B.Sc. B.Ed. (FOUR YEAR COURSE)

The course of study shall extend over a period of four years as an integrated course in Science, Education, General Hindi,General English andEnvironmental Education leading to the composite degree of B.Sc. B.Ed.

A. Eligibility

Candidates who have passed Senior Secondary 10+2 examination or any other examination recognized board with at least 50% marks in the aggregate are eligible for admission to the course.

Or

The Institute will regulate admission through selection on the basis of marks in the qualifying examination and/or in the entrance examination or any other selection process as per the policy of the state or NCTE and the University and in accordance with the state quota as decided.

Candidate will be eligible for admission to Physical Science (PCM) Group if she/he has qualified qualifying examination with Physics, Chemistry and Mathematics or Statistics and for admission to Biological Science (CBZ) Group if she/he has qualified qualifying examination with Physics, Chemistry and Biology or Biotechnology.

B. Reservation - Reservation of seats for SC/ST/OBC and Handicapped will be as per existing Rajasthan Govt. /Central Govt. /University rules.

C. Admission Procedure forBSCBED- Admission shall be made on merit on the basis of marks obtained in the qualifying Examination and/or in the entrance examination or any other selection process as per policy of the State Government and the University.

D. Duration and Working Days - **Duration** The B.Sc. B.Ed.Programme shall be of duration of four Academic Years, which can be completed in a Maximum of five Years from the date of the admission to the programme.

Working Days

- There shall be at least two hundrade fifty (250) working days each year exclusive of the period of examination and admission.
- Institution shall work for a minimum of thirty-six hours (36) a week, during which physical presence in the institution of all the teachers and student teachers is necessary to ensure their availability for advice, guidance, dialogue and consultation as and when needed.
- The minimum attendance of student-teachers shall have to be 80% for all course work and practicum, and 90% for school internship.

E. Objectives of BSCBED

- The objectives of this programme is to prepare teachers from upper primary to middle level (Classes VI-VIII) & Secondary Level (Classes IX-X) pre-service teacher education program are to enable the prospective teacher to –

- Understand nature of education and pedagogic processes through enriched experiences. Contribute to fillup the gap between theory and practice by dovetailing both appropriately.
- Interactive processes wherein group reflection, critical thinking and meaning making will be encouraged.
- Understand various educational issues in the context of diverse socio-cultural & Multilingual Indian Society.
- Enable them to face the challenging of social, political and technological issues.
- Understand the nature, purpose, influencing factors and problems of secondary education in contemporary issues.
- Describe teaching learning process in the classroom and various factors that influence it.
- Understand various level learners, their needs, and interest and peculiar problems and motivate them for learning.
- Conduct Pedagogical content analysis in subject areas and use it for facilitating learning in the classroom.
- Develop and select tests, evaluate and keep records of student's progress-cognitive as well as non-cognitive.
- Adopt and develop enrichment learning & instructional material in subject areas.
- To develop problem solving ability through action research.
- Foster skills and attitude for involving the Community as an educational partner and use society resources in education.
- Become self-regulated learners, develop professional commitment and work as responsible professionals.
- Become aware about human values and gender, school and society.
- To prepare the students to further their education in graduate school and/or directly pursue productive professional careers in the private, state, federal, or educational sectors.
- Enable the students to demonstrate possession and application of higher-level learning skills in critical thinking and problem solving as applied to science issues.
- To enable the students to effectively apply the scientific method.
- Enable to work both on cross-disciplinary teams and function independently as specialists in a science or technical field.
- Demonstrate broad knowledge and technical skills in at least one area of science, and a basic understanding of science disciplines.
- Develop, apply, integrate and generate scientific knowledge in professional contexts to analyse challenges and to develop effective solutions
- Demonstrate understanding of the importance of science to the human endeavour.
- Work and learn both independently and collaboratively to encompass diverse abilities and perspectives, exercise personal, professional and social responsibility as a global citizen.

Programme outcomes:

1. Competence to teach effectively two school subjects at the Elementary & secondary levels.

2. Ability to translate objectives of secondary education in terms of specific Programmes and activities in relation to the curriculum.
3. Ability to understand children‘s needs, motives, growth pattern and the process of learning to stimulate learning and creative thinking to faster growth and development.
4. Ability to use-
    1. Individualized instruction.
    2. Dynamic methods in large classes.
5. Ability to examine pupil's progress and effectiveness of their own teaching through the use of proper evaluation techniques.
6. Equipment for diagnosing pupil progress and effectiveness of their own teachings through the use of proper evaluation techniques.
7. Readiness to spot talented and gifted children and capacity to meet their needs.
8. Ability to organize various school programmes, activities for pupils.
9. Developing guidance point of view in educational, personal and vocational matters.
10. Ability to access the all-round development of pupils and to maintain a cumulative record.
11. Developing certain practical skill such as:
    1. Black board work
    2. Preparing improvised apparatus
    3. Preparing teaching aids and ICT.
12. Interest and competence in the development of the teaching profession and education. Readiness to participate in activities of professional organizations.

Programme Specific outcomes:

Students will be able to:

- Understand basic concepts and ideas of educational theory.
- Build understanding and perspective on the nature of the learner, diversity and learning.
- Comprehend the role of the systems of governance and structural – functional provisions that support school education.
- Develop understanding about teaching, pedagogy, school management and community involvement.
- Critically examine key universal constructs in developmental psychology and educational psychology.
- Develop a knowledge setup of content, contexts and circumstances of society.
- Build skills and abilities of communication, self-expression and ICT.
- Develop the potential for perspective building located in the Indian socio-cultural context.
- Analyse the structure of knowledge as reflected in disciplinary streams and subjects
- Develop an understanding of the concept of assessment and its practices.

The syllabus of this course comprises of the following –

F. Course Design: The syllabus of this course comprises of the following –

(a) Perspectives in Education – Course

- Course - Childhood, Growing Up & Learning.
- Course - Educations in Contemporary India.

- Course - Teaching and Learning.
- Course - Gender, School and Society
- Course - Knowledge and Curriculum
- Course - Creating an Inclusive School

(b) Curriculum and Pedagogic Studies –

- Course - Yoga for Holistic Health
- Course - Pedagogy of School Subject (I&II)
- Course - Assessment for Learning

(c) Engagement with the Field– the Self, the Child, Community and School -Task and assessment that run through all the courses as indicated in the year wise distribution of the syllabus.

- School Internship

(d) Specilization courses will be offered in areas such as given below or an additional pedagogy course (In another course at the secondary level or the same course at the high secondary level):-

- Health & Physical Education
- Educational aspects of The Geeta
- Environmental Studies
- Chetna Vikas Moolya Shiksha

(e) Core Courses

- Physics
- Chemistry
- Botany
- Zoology
- Mathematics

(f) Compulsory Course

- General English
- General Hindi
- ICT in Education
- Environmental Studies

G. COURSES OF STUDY AND SCHEME OF EVALUATION

FIRST YEAR –I

Course code	Title of the course	EVALUATION			
		External	**Internal**	**Practical**	**Total**
BSCBED110	Genral English (compulsory)*	70	30	-	100
BSCBED-151	Childhood, Growing up & Learning	70	30	-	100
BSCBED-152	Education in Contemporary India	70	30	-	100
BSCBED-153	Yoga for Holistic Health	35	15	-	50
BSCBED-154	Chetna Vikas Mulya Shiksha (Specialization)	35	15	-	50
BSCBED-155	Content: (PCB & PCM)				
BSCBED-155 a I	1. Physics I	40	10	50	150
BSCBED-155 a II	2. Physics II	40	10		
BSCBED-155 b I	3. Chemistry I	40	10	50	150
BSCBED-155b II	4. Chemistry II	40	10		
BSCBED-155 c I	5. Zoology I	40	10	50	150
BSCBED-155 c II	6. Zoology II	40	10		
BSCBED-155 d I	7. Botany I	40	10	50	150
BSCBED-155 d II	8. Botany II	40	10		
BSCBED-155 e I	9. Mathematics I	60	15		150
BSCBED-155 e II	10. Mathematics II	60	15		
	CCA				25
Prayer, Yoga, Meditation & Festival etc					25
Total					**800**

***Marks of compulsory subject shall not be added in the total marks.**

SECOND YEAR–II

Course Code	Title of the course	EVALUATION			
		External	**Internal**	**Practical**	Total
BSCBED-210	Gen. Hindi (compulsory)*	**70**	**30**	**-**	**100**
BSCBED-251	Knowledge & Curriculum	**70**	**30**	**-**	**100**
BSCBED-252	Teaching & Learning	**70**	**30**	**-**	**100**
BSCBED-253	Health & Physical Education	**35**	**15**		**50**
BSCBED-254	**Content: (BCZ& PCM)**				
BSCBED-254 a I	1. Physics I	**40**	**10**	**50**	**200**
BSCBED-254 a II	2. Physics II	**40**	**10**		
BSCBED-254 a III	3. Physics III	**40**	**10**		
BSCBED-254 b I	4. Chemistry I	**40**	**10**	**50**	**200**
BSCBED-254 b II	5. Chemistry II	**40**	**10**		
BSCBED-254 b III	6. Chemistry III	**40**	**10**		
BSCBED 250 c I	7. Zoology I	**40**	**10**	**50**	**200**
BSCBED 250 c II	8. Zoology II	**40**	**10**		
BSCBED-254 c III	9. Zoology III	**40**	**10**		
BSCBED-254 d I	10. Botany I	**40**	**10**	**50**	**200**
BSCBED-254 d II	11. Botany II	**40**	**10**		
BSCBED-254 d III	12. Botany III	**40**	**10**		
BSCBED-254 e I	13. Mathematics I	**60**	**7**		**200**
BSCBED-254 e II	14. Mathematics II	**60**	**7**		
BSCBED-254 e III	15. Mathematics III	**60**	**6**		
	CCA				**25**
Prayer, Yoga, Meditation & Festival etc					**25**
Total					**900**

***Marks of compulsory subject shall not be added in the total marks.**

THIRD YEAR–III

Course code	**Title of the course**	**EVALUATION**			
		External	**Internal**	**Practical**	Total
BSCBED-350	ICT in Education*	**70**	**30**		**100**
BSCBED-351	Gender. School & Society	**35**	**15**		**50**
BSCBED-352	Creating an Inclusive School	**35**	**15**		**50**
BSCBED-353	Educational aspects of Geeta	**35**	**15**		**50**
BSCBED-354	Pedagogy of School subject-I				
BSCBED-354-I	Mathematics	**35**	**15**		**50**
BSCBED-354-II	General Science	**35**	**15**		**50**
BSCBED-354-III	Chemistry	**35**	**15**		**50**
BSCBED-354-IV	Biology	**35**	**15**		**50**
BSCBED-354-V	Physics	**35**	**15**		**50**
BSCBED-355	Content: (BCZ& PCM)				
BSCBED-355 a I	1. Physics I	**40**	**10**	**50**	**150**
BSCBED-355 a II	2. Physics II	**40**	**10**		
BSCBED-355 b I	3. Chemistry I	**40**	**10**	**50**	**150**
BSCBED-355b II	4. Chemistry II	**40**	**10**		
BSCBED-355 c I	5. Zoology I	**40**	**10**	**50**	**150**
BSCBED-355 c II	6. Zoology II	**40**	**10**		
BSCBED-355 d I	7. Botany I	**40**	**10**	**50**	**150**
BSCBED-355 d II	8. Botany II	**40**	**10**		
BSCBED-355 e I	9. Mathematics I	**60**	**15**		**150**
BSCBED-355e II	10. Mathematics II	**60**	**15**		
	CCA				**25**
Prayer, Yoga, Meditation & Festival etc					**25**
Internship (4 Weeks)					**50**
Total					**750**

***Marks of compulsory subject shall not be added in the total marks.**

Internship (4 weeks) included in total marks.

FOURTHYEAR –IV

Course code	**Title of the course**	**EVALUATION**			
		External	**Internal**	**Practical**	Total
BSCBED-450	Environmental Studies*	**70**	**30**	**-**	**100**
BSCBED-451	Assessment for Learning	**70**	**30**	**-**	**100**
BSCBED-452	Agriculture	**35**	**15**	**-**	**50**
BSCBED-453	**Pedagogy of school subject-II**			**-**	
BSCBED-453 I	Mathematics	**35**	**15**	**-**	**50**
BSCBED-453 II	General Science	**35**	**15**	**-**	**50**
BSCBED-453 III	Chemistry	**35**	**15**	**-**	**50**
BSCBED-453 IV	Biology	**35**	**15**	**-**	**50**
BSCBED-453 V	Physics	**35**	**15**	**-**	**50**
BSCBED-454	Content: (PCB & PCM)			**-**	
BSCBED-454 a I	Physics I	**40**	**10**	**50**	**100**
BSCBED- 454 b I	Chemistry I	**40**	**10**	**50**	**100**
BSCBED- 454 c I	Zoology I	**40**	**10**	**50**	**100**
BSCBED- 454 d I	Botany I	**40**	**10**	**50**	**100**
BSCBED- 454 e I	Mathematics I	**80**	**20**	**-**	**100**
	CCA			-	**25**
Prayer, Yoga, Meditation & Festival etc				**-**	**25**
BSCBED- 455	**Internship (16 weeks)**				**200**
Total					**750**

***Marks of compulsory subject shall not be added in the total marks.**
Internship (16weeks) included in total marks.

SCHOOL INTERNSHIP

As the title suggests in this component of the programme,the student- teachers are actually placed in a school for duration of four and sixteen weeks,in two time slots. Initially, they will be attached to particular School for four weeks as ‘school attachment'.

This shorter period is to provide them adequate exposure to have a 'feel' of dealing with teaching- Learning.

A time gap after this school attachment will provide opportunity to student-teachers to share experiences, reflect, clarify several things with teacher educators and internalize them.

After about four weeks, they will go for ‘school placement’ of sixteen weeks. During this period, their role in the school is something like an 'apprentice' and its specific contours need to be worked out by course faculty.

They will be engaged in the school functioning in all its aspects.

MAIN OBJECTIVE

- Student teacher will be enabled to reflect on their practice,and learn to adapt and modify their visualisation/implementation towards betterment of student learning; involve in various school activities and processes in order to gain a 'feel' of the multiple roles of a teacher.
- Develop understanding of the 'school culture'; and learn to reflect upon, consolidate and share their school experiences; and to recognize one's own development as a teacher.
- To provide multiple components of field learning getting to know the school, observing children, observing teaching and learning in real classroom contexts & practicing teaching.
- To developing capacities to think with educational theories and applying concept in concrete teaching – learning situations,managing classroom learning, evaluating learners and providing feedback, learning to work with colleagues, reflecting on one’s own professional practice are drawn upon to provide appropriate learning experiences for the student teacher that is critical to the education of teachers.
- To undertake responsibility for planning and implementation of learning situations for specific units of study in the context of their school.

INSTRUCTION

Student teacher with supervision of their teacher educator must actively engaged in all the school activities at least their internship,(from school management,PTM (MNC) to classroommanagement)

Phase-I internship of third year = 50 marks
Phase-II internship of fourth year = 200 marks
Total Marks of Internship = 250 marks

Phase-I: Internship (4 weeks)

	Assessment is based on the following activities –	
Planning	Content Analysis and mode of transaction (Assignment in teaching subject)	**5**

	Creating and maintaining teaching learning material for the school (which can become valuable resource for the regular teachers of the school). a) TLM in any teaching subject	**5+5=10**
	Make lesson plan using 10- different methods in which 5 must involve,student could develop their own method (fusion based) with the help on teacher educator.	**5**
Planning & Execution	Identify a problem of action research and draft proposal on it.	**5**
	*Innovative Micro Teaching (5 Skills) (Teaching Subjects at secondary to senior secondary level)	5
Execution	One-week,regular observation of regular teacher (at the beginning of practice teaching.)	**5**
	Delivery of Four lessons based on model of teaching. (After each lesson of practice teaching student teacher need to discuss with subject teacher on their pedagogy and new practices it must be seconded.)	5
Assessment & Evaluation	Draft a report based on: - continuously and comprehensively evaluating students' learning for feedback into curriculum and pedagogic practice.	5
Regularity and involvement in different school activities	Observation of day-to-day * school activities and report of an in- depth study of four activities.	5
	TOTAL MARKS	**50**

* Note: Any of the above activity may be replaced as per the need of the course

SUGGESTED SCHOOL ACTIVITIES: -

Select any one activity from each group given below: -

A Group: -

- Organization of cultural activities,
- Organization of literary activities
- Organization of games/sports.
- Framing of time table.
- Water resource management through traditional methods.
- Prepare a report after interview of effective/good teachers.

B Group: -

- Attending and organizing morning assembly
- Maintenance of classroom discipline
- Review of School Records

- Guidance and Counseling
- Gardening

C Group: -

- Organizing science fair,exhibition,science club,nature study
- Maintenance of School library
- Maintenance of School laboratories.
- Health and hygiene.
- Study on role of community for school improvement
- School mapping

D Group: -

- Sensitization for environmental problems.
- Cleaning campaigning in school.
- School climate/Environment (any one aspect)
- Voluntary services.
- Mass awareness of social evils and taboos.
- Any other activity/s decided by the institute.

Internship (16 weeks)

TEACHING PRACTICE AND PRACTICAL WORK

Planning & Execution	Preparation, administration & analysis of diagnostic test (s) followed by remedial teaching any selected lesson.	**10**
Execution	Execution of action research project	**10**
	Observation and preparation of report	**10**
	Working with community project of social welfare. (submission of report)	**10**
	Exhibition of TLM in school prepared by student teacher	**10**
	Regular classroom teaching delivery of 70 lessons	**5+5=10**
Assessment & Evaluation	Two Criticism Lesson in teaching subject	**10+10=20**
	5 Lessons to be observe by teacher educator.	**5+5=10**
	Final Lesson (External evaluation)	**50**
Regularity & involvement in different school activities	Student teachers function in liaison with the regular teachers in the school in all day-to-day functioning along with teaching-learning by mentor teachers	**05**
	Participating in various 'out of classroom activities' in school Organizing events	**5**
	Participation in any two co-curricular activity and preparation of report	**10**
	Study (and preparation) of school calendar,time table,assessment schedule,library and laboratory.	**5**
	Portfolio,including detailing of teaching-learning plans,resources used,assessment tools,student observations and records.	**10**

	observations of work done by the students during the internship programme.(Seeking reactions of students,headmasters/ principals/ cooperating teachers and supervisors)	**05**
	Preparation and maintenances of feedback diary	**10**
	A journal by student teacher in which he/she records one's experiences, observations,and reflections.	**10**
	TOTAL MARKS	**200**

Examination &Evaluation: -

S. No.	Course	Distribution of Marks
1	Perspectives in Education	650
2	Curriculum and Pedagogic Studies (50+50)	100
3	Specialization	200
4	CCA & Prayer Yoga	200
5	Engagement with the Field – Internship	250
6	Core Courses	1800
7	Compulsory course	--
	GRAND TOTAL	**3200**

Marks Distribution of yearwise	
Year	**Total Marks**
I Year	800
II Year	900
III Year	750
IV Year	750
Grand Total	3200

Marks Distribution	Year of Study			
Areas of Marks	I Year	II Year	III Year	IV Year
Content Subjects	450	600	450	300
Perspective in Edu.	250	200	100	100
Specialization	50	50	50	50
Pedagogy Subject			50	50
CCA	25	25	25	25
Prayer & Yoga	25	25	25	25
Internship			50	200
Total	**800**	**900**	**750**	**750**
	Grand Total			3200

Successful candidates will be awarded division on the basis of the aggregate marks of all the Core Courses, Pedagogy Courses and perspective Courses

	As per the following:	
I.	First Division	60% or more
II.	Second Division	50% or more (but less than 60%)
III.	Third Division	40% or more in theory (but less than 50%)

Note-

The minimum pass marks in each year examination shall be 40% for each theory paper & practicum and 50% for internship in teaching separately.

Candidates can apply for Re-evaluation in any of the theory courses as per rules stipulated by the University for BSCBED degree. Changes in Statutes/ Ordinances/ Rules/ Regulations/ Syllabi and books may from time to time be made by amendment or remaking and a candidate shall, except in so far as the University determines otherwise, comply with any change that applies to years she/he has not completed at the time of change.

Notes

There shall be a University examination at the end of each year as per details of the scheme of examination.

A candidate will be permitted to appear in the annual examination only if he/she has pursued a regular course of study and attended at least 80% of the classes for all the course work and practicum and 90% for school internship.

A candidate shall be admitted to the next higher class only if s/he passes his/her Part I/ Part II / Part III Examination as per rules mentioned herein after.

In order to qualify for B.Sc. B.Ed. degree a candidate should obtain a minimum of 40% marks in theory and practical and 50% for internship in teaching separately, wherever applicable in each subject in each year of the course and 40% marks in Pre-Internship in III Year and also in Internship in Teaching in the Fourth Year.

In Part I, there will be two core courses; compulsory course is General Hindi/ General English, ICT in Education and Environmental Education. In order to pass, a candidate must secure atleast 40% marks in each Compulsay course. However, the marks obtained in these papers will not be taken into account for awarding the division. In case a candidate fails in the compulsory course, she/he has to clear the same in consequent year.

The minimum pass marks in the supplementary examination shall be the same as prescribed for the main examination for internship may pass % shall be 50% separately for internship. i.e. (250)

Rules &Regulation: -

- Final examination is dividing in to two parts external and internal in all the courses, except the courses having practical exams. Internal assignment will be included two tests (7.5 marks each) and any two assignments in course having 100 marks and one

assignment of 5 marks in the course having 50 marks along with two tests. In all the core course internal marks will be given by two tests.

- The candidate who has passed any year of B.Sc.B.Ed. Programme after taking supplementary examination will be awarded minimum pass marks in the concerned subject irrespective of marks actually obtained in the supplementary examination.
- A candidate who fails in 50% courses or less than 50% courses in first year of the programme will be eligible to take admission in second year and give the supplementary examination in the course(s) in which s/he fails along with subsequent examination and get two more chances for clearing this course. In second year,if a candidate is failed,she/he has only one more chance to qualify the exam. Non-appearance or absence from the examination of this paper will be counted as a chance.
- If a student is failed more than 50% courses in first year, he/she has to appear as ex-student in next subsequent year.
- A candidate who fails in one or two courses inany year of the programme will be eligible to take the supplementary examination in the course(s) in which s/he fails and get two more chances for clearing this course either along with the supplementary examination in next subsequent year. Non-appearance or absence from the examination of this paper will be counted as a chance.
- In case the candidate is not able to pass supplementary examination in two subsequent years,s/he can appear only as an ex-student in all courses again at the main examination of the next subsequent year. she/he will not be required to appear in practical(s) if she/he has already cleared the same and have to pay extra one third fee as ex-student. A candidate shall be deemed to be an ex-student if s/he completed a regular course of study at the Institute and fulfilled the required attendance and appeared in University examination but failed or did not take the examination.
- A candidate who fails in the practical/theory/field work of a course at the main examination shall be required to appear only in the corresponding practical/ theory of the supplementary examination.
- A candidate who appears for the supplementary examination may take provisional admission to the next higher class at his/her own risk. Such a candidate will,however,be allowed to appear in the University examination of the next higher-class course to his/her passing the supplementary examination,fulfilling the attendance requirement as a regular candidate and completion of courses of study as per scheme of examination. If a candidate getting supplementary does not take provisional admission to the next higher class by the notified last date of admission and passes the supplementary examination at a later stage, she/he will not be admitted to the next higher class. However, such a candidate may take admission to the next higher class in the next academic session.
- A candidate who fails in more than two courses (except General Hindi/General English/ Environmental studies and ICT in Education) in any year of the course shall be declared failed and will not be promoted to the next class. Such a candidate will be permitted to appear at the main examination of the subsequent year in all the courses only as an ex-student.
- Candidate who fails in more than two courses but passes in practical he/she will be required to appear again in all the courses (theory) except practical only as an ex-student.

- A candidate will be given a maximum of three chances at the main examination and the corresponding supplementary examination in any year of the course. If he/she does not pass the examination even thereafter, she/he will not be eligible for readmission to any year of the programme.

Pedagogical course – Learning to function as a teacher will be conducted in two phases. Phase I (Pre internship) of 50 marks and phase II (Internship in Teaching) of 200 marks will be conducted in B.Sc.B.Ed. Programme in Part III and IV respectively.

