) Meaning, Goals, and Characteristics of ESD.
- b) Education for Sustainable Development: Historical Perspective, Philosophical, Sociological and Psychological Perspective.
- c) Role and challenges of Education for Sustainable Development.

UNIT-II Concept of SDGs.

- a) Meaning, Nature and Significance of SDGs.
- b) Role of Educational Institutions and Challenges to Achieve SDGs.

UNIT-III: SDGs. And NEP 2020

- a) SDGs And NEP 2020
- b) Sustainable Lifestyle, Gender Equality, Global Citizenship to Achieve Sustainable Development.

UNIT-IV Pedagogical Issues for Sustainable Development

- a. Good Mental Health and Wellbeing, Justice In Society for SDG.
- b. Pedagogical Issues for Sustainable Development.
- c. Globalization and the Environment: Capitalism, Ecology and Power.
- d. Issues for Sustainable Development.

Assignment & Practical Works: (Any one)

1. Write the term paper on any above topic.
2. Prepare a report on Issues associated with schooling, health & wellness of children
3. Plan for student-teacher in activities undertaken under the National Service Scheme
4. Prepare models for Environmental protection, rainwater harvesting, planting trees

Course Outcomes: After completion of this course students would able to:

- ❖ Clarify the meaning and significance of sustainable development,
- ❖ Describe the characteristics of ESD,
- ❖ Explain the role of education in sustainable development,
- ❖ Critically analyze the education in the context of sustainable development.,
- ❖ Explain the role of education to achieve sustainable development,

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Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE806FD	Emerging Technologies in Education	CE	4	30	70	100

Objectives:

- ❖ To explain the need and uses of technology in the field of education,
- ❖ To explain the digital technologies for creating the resources,
- ❖ To explain the experiences for all types of learners including differently abled.
- ❖ To explain the Create learning environment in the classroom,
- ❖ To explain the role of ICT to enhance the creativity of students,
- ❖ To explain the use of massive open online courses (MOOCs),
- ❖ To explain the role of ICT in authentic and alternative assessment,
- ❖ To explain the social, economic and ethical issues associated with the use of ICT.

Course Contents:

UNIT-I Education and Technology

- a) Relationship between Education and Technology.
- b) Meaning, Nature and significance of Technology in Education.
- c) Principles of using Technology in Education.
- d) Emerging trends in Technology in Education.

UNIT- II Information and Communication Technology

- a) Meaning, nature, types and Fundamentals of Information and Communication Technology.
- b) ICT Tools and application.
- c) Hardware and Software: meaning, difference and types.
- d) ICT application and multiple intelligence.

UNIT- III Technology in Education and Pedagogy

- a) Approaches of integration of Technology in teaching and learning.
- b) Subject specific online resources and their uses in lesson Planning.
- c) Use of Technology for children with special needs: Tools and processes; Universal Design for Learning.
- d) Massive Open Online Courses (MOOC)- Concept and use.

UNIT-IV Online and Offline Software Applications

- a) Application software- meaning and types.
- b) Word processing, spreadsheet, presentation: Features and educational applications.
- c) Blog and microblog– reflective journaling and other educational applications.
- d) E-learning course ware (e-content) design
- e) Multimedia tools: Audio editing, video editing, screen casting, graphic editing and basics of animation and creating interactive media.

Assignment & Practical Works: (Any Two)

1. Creating an account in wikispace/wikipedia/media wiki and adding/editing content.
2. Developing an educational blog in www.blogger.com, www. Word press. com.
3. A critical study of some e-learning course.
4. Developing a multimedia e-content for a topic.
5. Planning and creating digital rubrics for any topic
6. Organizing web conferencing using Skype/Yahoo/Messenger/Google+.
7. Interview of computer hardware engineer/ICT specialist regarding Hardware planning, evaluation, maintenance and upgradation
8. Review of NEP, National ICT policy and curriculum in the context of Technology in Education.
9. Enrolling and completing some MOOC courses of interest.
10. Developing technology integrated unit/lesson plans and trying them out in schools.

Course Outcomes: After studying this course, student teachers will be able to:

- ❖ Describe the need and uses of technology in the field of education,
- ❖ Use various digital technologies for creating the resources,
- ❖ Provide learning experiences for all types of learners including differently abled.
- ❖ Create learning environment in the classroom,
- ❖ Understand the role of ICT to enhance the creativity of students,
- ❖ View the use of massive open online courses (MOOCs),
- ❖ Explain the role of ICT in authentic and alternative assessment,
- ❖ Discuss the social, economic and ethical issues associated with the use of ICT.