If a candidate fails in the Learning to function as a teacher (Pre-Intern - ship/Internship in Teaching) or is unable to complete Pre-Internship/Internship in teaching but passes in all other subjects he/she will be required to repeat the complete Pre-Internship/ _Internship in Teaching' in the next academic session along with regular candidates. Division will be awarded to the successful candidates only after the Part IV examination and on the basis of cumulative total of marks obtained in all the four years of the course in all the subjects including Internship in Teaching but excluding the core subjects i.e., General Hindi/General English,and Environmental studies.

FIRST YEAR –I

Course code	**Title of the course**	**EVALUATION**			
		External	**Internal**	**Practical**	**Total**
BSCBED110	Gen. English(compulsory)*	70	30	-	100
BSCBED-151	Childhood, Growing up & learning	70	30	-	100
BSCBED-152	Education in Contemporary India	70	30	-	100
BSCBED-153	Yoga for Holistic Health	35	15	-	50
BSCBED-154	Chetna Vikas Mulya Shiksha (Specialization)	35	15	-	50
BSCBED-155	Content: (PCB & PCM)				
BSCBED-155 a I	11. Physics I	40	10	50	150
BSCBED-155 a II	12. Physics II	40	10		
BSCBED-155 b I	13. Chemistry I	40	10	50	150
BSCBED-155b II	14. Chemistry II	40	10		
BSCBED-155 c I	15. Zoology I	40	10	50	150
BSCBED-155 c II	16. Zoology II	40	10		
BSCBED-155 d I	17. Botany I	40	10	50	150
BSCBED-155 d II	18. Botany II	40	10		
BSCBED-155 e I	19. Mathematics I	60	15		150
BSCBED-155 e II	20. Mathematics II	60	15		
	CCA				25
Prayer, Yoga, Meditation & Festival etc					25
Total					**800**

***Marks of compulsory subject shall not be added in the total marks.**

Course -1
General English
(CODE: BSCBED-110)

Maximum Marks: 100 **External Marks: 70**

Internal: 30Marks (in which two tests of 7.5-7.5 marks each are included)

Learning outcomes:

- Students develop proficiency in English which equips them to:
- Understand the demands of audience, course, situation and purpose and the Use of language for effective communication.
- Analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech. Examine authentic literary and non-literary texts and develop insight and appreciation.
- Gain an understanding of writing abilities and skills.
- To making students read English poetry & prose with a view to enhancing their comprehension of the language and encouraging them to develop reading habits.
- Developing basic skills in grammar, enriching their vocabulary and enabling them to write simple and correct English.

COURSE CONTENT

UNIT I: **Grammar**

- Tenses
- English sound & phonetic symbols
- Determinar
- Preposition
- Models

UNIT II- Reading & Comprehension

- Reading Comprehension and types of text
- Questions based on a passage from the prescribed text to test the candidate's comprehension and vocabular
- Questions based on an unseen passage to test the candidate's comprehension and vocabulary

UNIT III- P**oetry & Prose**

- John Milton- On his blindness
- William Blake- To the evening star
- Alfred Lord Tennyson- break,break,break
- Charls Lamb- A bachelor's complaint against the behaviour of married people
- J.B Priestly-On getting off to sleep

UNIT IV-Written Composition

- Summary writing
- Précise writing
- Letter/Application writing
- Report Writing

UNIT V- Enhancing writing abilities

- Advertisement
- Notice
- Invitation
- E-mail

Practicum/Field Work (any two of the following)

- Discuss in groups how the role of English language has changed in the twenty-first century.
- Keeping in view the topics given in this unit, prepare a questionnaire. Interview ten people and write a report on 'English Language in India'.
- Do a survey of five schools in your neighbourhood to find out the level of Introduction of English
- Materials (textbooks) used in the classroom
- Prepare a report on the challenges faced by the teachers and the learners in the teaching-learning process.

Recommended Books

- Abrams, M. H. (2005). *A glossary of literary terms.* New Delhi: Macmilan.
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- Deplit, L.D. (1988). *The silenced dialogue: power and pedagogy in educating other people's children*. Harvard Educational Review. 58(3): 280-299.
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- Hudson, W. H. (2012). *An introduction to the study of literature.* New Delhi: Maple Press.
- Long, W. J. (2015). *English Literature.* New Delhi: Rama Brothers India Educational Publishers.
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- Morris, W. A. (1985). *Harper dictionary of contemporary usage*(W. Morris, Ed.) New York: Harper & Row,Publishers.
- Naik, M. K. (1982). *A history of Indian English Literature.* New Delhi: Rabindra Bhawan.
- Prasad, B. (1999). *A background to the study of English Literature.* New Delhi: Macmillan.
- Thakar, D. A. (2008). *A concise history of English Literature.* Patna: Bharti Bhawan.
- Trivedi, R. D. (2018). *A compendious history of English Literature.* U.P: Vikas publishing house pvt.Ltd.
- Thwaite, A. &Rivalland, J. (2009) How can analysis of classroom task help teachers reflect on their practices? Australian journal of language and literacy. 32(1): 38
- Wolfreys, Julian(2012). the English Literature companions. New York: Palgrave MacMillan.

B.Sc.B.Ed.-I
Childhood, Growing up & Learning
(CODE: BSCBED-151)

Maximum Marks: 100 **External Marks: 70**

Internal: 30 Marks (in which two tests of 7.5-7.5 marks each are included)

Learning Outcomes: After completion of the course, student-teachers will be able to: -

- Understand children of different ages by interacting & observing them in diverse social, economic and cultural context rather than through an exclusive focus on child development.
- Study of childhood, child development and adolescence.
- Understand learning as divergent process.
- Make aware about the importance of healthy liking and preventing diseases.
- Introduce psychological traits of learners.
- Become health aware & sensitize children about mental and physical health.
- Understand the role of the family and the school in the child's development.

UNIT – I Childhood and Child Development

- Childhood: Meaning, concept and characteristics.
- Social and emotional development of child as an individual-concept development.
- Physical& intellectual development of child.
- Development of concept formation, logical reasoning, problem-solving and creative thinking & language development.
- Effect of family, schools, neighborhoods and community on social and emotional development of child.

Practicum/Field Work

- Organize creative activities for children of diverse socio- cultural background with aim to learn to communicate and relate with them.
- Create child based new activity to learn to listen to children with attention and empathy.
- Organize Creative activities (Such as slogan writing, Creative writing, story writing etc to cultivate linguistic skill.

UNIT – II Adolescent Development

- Adolescent: Meaning, concept and characteristics.
- Cognitive, Physical, social, Emotional and moral Development patterns and characteristics of adolescent's learner.
- Social and emotional construction of adolescence, various social-cultural and political dimension associates with its positioning and development in society.
- Impact of urbanization and economic change on adolescent. Issues of marginalization of difference and diversity and stereotyping.

Practicum/Field Work

- Identifying the adolescence's problem, a sound of discussion with parents will be held. Suggest the remedial majors to being about positive change.

- Project on your experiences to be had with adolescence of diverse contexts such as orphan, backward classess and street children, interact with them(special reference to their physical, mental and emotional development)
- Seminar or workshop for student teacher to observe, interact with and study adolescents of different ages in and outside the school, in diverge social-economic, cultural, linguistic and regional contexts.

UNIT – III Learning

- Learning: Meaning, Concept, Types and Nature of learning, factors influencing learning.
- Process and outcome of learning.
- Domains of learning, cognitive, Affective and psychomotor.
- Learning skills, E-Learning & use of ICT in self-learning.
- Motivation: Meaning and Role in the process of learning, Achievement Motivation.

Practicum/Field Work

- The pupil teacher will prepare at least two lessons based on computer assisted instruction and study its effectiveness.
- Observe two learners, in natural setting to study and write a report on their domain of learning, the report present class in the presence of teacher education.
- To study children of diverse economic and societal & cultural context for understanding learners' thinking and learning and prepare a report.

UNIT – IV Personality and Hygiene

- Mental Health & Hygiene: Meaning, Concept and Factors affecting mental Health & Hygiene.
- Development of Good mental Health, charasterstics of mentally healthy teacher, to improve mental health of teachers.
- Personal and environmental hygiene, Family and school health/prevention of accident, Health information, disease prevention.
- Personality: Meaning, Theories and assessment, adjustment and ists mechanism, maladjustment.
- The Psychological Disordres During Quarantine and Isolation.

Practicum/Field Work

- Examine the personal, domestic and physical hygiene of school of student.
- Conduct an awareness program in school by the pupil teacher on physical and mental health after getting training on prayer, yoga and meditation.
- Conduct a Study in your Society selscting any two Psychological variables (Stress, Mental Health, Tension, Conflict, Anxiety, Depression, SelfSteem etc.).

UNIT – V Development and implications in education of

- Self concept, attitudes, interest, habits, aptitude and social skills.
- Intelligence and creativity – meaning, theories and measurement, role in learning, emotional, maladjustment.
- Childhood and child Development implication in teaching and learning
- Physical & Mental Hygiene implication for teachers
- Adolescent Development implication for teachers,teaching and learning
- Learning implication for teachers

Practicum/Field Work

Apply any two psychological tests on two students and on the basis of the conclusion, make a comprehensive profile,(at least ten students for each test).

References:

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- Pareek, M. (2002). *Child Development and Family Relationship.* Jaipur: Research Publication.
- Sharma, R.K. (2006). *Psychological Foundation of Child Development* Agra*:* Radha Prakashan Mandir.
- Shrivastva, D.N.(2010). *Modern Experimental Psychology and testing*. Agra: Shri VinodPustakMandir.
- Shrivastva, D.N. & Verma P. (2007). *Child Development and Child Psychology*. Agra: Vinod Pustak Mandir.
- Singh, D.P. & Talang, Prakash (2002). *Psycho-social basis of learning and development.* Jaipur: Research Publication.
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- शर्मा, राजकुमारी (2016). *बाल्यावस्था और वृद्धि विकास.* आगराः राधा प्रकाषन.

Education in Contemporary India
(CODE: BSCBED-152)

Maximum Marks: 100 **External Marks: 70**

Internal: 30 Marks (in which two tests of 7.5-7.5 marks each are included)

Learning Outcomes: After completion of the course, student-teachers will be able to-

- Contextualize contemporary India with development of education.
- Understand the classroom as a social context.
- Appreciate diverse perspectives of social, cultural, economics and political issues.
- Critically analyse human and child rights.
- Equips the teacher with proactive perspective and sense of agency.
- Engage with concepts which are drawn from a diverse set of disciplines.
- Learn about policy debates overtime the implementation of policies and actual shaping of school education.

UNIT – I Diversity in contemporary Indian society & Education

- Indigenous Meaning, concept & characteristics.
- Education: Meaning, concept and Nature.
- Social & Cultural Diversity: Meaning, concept and their impact on Education.
- Social, Cultural, Economic and Political and technological perspective of society and Education.
- The role of educational institution for creating new social orders.
- Classroom as a social context.

Practicum/Field Work

- Project on tracing the process by which a consumer product is made available from its raw form to a finished product and studying the various factors of geography, economics, politics, history and sociology that may have influenced it in one way or another.
- Prepare a report on Parents and teacher experiences about their and others' culture and diversity.

UNIT – II Educational Management

- Concept and functions of education management, Education management in Rajasthan, School as a unit of decentralized planning, Educational management information System (EMIS), Institutional planning, School mapping, Block Resource Centre (BRC), School management Committee (SMC), District information System for Education (DISE), Sarva Shiksha Abhiyan (SDSA), Rashtriya Madhyanik Shiksha Abhiyan (RMSA).
- National integration and National security.

Practicum/Field Work

- Prepare a report after studying the difference in role and functions of Sarva Shiksha Abhiyan (SDSA), Rashtriya Madhyanik Shiksha Abhiyan (RMSA).
- Write a report on overall school performance in development of social and scientific attitude among student after analysis the whole day experiences of student with discussion at least fifteen days.

UNIT –III Constitutional Provision as the guideline to education

- Constitutional provisions related to education
- Constitutional provisions on human & child right, values & education.
- Role of NCPCR (National commission on protection of Child Right)
- Constitution direction for issues & problems in education

Practicum/Field Work

- Observe mid day meal of a school to assess its nutritive value and social integral value (when children from various socio-cultural background religion, caste etc.come together)
- Conduct an awareness programme on Child Rights with students, parents and community.
- What nations stand out with regard to high or low percentages of girls or women enrolled in schools at various levels of education? What seem to be some of the determinants of high or low percentages? What changes appear to be likely in the next few years?

UNIT – IV Emerging Indian Concerns and their educational implications

- Meaning, Concept and impact on education of liberalization, globalization, govermintization, Privatization.
- Stratification of Education: concept and process.
- Nationalist critique of colonial education and experiments with alternatives
- Education for marginalized group like women, dalits and tribal people on personal family and community hygiene.

Practicum/Field Work

- Discuss with parents and students about hygiene.
- Draft a report on above special camp and present it in classroom seminar.

UNIT – V Organisation of educational setup

- Organisation of educational setup at primary and secondary
- functions of RIE, SIERT, SBER, CTE, DIET,
- Educational initiative: Balika Shiksha Foundation, Kasturba Gandhi Balika Vidalaya, Rajasthan text book board, Bharat Scouts and Guides. Rasthriya Military school, Sainik school, Model school, E-Mitra, E-Governance, Rajshiksha, Edusat, Gyandarshan, Gyanvani.
- Right to Education,SSA, Policies for UEE, Nayee Taleem

Practicum/Field Work

- Examine policy & constitutional provision on equality and right to education.
- Train students in any five handicrafts on the basis of the Nayee taleem (such as paper Meshi, Mithi Kutti, Handloom etc) and other related to cottage industries.
- Organize an exhibition on handicraft material.

Reference

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- रूहेला, एस. पी. (2009). *षिक्षा के दार्षनिक व समाजश्षास्त्रीय आधार.* आगराः अग्रवाल पब्लिकेषन.
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- पाण्डेय, रामशकल (2007). *षिक्षा के दार्षनिक व समाजश्षास्त्रीय पृष्ठभूमि.* आगराः अग्रवाल पब्लिकेषन्स.
- सक्सेना, एन. आर. (2010). *षिक्षा सिद्वान्त.* मेरठः आर. लाल. बुक डिपो.
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- त्यागी, ओकांर सिंह (2009). *उदीयमान भारतीय समाज और षिक्षा.* जयपुरः अरहिंत प्रकाषन.
- पाठक, पी.डी. (2007). *षिक्षा के सामान्य सिद्वान्त.* आगराः विनोद पुस्तक मन्दिर.

Yoga for Holistic Health
(CODE: BSCBED-153)

Maximum Marks: 50 **External Marks: 35**

Internal: 15 Marks (in which two tests of 5-5 marks each are included)

Learning Outcomes:

- Understanding about the concept, scope & need of Holistic Health.
- Apply their Knowledge about yoga and fundamentals of holistic health in daily life.
- To compare the Education of holistic health between Indian & Western Context.
- Conceptualize Metaphysical Bases of Yoga.
- Integrate yoga & meditation in their daily life.
- Examine Different Yoga Systems and Characteristics of Yoga Practitioner.
- Able to perfectly select instrument of yoga and their effective uses.

UNIT – I Fundamentals of holistic health

- Concept of Holistic Health.
- Need & scope of education for Holistic Health.
- The Indian context and Western context of Education for Holistic Health.
- Dimensions of development of Holistic Health.

Practicum/Field Work

- Make a seven-day programme for holistic development of student through discussion the concept of holistic health with student.
- Organize five days shivir on Holistic Health.
- Comparative study of the concept of holistic health in Indian context & Western context.
- Institutional programme for development of Holistic Health through yoga.

UNIT – II Metaphysical Bases of Yoga

- Concept of Purush and Prakriti as Basic Component of Cosmic Reality.
- Concept of Antahkaran Man, Budhdhi, Chitt, Ahankar.
- The metaphysics of Sankhya, theory of causation.

Practicum/Field Work

- Workshop on Metaphysical Bases of Yoga.
- Awareness programme on Manviya Prakriti in school.

UNIT – III Philosophy of Yoga Education

- The meaning and definition of yoga.
- Needs, importance and scope of yoga education.
- Yoga as a way of healthy and integrated living.
- Yoga as a way of socio-moral upliftment of man.
- Yoga as a way of spiritual Enlightment, Atmanubhuti, Pratyakshanubhuti.

Practicum/Field Work

- Practice any five yogasana in school with involvement of parents for socio-moral and physical health upliftment of student.
- Orientation programme of school level students for integration of yoga in their daily life.

UNIT – IV Different Yoga Systems and Characteristics of Yoga Practitioner

- Ashtang yoga of Pantajali Pranayama-Pratyahar-Dharna-Dhyana, Samadhi.
- Gyan-Bhakti-Karma yoga of Bhagvadgita.

- Integral yoga of Aurbindo and modern school of yoga.
- Characteristics of a yoga practitioner.

Practicum/Field Work

- Discuss characteristics of a yogi pusush with student and make a idea Soutine for student.
- Attend morning assembly or prayer of a school for integrates Ashtang yogasna in it.

UNIT – V Instrument of Yoga

- Inner instrument to self awareness: Antah Karana (Sankhya philosophy)
- Different Asanas and Pranayam to promote a sound Physical and mental health.
- Dhyan and its therapeutic value.
- Selected ways of Dhyana.
- Awarness of COVID - 19: Mechanism during Quarantine and Home Isolation.

Practicum/Field Work

- Practice dhyana for five minutes to students before teaching and learning anlyse its impact on their performance.
- Conduct a Mechanism strategy of Yoga for Quarantine and Isolate people and prepare a Report of Yoga Aasana special for Isolate people.

Reference

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- Swami, A. P. & Mukerjee (2008).*Yoga lessons for developing spiritual consciousness*.New Delhi: Cosmo Publication.
- Yadav, S. & Kumar, S. (2014). To Study the Effectiveness of Yoga Education on Holistic Development of Teacher Trainees. *International Journal of Innovative Research & Development*. *3*(1).

Chetna Vikas Mulya Shiksha
मानव आचरण का अध्ययन
(CODE: BSCBED-154)

Maximum Marks: 50 **External Marks: 35**

Internal: 15 Marks (in which two tests of 5-5 marks each are included)

Learning outcomes: After completion of the course, student-teachers will be able to:-

To develop the understanding about:

- Life and values pertaining to Individual, Family and Society.
- Harmony in Environment, Nature and Existence.
- Humanity, Human Mindset, Humane Conduct and Universal Order in Nature & Existence.
- Evaluating and understanding the difference between Animal and Human consciousness.
- To ensure sustainable happiness and prosperity, which are the core aspirations of all human beings.
- To facilitate the development of a holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living.

UNIT-I Understanding of Human Being and Human Values and Humane Conduct

- Understanding the harmony in Self and Body
- Understanding Human being and Human Goal
- Humane Character and Morality
- Relationships and Justice (Nyaya) within Family & Society
- Relationship of Human being with Nature (Environment)
- Human Behavior, Humane instincts and Personality

UNIT-II Significance of Value Education

- Problems faced by the Humanity related to human value
- Social and Family disintegration
- Stress and conflict in individuals
- Significance of Value Educations for solving the human problems

UNIT-III Understanding the Values

- Eternal Values: Trust, Respect, Affection, Care, Guidance, Reverence, Glory, Gratitude, Love
- Behavioral Values: Complementariness, Compliance, Ease, Commitment, Unanimity, Self-restraint, Obedience, Spontaneity, Generosity
- Human Values
- Self (Jeevan) Values : Happiness, Peace, Satisfaction, Continuous happiness Material Values

UNIT-IV Understanding Existence & Co-existence and the Interrelationships in Nature

- Understanding the Existence & Co-existence / Nature
- Understanding the order, co-existence and interrelationships, Mutual Fulfillment and

Cyclicity (Avartansheelata) in nature

- Problems faced by the Humanity
- Ecological and Environmental imbalances

UNIT – VHarmony and Values in Family

- Family and Relationships: meaning, need, importance and purpose.
- Human relation: types and purpose.
- Meaning and purpose of fulfillment in relationships and Justice in relationships.
- Understanding values in family-relations, Importance of ethics and character.
- Family-work and Goal (Living with resolution and a feeling of prosperity, and participation in society).
- Reasons for breaking up of families and relationships.
- Purpose and need of marriage (vivaah sambandh) and a study of reasons and tendencies for breaking up of marriages.
- Comparative study of concept of a family and a family-based village governance order.

Sessional-Work (Any two of the following)

- A Report of a programme organized under the Chetna Vikas Moolya Shiksha programme.
- Propose a broad outline for Humanistic Constitution at the level of Nation.
- A Critical study of value-based book or work in any organization.

References

- Gaur, Sangal & Bagaria (2009). *A Foundation Course in Human Values and Professional Ethics*. New Delhi: Excel Books.
- Nagraj, A. (1998). *Jeevan Vidya Ek Parichay*. Amarkantak: Divya Path Sansthan.
- Dhar, & Gaur, (1990). *Science and Humanism*.Delhi: Commonwealth Publisher.
- Tripathi, A.N (2003). *Human Values.* New Age International Publishers.
- Banerjee, B.P. (2005). *Foundation of Ethics and Management.*New Delhi: Excel Books Value Education Website, http://www.uptu.ac.in
- Study Material provided by Jeevan Vidya Study Centre, Somaiya Vidya Vihar.

CORE COURSES (CC)

CC-1 Physics-I

CC-1 (I) Paper-I: Relativity, Mechanics, Oscillations and Waves

(CODE: BSCBED-155 a I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes -After completion of the course, student-teachers will be able to-

- Understand Newtonian mechanics, oscillations and waves.
- Apply Newton's laws to explain natural physical phenomena.
- Explain acoustics and waves in media.

UNIT – I

- **Relativity:** Reference systems, inertial and non-inertial frames, Galilean transformation, Galilean invariance and conservation laws, propagation of light, Michelson-Morley experiment. Postulates of the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition theorem, variation of mass with velocity, mass-energy equivalence, particle with a zero-rest mass.

UNIT -II

- **Mechanics:** Motion under central force, Kepler 's laws, Gravitational law and field, Potential due to a spherical body, Gauss and Poisson equations for gravitational potential, gravitational self-energy.
- Rigid body motion, Rotational motion, Moment of inertia and their products, principal moments and axes, Euler's equations.
- System of particles, centre of mass,equation of motion, single stage and multistage rocket, energy and momentum conservation, concepts of elastic and inelastic collisions.

UNIT -III

- **Oscillations:** Potential well and periodic oscillations, cases of harmonic oscillations, different equations and its solutions, Kinetic and potential energy, Simple Harmonic oacillations in Spring and mass system, Simple and compound pendulum, Torsional pendulum, Bifilar oscillations, Helmholtz resonator, LC circuits, Vibration of a magnet, Oscillation of two masses connected by a spring, Superposition of two simple harmonic motions of same frequency along the same line,Interference, Superposition of two mutually perpendicular simple harmonic vibrations of same frequency, Lissajou's figures, Cases of different frequency.

UNIT –IV

- **Coupled Oscillations:** Two coupled oscillators, normal modes, N-coupled oscillators, damped harmonic oscillators, Power dissipation, Quality factor, Driven harmonic oscillator, Transient and steady state, Power absorption, Resonance in system with many degrees of freedom.

UNIT-V

- **Waves in Media:** Speed of transverse waves on a uniform string, speed of Longitudinal waves in a fluid, energy density and energy transmission in waves, waves over liquid surfaces, gravity waves and ripples, Group velocity and Phase velocity, Superposition of

waves, linear homogeneous equations and the superposition principle, nonlinear superposition and consequences.

- **Acoustics**: Noise and Music, The human ear and its responses, limits of human audibility, intensity and loudness,bel and decibel, the musical scale, temperament and musical instruments, Production and detection of ultrasonic and infrasonic waves and applications,

Textbooks and References

1. Resnick, R. (1971). *Introduction to special relativity*.(Wiley India Pvt. Ltd.,2005) Charles Kittel, Berkeley Physics Course vol.-1, Mechanics (Mc Graw-Hill,1965)
2. Stephani, H. (2004). *Relativity: An introduction to special and general relativity*. Cambridge university press.
3. Feynman, R. P., Leighton, R. B., & Sands, M. (1965). The Feynman lectures on physics; vol. i. *American Journal of Physics*, *33*(9), 750-752.
4. Feynman, R. (2018). *Feynman lectures on gravitation*. CRC Press.
5. Bajaj, N. K. (1988). *The physics of waves and oscillations*. Tata McGraw-Hill Education.
6. Gambir, R.S.(2006) Mechanics (CBS Publishers and Distrubutions, New Delhi)
7. Garg, S. C. K. Ghosh, S.Gupta, (2009). Oscillations and Waves (PHI Learning Pvt. Ltd.
8. Ghosh, R.K (1975). The Mathematics of Waves and Vibrations, (Mc Milan, 1975)
9. Frank S. Crawford Jr., Berkely (1968). Physics Course: Vol.3, Waves (McGraw Hill book company, 1968)
10. Main, I G (1984). Vibrations and Waves (Cambridge University Press,
11. H J Pain, (2005). The Physics of Vibrations and Waves (John Wiley & Sons Ltd., 2005)

CC-1 Physics-II

CC-1 (II) Paper-II: Mathematical Background, Properties of Matter and Electromagnetic Waves

(CODE: BSCBED-155 a II)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes - After completion of the course, student-teachers will be able to:-

- Know the mathematical background, properties of matter and electromagnetic waves.
- Get familiar with concepts of scalars and vectors.
- Apply the principles of Kinematics of moving fluids and Electromagnetic induction in real situations.
- Learn the electromagnetic wave and Electromagnetic field and Energy density

UNIT -I

- **Scalars and Vectors:** dot products, triple vector product, gradient of scalar field and its geometrical interpretation, divergence and curl of a vector field, line, surface and volume integral, Flux of a vector field, Gauss divergence theorem, Green's theorem and Stokes theorem. Functions of two and three variables, Partial derivatives, geometrical interpretation of total differential of a function of two and three variables, higher order derivatives and their applications.

UNIT –II

- **Elasticity,** Small deformations, Young's modulus, bulk modulus and moudulus of rigidity for an isotropic solid, Poisson's ratio, relation among elastic constants, Theory of bending of beams and cantilever, Torsion of a cylinder, Bending moments and Shearing forces.

UNIT –III

- **Kinematics** of moving fluids, Equation of continuity, Euler's equation, Bernoulli's principle, viscous fluids, Streamline and turbulent flow, Poiseuille's law, Capillary tube flow, Reynold's number, Stokes 'law, Surface tension and surface energy, molecular interpretation of surface tension, Pressure on a curved liquid surface, wetting.

UNIT –IV

- **Electromagnetic** induction, Faraday's law (its integral and differential form), Lenz's law, Mutual and Self-inductance, Transformers, Energy in a static magnetic field, Measurement of self-inductance by Rayleigh's method, Maxwell's displacement current, Maxwell's equations, Electromagnetic field and Energy density.

UNIT –V

- **Plane** electromagnetic wave in vacuum, Wave equation for E and B of linearly, Circularly and elliptically polarized electromagnetic waves, Poynting vector, Reflection and Refraction at a plane boundary of dielectrics, Polarization by Reflection and total internal Reflection, Faraday effect, Wave in conducting medium, Reflection and Refraction by the ionosphere.

Textbooks and References

1. Zil'berman, G. E. (1970). Electricity and magnetism. *Elma*.
2. Bleaney, B. I., Bleaney, B. I., & Bleaney, B. (2013). *Electricity and Magnetism, Volume 2*(Vol. 2). Oxford University Press.
3. Neittaanmäki, P., Rudnicki, M., Rudnicki, M., & Savini, A. (1996). *Inverse problems and optimal design in electricity and magnetism* (No. 35). Oxford University Press.
4. Resnick, R., Walker, J., & Halliday, D. (1988). *Fundamentals of physics* (Vol. 1). Hoboken: John Wiley.
5. Blatt, F. J., & Blatt, F. J. (1989). *Principles of physics*. Boston, London: Allyn and Bacon.
6. Griffiths, D. J. (2005). Introduction to electrodynamics. Prentice Hall of India A.M parties, Electomagnetic field.
7. Griffiths, D. J. (1999). Introduction to Electrodynamics Prentice-Hall. *Upper Saddle River, NJ*.
8. Sarwate, V. V. (1993). *Electromagnetic fields and waves*. Bohem press.
9. Ghosh, S. N. (2002). *Electromagnetic theory and wave propagation*. CRC Press.
10. Kakani and Hemrajani (2008). Electromagnetism theory and Problems, New Delhi: CBS Publishers and Distributors.

PHYSICS PRACTICALS

Duration: 4 hrs **Max. Marks: 50**

Total number of experiments to be performed by the students during the session should be 16, selecting any eight from each section. In examination two experiments are to be performed taking at least one from each section.

The distribution of marks in the practical examination will be as follows:

(i) Two experiments	30 Marks
For each experiment, distribution of marks will be as follows:	
Figure:	2
Formula/Theory:	2
Observation:	7
Calculation and Result:	3
Precautions:	1
(ii) Viva voce	10
(iii) Records	10
Total	**50 Marks**

LIST OF EXPERIMENTS

Section A

- Study of conservation of momentum in two dimensional oscillations.
- Study of a compound pendulum.
- Study of damping of a bar pendulum under various mechanics.
- Study of oscillations of a mass under different combinations of springs.
- Study of bending of a cantilever or a beam
- Study of torsion of a wire (static and dynamic methods.)
- Study of flow of liquids through capillaries.
- Determination of surface tension of a liquid by different methods.
- Study of viscosity of a fluid by different methods.
- To find M.I. of an irregular body by inertia table.
- To study the random decay and determine the decay constant by statistical method.
- Determine Y by Searle's apparatus.

Section B

- Study of magnetic field due to a current
- Conversion of galvanometer into an ammeter
- Conversion of galvanometer into voltmeter.
- To determine the internal resistance of primary cell using potentiometer.
- Measurement of low resistance by Carey-Foster Bridge.
- Measurement of inductance using impedance at different frequencies.
- Measurement of capacitance using impedance at different frequencies.
- I-V characteristics of a P-N junction diode
- Determine unknown resistor by post office box.
- To determine Poisson's ratio of rubber tube.
- To determine the frequency of A.C main

CC-2 Chemistry-I
CC-2(I) Paper I-Inorganic Chemistry
(CODE: BSCBED-155 b I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- Understanding of principles of Atomic structure and Chemical Bonding.Get familiar with chemistry of main group elements.
- Apply the principles of Acids and Bases in real life situation.
- Determinethe crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).
- Define the characteristics of different type of bond.
- Define the Basic properties of main group elements&Transition Elements.

UNIT- I Atomic Structure and Bonding

- **Atomic Structure**: Idea of de-Broglie matter waves, Heisenberg uncertaintyprinciple, atomic orbitals, Schrödinger wave equation, significance of Ψ and Ψ^2, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d, orbitals.
- **Structure and Bonding**: Covalent Bond, Valence bond theory and its limitations, directional characteristics of covalent bond,various types of hybridization and shapes of simple inorganic molecules and ions,valence shall electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, ClF_3, ICl_2^- and H_2O, MO theory, homonuclear and heteronuclear (CO and NO) diatomic molecules, multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electro-negativity difference.

UNIT-II Chemistry of main group elements

- **S-Block Elements**: Comparative study, diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their function in bio-systems, an introduction to alkyls and aryls.
- **P-Block Elements**: Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides, oxy acids and halides of group 13-16, hydrides of boron-diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetra nitride, basic properties of halogens, interhalogens and polyhalides.
- **Chemistry of Noble Gasses**: Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

UNIT-III: Ionic compounds: Bonding and Structure

- **Ionic solids:** Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule, Metallic bond-free electron, valence bond and band theories.
- **Structure of Ionic solids**: Definition of space lattice, unit cell, Laws of crystallography (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of

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

Weak Interactions- Hydrogen bonding, van der Waals forces.

UNIT- IV Acids and Bases

- **Theories of Acids and Bases**: Arrhenius, Bronsted-Lowry, the Lux-Flood, solvent system and Lewis concept of acids and bases. Solvent system of acid and bases with special reference to liquid Ammonia, liquid BrF_3
- **Concept of Hard and Soft Acids and Bases (HSAB):** Classification ofacids and bases as hard and soft, Pearson's HSAB concept, acid-base strength and hardness and softness, Symbiosis, theoretical basis of hardness and softness, electro negativity and hardness and softness.
- **Solvent Systems:** Physical properties of a solvent, types of solvents andtheir general characteristics reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.

UNIT- VChemistry of Transition Elements

- **Chemistry of Elements of First Transition Series:** Characteristic properties of d block elements, properties of the elements of the first transition series,their binary compounds (hydrides,carbides and oxides) and complexes with respect to relative stability of their oxidation states, coordination number and geometry.
- **Chemistry of Elements of Second and Third Transition Series:** General characteristics, comparative treatment of Zr/Hf, Nb/Ta, Mo/W in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

Textbooks and References

- Lee, J.D. Concise Inorganic Chemistry, ELBS.
- Douglas, B.E. and Mc Daniel,D.H.,Concepts & Models of Inorganic Chemistry
- Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications.
- Shriver and Atkins Inorganic Chemistry,W. H. Freeman and Company
- James Huheey, Inorganic chemistry: Principles of Structure and Reactivity, Pearson Education India.
- B.N. Figgis, J.E Huheey, P.W. Atkins Inorganic Chemistry, Pearson Education.
- Duward Shriver, Inorganic Chemistry, W. H. Freeman.
- Gary Wulfsberg, Inorganic Chemistry, University Science Books.
- A. R. West, Solid State Chemistry and its Applications, Wiley.

CC-2 Chemistry-II
CC-2(II) Paper II: Physical Chemistry
(CODE: BSCBED-155 b II)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- Understand of Nuclear chemistry, behaviour of gases and liquid and colloidal States.
- Get familiar with Solutions, Dilute Solutions and Colligative Properties.
- Apply the principles of concept of Equilibrium in real life situation.
- Determine the liquid crystal,solid and liquid, Classification,structure of nematic and cholestric phases.

Unit- I Nuclear Chemistry

- **Nuclear Chemistry:** Radioactive decay–decay law, disintegration constant, half-life and average life, alpha and beta disintegration reactions, group displacement law, nuclear reactions fission, fusion, artificial radioactivity, applications of radioactivity, nuclear power, carbon dating, biological effects of various types of radiations, nuclear chemistry for peace, Nuclear chemistry in Medicine and diagnostic techniques.

Unit –II Behaviour of gases

- **Gaseous States:** Postulates of kinetic theory of gases, deviation fromideal behaviour, and Vander Waals equation of state.
- **Critical Phenomena**: PV isotherms of real gases,continuity of states, the isotherms of van der Waals equation, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state.
- **Molecular velocities**: Root mean square, average and most probable velocities, Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter, Liquification of gases (based on Joule – Thomson effect).

Unit III Liquid and Colloidal States

- **Liquid State:** Intermolecular forces, structure of liquids (a qualitativedescription). Structural differences between solids, liquids and gases, Liquid crystals: Difference between liquid crystal, solid and liquid, Classification, structure of nematic and cholestric phases, Thermography and seven segment cells.
- **Colloidal States:** Definition of colloids, classification of colloids, Solids in liquids (sols): properties kinetic, optical and electrical, stability of colloids, protective action, Hardy-Schulze law, gold number. Liquids in liquids (emulsions): types of emulsions, preparation, Emulsifier, Liquids in solids (gels): classification, preparation and properties, inhibition, general application of colloids, colloidal electrolytes.

Unit- IV Solutions, Dilute Solutions and Colligative Properties

- Ideal and no-ideal solutions, methods of expressing concentrations of solutions, activity and coefficient.
- Dilute solutions, colligative properties, Raoult’s law relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point. Thermodynamic derivation of relation between molecular

weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties.

Unit V Concept of Equilibrium

- **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, applications.
- **Equilibrium:** statement and meaning of the terms–phase, componentand degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system-water, CO_2 and S systems. Phase equilibria of two component system – solid – liquid equillibria, simple eutectic-Bi-Cd, Pb-Ag systems, and desilverisation of lead. Solid solutions-compound formation with congruent melting point (Mg-Zn) and incongruent melting point, ($NaCl-H_2O$), ($FeCl_3-H_2O$) system. Freezing mixtures, acetone-dry ice. Liquid-liquid mixtures-Ideal liquid mixtures, Raoult’s and Henry’s law. Non-ideal system-azeotropes- $HCl-H_2O$ and ethanol-water systems. Partially miscible liquids.

Textbooks and References

- Bajpai, D. N. (1998). *Advanced physical chemistry*. S. Chand.
- Christmann, K. (2013). *Introduction to surface physical chemistry* (Vol. 1). Springer Science & Business Media.
- Donnan, F. G. (1916). A System of Physical Chemistry. *Nature*, *98*(2446),25-26.
- Engel, T., Drobny, G., & Reid, P. J. (2008). *Physical chemistry for the life sciences*. Prentice Hall.
- Lewis, D., & Glasstone,S. (1960). *Elements of physical chemistry*. Macmillan.
- Lingafelter, E. C. (1960). Elements of Physical Chemistry (Glasstone, Samuel).
- White, M. A. (2018). *Physical properties of materials*. CRC press.

PRACTICAL

Duration: 5 Hours **Max. Marks: 50**

Inorganic Chemistry

Ex.1 Separation and identification of 3 cations and 3 anions in the mixture 15

Organic Chemistry

Ex.2 Laboratory Techniques 03

Ex.3 Qualitative Analysis Detection of elements and detection of functional group 10

Physical Chemistry

Ex.4 Perform one of the experiments mentioned in the syllabus. 12

Ex.5 Vive-Voce 05

Ex.6 Practical-Record 05

A. Inorganic Chemistry

- Semi micro analysis: Detection of the presence of three cations and three anions (including interfering) in a given mixture qualitatively.

B. Organic Chemistry

Laboratory techniques

Calibration of Thermometer

Naphthalene (80-82°C), Acetanilide (113.5-114°C), Urea (132.5-133°C), Distilled Water (100°C)

- **Distillation:**
- Simple distillation of ethanol-water mixture using water condenser
- Distillation of nitrobenzene and aniline using air condenser
- Crystallization
- Concept of induction of crystallization
- Phthalic acid from hot water (using fluted filter paper and stem less funnel)
- Acetanilide from boiling water
- Naphthalene from ethanol
- Benzoic acid from water
- Decolourisation and crystallization using charcoal
- Decolourisation of brown sugar (sucrose) with animal charcoal using gravity filtration.
- Crystallization and decolorisation of impure naphthalene (100g of naphthalene mixed with 0.3g of Congo Red using 1g decolorizing carbon) using ethanol
- **Sublimation (simple and Vacuum):**
- Camphor, Naphthalene, phthalic acid and Succinic acid.
- **Determination of melting point**: Naphthalene, Benzoic acid, Urea, Succinic acid, Cinnamic acid, Salicylic acid, Acetanilide, m-Dinitrobenzene, p-chlorobenzene, Aspirin.
- **Determination of boiling points:** Ethanol, Cyclohexane, Toluene, Anilineand Nitrobenzene.

C. Physical Chemistry

Chemical Kinetics

- To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
- To study the effect of acid strength on the hydrolysis of an ester.

- To compare the strength of HCI and H_2SO_4 by studying the kinetics of hydrolysis of ethyl acetate.
- To study kinetically the reaction rate of decomposition of iodide by H_2O_2

Colloids.

- To prepare arsenious sulphide sol and compare the precipitating power of mono -, bi- and trivalent anions.

Viscosity

- To determine the percentage composition of a given mixture (non interacting systems) by viscosity method.
- To determine the percentage composition of a given binary mixture by viscosity method. (acetone & ethyl methyl ketone)

Surface Tension

- To determine the surface tension of amyl alcohol in water at different concentrations and calculate the excess viscosity of these solutions.
- To determine the percentage composition of a given binary mixture by surface tension method (acetone & ethyl methyl ketone).

CC-3 Zoology-I
CC-3(I) Paper-I: Non-Chordata
(CODE: BSCBED-155 c I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- Understand invertebrates, the organizational hierarchies and complexities, the evolutionary trends in external morphology and internal structure; identification and classification with examples, to enable them to understand various modes of adaptations in animals.
- Get familiar with various kind of nonchordata Amoeba to Asterias.
- Apply the General principles of taxonomy and classification in real life situation and further studies.

UNIT – I

- General principles of taxonomy and classification. Outline classification of Protozoa up to order.
- General Structural organization of Amoeba, Euglena and Plasmodium.
- Habit and habitat, structure, nutrition, osmoregulation and reproduction of Paramecium
- Locomotion in Protozoans- pseudopodial, ciliary and flagellar.
- Nutrition in Protozoa
- Reproduction in Protozoa.

UNIT –II

- Outline classification of Porifera and Coelenterata up to order.
- Habit and habitat, morphology, internal structure, reproducation of Sycon
- Canal system and skeleton in Sponges
- Habit, habitat, morphology, internal structure, nutrition and reproducation of Obelia
- Polymorphism in coelenterates, coral reefs

UNIT –III

- Outline classification of Platyhelminthes and Nematheminthes up to order.
- Habit and habitat, morphology, internal structure, reproduction and life – cycle of Fasciola, and Ascaris
- Parasitic adaptations in Helminthes

Unit – IV

- Outline classification of Annelida and Arthropoda up to order.
- Habit and habitat, structure, nutrition, respiration, circulation, excretion, nervous system and reproduction of Hirudinaria *Palaemon*
- Peripatus: structure and affinities
- Mouth parts and feeding habits of Insects.

Unit – V

- Outline classification of Mollusca and Echinodermata up to order
- Habit and habitat, structure, nutrition, respiration, blood vascular system, excretion, nervous system and reproduction of Pila
- Torsion in Gastropoda

- Habit and habitat, structure, nutrition, respiration, blood vascular system, excretion, nervous system and reproduction of Asterias
- Larval forms of Echinoderms.

Textbooks References

- Barnes, R. D. (1987). *Invertebrate zoology* (No. Ed. 5). WB Saunders Company.
- Brooks, W. K. (1882). *Handbook of invertebrate zoology: for laboratories and seaside work*. SE Cassino.
- Brooks, W. K. (1882). *Handbook of invertebrate zoology: for laboratories and seaside work*. SE Cassino.
- Curtis, W. C., Guthrie, M. J., & Jeffers, K. R. (1938). *Textbook of general zoology*. Wiley.
- Hegner, R. W., & Engemann, J. G. (1968). *Invertebrate zoology*(No. QL362 H4 1968). Macmillan.
- Hyman, L. H. (1940). *The invertebrates: mollusca I* (Vol. 6). McGraw-Hill.
- Jordan, E. L., & Verma, P. S. (1996). Invertebrate Zoology sixth revised and enlarged edition. *S. Chand and Company, Ltd. 857pp*.
- Jordan, E. L., & Verma, P. S. (2009). *Invertebrate zoology*. S. Chand & Company.
- Light, S. F. (1941). *Laboratory and field text in invertebrate zoology*. Associated Students Store, University of California.
- McEdward, L. (2020). *Ecology of marine invertebrate larvae*. CRC press.
- Parker, T. J., & Haswell, W. A. (1967). *Textbook of zoology*. Macmillan International Higher Education.
- Scott-Ram, N. R., & Scott-Ram, N. R. (1990). *Transformed cladistics, taxonomy and evolution*. Cambridge University Press.
- Sedgwick, A. (1905). *A Student's Text-book of Zoology* (Vol. 2). Allen & Unwin.
- Verma, P. S. (2001). *Invertibrate Zoology*. S. Chand Publishing.
- Willmer, P. (1990). *Invertebrate relationships: patterns in animal evolution*. Cambridge University Press.
- Zoology, I. by EL Jordan and PS Verma, Publisher: S. *Chand And Company*.

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CC-3 Zoology-II
CC-3(II) Paper II: Animal Cell Biology and Genetics
(CODE: BSCBED-155 c II)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included):

Learning outcomes -After completion of the course, student-teachers will be able to:-

- Comprehend the modern concepts and applied aspects of Cell Biology and modern concepts of Genetics and to create awareness regarding inheritance.
- To appreciate the role and significance of cell in human welfare and environment.

Unit – I

- **Introduction of cell:** Discovery, characteristics of prokaryotic (bacterial) and eukaryotic cells (plant and animal cells), cell theory, viruses and viroids.
- **Cell membrane:** Ultra structure, chemical composition, models, unit membrane concept, fluidity, glycocalyx and functions of cell membrane. Modifications (specializations) of plasma membrane. Transport across cell membrane: Passive transport (osmosis, diffusion), facilitated (mediated) diffusion; active transport (primary and secondary) and Endocytosis and Exocytosis.
- **Mitochondria:** Morphology, ultra structure, chemical composition, functions, origin, electron transport chain and generation of ATP molecules.

Unit –II

- **Ultrastructure, types, chemical composition, origin and functions of:**
  ER and Golgi-complex
  Lysosome, Ribosome
  Centriole,
  Cilia and flagella

Unit- III

- **Nucleus:** occurrence, number, shape, size and structure (nuclear envelopes, nuclear matrix and nucleolus)
- **Chromosomes:** Introduction, discovery morphology, structure (chromatids, primary and secondary constrictions, nucleolar organizer and telomeres) types. Chemical composition and functions. Chromosomal organizations: Euchromatin, heterochromatin, nucleosome concept.
- **Cell reproduction:** Cell cycle, phases, process and significances of mitosis and meiosis.
- **Chromosomal mutations-**
  Variation in chromosome number (aneuploidy and euploidy)
  Structural changes in chromosomes (delection, duplication, inversion and translocation).

Unit – IV

- **Mendelian principles of inheritance-** monohybrid and dihybrid cross, back cross and test cross.
- **Deviation of Mendelism–** incomplete dominance, codominance and lethal genes, modification of 3: 1 and 9: 3: 3: 1 with examples and problems.
- **Gene interactions:** Epistasis, complementary, supplementary, duplicate genes with cumulative effects and collaborator genes.

- **Multiple alleles:** Characters, examples, pseudoalleles, inheritance of A, B, AB, O and Rh blood groups (antibody reactions)

Unit –V

- **Sex-determination**: Genetic (sex chromosome, genic balance and haplo-diploidy mechanisms), hormonal and environmental control of sex determinations with examples.
- **Sex-linked inheritance:** white eye color in Drosophila, colour blindness and hemophilia in man.
- **Linkage**: Definition difference between linkage and independent assortment, chromosomal theory of linkage, kinds, linkage groups and significances.
- **Crossing over:** Definition, mechanism, theories, kinds, frequency, factors affecting crossing over and significances.

Textbooks and References

- Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2015). *Molecular biology of the cell*. Garland Science. *New York*, 1227-1242.
- Blomquist, G. J., & Bagnères, A. G. (Eds.). (2010). *Insect hydrocarbons: biology, biochemistry, and chemical ecology*. Cambridge University Press.
- Conklin, K. F., Doerfler, W., Grafstron, R. H., Groudine, M., Hamilton, D. L., Jaenisch, R., & Langner, K. D. (2012). *DNA methylation: biochemistry and biological significance*. Springer Science & Business Media.
- Gupta, P. K. (2005). *Cell and molecular biology*. Rastogi Publications.
- Karp, G. (2007). *Cell and Molecular Biology*. John Wiley & Sons Incorporated.
- Karp, G. (2009). *Cell and molecular biology: concepts and experiments*. John Wiley & Sons.
- Kotpal, R. L. (1967). *Annelida*. Rastogi Publications.
- Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Scott, M. P., Bretscher, A., & Matsudaira, P. (2008). *Molecular cell biology*. Macmillan.
- Rosen, F. S., Steiner, L., & Unanue, E. (1989). *Macmillan dictionary of immunology*.
- Tripathi, G. (2010). *Cellular and Biochemical Science*. IK International Pvt Ltd.
- Wilson, E. B. K., & Walker, J. (2005). Biochemistry and Molecular biology. *Kuudes painos*.

PRACTICAL

Duration: 4 Hours **Max. Marks: 50**

Objectives:

- To understand internal organization and skills- of staining and mounting of materials. (Temporary and permanent), of dissection, display and labeling, of preparation of cultures of invertebrates by using common culture methods, laboratory observation of animal cell division.