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Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE807FD	Gender Education	CE	4	30	70	100

Objectives:

- ❖ Teacher trainees can aware about concept, methods & applications of Gender Education
- ❖ To aware the trainees about Constitutional Provisions with special reference to equity and equality rights of girls
- ❖ To know the analyzing school level curriculum from gender perspective
- ❖ To aware about the Sexual Child abuse from pre-primary stage to secondary stage
- ❖ To build sensitivity towards Legal perspectives for safety and security of girls and women

Unit I Gender and Education

- a) Conceptual clarity of related terms: Gender, sexuality, patriarchy, masculinity, feminist, gender bias, transgender, gender stereotyping
- b) Gender and school education
- c) Constitutional Provisions with special reference to equity and equality, rights of girls
- d) Education and women empowerment

Unit II Learning Gender Roles

- a) Gender Identity: social and cultural perspectives, role of family and school, media, and other formal and informal organizations/ agencies
- b) Socialization and learning gender roles
- c) Gender stereotyping/Role models
- d) Preventing Measures: role of school and home

Unit III Gender, Sexuality, Sexual Violence and Abuse

- a) Development of sexuality and its impact on children with reference to gender, body image, role-models
- b) Sexual Child abuse from pre-primary stage to secondary stage identifying signs of sexual abuse in children, Preventing measures
- c) Legal perspective: laws for safety and security of girls and women, implementation of the POCSO Act
- d) Violence in formal and informal institutions

UNIT IV Gender Education & Pedagogical Issues

- a) Analyzing classroom practices for Gender Education
- b) Creating gender friendly classrooms and school environment
- c) Analyzing Curriculum with gender perspective: Course Outcomes, textual material, teaching learning processes, language used, teaching aids, assessment strategies
- d) ICT pedagogy for gender sensitive school curriculum

Assignment & Practical Work: (Any Two)

1. Prepare a term paper with ppt on any above topic in units
2. Preparing a Report on National Educational Policy (2020) in the context of gender issues in Education
3. Analysis of textual materials from the gender perspective for identifying gender bias and gender stereotype in textual materials
4. Recommendations of commissions and policies on education to empower girls/women, Mahila Samakhya Programme
5. Field visits to schools to observe the schooling processes from a gender perspective.
6. Preparing Analytical Report on recent Legal perspective related to girls & women

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

- ❖ Clarify key concepts like gender, transgender, gender bias, gender stereotype, empowerment, gender parity, equity and equality and patriarchy
- ❖ Explain the shifting from women studies to gender studies
- ❖ Clarify gender issues in school, curriculum and textual materials across disciplines, pedagogical processes and its intersection with class, caste, religion and region
- ❖ Examine school environment, curriculum and pedagogy with reference to gender related issues,
- ❖ Address issues related to sexuality, sexual violence and abuse
- ❖ Draw framework for gender sensitized classroom and school environment

References:

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Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE808FD	Guidance and Counselling	CE	4	30	70	100

Objectives:

- ❖ To develop the understanding about the concept, need and significance of guidance and counseling
- ❖ To provide a comprehensive understanding of guidance and counselling principles, techniques and real-world applications
- ❖ To deal with psychological testing and diagnosis in counselling
- ❖ To examines the factors affecting guidance and counselling along with ethical considerations
- ❖ Importance of counselling for individuals with disabilities, visual impairment and hearing impairment
- ❖ To understand challenges related to providing counselling services in schools

Course Contents:

UNIT– I Guidance

- a) Meaning, nature, need, scope and Principles of Guidance
- b) Types of Guidance– Educational, Vocational and Personal
- c) Individual and Group Guidance
- d) Essential information for Effective Guidance
- e) Process of Guidance
- f) Importance of Guidance in schools for individual and for society

UNIT– II Counselling

- a) Meaning, Importance, Principles and Types (directive, non-directive and eclectic) of Counselling
- b) Distinction between Guidance and Counseling.
- c) Approaches to Counseling: behaviorally and cognitively oriented.
- d) Process of Counseling: initiating counseling, preparation and intake procedures, establishing rapport, termination of and response to initial interview.
- e) Establishing Structure: Setting boundaries, clarifying roles, setting goals, creating a safe environment and establishing a routine.
- f) Role of family, school and community in counseling

UNIT– III Tools and Techniques to Collect Data

- a) Psychological Testing and Diagnosis: Need and Nature.
- b) Test use and interpretation, appraisal techniques.
- c) Counseling Interview: Essential aspects, basis procedures, problems and their handling
- d) Material administration, scoring, interpretation, and evaluation of frequently used personality inventories/questionnaire and projective tests
- e) Personal orientation Tests and Rating Scales and their role in counseling
- f) Case Study: Need and Importance

UNIT– IV Issues Related to Guidance and Counselling

- a) Factors affecting Guidance and Counselling
- b) Ethical issues in Guidance and Counseling
- c) Limitation of diagnosis with special reference to Counselling
- d) Challenges to organize Guidance and Counselling programmes in schools
- e) Counselling and Guidance of persons with learning disabilities, visual and hearing impairment
- f) Challenges related to counselling services in schools

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

- ❖ Explain the basic meaning, need and significance of Guidance and Counseling in the context of education,
- ❖ Clarify the general social, psychological and historical perspective of Guidance and Counselling
- ❖ Explain the basic principles of Guidance and Counselling,
- ❖ Organize guidance program,

- ❖ Analyze the reports of educational commission and educational policies with reference to Guidance and Counselling
- ❖ Examine the factors affecting guidance and counselling along with ethical considerations
- ❖ Resolve the issues and challenges related to providing counselling services in schools

Assignment & Practical Works: (Any Two)

1. Survey in your local area school, identify student needs and problems of secondary level, provide them guidance and prepare a detailed report
2. Prepare a case study report of a student experiencing symptoms of depression and anxiety
3. Organize a guidance & counseling camp in a school and prepare its detailed report