Course Content

- **Study of museum specimens:** with respect to levels and patterns of organization biosytematics. Biodiversity, adaptations, development stages, population dynamics, ecological implications etc.
  Porifera: Sycon, Spongilla, Euplectella, Leucosolnia, Hylonema, Hypospongia, Euspongia:
  Coeleterata: Hydra, Tubularia, Millepora, Physalia, Porpita, Vellela, Aurelia, Tubipora, Alcyonium, Metridium, Pennatula, Grantia, Fungia, Gorgonia.
  Helminthes: Fasciola, Taenia solium, Planaria, Ascaris, Ancyclostoma
  Annelida: Nereis Heteroneresis, Aphrodite, Chaetoptreus. Arenicola, Pheretima, Hirudinaria
  Arthropoda: Palaemon, Eupagurus, Scolopendra, Apis, Peripatus.
  Mollusca: Chiton, Pila, Aplysia, Helix, Dentalium, Mytilus, Pinctada, Unio, Sepia, Loligo Octopus.
  Echinodermata: Antedon, Holothuria, Cucumaria, Astropecten, Asterias, Echinus
- **Microscope:** Simple and compound microscope, working mechanism and maintenance.
- **Study of Permanent slides:**
  Paramecium, Paramecium Conjugation, paramecium binary fission, Euglena, Vorticella, Sycon- L.S., Sycon T.S., Hydra L.S., Hydra T.S, Cercaria larva, Metacercaria, Miracidium larva, Sporocyst larva, Redia larva, Ascaris male and female T.S., T.S. thorough, pharynx region, Gizzard and intestinal region of Earthworm, T.S. through buccal cavity of Hirudinaria, Crustacean larva- Zoea, Metazoea, Nauplius, Mysis, T.S. of gill of Unio, T.S. of the shell & mantle of Unio. Glochidium larva of Unio.
- **Dissections** and/or its demonstration through Charts/Models/Video/CD/digital alternative etc and/or preparation of working models of the different systems of the following animals.
  Earthworm: Alimentary canal Nervous system, Reproductive system
  Leech: Alimentary canal
  Cockoach: Mouthparts, Digestive system, nervous system
  Prawn: Nervous system
  Pila: Nervous system
- **Microsopic preparation or their observation of the following:-**
  Paramecium, Eunglena, Sponge-spicules, gemmules, Obelia, Hydra, parapodium of Nereis, statocyst of Prawn, mouth parts of Cockroach, radula of Pila, gill of Unio.
- Study of bacterial and eukaroytic cell
- Slides of sub cellular components(Cell organelles)

- Erythrocyte plasma membrane permeability.
- Study of Karyotype and Idiogram of man.
- Study of Barr Bodies in human buccal epithelial cells.
- Drosophila culture and life cycle.
- Sexual Dimorphism in Drosophila, Identification of wild or mutant varieties.
- Study of salivary gland chromosomes of Drosophila
- Problems on pedigree analysis.
- Meiotic studies of testes of cockroach.

Guidelines/ Instructions for Practical Examination

Max. Marks: 50 **Time allowed: 4 Hrs.**

S. No.	Exercise	Marks
1.	Dissection* (Exposition, labeled diagram)	**6**
2.	Temporary mounting –one (Staining, identification, sketch	**3**
3.	Museum specimens – five (identification and classification	**10**
4.	Permanent slides – two or four (Identification with reasons)	**4**
5.	Preparation of chromosome slide (root tip/grasshopper testis)	**5**
6.	Drosophila spotting / pedigree	**5**
7.	Practical record and slides	**5**
8.	Viva	**4**
9.	Project report and assignment	**8**
* as per UGC guidelines		

Note:

- Use of animals for dissection is subject to the conditions that these are not banned under the Wildlife Protection Act or any other legislation.
- Students are required to submit the following during examination.
- One assignment on the instrument/ technique about its principle, working, precautions and applications, and /or reagents / solutions preparation.
- Report on study of animals from their natural habitat from their local surroundings. Vermicompost etc.

CC-4 Botany-I

CC-4(I) Paper-I: Diversity of Microbes and Lower Plants& Plant Pathology (Thallophyta)

(CODE: BSCBED-155 d I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes:

- To acquaint students with the diversity that exists in microorganisms;
- To understand the morphology, organization, structure, and reproduction in microbes;
- To appreciate the role and significance of microbes in human welfare and environment;
- To study the symptoms of selected diseases caused by microbes.

Unit – I

- **Viruses and Bacteria:** Structure, Multiplication, transmission and disease symptoms of viruses, Structure and economic importance of mycoplasma, Bacteria structure, nutrition, reproduction and economic importance, Gram‘s staining, Disease sysmptom of bacteria in plants e.g.:- Citrus Canker, Viruses e.g.:- Mosaic Viruses disesse in tobacco.
- General account and economic importance of Cyanobacteria.

Unit II

- **Fungi:** General characters, occurrence, classification (Alexopolus and Mims, 1979; G. C. Ainswort, 1986), Types of mycelia, structure of fungal cell, fungal flagella, Nutrition and economic importance of fungi. Host-parasite interaction, Control of plant diseases. Disease Symptoms of Fungi in Plants.

Unit III

Structure reproduction and life history of:

- Mastigomycotina – Synchytrium & Phytophthora
- Ascomycotina – Saccharomyces, Eurotium, Peziza
- Basidiomycotina – Puccinia, Agaricus, Ustilago
- Deuteromycotina – Alternaria, Cercospora, Colletotrichum, General account and economic importance of Lichens

Unit- IV

- **Algae:** General characters, occurrence, classification (Fritsch, 1935), Pigment constitution, fine structure of algal plastids, life-cycles, Origin and evolution of sex and thallus in algae.
- Cyanophyceae: Life Cycle of Nostoc, Anabaena and Oscillatoria

Unit V

Structure, reproduction and evolutionary significance of following genera:

- Chlorophyceae:Chlamydomonas, Volvox, Oedogonium, and Coleochaete
- Xanthophyceae:Vaucheria,
- Phaeophyceae: Ectocarpus, Sargassum
- Rhodophyceae:Polysiphonia

Suggested Readings:

- Dube, H. C. (1990). Fungi, general characteristics. *An introduction to fungi, 2nd revised edn. Vikas, New Delhi*, 11-146.
- Hays, J. (1986). *Genetics of bacteria*: Edited by J. Scaife, D. Leach, and A. Galizzi. New York: Academic Press. (1985).

- Mudd, J. B. (Ed.). (2012). *Responses of plants to air pollution*. Elsevier.
- Odom, J. M., & Singleton, R. (1993). *The sulfate-reducing bacteria: contemporary perspectives* (pp. 189-210). New York: Springer-Verlag.
- Sharma, O. P. (1986). *Textbook of algae*. Tata McGraw-Hill Education.
- Sharma, O. P. (1992). *Textbook of Thallophyta*. McGraw Hill Pub. Co.
- Sharma, P. D. (1991). *The Fungi*. Rastogi Publications.
- Sharma. P.D. 1991. The Fungi. Rastogi & Co. Meerut.
- Smith Jr, J. P. (2018). The Herbarium.
- Smith, GM. (1971). Cryptogamic Botany. Algae & Fungi. Vol. 1 New Delhi: Tata McGraw Hill Publishing Co.

CC-4 Botany-II

CC-4(II) Paper II: Diversity of Cryptogams (Bryophytes &Pteridophytes)

(CODE: BSCBED-155 d II)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes:-After completion of the course, student-teachers will be able to:-

- To acquaint students with the diversity that exists in cryptogams.
- To understand the morphology, organization, structure, and reproduction in cryptogams.
- To appreciate the role and significance of cryptogams in human welfare and environment.
- To study the Geological time scale, fossils and fossilization processes, significance of fossils.

Unit- I

- General characters, distribution, origin of the land habit in plants, classification, Evolutionary trends in thallus and sporophyte development, Alternation of generations, classification, and Economic importance of Bryophytes.

Unit- II

- Structure, reproduction, and evolutionary significance of following genera: Hepaticopsida – Riccia, Marchantia
- Anthocerotopsida – Anthoceros, Bryopsida - Funaria

Unit-III

- General characters, distribution, classification, stelar evolution, heterospory and origin of seed habit, and life cycles in pteridophytes.
- Structure, reproduction and evolutionary significance of the following genera:Psilotum, Lycopodium

Unit- IV

- Structure, reproduction and evolutionary significance of the following genera: Selaginella, Equisetum, Pteris and Marsilea.

Unit- V

- Geological time scale, fossils and fossilization processes, significance of fossils. Study of the following form genera of fossils
- Rhynia
- Calamites

Suggested Readings

- Arnold, C. A. (2013). *An introduction to paleobotany*. Read Books Ltd.
- Dube, H. C. (1990). Fungi, general characteristics. *An introduction to fungi, 2nd revised edn. Vikas, New Delhi*, 11-146.
- Sharma, P. D. (1991). *The Fungi*. Rastogi Publications.
- Sharma. P.D. 1991. The Fungi. Rastogi & Co. Meerut.
- Smith, GM. (1971). Cryptogamic Botany. Algae & Fungi. Vol. 1 New Delhi: Tata McGraw Hill Publishing Co.
- Stewart, W. N., Stewart, W. M., Stewart, W. N., & Rothwell, G. W. (1993). *Paleobotany and the evolution of plants*. Cambridge University Press.
- Stewart, W. N., Stewart, W. M., Stewart, W. N., & Rothwell, G. W. (1993). *Paleobotany and the evolution of plants*. Cambridge University Press.

PRACTICALS

Duration: 4Hours **Max. Marks: 50**

- Study of the genera included in Theory syllabus of Algae and Fungi by making temporary micro preparations and observation of permanent slides.
- Observation of disease symptoms in host infected by Fungi, Bacteria, Viruses and Mycoplasma. Section cutting of diseased material and identification of the pathogens as per the theory syllabus.
- Study of morphology, anatomy and reproductive structures of genera included in Bryophytes and Pteridophytes by making temporary micro preparations and observation of permanent slides.
- Gram staining of bacteria.
- Study of crustose, foliose & fruticose Lichens.
- Maintenance & submission of a record of all the Laboratory activities.

MARKING SCHEME

There shall be a practical examination of four hours duration and the distribution of marks shall be as follows:

1. A suitable stained section of plant part either of Bryophyte or Pteridophyte
   Marks: 10
2. Minor preparation of Bryophyte or Pteridophyte (not covered in Q.1)
   Marks: 08
3. Preparation and mounting of the part of :
   a) A Bryophyte Marks: 05
   b) A Fungus
   c) An Alga
   d) Bacteria
4. Spots: six (a) One from each group (Algae, Lichen, Bryophytes, Fungi, Fossil, and Pteridophytes, plant-pathogens). (b) One microbiological experiment for comments.
   Marks: 12
5. Viva-Voce Marks: 05
6. Practical Record Marks: 10

CC-5 Mathematics-I

CC-5 (I) Paper-I: Calculus

(CODE: BSCBED-155 e I)

Maximum Marks: 75 **External Marks: 60**

Internal: 15 Marks (in which **two tests** of 7.5-7.5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- Know the mathematical background, properties of volume and surface of solids formedby revolution.
- Get familiar with concepts of Tangents and Normal's, sub tangent and subnormal.
- Apply the principles of Asymptotes, multiple points, curve tracing in real situations.
- Learn the Quadrature, ractification, volume and surface of solids formed by revolution.

Unit-1

Tangents and Normal's, sub tangent and subnormal (Cartesian and polar forms), Derivative of an arc (Cartesian and polar), pedal equations, curvature.

Unit-2

Partial differentiation with Euler's theorem and its applications, total derivative, changeof variables (polar to Cartesian and vice-versa), concept of tangent plane and normal to a surface, maxima and minima of two variables including method of undetermined multipliers.

Unit-3

Asymptotes, multiple points, curve tracing (Cartesian, parametric and polar). Envelopsand Evolutes.

Unit-4

Reduction formulae, double and triple integrals, change of order of integration doubleintegrals, change of variables in multiple integration.

Unit-5

Quadrature, ractification, volume and surface of solids formed by revolution.

Textbooks and References:

1. Apostol, T. M. (1979). *Calculus (Vol. 1. Portugues)* (Vol. 1). Reverté.
2. Apostol, T. M. (2007). *Calculus, Volume I, One-Variable Calculus, with anIntroduction to Linear Algebra* (Vol. 1). John Wiley & Sons.
3. Kreyszig, E. (2009). Advanced Engineering Mathematics, 10th Eddition.WileyEastern
4. Ram, B. (2009). *Engineering mathematics*. Pearson Education India.
5. Stewart, J. (2012). Calculus 7th edn (Belmont, CA: Brooks/Cole).
6. Stewart, J. (2012). *Essential calculus: Early transcendentals*. Cengage Learning.
7. Thomas, G. B. (1968). *Calculus and analytic geometry* (No. 04; QA303, T4 1968.).
8. Wylie, C. R., Barrett, L. C., & Wylie, C. R. (1960). Advanced engineeringmathematics.Wiley Eastern

CC-5 Mathematics-II

CC-5 (II) Paper-II: Vector Geometry and Linear Algebra

(CODE: BSCBED-155 e II)

Maximum Marks: 75 **External Marks: 60**

Internal: 15 Marks (in which **two tests** of 7.5-7.5 marks each are included)

Learning outcomes: After completion of the course, student-teachers will be able to-

- Know about the Continuity and differentiability of vector functions, unit tangentvector.
- Get familiar with concepts of Integration of vectors, theorems of Stoke, Green and Gauss.
- Apply the principles of Asymptotes, multiple points, curve tracing in real situations.
- Learn the Matrices, system of linear equations, Gauss elimination method, Linear span,linear transformations.

Unit-1

Continuity and differentiability of vector functions, unit tangent vector. gradient, directional derivatives, tangent plane and normal line. divergence and curt of a vector field.

Unit-2

Integration of vectors, theorems of Stoke, Green and Gauss (statement and verification only). application to area.

Unit-3

General Equation of Second Degree, Polar Equation a Conic. Sphere, Cone and Cylinder.

Unit-4

Matrices, System of Linear Equations, Gauss Elimination Method, Elementary matrices, Invertible matrices Gauss-Jordan method for finding inverse of a matrix. determinants, basic properties of determinants. Cofactor expansion, determinant method for finding inverse of a Matrix, Crammer's Rule. Vector Space, Subspace, Examples.

Unit-5

Linear span, linear Independence and dependence, Theory of Equations, solutions of cubic and bi-quadratic Eqations Linear transformation, Kernel and Range of a linear map,Rank-Nullity Theorem. Rank of a Matrix, Row and Column spaces, Eigen values, Eigen vectors.

Textbooks and Reference

1. Apostol, T. M. (2007). Calculus, Volume I, One-Variable Calculus, with an Introduction to Linear Algebra (Vol. 1). John Wiley & Sons.
2. Demmel, J. W. (1997). Applied numerical linear algebra. Society for Industrial and Applied Mathematics.
3. G.B. Thomas, R. Finney (1995). Calculus and Analytic Geometry. Addison-Wesley.
4. Halmos, P. R. (2017). Finite-dimensional vector spaces. Courier Dover Publications.
5. Morgan, A. (2009). Solving polynomial systems using continuation for engineering and scientific problems. Society for Industrial and Applied Mathematics.
6. Noble, B., & Daniel, J. W. (1977). Applied linear algebra (Vol. 3). Englewood Cliffs, NJ: Prentice-Hall.
7. Stewart, J. (2012). Calculus 7th edn (Belmont, CA: Brooks/Cole).
8. Stewart, J. (2012). Essential calculus: Early transcendentals. Cengage Learning.
9. Strang, G. (2009). Introduction to Linear Algebra, 4th edn. Wellesley, MA: Wellesley.
10. Strang, G., Strang, G., Strang, G., & Strang, G. (1993). Introduction to linear algebra (Vol. 3). Wellesley, MA: Wellesley-Cambridge Press.
11. Thomas, G. B. (1968). Calculus and analytic geometry (No. 04; QA303, T4 1968.).
12. Trefethen, L. N., &Bau III, D. (1997). Numerical linear algebra (Vol. 50). Siam.
13. Wylie, C. R., Barrett, L. C., & Wylie, C. R. (1960). Advanced engineering mathematics. Wiley Eastern

SECOND YEAR–II

Course Code	Title of the course	EVALUATION			
		External	**Internal**	**Practical**	Total
BSCBED-210	Gen. Hindi(compulsory)*	**70**	**30**	**-**	**100**
BSCBED-251	Knowledge & Curriculum	**70**	**30**	**-**	**100**
BSCBED-252	Teaching & Learning	**70**	**30**	**-**	**100**
BSCBED-253	Health & Physical Education	**35**	**15**		**50**
BSCBED-254	**Content: (BCZ& PCM)**				
BSCBED-254 a I	16. Physics I	**40**	**10**	**50**	**200**
BSCBED-254 a II	17. Physics II	**40**	**10**		
BSCBED-254 a III	18. Physics III	**40**	**10**		
BSCBED-254 b I	19. Chemistry I	**40**	**10**	**50**	**200**
BSCBED-254 b II	20. Chemistry II	**40**	**10**		
BSCBED-254 b III	21. Chemistry III	**40**	**10**		
BSCBED 250 c I	22. Zoology I	**40**	**10**	**50**	**200**
BSCBED 250 c II	23. Zoology II	**40**	**10**		
BSCBED-254 c III	24. Zoology III	**40**	**10**		
BSCBED-254 d I	25. Botany I	**40**	**10**	**50**	**200**
BSCBED-254 d II	26. Botany II	**40**	**10**		
BSCBED-254 d III	27. Botany III	**40**	**10**		
BSCBED-254 e I	28. Mathematics I	**60**	**7**		**200**
BSCBED-254 e II	29. Mathematics II	**60**	**7**		
BSCBED-254 e III	30. Mathematics III	**60**	**6**		
	CCA				**25**
Prayer, Yoga, Meditation & Festival etc					**25**
Total					**900**

***Marks of compulsory subject shall not be added in the total marks.**

General Hindi/सामान्य हिन्दी
(CODE:BSCBED-210)

Maximum Marks: 100 **External: 70 Marks**

Internal: 30 Marks (in which two tests of 7.5-7.5 marks each are included)

अधिगम संम्प्राप्तिया

- विद्यार्थी हिन्दी साहित्य के इतिहास एवं लेखण परम्परा की गद्य–पद्य शैली से परिचित हो सकेंगे।
- हिन्दी साहित्य के प्रमुख कवियों एवं रचनाकारों की विस्तृत जानकरी प्राप्त कर सकेंगे।
- विद्यार्थी हिन्दी साहित्य की भाषा के साथ भारत सम्यता एवं संस्कृति को जान सकेंगे।
- आदि काल की हिन्दी साहित्य की रचनाओं की समकालीन प्रमुख रचनाओं से तुलनात्मक अध्ययन प्राप्त करेगे।
- हिन्दी साहित्य के गद्य पद्य शैली द्वारा विभिन्न विकासात्मक प्रवृतियों की जानकरी प्राप्त कर सकेंगे।
- हिन्दी साहित्य के प्रमुख रचनाओं एवं उनके कालों की जानकारी प्राप्त कर सकेंगे।
- हिन्दी साहित्य के व्याकरण एवं भाषागत विकास को समझ सकेगे।
- विद्यार्थी हिन्दी साहित्य के विभिन्न पारिभाषित शब्दों एवं प्रारूप से परिचित हो सकेंगे।
- हिन्दी भाषा एवं साहित्य के प्रति सकारात्मक अभिरूचि एवं वृतियों का विकास हो सकेगा।

इकाई– 1

साहित्य खण्ड –

(क) गद्य भाग :– निर्धारित रचनाएँ :–

- भारतवर्ष की उन्नति कैसे हो सकती है – भारतेन्दु
- मेरा जीवन – प्रेमचन्द
- मजदूरी और प्रेम – पूर्ण सिंह
- भारतीय संस्कृति की देन – हजारी प्रसाद द्विवेदी
- सोना – महादेवी वर्मा (रेखाचित्र)
- राष्ट्रपिता महात्मा गांधी – मुक्तिबोध
- सवालों की नोक पर – मोहन राकेश
- गर्दिश के दिन – गुलशेर अहमद खान 'शानी'
- निन्दा रस – हरिशंकर परसाईं (व्यंग्य)
- नेता नहीं नागरिक चाहिए – रामधारी सिंह दिनकर
- आज भी खरे हैं तालाब – अनुपम मिश्र

इकाई– 2

(ख) पद्य भाग :– निर्धारित रचनाएँ :–

- अयोध्यासिंह उपाध्याय 'हरिऔध' – कर्मवीर
- मैथिलीशरण गुप्त – भूलोक का गौरव (भारत–भारती)
  (भूलोक का गौरव....आज भी कुछ खड़े हैं।)
  संदेश यहाँ मैं नहीं स्वर्ग का लाया (साकेत–आठवां सर्ग)
  (निज रक्षा का अधिकार.....उच्च फल जैसा।)
- सूर्यकान्त त्रिपाठी 'निराला' – तोड़ती पत्थर

- जयशंकर प्रसाद – अरूण यह मधुमय देश हमारा, (चन्द्रगुप्तसे) हमारा प्यारा भारतवर्ष (स्कन्दगुप्त से)
- सुभद्रा कुमारी चौहान –झाँसी की रानी
- हरिवंशराय बच्चन – पथ की पहचान
- शिव मंगल सिंह सुमन – परिचय (हिल्लोल से)
- केदार नाथ अग्रवाल – जब–जब मैंने उसको देखा,धरती उस किसान की
- नागार्जुन – प्रेत का बयान
- भवानी प्रसाद मिश्र – गीतफरोश
- ताराप्रकाश जोशी – आ रे आ बादल
- सरल विशारद – यही एक दर्द, अनुभूति सुख, एक अनुभूति, परिवार के चार चित्र (खामोशी के रंग से)

इकाई– 3

- संक्षेपण
- लोकोक्ति, मुहावरे
- शुद्धिकरण
  (क) शब्द शुद्धिकरण
  (ख) वाक्य शुद्धिकरण

इकाई– 4

- पारिभाषिक शब्द
- शब्द युग्म
- पल्लवन
- पत्र (प्रारूप)

इकाई– 5

निबन्ध– किसी भी विषय पर पाँच निबन्ध पूछे जायेंगे, जिनमें से एक करना होगा।

परियोजना कार्यः–

- "आई.सी.टी. की षिक्षण व षिक्षा प्रकिया में महत्ता" विषय पर महाविद्यालय स्तर पर गोष्ठी।
- 'मेरा संकलन' स्क्रेप बुक/पुस्तिका का निर्माण करवाना जिसमें पत्रिकाओं, समाचार पत्रों, आदि में से प्रमुख महापुरूषों, प्रसिद्ध लेखकों, कवियों, कवयित्रियों खिलाड़ियों व अन्य प्रसिद्ध व्यक्तियों के जीवन परिचय, उपलब्धि व चित्रो का संकलन।
- अपनी पसंदीदा कहानी, कविता, नाटक का संकलन।
- किसी स्थानीय कवि/लेखक/साहित्यकार का साक्षात्कार व रिपोर्ट निर्माण
- भाषा प्रयोगषाला का प्रयोग करके उच्चारण कौषल, वर्तनीगत शुद्वता/लेखन कौषल, वाचन व श्रवण कौषल का अभ्यास करवाना।
- वाद–विवाद करवाना, विभिन्न कौषलों से जुड़े खेल (अंताक्षरी, विलोम बताना पर्यायवाची बताना)

संदर्भ ग्रंथ सूची

- पाण्डेय. मुतिकान्त (2010). *हिन्दी षिक्षण–अभिनव आयाम.* नई दिल्ली : विष्व भारती पब्लिकेषन.
- शर्मा, अनुराधा (2012). *भाषा विज्ञान तथा सिद्धान्त.* नई दिल्ली : विष्व भारती पब्लिकेषन.
- गुप्ता, प्रभा (2012). *मातृभाषा व विविध योजनाएँ.* आगराः साहित्य प्रकाषन, आपका बाजार.
- गुप्ता, ओ.पी. (1994). *वृहत पुस्तकालय व सूचना विकाष शब्दावली.*, नई दिल्ली
- आचार्य, किशोरीदास (2013). *हिन्दी की वर्तनी व शब्द प्रयोग मीमांसा.* नई दिल्लीः वाणी प्रकाषन.
- नारंग, वैष्ना (2013). *सम्प्रेषणपरक हिन्दी भाषा षिक्षा.* कचहरी घाट आगराः ए.पी. भार्गव बुक हाऊस.
- शर्मा, प्रसाद प्रीतम (2007). *हिन्दी षिक्षण.* जयपुर : साहित्यागार.
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Knowledge and Curriculum
(CODE: BSCBED-251)

Maximum Marks: 100 **External: 70 Marks**

Internal: 30 Marks (in which two tests of 7.5-7.5 marks each are included)

Learning outcome: After completion of the course, student-teachers will be able -

- To understand concept & the process of knowledge generation and their linkage with society.
- To critically analyse various/ curriculum textbook
- To identify various dimensions of the curriculum and their relationship.
- To identify relationship between the curriculum framework and syllabus.
- To understand the relationship between ideology and the curriculum.

Unit –I Knowledge Generation

- Meaning Concept & nature of knowledge
- Distinction between Data, knowledge, Information and skill Teaching and Training, Knowledge and information, reason and belief.
- Process of Knowledge generation: Local window, Sharing, practice & creation.
- Various structures of society and knowledge and their linkage and relationship.

Practicum/Field Work

- The mentor will help the students to make the critical analysis of a lesson prescribed in the text book.
- Conduct a play on journey of knowledge on any one issue/innovation/Discovery such as aeroplane or bio-computer.
- Make use of full presence of students and staff for impressive performance.
- Analysis of social myths in the light of scientific values and culture, life skills etc.

Unit –II Concept & Type of Curriculum

- Knowledge as the bases of curriculum
- Curriculum: Meaning, concept, nature component and its basis.
- Type of curriculum: Explicit, hidden, absent or null curriculum.
- Syllabus, curriculum& co-curriculum.

Practicum/Field Work

- Identified the transaction of curriculum in a prescribed text book.
- Organize child Centered activity for enhancement of children education and values. (Gandhian/ Ravindra thoughts.)

Unit- III Features of Curriculum Framework

- The salient features of National Curriculum Framework 2005 and NCFTE 2010 and analysis of these documents with respect to various aspects of foundations, concerns and the changes made with important considerations.

Practicum/Field Work

- Make a comparative Analysis of curriculum of school at any one level in the light of NCF 2005.
- Prepare Project on NCF 2005.

- Organize an orientation program for school teachers on NCF 2005 and NCFTE 2010.

Unit – IV Text book and curriculum

- Text book – Criteria of selection, and critical analysis of Text Book, Children's literature and teacher's handbooks.
- Relationship among curriculum, syllabus and textbook.
- Selection of materials; Development of activities and tasks.
- Connecting learning to the world outside - Moving away from rote-learning to constructivism.

Practicum/Field Work

- The men will motive the students to know the good qualities of book and then in the light of the knowledge select the book. A report will be prepared based on this process.
- Organize a seminar on relationship among power, ideology and Curriculum.
- Critical review or analysis of the text book at upper primary and senior secondary level.

Unit – V Modernity, Post Modernity & Knowledge in Curriculum

- Meaning and Concept of knowledge in mordenity
- Meaning and Concept of knowledge in Post-mordenity
- Knowledge process through curriculum transaction.

Practicum/Field Work

- Organize a poster designing competition for awareness of girl's education and Female infanticide.
- The students will be asked to collect the facts regarding current knowledge and then prepare report.
- Student should contact the people of nearby area of school for social issues.
- For collecting information related to Folk songs, Folk culture and Customs, student should contact rural people.
- To understand how to sing folk songs, the student should be present in the folk song events.

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Teaching & Learning
(CODE: BSCBED-252)

Maximum Marks: 100 External Marks: 70
Internal: 30 Marks (in which two tests of 7.5-7.5 marks each are included)
Learning outcome: After completion of the course, student-teachers will be able -

- To develop scientific attitude for the process of teaching & learning.
- To develop understanding about the relationship of cognitive, social and emotional development with learning process.
- To provide an overall view on teaching & learning style and ideas to enhance these activities.
- To make aware about teaching skills, components and parameters of effective teaching.
- To relate various Psychological domains of Teaching & Learning.
- To effect use of ICT in teaching & learning process.

Unit -1 Psychological domains of Teaching & Learning

- Cognitive psychology: - meaning, concept, important, domains and its relationship with learning & teaching.
- Social development – meaning, importance, social process and its effect on teaching & learning, theory of social construction.
- Emotional development: - meaning, process, need to study and its effect on teaching and learning process.
- Spiritual development: - meaning, concept, important, domains and its relationship with learning & teaching.

Practicum/Field Work

- Critical analysis of School situation in terms of its role in promoting learner's cognitive and non-cognitive learning outcome and report on entire activities.
- Preparation of learner's profile based on cognitive and non cognitive characteristics of two adopted students.

Unit-2 Effective Teaching

- Effective Teaching: Meaning, Component and Parameters of Effective Teaching, Identification of Teaching Skills, Principles of Teaching, Classroom instruction strategies, Teacher as a Learner, Responsibilities of Teacher.
- Teaching for culturally diverse students, theory of culturally relevant pedagogy.
- Values and personal relationship between Teachers and Learners, relationship among learners, self–esteem and freedom experienced by learner.
- Teaching Models & factor effecting teaching & learning.

Practicum/Field Work

- A Survey based report on an effective Teacher behaviours or class room Instruction Strategies of effective Teacher.
- Prepare academic schedule of student after analysis of school dairy of student and used its implementation. Analysis of record or Teaching and Learning.

Unit-3 Learning

- Learning – meaning, and characteristics, learning factors, influencing factors, kind of learning, tradition and changes in view of the learning process a shift from teaching to learning.
- Principles of learning, quality of learning.
- Discovering learning-meaning, concept, principle to assess quality of learning.
- A learning cycle for discovery, classroom instruction strategies theories supporting the new view of the learning process.
- Learning as construction of knowledge (ncert, 2005) learning in and outside school and its relationship with learners' motivation learning in diverse socio-cultural condition.

Practicum/Field Work

- Study of a case and prepare a report on influential factors of learning on two adopted students.
- A conduct HBDI test of at least two students to determine which side of brain is more powerful.
- On the basis of regular visit (one week) to same class and student, analysis of influential factors of learning of two adopted students.
- Present the report in class workshop.

Unit – 4 Learning style

- Diversity among learners and learning needs (with reference to special needs) background & Concept of Multilingual.
- Learning & thinking Style: - Concept, Types and importance in Teaching – Learning process, factor effecting and relationship between learning & thinking style.
- Role of ICT in learning enhancement.

Practicum/Field Work

- Make academic record of two students all of the session and justified your contribution in academic enhancement of them.
- Through active involvement with students(playing, storytelling, puzzle games, reading etc) observe differential learning needs of the learners with regard to learning styles and draft a report for presentation.

Unit- V Teaching style

- Teaching style - concept, types and effect on learners' learning process, factor effecting on teaching style.
- Effective teacher behavior, role of hemisphere city in thinking learning and teaching style.
- Teaching as profession, effective classroom management.
- ICT & teaching.

Practicum/Field Work

- Draft a report on Teachers' Teaching Style by one-week Classroom observation of two teachers.
- Make your own lesson Plan by studying Teacher's diaries.
- Create facilitative learning environments through enhancing motivation, positive emotions,collaborative and self regulated learning, examine the effect on learning level.

(Through pre and post test of learner's treatment should at least of one week)

- Present the report of entire programme in class.

Reference

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Health and Physical Education

(CODE: BSCBED-253)

Maximum Marks: 50 **External Marks: 35**

Internal: 15 Marks (in which two tests of 5-5 marks each are included)

Learning outcome: After completion of the course, student-teachers will be able -

- To develop positive attitude towards health as individual and be collectively responsible to achieve it.
- To know their health status, identify health problems and be informed for taking remedial measures.
- To generate awareness about rules of safety in hazardous situation (illness, accident and injury) and equip them with first aid measures about common sickness and injuries.
- To learn and to form right habits about exercise, games and sports, sleep, rest and relaxation.
- To sensitise, motivate and help them to acquire the skills for physical fitness, learn correct postural habits and activities for its development.
- To understand various policies and programmes related to health, physical education and Yoga.
- To understand the process of assessment of health and physical fitness.

UNIT – I

- Concept of health, importance, dimensions and determinants of health; Health needs of children and adolescents, including differently-abled children.
- Physical Education- Meaning, concept and importance.
- Health and physical Education and its relationship with other subject areas like Science, Social Science and Languages.

Practicum/Field Work

- Analysis various text book in light of health education. Parepare report.
- Prepare an awareness program on healthy life style of children or adolescence.

UNIT – II

- The body system-skeleton, muscular, respiratory, circulatory and digestive in relation to health fitness, bones, muscles and joints, their Functions/
- Food and nutrition, food habits, timing of food, nutrients and their functions, diversity of Indian food, seasonal foods and festivals, economics of food, preservation of food value during cooking, indigenous and modern ways to persevere food, shift in food practices food and waterborne and deficiency diseases and prevention.

Practicum/Field Work

- Ask school student to prepare a first aid box and conduct a training program on first aid treatment of enjury.
- Conduct an awareness program in community on preservation of food value during cooking.

UNIT – III

- Safety and security — disasters in and outside schools, ways of prevention, safety from snake and dog bites, animal attacks, prevention and treatment.
- Physical fitness, strength, endurance and flexibility, its components, sports skills, indigenous and self-defence activities.

Practicum/Field Work

- Organize a Training program for girl students of school on self-defence activities.
- Oranize a workshop on prevention of disasters in school.

UNIT – IV

- Games and sports — athletics (general physical fitness exercises), games (lead-up games, relays and major games) rhythmic activities, gymnastics and their impact on health.
- Fundamental skills of games and sports; Sports for recreation and competition; Rules and regulations of sports; sports, ethics; sports awards and scholarships, sports-personship.

Practicum/Field Work

- Organisation of inter school games and sports tournaments in your district/village/town.
- Orientation program on Fundamental Sports Skills: Basics of track and field (100 mts. 200 mts., long jump, shotput, 4 × 50 mts. Relay) Gymnastics.

UNIT – IV

- Yogic practices—importance of yoga, yogasanas, kriyas and pranayams of (school, family and sports), health services, policies and major of institutions.

Practicum/Field Work

- Learning and performing of basic yogic activities.
- Conduct yoga activities for development of physical fitness, i.e strength, speed, endurance, flexibility and body composition of students in school.

References

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B.Sc. B.Ed-II
Group B: Core Course
CC-1 Physics-I
CC-1(I) Paper-I: Electricity and Magnetism
(CODE: BSCBED-254 a I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes -After completion of the course, student-teachers will be able to-

- Acquire a broad conceptual framework of electromagnetic phenomenon.
- Evaluating and understanding the difference between steady and alternating current.
- Get familiar with concepts of force on a moving charge.
- Apply their Knowledge of Magnetic Fields of Matter in higher study.

Unit – I Electrostatics

- Coulomb's law, calculations of E for simple distributions of charges at rest, dipole and quadrupole fields, Work done on a charge in an electrostatic field, conservative nature of the electrostatic field, Electric potential, relation between electric field and electric potential, torque on a dipole in a uniform electric field and its energy, flux of the electric field, Gauss's law and its application for finding E for symmetric charge distributions, Gaussian pillbox, Fields at the surface of conductor, Screening of E field by a conductor, capacitors, electrostatic field energy, force per unit area of the surface of conductor in an electric field, conducting sphere in a uniform electric field, point charge in front of a grounded infinite conductor.

Unit –II Dielectrics

- Parallel plate capacitor with a dielectric, dielectric constant, polarization and polarization vector, displacement vector D, molecular interpretation of Claussius Mossotti equation, boundary conditions satisfied by E and D at the interface between two homogenous dielectrics: illustration through simple examples.

Unit –III Electric Currents (steady and alternating)

- Steady current, current density J , non-steady currents and continuity equation, Kirchoff's law and analysis of multiloop circuits, rise and decay of current in LR and CR circuits, decay constants, transients in LCR circuits, AC circuits, complex numbers and its application in solving AC circuit problems, complex impedance and reactance, Measurement of capacitance using impedance at different frequencies, series and parallel resonance, Q factor, power consumed by an AC circuit, power factor, Y and delta networks and transmission of electric power.

Unit-IV Magnetostatics

- Force on a moving charge: Lorentz force, equation and definition of B, force on a straight conductor carrying current in a uniform magnetic field, Torque on a current loop, magnetic dipole moment, angular momentum and gyromagnetic ratio. Motion of charged particles in electric and magnetic fields. Linear accelerator, E as deflecting field, CRO sensitivity. Transverse B field, curvatures of tracks for energy determination of nuclear particles, principle of a cyclotron. Mutually perpendicular E and B fields, mass spectrograph, velocity selector, its resolution. Response curve for LCR circuit and resonance frequency, quality factor.

Unit – V Magnetic Fields in Matter

- Biot-Savart law, calculation of H in simple geometrical situations, Ampere's Law, the divergence and curl of B, field due to a magnetic dipole, magnetization current, magnetization vector, magnetic permeability (linear cases), interpretation of a bar magnet as a surface distribution of solenoidal current, the field of a magnetized object**.**

Textbooks and references

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CC-1 Physics-II

CC-1(II) Paper II: Kinetic Theory and Thermodynamics

(CODE: BSCBED-254 a II)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes -After completion of the course, student-teachers will be able to-

- Know the background and properties of gases.
- Get familiar with the laws of thermodynamics.
- Apply the principles of laws of thermodynamics in real situations.
- Learn the Blackbody radiation and Kinetic Theory of Matter.

Unit - I

- **Ideal Gas**: Kinetic model, deduction of Boyle's law, interpretation of temperature, estimation of rms speeds of molecules, Brownian motion, estimate of the Avogadro number, Equipartition of energy, specific heat of monoatomic gas, extension to di-and triatomic gases, Behaviour at low temperatures, Adiabatic expansion of an ideal gas, applications to atmospheric physics.
- **Real Gas**: Van der Waals gas, equation of state, nature of Van der Waals forces, comparison with experimental P-V curves, The critical constants, gas and vapour, Joule expansion of ideal gas and of a Van der Waals gas, Joule coefficient, Joule-Thomson effect.

Unit - II

- **Liquefaction of gases**: Boyle temperature and inversion temperature, Principle of regenerative cooling and of cascade cooling, liquefaction of hydrogen and helium, Refrigeration cycles, meaning of efficiency.
- **Transport phenomena in gases:** Molecular collisions mean free path and collisioncross sections, estimates of molecular diameter and mean free path, Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.

Thermodynamics

Unit -III

- **The laws of thermodynamics**: The Zeroth law, various indicator diagrams, workdone by and on the system, first law of thermodynamics, internal energy as a state function, reversible and irreversible changes, Carnot cycle and its efficiency, Carnot theorem and the second law of thermodynamics, Different versions of the second law, practical cycles used in internal combustion engines, Entropy, principle of increase of entropy, The thermodynamic scale of temperature, its identity with the perfect gas scale, Impossibility of attaining the absolute zero temperature, third law of thermodynamics.

Unit - IV

- **Thermodynamic relationships**: thermodynamic variables: extensive and intensive, Maxwell's general relationships, application to Joule Thomson expansion and adiabatic cooling in a general system, Van der Waals gas, Clausius-Clapeyron heat equation, Thermodynamic potentials and equilibrium of thermodynamical systems, relation with thermodynamical variables, Cooling due to adiabatic demagnetization, production and measurement of very low temperatures.

Unit - V

- **Blackbody radiation**: Pure temperature dependence, Stefan-Boltzmann law, pressure of radiation, Spectral distribution of blackbody radiation, Wein ‘s displacement law, Rayleigh-jean’s law, Planck’s quantum postulates, Planck’s law, complete fit with experiment, interpretation of behaviour of specific heats of gases at low temperature.

Textbooks and References

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2. Hirschfelder, J. O., Curtiss, C. F., Bird, R. B., & Mayer, M. G. (1964). *Molecular theory of gases and liquids* (Vol. 165). New York: Wiley.
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CC-1 Physics-III
CC-1(III) Paper-III: Optics and Lasers
(CODE: BSCBED-254 a III)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to -

- Gain knowledge on various theories of light.
- Classify the properties of light like reflection, refraction, interference, diffraction etc.
- Apply the principles of Construction, Working principle and Applications of laser induction in real situations.
- Learn the Interference of a light, optics, Polarization and Optical Rotationand lasers.

Unit I Optics

- **Fermat's Principle:** Principle of extremum path and application to laws of reflection and refrection.

- **General theory of image formation:** Cardinal points of an optical system, general relationships, thick lens and lens combinations.

- **Aberration in images**: Chromatic aberrations, achromatic combination of lenses incontact and separated lenses, Monochromatic Aberration and corrections, aplanatic points of a spherically refracting surface and sphere, oil immersion objectives, meniscus lens.
- **Optical instruments**: Entrance and exit pupils, Need for a multiple lens, eyepiece, common types of eyepieces.

Unit – II

- **Interference of a light**: Division of wavefront and division of amplitude, The principle of superposition, two-slit interference, Fresnel biprism, thin film interference, Newton‘s rings, application of interference in determination of wavelength and precision measurements.
- **Haidinger fringes:** fringes of equal inclination, Michelson interferometer, itsapplication for precision determination of wavelength, wavelength difference and the width of spectral lines, Intensity distribution in multiple beam interference, Fabry-Perot interferometer.

Unit - III

- **Fresnel diffraction:** Fresnel half-period zones, Types of zone plates, Circular aperture, Circular disc, Diffraction at a straight edge, Construction and working principle of Zone plate and its application as a lens.
- **Fraunhofer diffraction:** Phasor diagram, Diffraction at a single slit, double slits & N parallel slits and their intensity distribution, plane diffraction grating, reflection grating and blazed grating, Concave grating and different mountings, diffraction at a circular aperture.
- Rayleigh criterion of Resolution, resolving power of Telescope, Microscope, Grating and Prism.

Unit IV

- **Polarization and Optical Rotation**: Meaning and representation of Polarized light, Types of polarized light, Production of Polarized light, Brewster law, Malus law, double refraction, Phase retardation plates, Analysis of Polarized light as plane polarized, circularly polarized and Elliptically polarized light, Rotation of plane of polarization, Specific rotation and its experimental determination, Polarimeter (Laurent and Biquartz).

Unit – V

- **Lasers:** Laser system, Radiative and Non-radiative Transition mechanisms, Basicnecessity for a Lasing device, Purity of a spectral line, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients, Spontaneous and Induced emissions, conditions for laser action, population inversion.
- Construction, working principle and Applications of Ruby laser, He-Ne Laser and Semiconductor lasers, spatial coherence and directionality, estimates of beam intensity, temporal coherence and spectral energy density. Basic concepts of Holography, Construction of a Hologram and reconstruction of the image.

Textbooks and References

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10. Martin, B. R., & Shaw, G. (2017). *Particle physics*. John Wiley & Sons.
11. Walls, D. F., & Milburn, G. J. (2007). *Quantum optics*. Springer Science & Business Media.
12. Wood, R. W. (1905). *Physical optics*. Macmillan.

PHYSICS PRACTICALS

Duration: 4 hrs **Max. Marks: 50**

Total number of experiments to be performed by the students during the session should be 16, selecting any eight from each section. In examination two experiments are to be performed taking at least one from each section.

The distribution of marks in the practical examination will be as follows:

(i) Two experiments	30 Marks
For each experiment, distribution of marks will be as follows:	
Figure:	2
Formula/Theory:	2
Observation:	7
Calculation and Result:	3
Precautions:	1
(ii) Viva voce	10
(iii) Records	10
Total	**50 Marks**

LIST OF EXPERIMENTS

Section: A

- Determination of wavelength using Biprism.
- Determination of wavelength of light using diffraction grating.
- Michelson's interferometer and determination of D_1& D_2.
- To find out the wavelength of a monochromatic source of light using Newton's ringsand find the refractive index of liquid.
- Determine the specific rotation of sugar solution by Polarimeter.
- Find out the melting point of a given substance using platinum resistance thermometer.
- Determine thermal conductivity of a bad conductor by Lee's method.
- Determine the thermodynamic constant (γ) using Clements's and Desormasmethod.
- Study of variation of total thermal radiation with temperature.
- Determination of Resolving Power of Telescope.
- Determine wavelength of laser light using a diffraction grating.
- Determination of wavelength of Mercury source.

Section: B

- Study thermo emf versus temperature of a thermo couple. Find the neutral temperatureand use it to find temperature of an unknown substance.
- Study the magnetic field along the axis of a current carrying circular coil for different currents. Plot the observations on a graph and find out the radius of a circular coil.

- Determination of band gap using a junction diode.
- Measurement of inductance of a coil by Anderson's bridge.
- Measurement of Capacitance and dielectric constant of a liquid by Desauty bridge.
- Study of decay of currents in LR and RC circuits.
- Response curve for LCR circuit and resonance frequency and quality factor.
- Determination of power factor (Cos θ) of a given coil using CRO.
- Determination of velocity of sound in air by standing wave method using speakermicrophone and CRO.
- Determine the Ballistic constant of a ballistic galvanometer.
- Determination of a small thickness by interference method.

CC-2 Chemistry-I
CC-2(I) Paper-I: Inorganic Chemistry
(CODE: BSCBED-254 b I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Note: The paper is divided in five independent units. Two questions will be setfrom each unit. The candidates are required to attempt one question from each unit.

Learning outcomes -After completion of the course, student-teachers will be able to -

- Know the background, properties of organometallic compounds.
- Get familiar with concepts of coordination compounds, chemistry of lanthanide and actinids.
- Apply the principles of thermodynamics stability of metal complexes and factors affecting the stability.
- Learn the Stability of Metal complexes and Oxidation Reduction.

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. Limitations of valance bond theory, an elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planner complexes, factors affecting the crystal-field parameters.

Unit- II Chemistry of Lanthanide and Actinides

- **Chemistry of Lanthanide:** Occurrence and separation, Electronicstructure, oxidation states and ionic radii and lanthanide contraction, spectral and magnetic properties, complex formation and applications.
- **Chemistry of Actinides:** Electronic configuration, oxidation states, actinide contraction, complex formation spectral and magnetic properties, applications. Chemistry of separation of Np, Pu and Am from Uranium, similarities between the later actinides and later lanthanides.

Unit-III Organometallic compounds

- 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-ethylene complexes and homogenous hydrogenation.

Unit - IV Carbonyls and Nitrosyls

- **Metallic carbonyls**: Metallic carbonyls General methods of Preparation, general properties, structure and nature of Metal carbonyls, bonding in carbonyls, Effective atomic number (EAN) rules as applied to metallic carbonyls. 18-electron rules applied to metallic carbonyls. Preparation, properties and structure of nickel tetracarbonyl, iron penta carbonyls, chromium hexa carbonyls, dimanganese deca carbonyl, dicobalt octa carbonyl.
- **Metallic** nitrosyls**:** Some metallic notrosyls: Metal nitrosyl carbonyls, metal nitrosyl halides, sodium nitroprusside (Preparation properties, structures and uses) structure and nature of M-N bonding in nitorsysl. Effective atomic number (EAN) rules as applied to metallic nitrosyls.

Unit- V Stability of Metal complexes and Oxidation Reduction

- **Thermodynamic and Kinetic Aspects of Metal Complexes:** A brief outlineof thermodynamics stability of metal complexes and factors affecting the stability, stability constants of complexes and their determination, substitution reactions of square planar complexes.
- **Oxidation Reduction:** Use of redox potential data-analysis of redox cycle, redox stability in water – Frost, Latimer and Pourbaix diagrams. Principles involved in the extraction of the elements.

Textbooks and References

- Mehrotra.R. C. and A. Singh (1991). *Organometallic ChemistryA Unified Approach*. Wiley.
- Shar.A. G. (2012).*Inorganic Chemistry*. Pearson.
- Bell and Lott (1995).*Modern approach to Inorganic chemistry*. Van Nostrand.
- Emelns and Anderson (1991). *Principles of Inorganic Chemistry –*
- Miessler.G. L. and D. A. (1962).*Tarr Inorganic Chemistry.* Prentice Hall.
- Cotton and Wilkinson (2001).*Advanced Inorganic Chemistry*. 6th Edition. Wiley.
- Lee, J.D.(1964).*Concise Inorganic* Chemistry. ELBS.
- Douglas, B.E. and Mc Daniel, D.H.(1994).*Concepts & Models of Inorganic Chemistry*.
- Day, M.C. and Selbin, J. (1963).*Theoretical Inorganic Chemistry*. ACS Publications.
- Shriver and Atkins (2003).*Inorganic Chemistry*. W. H. Freeman and Company
- James Huheey, (1972). *Inorganic chemistry*: Principles of Structure and Reactivity, Pearson Education India.
- B.N. Figgis, J.E Huheey, P.W. (1990). *Atkins Inorganic Chemistry*. Pearson Education.

CC-2 Chemistry-II
CC-2(II) Paper II: Organic Chemistry
(CODE: BSCBED-254 b II)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- Know the background, properties of Fundamentals of Organic Chemistry.
- Get familiar with concepts of isomerism and Types of isomerism.
- Apply the principles of IUPAC nomenclature of branched and unbranched alkanes.
- Learn the Cycloalkenes, Dienes, and Alkynes.