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Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE809FD	Human Right Education	CE	4	30	70	100

Objectives:

- ❖ Develop analytical skills to question and appraise Human Rights policies and practices at national and international levels;
- ❖ Explore the substantive knowledge of policies concerning Human Rights Education, prevailing trends in the field of Human Rights Education and of the challenges and contributions of critics;
- ❖ Perceive improvements, discern ambiguities and identify contradictions in the field of Human Rights Education;
- ❖ Understand the roles of various state and non-state agencies in the promotion and enforcement for Human Rights; and
- ❖ Identify potential roles for oneself in the promotion of Human Rights Education

Course Contents:

UNIT-1 Conceptualizing Human Rights and Human Rights Education

- a) Introduction to Rights, Human Rights and Human rights Education with reference to Philosophical, Psychological, Political, and Sociological perspective.
- b) Interrelationships of rights and duties: Harmony and Conflict.
- c) Human Rights perspective in curriculum and in teaching-learning Processes
- d) Human Right Perspective and school ethos and culture

Unit-2 Emerging Concerns in Human Rights:

- a) Understanding Human Rights of Children, Women, Minorities, Dalits, differently abled and Homosexuals.
- b) Constitution and Institutional Aspects of Human Rights in India: National Human Rights Commission, SC/ST Commission, Minorities Commission, Women's Commission
- c) Problems of Enforcement of Human Rights in India

Unit-3 International Perspectives on Human Rights:

- a) United Nations Character, Universal Declaration of Human Rights, 1948;
- b) UN High Commissioner for Human Rights.
- c) Major UN instruments on human rights (Conventions on Racial Discrimination, Women's Rights, Rights of the Child, Torture)

UNIT- 4 Issues, Movements and Promotion of Human Rights

- a) Right to Clean Environment and Public Safety.
- b) Role of Government, Non-Government Organizations, Education, family and self in Promotion of Human Rights.
- c) Human Rights movements in India: National freedom movement, Social and political movements, Dalit movements, Women's movements and Environmental movements

Assignment & Practical Works: (Any Two)

1. A case involving violation of human rights
2. Human rights in a socio-cultural context
3. Review and Critical Analysis of National Policy Documents with reference to Human Rights Perspective
4. Awareness Camp to promote Human Rights Education
5. Series of Street plays (nukkad naatak) about Human Rights Education
6. Any other task after consultation with teacher

Course Outcomes: After completion of this course students would able to:

- ❖ Imbibe the knowledge about human rights and Human Rights Education.
- ❖ Comprehend the roles of various state and non-state agencies in the promotion and enforcement for Human Rights
- ❖ Apply the concept of Citizenship Education in making themselves responsible, productive, and effective citizens of a democratic society.
- ❖ Apply the analytical skills to question and appraise Human Rights policies and practices at national and international levels;
- ❖ Point out their potential roles in the promotion of Human Rights Education

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4. NHRC (2005). Human Rights Education for beginners, New Delhi, National Human Rights Commission.
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Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE810FD	Peace Education	CE	4	30	70	100

Objectives:

- ❖ To understand the concept of piece and peace education.
- ❖ To acquire the knowledge about peaceful mind makes peaceful world.
- ❖ To understand the theory and practice of peace education
- ❖ To understand the philosophical thoughts for peace.
- ❖ To promote awareness about the existence of conflicting relationships between people, within and between nations and between nature and humanity.
- ❖ To create frameworks for achieving peaceful and nonviolent societies.

Course Contents:

UNIT– I: Peace Education: Nature and Significance

- a) Peace and Types of Peace (positive, negative, inner, social and with nature)
- b) Meaning, need, dimensions and goal of Peace Education.
- c) A brief review of historical development of Peace Education.
- d) Philosophical, sociological, and psychological perspectives of Peace Education.
- e) Learning from experiences to explore the scope of Peace Education.
- f) Challenges to Peace Education.

UNIT– II: Towards the Global Culture of Peace

- a) Process of Peace building
- b) Approaches to Peace Education
- c) Conflict analysis and resolution
- d) Role of social and religious foundations in peace building (Family, Religion, Mass Media, Community, School, NGO's, Government Agencies).
- e) Role of local and international agencies in the peace building process.
- f) Addressing challenges to peace in multicultural society.

UNIT– III: Thoughts on Peace and Harmony

- a) Ancient Indian views.
- b) Constitutional provisions.
- c) Life skills required for Peace Education (WHO)
- d) UNO role for Global Peace Education.
- e) Programmers' for promoting Peace Education– UNESCO
- f) Study of following thinkers in context of global Peace and Harmony: J. Krishnamurti, Sri Aurobindo, Rabindra Nath Thakur, Mahatma Gandhi, Montessori, Russell, Dalai Lama.

UNIT– IV: Pedagogical Issues for Peace Education

- a) Integration of Peace Education through curricular and co-curricular activities
- b) Strategies and methods of teaching Peace Education- Meditation, Yoga, Dramatization, Debate and etc.
- c) Model of integrated Learning– Transactional Modalities - Cooperative Learning, Group Discussion, Project Work, Role Play, Story Telling, Rational Analytic Method– Case Analysis and Situation analysis,
- d) Becoming peace teacher-acquisition of knowledge, values and attitudes.
- e) Critical analysis of school curriculum at school level in the light of peace building process.
- f) Challenges of pedagogical issues of Peace Education.