Unit I: Fundamentals of Organic Chemistry:

- **Structure and Bonding:** Hybridization, bond lengths and bond angles, bondenergy, localized and delocalized chemical bonding, van der Waals interactions, inclusion compounds, clatherates, charge transfer complexes, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.
- **Mechanism of Organic Reactions:** Curved arrow notation, drawing electronmovements with arrows, half-headed and double-headed arrows, 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. Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

Unit II: Stereochemistry of Organic Compounds:

- Concept of isomerism, Types of isomerism; Optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogenic center, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centers, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomer, inversion, retention and racemisation.
- Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.
- Geometric isomerism: determination of configuration of geometric isomers, E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.
- Conformational isomerism: conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives, Newman projection and Sawhorse formulae, Fischer and flying wedge formulae, Difference between configuration and conformation.

Unit III: Alkanes, Cycloalkanes and Alkenes:

- **Alkanes:-** IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atom in alkanes, Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes, Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.

- **Cycloalkanes**: Nomenclature, methods of formation, chemical reactionsBaeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring, banana bonds.
- **Alkenes**:- Nomenclature of alkenes, methods of formation, mechanisms ofdehydration of alcohols and dehydrohalogenation of alkyl halides, regionselectivity in alcohol dehydration, The Saytzeff's rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes, mechanism involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration oxidation, oxymercuration-reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$, Polymerization of alkenes, Substitution at the allylic and vinylic positions of alkenes, Industrial applications of ethylene and propene.

Unit IV: Cycloalkenes, Dienes, Alkynes:

- **Cycloalkenes**: Methods of formation, conformation and chemical reactions ofcycloalkenes, Nomenclature and classification of dienes: isolated, conjugatedand cumulated dienes, Structure of allenes and butadiene, methods of formation, polymerization, chemical reaction – 1, 2 and 1, 4 additions, Diels-Alder reaction.
- **Alkynes**: Nomenclature, structure and bonding in alkynes, Methods offormation, Chemical reactions of alkynes, acidity of alkynes, Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal-ammonia reductions, oxidation and polymerization.
- **Arenes and Aromaticity:** Nomenclature of benzene derivatives, the arylgroup, Aromatic nucleus and side chain, Structure of benzene; molecular formula and kekule structure, stability and carbon-carbon bond lengths ofbenzene, resonance structure, MO picture. **Aromaticity**: The Huckle rule, aromatic ions.

Unit V: Concept of Electrophilic substitution reaction

- **Aromatic electrophilic substitution:** general pattern of the mechanism, role of σ- and π- complexes, Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho-para ratio, Side chain reactions of benzene derivatives, Birch reduction, Methods of formation and chemical reactions of alkylbenzenes alkynylbenzenes and biphenyl, naphthalene and Anthracene.
- **Alkyl and Aryl Halides**: Nomenclature and classes of alkyl halides, methods of formation, and chemical reactions, Mechanisms of nucleophilic substitution reactions of alkyl halides, SN^2 and SN^1 reactions with energy profile diagrams, Polyhalogen compounds: Chloroform, carbon tetrachloride.
- Methods of formation of aryl halides, nuclear and side chain reactions, The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions, Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides, synthesis and uses of DDT and BHC.

Textbooks and References

- Ali, Hashmat, (2016). Reaction Mechanism in Organic Chemistry. S. Chand publishing.
- Eliel, E. L. & Wilen, (1994).Stereochemistry of Organic Compounds; Wiley: London,
- Finar, I. L. (2011). Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. (2011). Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Singh, Harkishan and V. K. Kapoor. (1996). Medicinal and Pharmaceutical Chemistry. Vallabh Prakashan Publishers, Delhi.
- John Leonard, Barry Lygo (1995).Garry Procter Advanced Practical Organic Chemistry. Third Edition.
- March's Advanced (2001).Organic Chemistry: Reactions, Mechanisms, and Structure, Sixth Edition.
- Morrison, R. N. & Boyd, R. N. (2010) Organic Chemistry. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Peter Sykes, (2003). A Guidebook to Mechanism in Organic Chemistry Paperback.
- Madan, R L (2003). Chemistry for Degree Students B.Sc. 2nd Year. S. Chand Publishing.

CC-2 Chemistry-III
CC-2(III) Paper-III: Physical Chemistry
(CODE: BSCBED-254 b III)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- Know the background, properties of Fundamentals of thermodynamics.
- Get familiar with concepts of Chemical Kinetics and Catalysis.
- Apply the principles laws of thermodynamics and thermo chemistry.
- Learn the Electrical transport-conduction in metals and in electrolyte solutions, conductance.

Unit- I Thermodynamics-I

- **Thermodynamics:** Definition of thermodynamic terms: system, surroundingsetc. Types of systems, intensive and extensive properties, State and path functions and their differentials.Thermodynamic process, Concept of heat and work. First Law of Thermodynamics: Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law-Joule-Thomson coefficient and inversion temperature. Calculation of w, q, dU, & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.
- **Thermo chemistry**: standard state, standard enthalpy of formation–Hess'sLaw of heat summation and its applications. Heat of reaction at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy, Kirchhoff's equation.

Unit II: Thermodynamics-II

- **Thermodynamics**: Second law of thermodynamics: need for the law, differentstatements of the law. Carnot cycle and its efficiency, Carnot theorem. Thermodynamic scale of temperature.
- **Concept of entropy:** entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, clausius inequality, entropy as a criterion of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.
- **Third law of thermodynamics:** Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions, Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G with A with P, V and T.

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's dilution law its uses and limitations.

- Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method.
- Applications of conductivity measurements: determination of degree of dissociation, determination of K_a of acids, determination of solubility product of sparingly soluble salt, conductometric titrations.

Unit - IV Electrochemistry –II

- Types of reversible electrodes-gas-metal ion, metal-insoluble salt anion and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode-reference
- Electrodes-standard electrode potential, sign conventions, electrochemical series and its significance. Electrolytic and Galvanic cells-reversible and irreversible cells, conventional representation of electrochemical cells. EMF of a cell and its measurements. Computation of cell EMF. Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH, and ΔK), polarization, over potential and hydrogen over voltage.
- Concentration cell with and without, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations. Definition of pH and pK_a determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods.
- Buffers-mechanism of buffer action, Handerson-hazel equation. Hydrolysis of salts. Corrosion-types, theories and methods of combating it.

Unit -V Chemical Kinetics and Catalysis

- **Chemical Kinetics:** Chemical kinetics and its scope, rate of a reaction, factorsinfluencing the rate of a reaction-concentration, temperature, pressure, solvent, light catalyst, concentration dependence of rates, mathematical characteristics of simple chemical reactions- zero order, first order, second order, pseudo order, half-life and mean life, Determination of the order of reaction differential method, method of integration, method of half-life period and isolation method.
- Radioactive decay as a first order phenomenon, Experimental methods of chemical kinetics: conductometric, potentiometric, optical methods, polarimetry and spectrophotometer. Theories of chemical kinetics: effect of temperature on rate of reaction, Arrhenius equation, 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.

Textbooks and References

- Adamson, A. (2012). *A textbook of physical chemistry*. Elsevier.
- Atkins, P., & De Paula, J. (2009). *Elements of physical chemistry*. Macmillan.
- Espenson, J. H. (1995). *Chemical kinetics and reaction mechanisms* (Vol. 102). New York: McGraw-Hill.
- Glasstone, S. (1951). *Textbook of physical chemistry*. Macmillan.
- Jones, H. C. (1903). *The elements of physical chemistry*. Macmillan Company.
- Kapoor, K. L. (2001). *A textbook of Physical Chemistry* (Vol. 3). Macmillan.
- Laidler, K. J. (2008). *Chemical Kinetics. (3rdedn)*. Pearson Education.
- Lewis, D., & Glasstone, S. (1960). *Elements of physical chemistry*. Macmillan.
- Negi, A. S., & Anand, S. C. (1985). *A textbook of physical chemistry*. New Age International.
- Renner, T. (2007). *Quantities, units and symbols in physical chemistry*. Royal Society of Chemistry.
- Roussel, M. R. (2012). *A life scientist's guide to physical chemistry*. Cambridge University Press.
- Steinfeld, J. I., Francisco, J. S., & Hase, W. L. (1999). *Chemical kinetics and dynamics* (pp. 325-389). Upper Saddle River, NJ: Prentice Hall.

PRACTICALS

Time – 4 hours **Maximum Marks- 50**

Inorganic Chemistry

Ex.1 Volumetric analysis 15

Organic Chemistry

Ex.2 Identification of given organic compounds through functional group analysis 15

Physical Chemistry

Ex.4 Perform one of the experiments mentioned in the syllabus. 10

Ex.5 Vive-Voce 05

Ex.6 Practical-Record 05

Inorganic Chemistry

Quantitative Analysis: Volumetric Analysis-

- Determination of acetic acid in commercial vinegar using NaOH.
- Determination of alkali content – antacid tablet using HCl.
- Estimation of calcium content in chalk as calcium oxalate by permanganometry.
- Estimation of ferrous and ferric by dichromate method.
- Estimation of copper using thiosulphate.

Organic Chemistry

Qualitative Analysis

- Detection of extra elements (N, S and halogens), solubility behaviour and functional groups (Alcoholic, phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and anilide) in simple organic compounds.
- Identification of an organic compound through the functional group analysis and preparation of suitable derivatives.

Physical Chemistry

- Determination of the **transition temperature** of the given substance by thermometric/ dialometric method (e.g.$MnCl_2.\ 4H_2O/SrBr_{2.}\ 2H_2O$).

  Phase Equilibrium
- Study of the effect of a solute (e.g. NaCl, succinic acid) on the critical solution temperature of two partially miscible liquids (e.g. phenol-water system) and to determine the concentration of that solute in the given phenol-water system.
- Construction of the phase diagram of two component (e.g. diphenylamine, benzophenone) system by cooling curve method.

  Thermo chemistry
- Determination of the solubility of benzoic acid at different temperatures and to determine ΔH of the dissolution process.
- Determination of 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.
- Determination of the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber cycle.

  Distribution Law
- Determination of the distribution coefficient for the distribution of iodine between water and CCl_4.
- Study the distribution of benzoic acid between benzene and water.

CC-3 Zoology-I
CC-3(I) Paper-I: Chordata
(CODE: BSCBED-254 c I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which two tests of 5-5 marks each are included)

Learning outcomes: After completion of the course, student-teacher will be able:-

- To enable students to understand in respect of vertebrates– their organizational hierarchies and complexities, the evolutionary trends in external morphology and comparative studies of internal structures; identification and classification with examples; to enable them to understand various modes of adaptions in animals.

Note: The paper is divided in five independent units. Two questions will be set from each unit. The candidates are required to attempt one question from each unit.

Unit-I

- An outline classification of chordates up to orders but up to sub-classes only in case of protochordate groups and mammals.
- Comparative anatomy of vertebrates from an evolutionary point of view of the following:
  Alimentary canal
  Heart and aortic arches.
  Kidney and associated urinogenital ducts

Unit-II

- Habit and habitat, structure, reproduction (excluding development) of following types:-
  Hemichordate: *Banlanoglossus*
  Urocohordata: *Herdmania,* ascidian tadpole larva and its metamorphosis.
  Cephalochordata: *Amphioxus*
  Agnatha: Petromyzon

Unit-III

- Habit and habitat, structure (morophology, digestive system, respiratory system, blood vascular system, nervous system (central and peripheral) and urinogenital system of the following types –
  Pisces: scoliodon
  Structure and development of placoid scales
  Amphibia: frog
  Parental care in Amphibia.

Unit-IV

- Habit and habitat, structure (morophology, digestive system, respiratory system, blood vascular system, nervous system (central and peripheral) and urinogenital system of the following types –
  Reptile: uromastix
  Poisonous and non-poisonous snakes, poison apparatus and biting mechanism. First aid of snake bite.

Unit- V

- Habit, habitat, structure, morophology, digestive system, respiratory system, blood vascular system, system nervous system (central and peripheral) and urinogenital syestem of the following types:-
  Aves: *Columba*
  Mammalia: *Rabbit*.
  Origin of birds, migration & flight adaptation of birds.

Textbooks and References

- Barnes, R. D. (1987). *Invertebrate zoology* (No. Ed. 5). WB Saunders Company.
- Brooks, W. K. (1882). *Handbook of invertebrate zoology: for laboratories and seaside work*. SE Cassino.
- Brooks, W. K. (1882). *Handbook of invertebrate zoology: for laboratories and seaside work*. SE Cassino.
- Curtis, W. C., Guthrie, M. J., & Jeffers, K. R. (1938). *Textbook of general zoology*. Wiley.
- Hegner, R. W., & Engemann, J. G. (1968). *Invertebrate zoology*(No. QL362 H4 1968). Macmillan.
- Hyman, L. H. (1940). *The invertebrates: mollusca I* (Vol. 6). McGraw-Hill.
- Jordan, E. L., & Verma, P. S. (1996). *Invertebrate Zoology*. Sixth revised and enlarged edition. *S. Chand and Company, Ltd. 857pp*.
- Jordan, E. L., & Verma, P. S. (2009). *Invertebrate zoology*. S. Chand & Company.
- Light, S. F. (1941). *Laboratory and field text in invertebrate zoology*. Associated Students Store, University of California.
- McEdward, L. (2020). *Ecology of marine invertebrate larvae*. CRC press.
- Parker, T. J., & Haswell, W. A. (1967). *Textbook of zoology*. Macmillan International Higher Education.
- Scott-Ram, N. R., & Scott-Ram, N. R. (1990). *Transformed cladistics, taxonomy and evolution*. Cambridge University Press.
- Sedgwick, A. (1905). *A Student's Text-book of zoology* (Vol. 2). Allen & Unwin.
- Verma, P. S. (2001). *Invertibrate Zoology*. S. Chand Publishing.

CC-3 Zoology-II

CC-3(II) Paper-II: Animal Physiology and Endocrinology

(CODE: BSCBED-254 c II)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes - After completion of the course, student-teacher will be able:-

- To enable students to comprehend the modern concepts of physiological aspects on various organs and systems of animals and human being to comprehend chemical nature, biological molecules and physiological roles.

Unit-I

- **Physiology of digestion:** Chemical nature of food stuff (including micronutrients), various types of digestive enzymes and their digestive action in the alimentary canal, role of GI hormones in digestion, mechanism of absorption of digested food.
- **Physiology of respiration:** Mechanism and control of breathing, exchange of gases transport of respiratory gases (oxygen and carbon dioxide)

Unit-II

- **Physiology of blood circulation:**
  Composition and function of blood.
  Blood groups (ABO and Rh)
  Blood coagulation – factors, mechanism, theories and anticoagulants.
  Origin, conduction and regulation of heart beat in mammals.
  Cardiac cycle, ECG

Unit-III

- **Nerve physiology:** structure and types of neuron, origin and conduction of nerve impulse, Synapse-structure, types, properties and signal transmission through synapses.
- **Muscle physiology:** Ultra-structure and mechanism of contraction of skeletal muscle, summation and fatigue.

Unit-IV

- **Physiology of Excretion:** Nitrogenous wastes, anatomy of mammalian kidney, structure of nephron, mechanism of urea and urine formation (including hormonal regulation)
- Osmoregulation
- **Physiology of Reproduction:** Hormonal control of male and female reproduction, implantation, parturition and lactation in mammals, Reproductive cycles

Unit-V

- **Endocrinology**
  Hormones: Classification, properties of hormones.
  Mechanism of hormone action (peptide and steroid hormones)
  Endocrine glands:
  Pituitary gland: Location, anatomy and functions of hormones with hypothalamic regulation
  Thyroid gland: Location, anatomy, synthesis and function of T3 &T4
  Adrenal gland, Islets of Langerhans, Tests and Ovaries

Textbooks and References

- Guyten and hall (2013), *A text book of Medical physiology*, Elsvier Pub (South Asia)
- Schmidt – Nielson, (2013).*Animal Physiology*, 5th ed, Cambridge Pub
- D Voet & JG Voet (2011).*Biochemistry,* Wiley Arumugam Animal Physiology (Saras Publication, Nagercoil, Tamil Nadu).
- K.V. Sastry (2008).*Animal Physiology and biochemistry*, Rastogi Publications.
- Pandey, Kamleshwar and Shukla, J.P. (2008). *Regulatory mechanism in Vertebrates*– Jaipur: Rastogi Publications.
- Goyal, K.A. and K.V. Sastry (2008).*Animal Physiology*, Rastogi Publication.
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- Arora, M.P. (1989). *Animal Physiology*–Shimla: Himalaya Pucations House.
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- Hoar, W.S. (1983).*General and Comparative Physiology*-Prentice Hall Publication).
- Hurtkar, P.C. & Mathur, P.N. (1976). *A textbook of Animal Physiology*. S Chand & Co.
- Turner, C.D. & Gangara, J.T. (1971). *General Endocrinology* - W. B. Saunders & Co.
- Soni, KC (2001). *Animal Physiology and Immunology*, Hindi Edition, Jaipur: College book centre, Chaura Rasta.
- Pawar, VS (2001). *Mammalian Endocrinology and Animal Behavior*, Hindi Edition, Jaipur: College book centre, Chaura Rasta.

CC-3 Zoology-III
CC-3(III) Paper III: Evolution and Palentology
(CODE: BSCBED-254 c III)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- Know about Origin of life, Molecular basis of evolution and Variation.
- Get familiar with concepts of species/subspecies/sibling, Isolation, Embryology and Paleontology.
- Apply the Theories of evolution in understanding of real life.
- Learn the Mimicry and protective coloration.

Unit –I

- **Origin of life** (Abiogenesis and biogenesis): Evidence in favor of evolution: Evidences from morphology and comparative anatomy, Embryology and Paleontology. Molecular basis of evolution.

Unit – II

- **Theories of evolution:** Lamarckism, inheritance of acquired characters and Neo-Lamarckism. Darwinism, theory of natural selection and Neo Darwinism, Mutation theory of Hugo de Vries, Weismann theory of germplasm, Recapitulation theory.

Unit –III

- **Variation:** Kinds, sources of variation, origin of new mutations.
- **Isolation:** Definition, mechanism and role of isolation in evolution.
- **Adaptation:** Introduction, kinds (structural, physiological and behavioural), Mimicry and protective coloration: Definition, kinds, condition necessary for mimicry, significance, divergent evolution, convergent evolution,

Unit –IV

- **Origin of species:** Concept of species/subspecies/sibling, Factors causing genetic divergence in the population of species, genetic drifts, Bottle Neck effect founder's effect.
- Zoogeographical distribution of animals, geological time scale, eras origin and evolution of amphibian, reptiles, birds and mammals.

Unit –V

- Introduction, formation, kinds, determination of age of fossil and its significance.
- Dinosaurs, fossil evidence & reasons for extinction of dinosaurs.
- **Evolution of man:** Time of origin, compelling causes, ancestor of man, evolution from apes and evolutionary trends.

Textbooks and References

- Becker, J. B., Breedlove, S. M., Crews, D., & McCarthy, M. M. (Eds.). (2002). *Behavioral endocrinology*. Mit Press.
- Blackwelder, R. E., & Blackwelder, R. E. (1967). *Taxonomy: a text and reference book* (No. QL351 B54). New York: Wiley.
- Cope, E. D. (1904). *The primary factors of organic evolution*. Open Court.
- Darlington, C. D. (1969). *The evolution of man and society* (p. 69ff). New York: Simon and Schuster.
- Gilbert, W. (1986). *Origin of life: The RNA world*. *Nature*, *319* (6055), 618-618.
- Haeckel, E. (1897). *The evolution of man* (Vol. 1). D. Appleton.
- Harvey, P. H., & Pagel, M. D. (1991). *The comparative method in evolutionary biology* (Vol. 239). Oxford: Oxford university press.
- Küppers, B. O. (1990). *Information and the Origin of Life*. Mit Press.
- Nelson, R. J. (2005). *An introduction to behavioral endocrinology*. Sinauer Associates.
- Provine, W. B. (1989). *Sewall Wright and evolutionary biology*. University of Chicago Press.
- Rose, M. R. (1994). *Evolutionary biology of aging*. Oxford University Press on Demand.
- Spencer, H. (1887). *The factors of organic evolution*. D. Appleton.
- Washburn, S. L. (1978). *The evolution of man*. *Scientific American*, *239*(3), 194-211.

Practical

Duration: 4 hrs. **Maximum Marks - 50**

Learning outcome: -

- To develop in the student the skills of staining and mounting of materials (temporary and permanent) and of dissection, display and labeling as per UGC guidelines; Cadaver or otherwise collection, preservation, mounting, identification and labeling of specimens as per UGC guidelines: Field observation of animals. To enable students to develop the skills of hematology and endocrinology.

Course Content

- Study of Museum specimen with respect to levels and patterns of organization, biosystematics, biodiversity, adaptations, development stages, population dynamics, ecological implications ets.
- Hemichordata:*Balanoglossus*.
- *Urochordata: Herdmania, Pyrosoma*
- *Cephalochordata: Petromyzon, Myxine*
- *Cyclostomata: Petromyzon, Myxine*
- *Pisces: Scoliodon, Sphyrna, Torpedo, Pristis, Trygon Lepidosteus, Clarias, Ophiocephalus, Anabas. Exocoetus, Hippocampus, Tetradon, Protopterus*
- *Amphibia: Icthyophis, Necturus, Proteus, Ambystoma, Axolotl larva, Triturus. Amphiuma, Alytes Bufo.*
- *Reptilia: Testudo, Trionyx, Sphenodon, Hemidactylus, Draco, Calotes, Chamaeleon, Varanus, Heloderma, Typhlops, Eryx, Hydrophis, Viper, Bungarus, Naja Alligator,*
- *Aves: Pavo, Columba, Psitacula, Passer, Corvus, Archaeopteryx.*
- *Mammals: Ornithorhynchus, Echidna, Macropus, Loris, Manis, Rattus.*

Study of Permanent Sildes

- *Balanoglossus:* T.S. of proboscis, collgar region and trunk
- *Amphioxus:*T.S. or oral hood, pharynx.
- *Mammals:* T.S., skin Stomach, Duodenum, IIeum, liver, Pancreas, spleen, lung, kindney Testis, Ovary.
- Study of skull bone of Frog, Varanus, Bird and Rabbits.
- Study of vertebral of Frog. Varanus, Bird and Rabbit.
- Study of girdles, forelimb and hind limb bones of Frog, Varanus, Bird and Rabbit.
- Dissections and/or its demonstration through Charts / Models/Video/CD/digital alternatives etc and/or preparation of working
- Models of the different system of the following animals.
- *Scoliodon:* Afferent brachial systems, efferent branchial system, cranialnerves and internal ear.
- Frog: Anatomy, digestive, system, Urino-genital system
- Permanet /Temporary preparation of the follwing-:
- Scales: Placoid, Cycloid
- Blood film of any vertebrate
- Filoplumes of birds
- Thigh muscles of frog

- Estimation of Hemoglobin.
- Enumeration of RBC in blood samples.
- Enumeration of WBC in blood samples.
- Preparation of Haemin Crystals.
- Effect of different concentrations of NaCI on RBC.
- Measurement of blood pressure, Heart beat and Pulse rate.
- Study of bleeding time, Coagulation time of blood.
- Study of Histological slides of the following endocrine gland of mammal testis, ovary, thyroid, adrenal, pituitary, Islets of Langerhans

Note:

- Use of animals of materials for dissection or otherwise is subject to the condition that these are not banned under the Wildlife Protection Act.
- Report on study of animals from their natural habitat from their local surroundings or as assigned.

Guidelines/Instructions for Practical Examination

Time allowed: 4 Hrs. **Max.Marks: 50**

S. No.	Exercise	Marks
1.	Dissection* (Exposition, labeled diagram)	**6**
2.	Temporary mounting –one (Staining, identification, sketch	**3**
3.	Museum specimens – four or six (identification and classification	**12**
4.	Permanent slides – two or four (Identification with reasons)	**4**
5.	Osteology	**3**
6.	Physiological exercise	**5**
7.	Practical record and slides	**5**
8.	Viva	**4**
9.	Project report assignment	**8**
* as per UGC guidelines		

CC–4 Botany-I

CC–4(I) Paper–I: Diversity of Seed Plants

(Gymnosperm, Angiosperm and Plant breeding)

(CODE: BSCBED-254 d I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes:-After completion of the course, student-teachers will be able to:-

- Know aboutCharacteristics, Origin and evolution of seed plants.
- Get familiar with General features of gymnosperms.
- Apply the principles of Asymptotes, multiple points, curve tracing in real situations.
- Learn Morphology and anatomy of vegetative and reproductive parts.