Assignment & Practical Works: (Any Two)

1. Prepare a Role Play of Great Personalities who worked/ contributed towards Peace.
2. Organize an activity in schools to promote Peace.
3. Write a report on Gandhi and Peace.
4. Write about the contribution of any two Noble prize winners for Peace.
5. Prepare an album of Indian Philosophers and write their thoughts on peace.
6. Critical analysis of Educational Policies, Curriculum and Text Material for Peace- building Process.
7. Collection of statements, shloka or sukti (Good Sayings) from ancient Indian literature related

to inner and Social Peace.

8. Study of Yoga-Darshana as a process of Peace and Harmony.

Course Outcomes: After completion of this course students would able to:

- ❖ Acquire a holistic and critical understanding of the theoretical and practical bases of peace education,
- ❖ Searching and identifying the best ways to follow peace in life,
- ❖ Show ability to select and use appropriate method of resolving conflict,
- ❖ Become critical learners and reflective peace practitioners,
- ❖ Appreciate the foundations of just and peaceful societies,
- ❖ Understand and practice the positive action and non-violent conflict resolution in society,
- ❖ Enhance students' intellectual flexibility, creativity & problem-solving capacities,
- ❖ Connect course content to current public events and issues worldwide.

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1. Sharma, Ambika Prasad (2023). Peace Education, Rakhi Prakashan
2. Kaur, Balvinder (2006). Peace Education: New Trends and Innovations. New Delhi: Deep & Deep Publications Private Limited
3. Mahesh Bhargava and Haseen Taj (2006). Glimpses of Higher Education. Rakhi Prakashan, Agra-2
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<http://www.un.org/cyberschoolbus/peace/content>.

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE811FD	Sports and Fitness Education	CE	4	30	70	100

Objective

- ❖ To develop a comprehensive and holistic understanding about the concept of health, its various dimensions, and determinants.
- ❖ To develop understanding about the evolution of Health and Physical Education.
- ❖ To develop understanding about the historical development of the discipline with special reference to Indian Education and its relation to other subjects.
- ❖ To develop understanding about the importance of physical
- ❖ fitness policies, programs and services addressing health initiatives in school context.

UNIT– I Evolution of Health and Physical Education

- a) Health and Physical Education: Conceptual Clarity (locally as well as globally),
- b) Importance and aims.
- c) Place in School Curriculum: Historical Development as a subject, Objectives with special
- d) Reference to Indian Education and its relationship with other subjects.
- e) Status of Health and Physical Education: From primary to secondary education in a
- f) Global perspective, ayurvedic and yogic concept of Health Education,
- g) Legal perspective of Health and Health Education in India.

UNIT– II Health Education

- a) Concept, dimensions and determinants of health with special to India.
- b) Understanding the body system and its functions
- c) Common health problems and diseases: causes, prevention and cure, immunization and first aid.
- d) Impact of Physical activities, games, sports and yoga on different body systems.

UNIT– III Games and Fitness

- a) Physical fitness and its components: athletics (general physical fitness exercises), games (lead-up games, relays and major games), Rhythmic activities, gymnastics and their impact on health.
- b) Development of physical fitness: Postures and Importance of relaxation, Fitness tests; Resources and services for games and sports and Health.
- c) Fundamentals skills of sports: Sports for recreation and competition, Sports awards and scholarships, sport person ship, Indigenous and self-defense activities.
- d) First Aid: Need and Principles.

UNIT– IV Policies, Programmes and Assessment

- a) Policies, programmes and services for addressing health needs.
- b) School Health Programme: school health services, health promoting schools, global school health initiatives.
- c) POCSO (Protection of Children from Sexual Offences Act, 2012), PWD 2016, the Integrated Child Protection Scheme.
- d) Assessment of health performance testing in games and sports, reporting of health condition and performance of child in the sport fields.

Assignment (any two)

1. Analyzing NEP, 2020 with reference to Games Oriented Education.
2. Planning activities for development of physical fitness.
3. Organization of games and sports tournaments.
4. Preparation of First Aid kit.

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

- ❖ Understand the concept of holistic health, its various dimensions, and determinants,
- ❖ Develop positive attitude towards health physical education and yoga as individual,
- ❖ Sensitize, motivate, and help them to acquire the skills for physical fitness, learn correct
- ❖ Postural habits and activities for its development,
- ❖ Understand various policies and programmes related to health, physical education and yoga,

❖ Help to understand the process of assessment of health and physical fitness.

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Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSE812FD	Tribal education	CE	4	30	70	100

Objectives:

- ❖ To develop the understanding how tribes are classified.
- ❖ To develop the understanding tribal culture, social organization and economy.
- ❖ To develop the understanding impact of modernization and globalization.
- ❖ To develop the understanding that how the tribal movement have played a crucial role in resisting oppression and demanding rights.
- ❖ To develop the understanding tribal law and rights.