Unit – I

- Characteristics of seed plants, (Gymnosperm & Angiosperm), Homospory, Heterospory & orgion of Seed Plants, Fossil and Living seed Plants, Fossil Gymnosperms.(williamsonia)

Unit – II

- **Angiosperms:** Origin and Evolution, Primitive Angiosperms. Diversity in Plant Forms-annuals, Biennials and Perennials, Convergence of Evolution of Tree Habit in Gymnosperms, Monocotyledons and di-cotyledons, Trees-Largest and Longest-Lived Seed Plants.

Unit –III

- General features of Gymnosperms, Distribution and Their Classification, Morphology and Anatomy of Vegetative and Reproductive Parts and Life Cycle of Cycas.

Unit – IV

- Morphology and Anatomy of Vegetative and reproductive Parts and life cycle of Pinus and Ephedra, Economic importance of Gymnosperms

Unit – V

- Principles of Plant breeding, Methods of Breeding, Introducation and Acctimatisation, Selection (mass, purelme, and clonal), Hydridizaion, pedi-gree analysis, Hybrid vigour, use of mutation and Polyploidy in breeding.

Suggested Readings

- Bhatnagar, A.P. and Moitra, A. (1996). *Gymnosperms*. New Delhi: New Age International Limited.
- Gifford, E.M. and Foster, A.S. (1988). *Morphology and Evolution of Vascular Plants*. New York: W. H. Freeman & Company.
- Singh, D. (2009). *Diversity and Systematics of Seed Plants*. Jaipur: Rastogi Publications.
- Sporne, K.R. (1965). *The Morphology of Gymnosperms*. London: Hutchinson & Co. (Publishers) Ltd., London. Stewart, W. M. (1983). Paleobotany and the Evolution of Plants. Cambridge University Press. Cambridge.
- Van Balgooy, M. M. J. (1997). *Malesian seed plants* (Vol.1). Rijksherbarium/Hortus Botanicus.

CC–4 Botany-II

CC-4 (II) Paper–II: Systematics of Angiosperms

(CODE: BSCBED-254 d II)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- Know about the Continuity and differentiability of vector functions, unit tangent vector.
- Get familiar with concepts of artificial, natural and phylogenetic system of classification.
- Apply the principles of Principles and rules of ICBN in real situations.
- Learn the Botanical Nomenclature.
- Develop Herbarium and identified on the bases of diversity of flowering plants as illustrated by members of the families.

Unit – I

- Angiosperm taxonomy: Brief history, aims and fundamental concepts of artificial, natural and phylogenetic system of classification, Bentham & Hooker, Engler & Prantle and Hutchinson, system of classification.
- Herbarium; Tools and techniques, important herbaria and botanical gardens of India and their importance.

Unit – II

- Botanical Nomenclature: Principles and rules of ICBN, type of concept, taxonomical categories, principle of priority, identification keys, floras.

Unit – III

- Diversity of flowering plants as illustrated by members of the families– Brassicaceae, Malvaceae, Rutaceae, and Fabaceae (Lotoidae, Caesalpinoidae, and Mimosoidae) Apiaceae.

Unit – IV

- Diversity of Flowering plants as illustrated by members of the families– Apocynaceae, Asclepiadaceae, Asteraceae, Solanaceae, and Lamiaceae.

Unit –V

- Diversity of flowering plants as illustrated by members of the families– Amaranthaceae, Cucurbitaceae, Euphorbiaceae, Liliaceae, and Poaceae.

Suggested Readings

- Davis, P.H. and Heywood, V.H. (1963). Principles of Angiosperm Taxonomy. Oliver and Boyd, London.
- Heywood, V.H. and Moore, D.M. (eds.) (1984). Current Concepts in Plant Taxonomy. Academic Press. London.
- Jaffrey, C, (1982). An Introduction to Plant Taxonomy, Cambridge University Press, Cambridge, London.
- Jones, S.B., Jr. and Luchsinger, A.E. (1986). Plant Systematics (2nd edition). Mc Graw-Hill Book Co., New York.
- Maheshwari, J.K. (1963). Flora of Delhi, CSIR, New Delhi.
- Radrord, A.E. (1986). Fundamentals of Plant Systematics. Harper and Row, New York.
- Singh, F. (1999). Plant Systematics: theory and Practice. Oxford and IBH Pvt. Ltd., New Delhi.

CC–4 Botany-III

CC-4 (III) Paper–III: Plant Cell Biology and Genetics

(CODE: BSCBED-254 d III)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- Know about the Ultrastructure of cell and cell organelles.
- Get familiar with concepts of Chromosome organization and genetic expression.
- Apply the principles of Mendal's law of inheritance, Linkage and crossing over; allelic and non-allelic interactions in real situations.
- Learn the Nuclear and extra nuclear genetic material.

Unit – I

- Ultrastructure of cell and cell organelles; Cell wall, Plasma membrane, Golgi Complex, endoplasmic reticulum, Lysosomes, Ribosomes, peroxisomes, vacuoles, mitochondria, chloroplast, nucleus.

Unit – II

- Chromosome organization: Structure/Morphology, centromere and telomere, chromosome aberrations: deletions, duplication, inversions and translocations, Variations in chromosome number – aneuploidy, euploidy, sex chromosomes.
- Cell division: Cell cycle and Mitosis and meiosis.

Unit – III

- Nuclear and extra nuclear genetic material: DNA structure, replication, DNA protein interaction, nucleosome model, genetic code, satellite and repetitive DNA, mitochondrial and plastid DNA, plasmid, gene mapping

Unit – IV

- Gene expression: Structure of gene, transfer of genetic information, protein structure and classification, transcription, translation, regulation of gene expression in prokaryotes and eukaryotes.

Unit – V

- Genetic inheritance: Mendelism, Mendal's law of inheritance, Linkage and crossing over, allelic and non-allelic interactions.
- Genetic variations: Mutations-spontaneous and induced, transposable genetic elements, DNA damage and repair.
- Mean, mode, median, $x^2\ test$, standard deviation, standard error

Suggested Readings

- Alberts, B., Bray, D., J., Raff, M., Roberts, K and Watson, I. D. (2001). *Molecular Biology of Cell*. New York, USA: Garland Publishing Co. Inc.
- Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2002). General principles of cell communication. In *Molecular Biology of the Cell. 4th edition*. Garland Science.
- Baserga, R. (1985). *The biology of cell reproduction*. Harvard University Press.
- Gupta, P.K. (1999). A Textbook of Cell and Molecular Biology. Rastogi Publications, Meerut.
- Karp, G. (2009). *Cell and molecular biology: concepts and experiments*. John Wiley & Sons.
- Klug, W. S., & Cummings, M. R. (2006). *Concepts of genetics*. Upper Saddle River, NJ: Pearson Education.
- Levitan, I. B., & Kaczmarek, L. K. (2015). *The neuron: cell and molecular biology*. Oxford University Press, USA.
- Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Scott, M. P., Bretscher, A., ... & Matsudaira, P. (2008). *Molecular cell biology*. Macmillan.
- Nei, M. (1975). *Molecular population genetics and evolution*. North-Holland Publishing Company.
- Richardson, P. D., & Steiner, M. (2017). *Principles of Cell Adhesion (1995)*. CRC Press.
- Snustad, D.P. and Simmons, M. J. (2000). *Principles of Genetics*. John Wiley & Sons, Inc., USA.
- Stent, G.S. (1986). Molecular Genetics. Delhi: CBS Publications.
- Weissleder, R. (2010). *Molecular imaging: principles and practice*. PMPH-USA.
- Wilson, K., & Walker, J. (Eds.). (2010). *Principles and techniques of biochemistry and molecular biology*. Cambridge university press.
- Wolfe, S.L. (1993). *Molecular and Cell Biology*. Wodsworth Publishing Co., California, USA.

PRACTICALS

Duration – 4 Hrs **Maximum Marks: 50**

Gymnosperms:

1. Cycas

- Habit, armour ofleaf bases on the stem, very young leaf (circinate vernation)and old foliage leaves, scale leaf, bulbils, male cone, microsporophyll, megasporophyll, and mature seed.
- Study through temporary micro preparations or permanent slides – normal root, coralloid root, stem, rachis, leaflet, microsporophyll, pollen grains, and ovule.

2. Pinus

- Habit, long and dwarf shoot showing cataphylls and scale leaves, T.S. wood showing growth rings, male cones, female cones, and winged seeds.
- Study through temporary micro preparations and/or permanent slides – stem (young and old), needle, pollen grains, root, female cone, ovule, embryo (W.M.) showing polycotyledonous condition.

3. Ephedra

- Habit and structure of whole male and female cones.Temporary micro preparations and/or permanent slides of node, internode, macerated stem to see vessel structure; epidermal peel mount of vegetative parts to study stomata, male cone, female cone, and pollen grains.

4. Angiosperms

- Familiarity with the terms used in technical description of plants. Study of representative plants of families included in the syllabus.

1. Cyto-genetics

- Study of cell structure from onion leaf peels; demonstration of staining and mounting methods.
- Comparative study of cell structure in onion cells, *Hydrill*a and *Spirogyra*. Study of cyclosis in Tradescantia, staminal hairs.
- Study of plastids to examine pigment distribution in plants (e.g., *Cassia, Lycopersicon*and *Capsicum*).
- Examination of electron micrographs of eukaryotic cells with special reference to organelles.
- Study of electron micrographs of viruses, bacteria, cyanobacteria and eukaryotic cells for comparative cellular organization.
- Examination of various stages of mitosis and meiosis using appropriate plant material (e.g. onion root tips, onion flower buds),
- Preparation of karyotypes from dividing root tip cells and pollen grains.
- Cytological examination of special types of chromosomes: bar body, lamp brush and polytene chromosomes.
- Working out the laws of inheritance using seed mixtures.
- Working out the mode of inheritance of linked genes from test cross and or F2 data.
- Plant breeding–Monohybrid, and dihybrid crosses, emasculation,

5. Biostastics- Mean, mode, median, $x^2 test$, standard deviation.

MARKING SCHEME

There shall be a practical examination of four hours duration and the distribution of marks shall be as follows:

1. A double stained section of plant part either of Gymnosperm glycerine mount Marks: 08
2. An angiosperm material for anato-mical study with (i) double stained, labelled cellular sector diagram, identification and (iv) special (anatomical/ecological) character. Marks: 08
3. Smear preparation for two stages of cell division. Marks: 03
4. Genetic exercise Or Emasculation technique. Marks: 03
5. Statistical exercise. Marks: 03
6. Spots five (At least one from each paper) Marks: 10
7. Vive-Voce Marks: 05
8. Practical Record Marks: 10

Suggested Readings

- Fukui, K. an``d Nakayama, S. (1996). *Plant Chromosomes: Laboratory Methods*. Florida: CRC Press, Boca Ratin.
- Gunning, B.E.S. and Steer, M. W. (1996). *Plant Cell Biology: Structure and Function*. Boston Massachusetts: Jones and Barlett Publishers.
- Harris, N. and Oparka, K. J. (1996). *Plant Biology: A Practical Approach*. IRL Press at Oxford University Press. Oxford, UK.
- Sharma A.K. and Sharma A. (1999).*Plant Chromosomes: Analysis, Manipulation and Engineering*. Harwood: Academic Publishers Australia.

CC-5 Mathematics-I
CC-5 (I) Paper-I: Abstract Algebra
(CODE: BSCBED-254 e I)

Maximum Marks: 67 **External Marks: 60**

Internal: 7 Marks (in which **two tests** of 3.5-3.5 marks each are included)

Note:-The paper is divided in five independent units. Two questions will be setfrom each unit. The candidates are required to attempt one question from each unit.

Learning Outcomes: After completion of the course, student-teacher will be able to-

- Know about groups, subgroups and its properties, cosets and cyclic groups.
- Know about normal subgroups, group homomorphism and isomorphism and their properties.
- Know about permutations and alternating groups, simple groups and order of element in a group.
- Know about ring, integral domain, fields, ideals and its properties.

Unit-1

Set, Relations, functions and binary operations, binary operations in contrast to unary and ternary operations. Group: Definition, examples and simple properties of group and subgroup

Unit-2

Permutation group, cyclic group, cosets, Lagrange theorem, homomorphism andisomorphism of group, cayley's theorem.

Unit-3

Normal subgroup and Quotient group, theorem. Fundamental theorem of homomorphismof group.

Unit-4

Rings: Definition and example. Residue classes ring, Special classes of ring, integral domain, division ring (ring, field) simple properties & ring, sub ring, sub field, ring homomorphism and ring isomorphism.

Unit-5

Ideal, principal ideal, principal ideal ring, quotient ring, prime ideal, maximal ideal,Euclidean ring and its properties, polynomial ring.

Textbooks and References:

1. Herstein, (1975).Topics in Algebra: Wiley Eastern, New Delhi, 2nd ed.
2. Khanna V.K. and S.K. Bhambri, (1998).A Course in Abstract Algebra: Vikas Pub.House, New Delhi, 2nd rev. ed. 1998.
3. Vashistha, A.R. (1971). Modern Algebra: Krishna Prakashan Mandir, Meerut,2ndrev.ed.
4. Artin, M. (1991) *Algebra*:Prentice Hall.

CC-5 Mathematics-II
CC-5 (II) Paper-II: Real Analysis
(CODE: BSCBED-254 e II)

Maximum Marks: 67 **External Marks: 60**

Internal: 7 Marks (in which **two tests** of 3.5-3.5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to-

- Get familiar with concepts and know about the Real Numbers system, integral andReal sequence.
- Apply the properties of Real Numbers system in real situations.
- Learn the Uniform convergence of series of function, Real Numbers system and fundamental theorem of integral calculus, Mean value theorems of integral calculus.

Unit- 1

Real Numbers system: completeness axiom, densities of rational/irrational, properties of real numbers, least upper bound axiom of a function, Basic properties of the limits Continuous functions and classification of discontinuities, properties of continuous functions Boundedness of a continuous function on a closed interval [a, b] existence of a maximum of a continuous function on [a, b], uniform continuity,

Unit-2

Differentiability, chain rule of differentiability, Mean value theorems and their geometrical interpretations, Darboux's intermediate value theorem for derivatives, Taylor's theorem with various forms of remainders,

Unit-3

Riemann integral, Integrability of continuous and monotonic functions, Thefundamental theorem of integral calculus, Mean value theorems of integral calculus.

Unit-4

Real sequence, Definition, Theorems on limits of sequences, Bounded and monotonic sequences, Sequential Continuity, Cauchy's convergence criterian, Infinite series of non negative terms, comparison tests, Cauchy's integral test, Ratio tests, Raabe's logarithmic, De Morgan and Bertrand's tests, Alternating series, Leibnit'z theorem, Absolute and conditional convergence.

Unit-5

Uniform convergence of series of function, Weirestrass M-Test Abel's and Dirichlets' test for uniform convergence. Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests.

Textbooks and References

1. Malik, S.C. (2004) Mathematical Analysis: New Age International, New Delhi.
2. Apostol, T.M. (1985) Real Analysis: Narosa Publishing House, New Delhi
3. Royden, H.L. (1993).Real Analysis: Macmillan, 4th edition
4. Rudin, W. (1976).Principles of Mathematical Analysis: McGraw Hill, 3rd edition1976.

CC-5 Mathematics-III
CC-5 (III) Paper-III: Differential Equation
(CODE: BSCBED-254 e III)

Maximum Marks: 66 **External Marks: 60**

Internal: 6 Marks (in which **two tests** of 3-3 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to -

- Know about the Linear equations and equations reducible.
- Get familiar with concepts of Ordinary simultaneous, Series solution and Partialdifferential equations.
- Apply the principles of Partial differential equations.

Unit-1

Linear equations and equations reducible to linear form. Exact differential equations, integrating factors, first order and higher degree equations solvable, for x, y, p. Clairaut's form and singular solutions, Geometric. meaning of a differential equation, orthogonal trajectories linear differential equations with constant coefficients, homogeneous linear ordinary differential equations.

Unit-2

Ordinary simultaneous differential equations, total differential equations. Linear differential equations of second order, transformation of the equation by changing dependent independent variable, method of variation of parameters.

Unit-3

Series solution of differential equations, power series method, Bessel, Legendre and Hypergeometric equations, Bessel, Legendre and Hypergeometric functions and their elementary properties.

Unit-4

Partial differential equations of the first order, Lagrange’s solution, some special type ofequations which can be solved easily by methods other than the general method, Charpit's general method of solution.

Unit-5

Partial differential equations of second order and higher orders, classification of linear partial differential equations of second order, homogeneous and non-homogeneous equations with constant coefficients partial, differential equations reducible to equations with constant coefficients, Monge’s method.

Textbooks and References

1. Boyce, W. E., DiPrima, R. C., & Meade, D. B. (2017). Elementary differential equations. John Wiley & Sons.
2. Mao, X. (1994). Exponential stability of stochastic differential equations. Marcel Dekker.
3. Hale, J. K. (1971). Functional differential equations. In Analytic theory of differential equations (pp. 9- 22). Springer, Berlin, Heidelberg.
4. Sewell, G. (2005). The numerical solution of ordinary and partial differential equations (Vol. 75). John Wiley & Sons.
5. Yakubov, Y., & Yakubov, S. (1999). Differential-operator equations: ordinary and partial differential equations (Vol. 103). CRC Press.
6. Fox, L. (2014). Numerical solution of ordinary and partial differential equations: based on a summer school held in Oxford, August-September 1961. Elsevier.
7. Coddington, E. A. (2012). An introduction to ordinary differential equations. Courier Corporation.
8. Robinson, J. C. (2004). An introduction to ordinary differential equations. Cambridge University Press.
9. Amann, H. (2011). Ordinary differential equations: an introduction to nonlinear analysis (Vol. 13). Walter de gruyter.

THIRD YEAR–III

Course code	Title of the course	EVALUATION			
		External	**Internal**	**Practical**	Total
BSCBED-350	ICT in Education*	**70**	**30**		**100**
BSCBED-351	Gender. School & Society	**35**	**15**		**50**
BSCBED-352	Creating an Inclusive School	**35**	**15**		**50**
BSCBED-353	Educational aspects of Geeta	**35**	**15**		**50**
BSCBED-354	**Pedagogy of school subject-I**				
BSCBED-354-I	Mathematics	**35**	**15**		**50**
BSCBED-354-II	General Science	**35**	**15**		**50**
BSCBED-354-III	Chemistry	**35**	**15**		**50**
BSCBED-354-IV	Biology	**35**	**15**		**50**
BSCBED-354-V	Physics	**35**	**15**		**50**
BSCBED-355	Content: (BCZ& PCM)				
BSCBED-355 a I	11. Physics I	**40**	**10**	**50**	**150**
BSCBED-355 a II	12. Physics II	**40**	**10**		
BSCBED-355 b I	13. Chemistry I	**40**	**10**	**50**	**150**
BSCBED-355b II	14. Chemistry II	**40**	**10**		
BSCBED-355 c I	15. Zoology I	**40**	**10**	**50**	**150**
BSCBED-355 c II	16. Zoology II	**40**	**10**		
BSCBED-355 d I	17. Botany I	**40**	**10**	**50**	**150**
BSCBED-355 d II	18. Botany II	**40**	**10**		
BSCBED-355 e I	19. Mathematics I	**60**	**15**		**150**
BSCBED-355e II	20. Mathematics II	**60**	**15**		
	CCA				**25**
Prayer, Yoga, Meditation & Festival etc					**25**
Internship (4 Weeks)					**50**
Total					**750**

***Marks of compulsory subject shall not be added in the total marks.**
Internship (4 weeks) included in total marks.

B.Sc.B.Ed.-III
ICT in Education
(CODE: BSCBED-350)

Maximum Marks: 100 **External Marks: 70**

Internal: 30 Marks (in which two tests of 7.5-7.5 marks each are included)

Learning outcomes:

On the completion of the Course, the student teacher will be able to

- To acquaint the teacher educator with the knowledge of latest computer technology and its use in education.
- To acquaint the teacher educator with the various computer software packages available now a days.
- To develop the capabilities to analyse the educational data using computers and already developed software
- To train the teacher educators to computer science as a subject at Secondary level and Graduation/B.Ed. (Computing) level.
- To acquaint the students with Author ware package.
- To develop the skills of writing programs to analyse and process the statistical data.
- Recognise, understand and appreciate ICT as an effective learning tool for learners and as an enormous functional support to teachers.

Course Outline:

Unit- I

Computer Fundamentals: -Introduction to InformationTechnology, Generation of Computers, Types of computers: Micro, Mini, Mainframe, Super, Architecture of Computer System: CPU, ALU Primary Memory: RAM, ROM, Cache memory, Secondary Memories, Input/Output device, Pointing device. Number System (binary, octal, decimal and hexadecimal) and their conversions, Logic gates, Languages: machine, assembly and high-level languages including 3GL, 4GL.

Unit – II

Word Processing packages: Standard features like toolbar, word wrap, text formatting, paragraph formatting, effect to text, mail merge.

Spreadsheet Packages: Type of entries, Simple arithmetic calculations, formula and statistical functions, Different types of charts, Sorting, searching, formatting, printing.

Power point: - Slide creation, slide show, adding graphics, formatting, customizing and printing.

Unit – III

Multimedia techonolgy Introducing framework for multimedia devices, imae compression standrsa, JPEG, MPEG, MIDI formats.

Database Management System: Data, fileds and records, information database, creation of a database file, inserting, deletion and updating of records, modifying structure, editing and browsing of records, searching, sorting and indexing of records.

Unit – IV

Concept of Operating System, need and types of operating systems: batch, single user, multiprocessing, and time sharing, introduction to Unix/Linux, Windows and its simple commands.

Type of networks, LAN, MAN and WAN, concept of topology, bridges, routers, gateways, modems, ISDN leased lines, teleconferencing and videoconferencing.

Unit – V

Internet: Concept, email services, www, web browsers, search engines, simple programs in HTML, type of HTML document, documents structures: element, type and character formatting, tables, frames and forms, E-mail.

E-Commerce: Concept of e-commerce, benefits and growth of e-commerce, e-commerce categories, e-Governance, EDI, electronic funds transfer on EDI networks Electronic payment system.

Practical: -

The laboratory exercise will be designed to help in the understanding of concepts of computer and the utilization in the areas outlined in the theory syllabus. The emphasis should be on practical usage rather than on theoretical concept only. In addition, DOS, MS Windows, MS Word, MS Excel, MS Power Point packages has to be practiced in the lab.

Suggested Readings:

- Bott, E., Siechert, C., & Stinson, C. (2009). *Windows 7 inside out*. Pearson Education.
- Comer, D. E. (2018). *The Internet book: everything you need to know about computer networking and how the Internet works*. CRC Press.
- Emberton, D. J., & Hamlin, J. S. (2000). *Flash 4 magic*. New Riders Publishing.
- Geoghan, D. (2011). *Visualizing Technology, Introductory*. Delhi: Pearson Higher Ed.
- Melton, B., Dodge, M., Swinford, E., & Schorr, B. (2013). *Microsoft Office Home and Student 2013 Step by Step*. Pearson Education.
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- Saxena, J. (2008). *Role of Ict & Total Quality Management in Professional Education*. New Delhi: APH Publishing Corporatio.
- Shaikh, I. R. (2013). *Introduction to Educational Technology & ICT*. Tata McGraw-Hill Education.
- Solomon, G., & Schrum, L. (2007). Web 2.0. *New tools, new schools. Eugene, Oregon, Washington, DC: ISTE*.
- Solomon, G., & Schrum, L. (2007). *Web 2.0: New tools, new schools*. ISTE (Interntl Soc Tech Educ.

B.Sc.B.Ed.-III
Gender, School and Society
(CODE: BSCBED-351)

Maximum Marks: 100 **External Marks: 70**

Internal: 30 Marks (in which two tests of 7.5-7.5 marks each are included)

Learning outcome: After completion of the course, student-teachers will be able -

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

Unit – I Gender Issues: Key Concepts

- Gender, Social construction of Gender
- Gender socialization and Gender Roles
- Gender discrimination at different levels of institutions (institutions related to social, cultural, religious, economic, political and educational settings).

Practicum/Field Work

- Organize debates on equity and equality cutting across gender, class, caste, religion, ethnicity, disability, and region etc.
- Collect material related to Women Role Models in various fields with Emphasis on Women in Unconventional Roles and prepare a brief report.
- Collect thoughts of Eminent Men and Women of India on Girls Education and Women‘s Empowerment.