Course Contents:

Unit- I Anthropological perspective on tribals

- a) Definition and characteristics of tribes.
- b) Type of tribal societies (hunter- gatherers, pastoralists, shifting cultivators, settled age)
- c) Tribal culture, social organization (kinship, marriage, family and clan structures) and tribal economy.

Unit II Tribal Art, music and folk tradition in India

- a) Major form of tribal art in india (warli art, Gond art, Saura art, Pithora art, Bhatti chitra)
- b) Tribal music (santhali music, Baiga songs, Bodo folk songs, Ho and munda songs)
- c) Tribal dance and folk traditions (dhurwa and Bison horn maria dance, Ghoomar, saila dance, Cheraw dance, karma dance, hojagiri dance)

Unit- III Tribal movement in India.

- a) Pre – independence tribal movement (santhal rebellion, munda rebellion, Bhil rebellion)
- b) Post independence (Jharkhand movement, Bodoland movement, narmada bachao andolan, dongria kondh movement, forest right movement)
- c) Impact of modernization and globalization.

Unit IV constitutional provisions for tribal in India.

- a) Tribal law and rights, article 15 & 46 article 244, article 275, article 330 & 332
- b) 5th and 6th schedule,
- c) PESA Act, Forest right act, sc/st Act 1989

Assignment & Practical Works: (Any two)

1. Write a Term paper on a topic given in the course
2. Prepare an article on tribal's life.
3. Prepare scrape book on tribals culture.
4. Prepare report on tribals problems.
5. Write an article on constitutional provisions for tribal in India.

Course Outcomes: After completion of this course students would able to:

- ❖ Develop the understanding how tribes are classified
- ❖ Understand tribal culture, social organization and economy.
- ❖ Understand impact of modernization and globalization.
- ❖ Know the right and laws of tribals.
- ❖ Develop empathy toward tribals.

References:

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2. Kiro, santosh (2022). Tribal philosophy, Prabhat Prakashan PVT. Ltd.
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5. Yadappanavar, A.V. (2003). Tribal education in India, discovery publishing house.
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Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE813FD	Economics of Education	CE	4	30	70	100

Objectives:

- ❖ To help the students to acquire the basic understanding in the field of Economics.
- ❖ To enable the student teachers to understand the aims and objectives of teaching Economics at the secondary school stage.
- ❖ To develop the ability, to evaluate the present curriculum in Economics at the secondary level.
- ❖ To develop the ability to organize group activities and projects in the subject.
- ❖ To develop the ability to use of various methods of teaching Economics.
- ❖ To enable the student to acquire necessary skills for the use and preparation of teaching aids and instructional material in Economics.
- ❖ To develop in the student's appropriate attitudes towards the country's Economy.
- ❖ To develop in the student an adequate sense of awareness about Economic issues of the country and an out-look of problem solving through analysis and application of the theory of Economics.
- ❖ To develop competence in framing objective-based achievement and diagnostic test, their administration and their scoring and drawing conclusions there of. 10. To develop in the students an ability to conduct various surveys in Economics and organize field trips.
- ❖ To enable the student-teachers to prepare unit plan, lesson plan and related teaching learning strategies.
- ❖ To enable the student teachers to review the text book of Economics.

Course Contents:

Unit- I Meaning and Concept of Micro and Macro Economics

- a) Micro Economics
- b) Macro Economics
- c) Concept of National Income

Unit- II Demand and Supply and Money

- a) Basic concept of Demand and supply
- b) Consumer Equilibrium
- c) Definition of Money, Its Function
- d) Functions of Commercial Bank
- e) Functions of Central Bank

Unit- III Indian, Foreign Trade and Economics Planning

- a) Indian Foreign Trade - Direction and Trends
- b) Concept of Globalization, Privatization and Liberalization
- c) Economic Planning in India
- d) Poverty in India
- e) Unemployment in India

Unit- IV Method and Evaluation in Economics

- a) Programmed Instruction Methods
- b) Team Teaching
- c) Computer assisted Instruction (CAI)
- d) Lecture cum Demonstration Method
- e) Evaluation in Economics

Assignment & Practical Works: (Any two)

1. Preparation an assignment works any one subject topic.
2. Review of two published papers related to subject
3. Prepare Paper
4. Solve Paper

Course Outcomes: After completion of this course students would able to:

- ❖ Help the students to acquire the basic understanding in the field of Economics.
- ❖ Enable the student teachers to understand the aims and objectives of teaching Economics at the secondary school stage.
- ❖ Develop the ability, to evaluate the present curriculum in Economics at the secondary level.
- ❖ Enable ability to organize group activities and projects in the subject.
- ❖ Understand to use of various methods of teaching Economics.
- ❖ Enable the student to acquire necessary skills for the use and preparation of teaching aids and instructional material in Economics.
- ❖ Develop in the student's appropriate attitudes towards the country's Economy.
- ❖ Develop in the student an adequate sense of awareness about Economic issues of the country and an out-look of problem solving through analysis and application of the theory of Economics.
- ❖ Develop competence in framing objective-based achievement and diagnostic test, their administration and their scoring and drawing conclusions there of.
- ❖ To develop in the students an ability to conduct various surveys in Economics and organize field trips.
- ❖ Prepare unit plan, lesson plan and related teaching learning strategies.
- ❖ Review the text book of Economics.

References:

1. Datt. Ruddar, Sundharam, K. M. (2006). Indian Economy, S. Chand & Company Ltd., New Delhi
2. Lawson, Tony (1997). Economics and Reality, Rout Ledge, London and New York
3. Rasure, K. A. (2009), Economics and Business Environment, Avinash Paper Backs, Delhi
4. Samuelson & Nordhaus (2006). Economics, Tata Mc Grow-Hill Publishing Company Ltd, New Delhi
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11. माथुर, बी. एल. (2009). आर्थिक नीति एवं विकास, अर्जुन पब्लिशिंग हाऊस, नई दिल्ली

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE814FD	Jain Culture and Life Value	CE	4	30	70	100

Objectives:

- ❖ To develop the cultural Aspects of Jain Traditions
- ❖ To develop the Historical background of Jain traditions
- ❖ To develop The Jain life style will be well known of the students.
- ❖ To develop the method of Jain spiritual Practice (Sadhana)
- ❖ To develop equipped with the Knowledge of Jain metaphysics.
- ❖ To develop well know the method of value development

Unit I: Jain History and Culture

- a) Antiquity of Jainism
- b) Teerthankar Lord Rishabha and Mahavira
- c) Jain Religious Schools, Orders and Sects
- d) Characteristics of Jain Culture

Unit II: Jain Ethics and Metaphysics

- a) Three Jewels (Ratnatraya)
- b) Code of Conduct of Ascetics (Shramanachar) and Householder (Shravakachar)
- c) Jain way of Life
- d) The Nine Truths
- e) Six Substances
- f) Cosmology: Jain Perspective

Unit III: Science of Living and Value Development

- a) Science of Living a new way of Education
- b) Seven Parts of Science of Living
- c) Science of Living and Value Development
- d) Non-violence and its training
- e) Non-absolutism and its application
- f) Anuvrat Movement and Morality

Unit IV: Preksha Meditation and Management

- a) Aim and Objective of Preksha Meditation
- b) Time Management
- c) Goal Management
- d) Health Management
- e) Stress Management
- f) Addiction Free Management

Course Outcomes:

- ❖ Students will be introduced to the cultural Aspects of Jain Traditions
- ❖ Students will know the Historical background of Jain traditions
- ❖ The Jain life style will be well known of the students.
- ❖ Students will know the method of Jain spiritual Practice (Sadhana)
- ❖ Students will be equipped with the Knowledge of Jain metaphysics.
- ❖ Students well know the method of value development

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2. Jain itihasa aur sanskriti, By Dr Samani Riju Prajna, JVBU, Ladnun
3. Jain Tattva mimansa aur Achara Mimansa, By Dr Samani Riju Prajna, JVBU, Ladnun

Course Code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE815AV	Yoga and Understanding Self	CC	2	15 Practical	35	50

Objectives:

- ❖ जीवन विज्ञान, प्रेक्षाध्यान एवं योग विद्या की जानकारी प्राप्त कर सकेंगे।
- ❖ संतुलित व्यक्तित्व का निर्माण।
- ❖ विद्यालयस्तरीय ध्यान एवं योग के प्रशिक्षक तैयार करना।

अधिगम की उपलब्धि

- ❖ जीवन विज्ञान, प्रेक्षाध्यान एवं योग विद्या की जानकारी प्राप्त कर सकेंगे।
- ❖ संतुलित व्यक्तित्व का निर्माण।
- ❖ विद्यालयस्तरीय ध्यान एवं योग के प्रशिक्षक तैयार करना।

विषयवस्तु :

इकाई-1 योग के प्रयोग

- 1 योग : अर्थ, परिभाषा, अष्टांग योग की उपयोगिता
- 2 आसन : सूर्यनमस्कार, (अर्थ, प्रक्रिया एवं लाभ) ताड़ासन, पाद्मस्तासन, गरुडासन, जानुशिरासन, वक्रासन, वज्रासन, पद्मासन, उत्तानपादासन, पवनमुक्तासन, भुजंगासन, शलभासन, (स्थिति, विधि, लाभ)
- 3 प्राणायाम : सूर्यभेदी, चन्द्रभेदी व अनुलोम विलोम
- 4 मुद्रा : ज्ञान मुद्रा, वीतराग मुद्रा
- 5 बन्ध : मूलबन्ध, उड्डियानबन्ध व जालधर बन्ध

इकाई-2 प्रेक्षाध्यान

1. प्रेक्षाध्यान का इतिहास, अर्थ एवं उद्देश्य
2. प्रेक्षाध्यान के सहायक अंगों का संक्षिप्त परिचय एवं महत्व
3. कायोत्सर्ग, अन्तर्यात्रा, श्वास प्रेक्षा एवं ज्योतिकेन्द्र प्रेक्षा (प्रयोग, अभिव्यक्ति एवं प्रस्तुति)
4. प्रेक्षाध्यान के मुख्य चरणों का संक्षिप्त परिचय

सत्रीय कार्य :(कोई एक)

1. विषय से सम्बन्धित कोई एक टर्म पेपर तैयार करना।
2. सूर्य नमस्कार की विभिन्न स्थितियों का प्रदर्शन।

Course Outcomes:

- ❖ जीवन विज्ञान, प्रेक्षाध्यान एवं योग विद्या की जानकारी प्राप्त कर सकेंगे।
- ❖ संतुलित व्यक्तित्व का निर्माण।
- ❖ विद्यालयस्तरीय ध्यान एवं योग के प्रशिक्षक तैयार करना।

सन्दर्भ ग्रन्थ सूची :

1. अमूर्त चिन्तन : आचार्य महाप्रज्ञ
2. जीवन विज्ञान की रूपरेखा, लेखक : मुनि धर्मेश कुमार
3. जीवन विज्ञान शिक्षक निर्देशिका – मुनि किशनलाल
4. जीवन विज्ञान : मूल्यपरक शिक्षा का एवं अभिनव प्रयोग – मुनि धर्मेश
5. जीवन विज्ञान प्रेक्षाध्यान एवं योग : समणी मल्लि प्रज्ञा
6. जीवन विज्ञान : शिक्षा का नया आयाम, लेखक : आचार्य महाप्रज्ञ
7. जीवन विज्ञान : शिक्षक प्रशिक्षक मार्गदर्शिका– मुनि किशनलाल
8. जीवन विज्ञान : स्वस्थ समाज रचना का संकल्प, लेखक : आचार्य महाप्रज्ञ
9. नया मानव : नया विश्व – आचार्य महाप्रज्ञ
10. परिवार के साथ कैसे रहें ? – आचार्य महाप्रज्ञ
11. प्रेक्षाध्यान प्रयोग पद्धति – लेखक : आचार्य महाप्रज्ञ
12. प्रेक्षाध्यान : आसन प्राणायाम, मुनि किशनलाल
13. प्रेक्षाध्यान : सिद्धान्त और प्रयोग, लेखक : आचार्य महाप्रज्ञ, सम्पादक : मुनि किशन लाल, शुभकरण सुराना
14. प्रेक्षाध्यान : यौगिक क्रियाएं, मुनि किशनलाल
15. प्रेक्षाध्यान : शरीर विज्ञान, श्री जेठालाल जवेरी, मुनि महेन्द्र कुमार
16. प्रेक्षाध्यान : स्वास्थ्य विज्ञान (भाग 1,2), श्री जेठालाल जवेरी, मुनि महेन्द्र कुमार 'तुम स्वस्थ रह सकते हो, लेखक – आचार्य महाप्रज्ञ
17. प्रेक्षाध्यान : व्यक्तित्व विकास, लेखक : मुनि धर्मेश कुमार
18. प्रेक्षा संदर्शिका – मुनि धर्मेशकुमार

19. Preksha Meditation: Therapeutic Thinking by Arun Zaveri
20. Science of Living, Ed. Muni Mahendra Kumar

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE816AV	Citizenship Education, Sustainability and Environment	CC	2	15	35	50

Objectives:

- ❖ To enable student-teachers understand the concept of citizenship education and global citizenship education
- ❖ To make future teachers aware of the Fundamental Rights and Fundamental Duties as a Citizen.
- ❖ To encourage student's inquiry into the India's rich heritage and philosophical foundation of Vasudhaiva Kutumbkam.
- ❖ To enable students to deepen the knowledge relating to India's environment in its totality.
- ❖ To orient student-teachers to the criticality respecting and protecting the environment.
- ❖ To create awareness among student-teachers about the contemporary global issues and challenges.

Course Contents:

UNIT– I: Citizenship Education

- a) Concept of citizenship and citizenship education.
- b) Aims Types, Importance and approaches of citizenship education.
- c) Concept of Global Citizenship and Global Citizenship Education.
- d) Aims and approaches of global citizenship education.
- e) Concept of Vasudhaiva Kutumbakam, its importance in development of a holistic perspective towards local and global communities.
- f) Roles and responsibilities of citizens to Fundamental Rights and Fundamental duties.

UNIT– II: Sustainability and Environmental Education

- a) Concept of Sustainability in all fields of human activities.
- b) Approaches to achieving sustainable development in its three dimensions– economic, social, and Environmental.
- c) Education for sustainable development, School and community-based activities.
- d) Actions required for mitigating the effects of climate change, reducing environmental degradation, Pollution etc.
- e) Initiatives required for effective waste management, conservation of biological diversity, management of biological/natural resources, forest and wildlife conservation, and sustainable development and living.
- f) Role of Mass Media and Technology; Governmental and Non-Governmental Organization in delivering environmental education.
- g) School and community-based environmental education activities.

Assignment & Practical Works: (Any One)

1. Prepare a term paper on Concept of Vasudhaiva Kutumbakam, its importance in development of a holistic perspective towards local and global communities.
2. Prepare a term paper on School and community-based activities of sustainability and environmental education.
3. Point out environmental problems of your local area by survey and prepare a detailed report on how these problems can be solved

Course Outcomes: After completion of this course students would able to:

- ❖ Apply the concept of Citizenship Education in making themselves responsible, productive, and effective citizens of a democratic society.
- ❖ Imbibe the knowledge, attitudes and skills needed to sustainable development and Environmental management.
- ❖ Apply the concept of Environmental Education in the conservation biodiversity, forests and wild lives;
- ❖ Point out their role in becoming active promoters of more peaceful, tolerant, inclusive, secure, and sustainable societies.

- ❖ Comprehend the importance of India's rich heritage and philosophical foundation of Vasudhaiva Kutumbkam.

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3. Kumar, S.B. (2010). Environmental Problems and Gandhian Solution, New Delhi, Deep & Deep Publications.
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6. Sinha, R.K. (2006). Environmental Science: Health, Education, Law. New Delhi, Commonwealth Publishers.
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8. शर्मा, राजकुमार (2021). पर्यावरण समस्या व समाधान दिल्ली, कल्पना प्रकाशन।
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Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSE817SI	Post Internship (Review and Analysis)	CC	2	Post Internship (Review and Analysis) 50		50

Objectives:

- ❖ To compile the learnings during internship programme
- ❖ To discuss with peers about their experiences
- ❖ To write internship experiences for preparation of report.
- ❖ To develop comprehensive understanding of the school ecosystem.
- ❖ To organize different co-curricular activities in the school.
- ❖ To reflect on learning experience.

Course Contents:

Unit-I School Observation

- a) Learnings during internship programme
- b) Discussions about school experiences
- c) Writing of internship experiences.
- d) Analyzing the school system.
- e) School administration and examination

Unit-II School experience and activities

- a) Co-curricular activities in the school
- b) Organization of various school activities.
- c) Reflect on learning experience.
- d) Sharing experience and learning gained during internship

All the above work has to be done

Course Outcomes: After completion of this course students would able to:

- ❖ Compile the learnings during internship programme
- ❖ Discuss with peers about their experiences
- ❖ Write internship experiences for preparation of report.
- ❖ Develop comprehensive understanding of the school ecosystem.
- ❖ Organize different co-curricular activities in the school.
- ❖ Reflect on learning experience.

Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSEEDU818SI	Creating Teaching Learning Material/ Work Experience	CC	2		Work Experience50	50

Objectives:

- ❖ To know about teaching learning material
- ❖ To understand types of teaching learning material
- ❖ To prepare relevant and useful teaching learning material for specific groups of children
- ❖ To discuss with peers about their learning material
- ❖ To write about the utility of teaching learning material.

Course Contents:

UNIT-I Teaching learning material

- a) Objectives meaning and purpose of teaching learning material
- b) Types of teaching learning materials
- c) Preparation of low cost teaching learning material
- d) Participation of students in teaching learning materials

UNIT-II Work experience

- a) Model
- b) Games
- c) Art and literary project
- d) Science experiments
- e) Other areas ICT audio, video aids prepare

All the above work has to be done

Course Outcomes: After completion of this course students would able to:

- ❖ Prepare relevant and useful teaching learning material for specific groups of children
- ❖ Discuss with peers about their learning material
- ❖ Write about the utility of teaching learning material.

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Course code	Course Title	Course Category	Credit	CIA	Theory	Total
BBSEEDU819CE	Community Engagement and Service	CC	2	Community Engagement and Service 50		50

Objectives:

- ❖ To expose student-teachers to the socio-economic issues in society and community-supported development activities
- ❖ To generate solutions to real-life problems.
- ❖ To understand functions of the community
- ❖ To enhance the ability of student-teachers to enlist community support for school-related activities,
- ❖ To understand issues associated with schooling, health & wellness of children
- ❖ To sensitize and mobilize the community members to address the social, cultural and educational problems education
- ❖ Develop participation of student-teacher in activities undertaken under the National Service Scheme (NSS)
- ❖ To know New India Literacy Programme, mentoring initiatives, first aid
- ❖ To make the community members aware of the importance of environmental protection, rainwater harvesting, planting trees
- ❖ To provide career counseling to secondary school students

Course Contents:

UNIT-I Community and issues

- a) Socio-economic issues in society and community-supported development activities
- b) Solutions to real-life problems.
- c) Functions of the community
- d) Community support for school-related activities,
- e) Issues associated with schooling, health & wellness of children

UNIT-II Social Aspects of Education

- a) Social, cultural and educational problems education
- b) Student-teacher in activities undertaken under the National Service Scheme (NSS)
- c) New India Literacy Programme, mentoring initiatives, first aid
- d) Environmental protection, rainwater harvesting, planting trees
- e) Career counseling to secondary school students

All the above work has to be done.

Course Outcomes: After completion of this course students would able to:

- ❖ Expose student-teachers to the socio-economic issues in society and community-supported development activities
- ❖ Generate solutions to real-life problems.
- ❖ Understand functions of the community
- ❖ Enhance the ability of student-teachers to enlist community support for school-related activities,
- ❖ Understand issues associated with schooling, health & wellness of children
- ❖ Sensitize and mobilize the community members to address the social, cultural and educational problems education
- ❖ Develop participation of student-teacher in activities undertaken under the National Service Scheme (NSS)
- ❖ Know New India Literacy Programme, mentoring initiatives, first aid
- ❖ Make the community members aware of the importance of environmental protection, rainwater harvesting, planting trees
- ❖ Provide career counseling to secondary school students

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- 1 Sujatha M. (2020). Sociological Foundations of Education, Neel Kamal Publications PVt. Ltd. Hyderabad
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