UNIT – II Gender Identities and Socialisation Practices in:

- Family

- Schools
- Other formal and informal organization.
- Schooling of Girls: Inequalities and resistances (issues of access, retention and exclusion).
- Gender Concerns related to access, enrolment, retention, participation and overall achievement.

Practicum/Field Work

- Collection of folklores reflecting socialization processes and drafts a report on entire programme.
- Analyse of textual materials from the perspective of gender bias and stereotype.
- Find out the concept of women empowerment in ancient Indian culture and analyse its relevance at present scenario.

UNIT – III Creating Gender Inclusive Classroom:

- Developing positive self concept and self esteem among girls.
- Teaching Learning Materials
- Classroom transaction
- Teacher as an agent of change

Practicum/Field Work

- Write a survey-based report on financial allocations/field conditions/policies/ imperatives of schools.
- Debate and discussion on rights of girls and women.
- Field visits to schools, to observe the schooling process from a gender perspective.
- Preparation of indicators on participation of boys and girls in heterogeneous schools– public and private,aided and managed by religious organizations and prepare a report.

UNIT – IV Gender Issues in Curriculum

- Gender, culture and institution: Intersection of class, caste, religion and region
- Curriculum and the gender question
- Construction of gender in curriculum framework since Independence: An Analyse
- Gender and the hidden curriculum
- Gender in text and context (textbooks' inter-sectionalist with other disciplines, classroom processes, including pedagogy)

Practicum/Field Work

- Debate on women role models in various fields with emphasis on women in unconventional roles.
- Prepare tools to analyse reflection of gender in curriculum and draft a report after administration of scoring and prepare a report. Report will be presented in seminar.

UNIT – V Gender, Sexual Harassment and legislative action

- Institutions redressing sexual harassment and abuse.
- Prenatal Diagnostic Technique Act, 1994
- The draft sexual Law Reforms in India, 2000
- Domestic Violence Act, 2005
- Reservation for Women

- Supreme Court Verdict about transgender.

Practicum/Field Work

- Gathering Information on Laws by Compiling Violence against Girls and Women in India.
- Case study on how students perceive role models in their own lives.
- Draft a report with the help of field interview while studying the issue of reservation as an equalitarian policy.
- Group Assignment on Examining Policies and Schemes on Girls Education and Women‘s Empowerment.

References

- Johri, D. (2019). *Gender School and Society* (New Ed.). Meerut: R Lall Educational Publishers.
- Malik, C.D (2008). Social and Political Thoughts of B.R. Ambedkar. New Delhi: Arise Publishers and Distributers.
- Mathur, S. (2008). Sociological Foundation of Education. Jaipur: Kavita Prakashan.
- Mudgal, S.D. (2007). Social Work Education Today and Tomorrow. Jaipur: Book Enclave
- Naik, S.C. (2005) Society and Environment. New Delhi: Oxford & 1B Publishing Co. Pvt.Ltd.
- Nath, P.R. (2006). Gender Equality and Women’s Empowerment. Delhi. Abhijeet Publication
- Ojha, T.V. (2016). Gender School and Society. Agra: Agrawal Publication.
- Robert. A B. (2010). Social Psychology. New Delhi: Pearson Education.
- Runela, S. (2009). Society of The Indian Education. Jaipur: Rajasthan Hindi Granth Akadmi
- Sidhu.R (2009). Sociology of Education. New Delhi: Shri Sai Publisher.

Creating an Inclusive School
(CODE: BSCBED-352)

Maximum Marks: 100 **External Marks: 70**

Internal: 30 Marks (in which two tests of 7.5-7.5 marks each are included)

Learning outcome: After completion of the course, student-teachers will be able -

- Understand concept, meaning and significance of inclusive education
- Bring about an understanding of the culture, policies and practices that need to be addressed in order to create an inclusive school.
- Appreciate the need for promoting inclusive practice and the roles and responsibilities of the teachers.
- Develop critical understanding of the recommendations of various commissions and committees towards teacher preparation for inclusive education; understand the nature of difficulties encountered by children.
- Prepare teachers for inclusive schools.
- Analyze special education, integrated education, mainstream and inclusive education practices.
- Identify and utilize existing resources for promoting inclusive practice.
- Develop a positive attitude and sense of commitment towards actualizing the right to education of all learners.
- Prepare a conducive teaching learning environment in varied school settings.
- Develop the ability to conduct and supervise action research activities.

Unit - I Introduction, Issues & perspectives of Inclusive Education

- Definitions, concept and importance of inclusion and disability Difference between special education, integrated education and Inclusive education.
- Advantages of inclusive education for education for all children in the context of right to education.
- Meaning, Concept and need for inclusive school.

Practicum/Field Work

- Observe inclusive teaching strategies in an inclusive classroom and discuss with teacher for further planning.
- To investigate the opinion of teachers on the integration of students with disability in normal schools.

Unit - II Concept & Policy Perspective

- Recommendations of the Indian Education Commission (1964-66), National Curriculum Framework, 2005 NCERT, The Convention on the Rights of the Child (specific articles related to inclusive education).
- The World Declaration on the Survival, Protection and Development of Children and the Plans of action (Outcome of the UNICEF World Summit for Children, (1990) Promoting Inclusion Preventing Exclusion, UNESCO Conventions, declaration and recommendations related to Rights of persons with Disabilities.

Practicum/Field Work

- To study the conceptions of teachers about the need of inclusive education in primary schools, then method: collect views of teachers and heads of school.

- Analyse and interpret results in the light of inclusive education and write a report.
- Explain the main constitutional provisions on inclusive education.

UNIT - III Diversity in the classroom

- Diversity due to disability: Nature, Characteristic and Needs.
- Diversity due to socio-cultural and economic factors: discrimination, language attitudes, violence and abuse.
- Concept, Nature, and Characteristics of Multiple Disabilities, classroom management for inclusive education
- MDGs (Millennium Development Goals) and EPA goal of UNESCO

Practicum/Field Work

- Study the educational resources for persons with disability (POD) in local secondary schools, two primary schools of your choice, result may be discussed in school in the present context of teacher education.
- Conduct an awareness program on millennium goal of UNESCO.
- Conduct a survey in the local area to ascertain the prevailing attitudes / practices toward social, emotional and academic inclusion of children with diverse needs.
- Conduct a survey on the type of supportive service needed for inclusion of children with any disability and share the findings in the class.

UNIT - IV Curriculum & Pedagogy in Inclusive School

- Inclusive curriculum- Meaning and characteristics.
- Teaching and learning environment with special reference to inclusive school
- Guidelines for adaptation for teaching/ practicing science, mathematics, Social Sciences, languages in inclusive settings.

Practicum/Field Work

- Planning and conducting multi level teaching in the persons with disabilities (two classes).
- To study the barriers/problems in relation to development of positive policy regarding inclusive teaching-learning practices in local private schools/schools in slums/rural areas, method may be: collection of the views of managing committees/heads/teachers on development of positive policy regarding inclusive teachers-learning facilities.
- Write a report on entire activity and present it in classroom presentation. (among peer group)

Unit - V Assessment in Inclusive School

- Alternative means for assessment and evaluation in inclusive classroom.
- Utilization of records/ case profiles for identification, assessment and intervention for inclusive classrooms.
- Evaluation and follow-up programmes for improvement of teacher preparation programmes in inclusive education.

Practicum/Field Work

- Discussion, group work and presentation by students on uses of internet in inclusive setting.
- Study the assessment and evaluation practice being followed in a school. Critically reflect on the practice in the context of inclusive education.

References

- Siddiqui, Hena (2016*). Inclusive education*. Agra:Agraval Publication.
- Mitara, Krishna and Saxena, Vandana (2008). *Inclusive Issues and Perspectives*. Jaipur: Arihant Publication
- Sharma, P. L. (2003). Planning Inclusive Education in Small Schools. *R. I E. Mysore Chudhary, B.(1992): Tribal Transformation in India*, *5*.
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- GOI, (1966). *Report of the education commission: Education and national development*. New Delhi: Ministry of Education.
- Govinda, R. (Ed.). (2011). *Who goes to school? : Exploring exclusion in Indian education*. Oxford University Press.
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- Della Fina, V., Cera, R., & Palmisano, G. (Eds.). (2017). *The United Nations convention on the rights of persons with disabilities: A commentary*. Springer.
- UNESCO, P. U. (2009). *Policy guidelines on inclusion in education. UR L (last*.

Educational Aspect of Geeta
(**CODE: BSCBED-353**)

Maximum Marks: 50 **External Marks: 35**

Internal: 15 Marks (in which two tests of 5-5 marks each are included)

Learning outcomes: After completion of the course, student-teachers will be able to:-

- Develop understanding about the Meaning & Nature of The Geeta Philosophy.
- Understand impact of the Geeta on Education.
- Understand Concept related to the Geeta Philosophy.
- ImplementSocial theories with special reference to the Geeta in education.
- Understand Contribution of the Geeta in the various fields of Education.

UNIT – I :- Introduction of The Geeta

- General assumption and Ideas.
- Need, Importance and concept of The Geeta Education.
- Different aspects of The Geeta Education.
- Educational aims and place of The Geeta.
- Life philosophy in The Geeta.
- Educational elements – Teacher, Student, Teaching Method, Curriculum.

UNIT – II :- Philosophical Aspects

- God, Human being, Nature, Universe.
- Human life and duties.
- Soul, Knowledge and Science.
- Religion, Morality and Nishkam karma (Service of Selflessness)

UNIT – III :- Social Aspect

- Man and its social nature.
- Social duty, understanding and coordination.
- Concept and Significance of Lok Sangrah (Public Collection)
- Importance of The Geeta in present social scenario.
- Social life skill and management

UNIT – IV :- Psychological Aspect

- Nature of Man- satvik, Rajashi & Tamasi.
- Nature, Types and forms of intelligence in The Geeta.
- Concept of mind in The Geeta.
- Guidance and motivation in The Geeta.

UNIT – V :- Multi-dimensional aspects and current significance of The Geeta.

- Yoga and spiritualism.
- Religion, Religious – Secularism, Peace and Ahimsa.
- Universal values and decision-making system (Conviction)
- Cosmic order and symbolism in The Geeta, expansion of all religions fellow feeling.
- Environmental Conservation.

Practicum/Field Work (any two of the following)

- Practise surynamaskar with school students and explain them importance of the yoga.
- Plant at least one plant in school and motivate students to plant and care it throughout the year.
- Plan and organiz Visit a a goshalla with students and make them aware about cow products (such as milk urine, gobar etc.) The visit may be on Gogahavmi, on Goverdhan puja etc.
- Organize a Drama/ play on universal values as deseribed in The Geeta Darshan.
- Conduct a drama to demostrate life philosophy in The Geeta.
- By playing method show teacher student relationship according to The Geeta.
- Debate on "need of The Geeta in school curriculum",
- Poster presentation competition on god, human being, nature and universe according to The Geeta darshan.
- Review of secondary level science curriculum with reference to knowledge and science according to The Geeta.
- Easy competition on Nishkam Karma (concept of The Geeta)
- Conduct an awareness programme in society with the help of students on social duties/social life skill then assess the impact of program and present the report in class.
- Discussion on concept of social life skill in The Geeta and other scripture.
- Conduct one-week orientation program in school on The Geeta Darshan. and evaluate the effectiveness of the program through examination.
- Conduct a nukkar natak, to demonstrate satvik, rajsi & tamsi nature of man, to promote satvik nature.(Explain the type of intelligent people thourgh a play/ drama based on the philosophy of The Geeta.)

Reference:

- Deshmukh, R., & Dwivedi, J. (2016). Reinterpretation of Amish Tripathi's Shiva Triology with Selected Verses of Bhagwat Gita. *Rupkatha Journal on Interdisciplinary Studies in Humanities*, *8*(4), 0975-2935.
- Gautam, S. (2012). *Shrimad Bhagwat Geeta mein Shiksha-Prakrad* (Doctoral dissertation).
- Geeta, B. (1992). Gorakhpur. *Geeta Press, Adhyay*, *2*, 48.
- Sharma, M. (2012). Human Happiness: Management Lessons from Bhagwat Gita. *Journal Impact Factor*, *3*(1), 186-196.
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PEDAGOGY COURSES
Pedagogy of Mathematics
(CODE: BSCBED-354-I)

Maximum Marks: 50 **External Marks: 35**

Internal: 15 Marks (in which two tests of 5-5 marks each are included)
Learning outcome: After completion of the course, student-teachers will be able -

- Develop insight into the meaning, nature, scope and objective of mathematics education.
- Learn important mathematics: mathematics is more than formulas and mechanical procedures.
- See mathematics as something to talk about, to communicate through, to discuss among them-selves to work together on; Pose and solve meaningful problems.
- Appreciate the importance of mathematics laboratory in learning mathematics.
- Stimulate curiosity, creativity and inventiveness in mathematics.
- Develop competencies for teaching-learning mathematics through various measures.

Unit -I Nature and Scope of Mathematics

- Meaning, Nature and Scope of Mathematics teaching.
- History of mathematics teaching and contribution of mathematician with reference to – Bharkaracharya, Aryabhatta, Ramanujan, Euclid, Pythogores,
- Importance of Aims and Objectives of Mathematics Teaching.
- Nature of mathematical propositions, truth values, compound propositions,

Practicum/Field Work

- Prepare a model of Pythagoras Theorem/Cube, Cuboid, and Cone etc.

Unit -II Aims and Objectives of Teaching School Mathematics

- Nature of concepts, concept formation and concept assimilation, concept mapping.
- Aims and general objectives of teaching mathematics, Bloom's Digital Taxonomy, Vis-a Vis the objectives of school education; writing specific objectives and teaching points of various content areas in mathematics like algebra, geometry, trigonometry, etc.
- Approaches to teaching of mathematics – Analytic, Synthetic, Inductive-Deductive, Heuristic, Concept mapping, Project and Laboratory; using various techniques of teaching mathematics viz, oral, written, drill, assignment, supervised study and programmed learning.

Practicum/Field Work

- Draft a report on role of mathematics Teachers' association and its utility for rural teacher. After report writing conducts an awareness programme in rural area (or lab school) under mathematics teachers association.

Unit - III ICT & Materials in Teaching-learning of Mathematics

- Use of ICT: Video clips, Power points presentations, films etc.
- Dale cone of experiences, Planning, preparation and presentation of Instructional Material.
- Techniques: Using textbooks, using audio-visual aids, CDs, multimedia and internet; case study approach.

Practicum/Field Work

- Prepare and present a lesson through power point presentation on any topic of your choice. Organize maths fair with the help of school students.
- Make five different teaching materials using different type of teaching aids at school level.

Unit -IV Teaching-learning Resources in Mathematics

- Types of primary and secondary sources: data from field, textual materials, journals, magazines, newspapers, etc.
- Using the library for secondary sources and reference material, such as dictionaries and encyclopedias.
- Mathematics laboratories, online resources. Unit and lesson plan.

Practicum/Field Work

- Using low-cost material – preparation of various activities, such as verification of algebraic identities, surface areas and volumes of cube, cuboids, cylinder, cone, sphere, conic sections, etc.
- Encouraging learner to examine a variety of methods of assessment in mathematics so as to assess creativity, problem-solving and experimentation/activity performance; appreciating evaluation through overall performance of the child; self and peer evaluation.

Unit -V Assessment and Evaluation

- Meaning, concept and construction of Achievement test, diagnostic test and remedial teaching.
- Blue print: Meaning, concept, need and construction.
- Continuous and Comprehensive Evaluation: Meaning, concept, importance and limitations.

Practicum/Field Work

- Construction, administration and interpretation of an achievement test of any standard of school.
- Make a diagnostic test of your subject and apply it in school, after discussion with concerning teacher and give remedial measure.
- Mark the student with less than 60% in Mathematics, diagnose the difficulties and give appropriate remedial measure.

Reference

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- Huang, R., & Li, Y. (Eds.). (2017). *Teaching and learning mathematics through variation: Confucian heritage meets western theories*. Springer.
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PART-I

Pedagogy of General Science

(CODE: BSCBED-354-II)

Maximum Marks: 50 **External Marks: 35**

Internal: 15 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: After completion of the course, student-teachers will be able to:-

- Develop insight on the meaning and nature of General science for determining aims and strategies of teaching- learning.
- Appreciate that science is a dynamic and expanding body of knowledge.
- Appreciatethefactthateverychildpossessescuriosityabouthis/hernatural surroundings.
- Identify and relate everyday experiences with learning of science.
- Appreciate various approaches of teaching- learning of science.
- Explore the process skill in science and role of laboratory in teaching- learning.
- Use effectively different activities / experiments/ demonstrations / laboratory experiences for teaching-learning of science.
- Integrate the science knowledge with other school subjects.
- Analyze the contents of sciencewithrespecttopots, branches, processskills, knowledge organization and other critical issues.
- Develop process-oriented objectives based on the content themes/units.
- Identify the concepts of science that are alternatively conceptualized by teachers and students in general.

Unit I: Nature and Scope of Genral Science

- Concept, Nature, Need& Importace of Science & Science Teaching.
- Main discoveries and development of science (special reference to ancient India) Science as a domain of enquiry, as a dynamic and expanding body of knowledge, science as a process of constructing knowledge. Science as interdisciplinary area of learning (Physics, chemistry, biology etc) science for environment, health, peace & equity, science and society. Fact, concept, principles, laws and theories- their characteristics in context of general science.

Practicum/ Field Work

- Visit a KVK/ Ayurveda college/ science labs to address their working process and draft a report on their contribution to prosperity.
- Discussion on development of New theories/ Principles.
- Instruct students to make use of her/his previous knowledge in science gained through classroom / environment / parents and peer group.
- Planning and organizing events on special days related to science such as earth day, environmental day, cancer and DIVAID& day.

Unit II: Teaching-learning of General science

- Scientific attitude and scientific temper: Nurture the natural curiosity, aesthetic senses and creativity in biology: essential skills, methods and process that lead to exploration: Generalization and validation of scientific knowledge in biological science.

- Team teaching, project method, problem solving method, programme instruction, investigatory approach, concept mapping, collaborative learning, and experiential learning in science: Facilitating learners for self-study.

Unit III: ICT & Materials in Teaching-learning of Genral Science

- Use of ICT: Video clips, Power points presentations, films etc.
- Dale cone of experience, Planning, preparation and presentation of Instructional Material.
- Techniques: Using textbooks, using audio-visual aids, CDs, multimedia and internet; case study approach.
- Planning, Organisation and activity of science club.

Practicum/ Field Work

- Prepare and present a lesson through power point presentation on any topic of your choice.
- Organize and plan excursions with school students of scientifically significant local areas.
- Designing programme instruction to facilitate learners for self study.
- Conduct at least two activities related to science club with a report.

Unit IV: Teaching-learning Resources in Genral Science

- Types of primary and secondary sources: data from field, textual materials, journals, magazines, newspapers, etc.
- Using the library for secondary sources and reference material, such as dictionaries and encyclopedias.
- Various teaching aids, Audio-visuals & online resources.

Practicum/Field Work

- Make five different teaching materials using different type of teaching aids (e. I. chart, atlas, model & PowerPoint, etc) at school science subject.
- Conduct a training program on use of digital library especially for secondary sources and reference material, such as dictionaries and encyclopedias.
- Going beyond the textbook; Getting children to craft little nuggets of History from primary sources.
- Observation of skills relating to primary and secondary data; Observing coins, inscriptions (if available), the material remains of the past and visuals; Helping children to read passages from primary sources; Thinking about what all these sources might or might not reveal. Prepare a report on entire activity.

Unit V: Assessment and Evaluation

- Meaning, concept and construction of Achievement test, diagnostic and remedial test.
- Blue print: Meaning, concept, need and construction.
- Continuous and Comprehensive Evaluation (CCE) in Sciences.
- Characteristics of Assessment in Sciences.

Practicum

- Construction, administration and interpretation of an achievement test.

- Make a diagnostic test of your subject and apply it in school, after discussion with concerning teacher and give remedial measure.
- Mark the student with less than 60% in Mathematics, diagnose the difficulties and give appropriate remedial measure.
- Conduct a programme with students for nurturing natural curiosity of observation and drawing conclusions.

References:

- Solomon, J., & Aikenhead, G. (1994). *STS Education: International Perspectives on Reform. Ways of Knowing Science Series*. NY: Teachers College Press.
- Lawson, A. E. (1995). *Science teaching and the development of thinking*. Belmont, CA: Wadsworth.
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- National Research Council. (2007). *Taking science to school: Learning and teaching science in grades K-8*. National Academies Press.
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Pedagogy of Chemistry
(CODE: BSCBED-354-III)

Maximum Marks: 50 **External Marks: 35**

Internal: 15 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: After completion of the course, student-teachers will be able to:-

- Gain insight on the meaning and nature of chemistry for determining aims and strategies of teaching-learning.
- Appreciate that science is a dynamic and expanding body of knowledge.
- Appreciate the fact that every child possesses curiosity about his/her natural surroundings.
- Identify and relate everyday experiences with learning chemistry.
- Appreciate various approaches of teaching-learning of chemistry.
- Understand the process of science and role of laboratory in teaching-learning situations.
- Use effectively different activities/*demonstration*/laboratory experiences for teaching-learning of chemistry.
- Integrate in chemistry knowledge with other school subjects.

Unit- I Nature and scope of chemistry

- Concept, Nature, scope, &Importace of chemistry & chemistry Teaching.
- Relation of chemistry to the environment (natural environment, artifacts and people issues at the interface of science technology and society, imbibe the values (honesty, integrity, cooperation, concern for life and preservation of environment, solving, problems of everyday life) facts and principles of chemistry its application consistent with the stages of cognitive development of learners. (e.g. Heat, carbon and its cornpound, acid, basis and salts, Thermodynamics, physical and chemical changes, stages of liquid nature and states of matter, rectal, and non metal. etc) Specific objective of different content areas in science (Physics and Chemistry).
- Planning, organizing and conducting of small community survey.

Practicum work

- Drama or role plays activity in class on life sketch & their contribution of any chemistry scientist.
- Prepare anyone of the following related to environment
  (1) Poster (2) article(3) story (4) play.

Unit-II Teaching-learning of Chemistry

- Scientific attitude and scientific temper: Nurture the natural curiosity, aesthetic senses and creativity in biology: essential skills, methods and process that lead to exploration: Generalization and validation of scientific knowledge in biological science.
- Team teaching, project method, problem solving method, programme instruction, investigatory approach, concept mapping, collaborative learning, and experiential learning in chemistry: Facilitating learners for self-study.

Practicum work:-

- Conducting two experiments useful at Sec/ Sr. sec level, ex-physical and chemistry changes, heat, acid, basis and salts.

- Make a project based on survey of 10 families nearby/their horse of using various types of fuels.

Unit-IIII CT& Materials in Teaching-learning of Chemistry

- Use of ICT: Video clips, Power points presentations, films etc.
- Dale cone of experiences, Planning, preparation and presentation of Instructional Material.
- Techniques: Using textbooks, using audio-visual aids, CDs, multimedia and internet; case study approach.

Practicum work

- Lesson presentation by different methods e.g. OHP, Transpararnt slides, project, power point, working model etc,
- Organize tram teaching, workshop, seminar. Debate demonstration (experiment) on different topic.
- Description & design of any improvised apparatus.

Unit -IV Teaching-learning Resources in Chemistry

- Types of primary and secondary sources: data from field, textual materials, journals, magazines, newspapers, etc.
- Using the library for secondary sources and reference material, such as dictionaries and encyclopedias.
- Various teaching aids, audio-visuals & online resources

Practicum work-

- Content Analyse of science books of class X chemistry study and chemistry as an experimental approach and preparation of reports.
- Pilot study
- Construct a science lab (based on primary, upper, middle, sec, Sr, sec)

Unit- V Assessment and Evaluation

- Meaning, concept and construction of Achievement test, diagnostic and remedial test.
- Blue print: Meaning, concept, need and construction.
- Continuous and Comprehensive Evaluation.

Practicum/Field Work

- Construct an achievement test of any standard of school and administer and interpretate its findings.
- Make a diagnostic test of your subject and apply it in school, after discussion with concerning teacher and give remedial measure, too.
- Mark the student with less than 60% in chemistry, diagnose the difficulties and give appropriate remedial measure, too.

References

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- Eilks, I., & Byers, B. (Eds.). (2015). *Innovative methods of teaching and learning chemistry in higher education*. Royal Society of Chemistry.
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- Ellison, M. D., & Schoolcraft, T. A. (2008). *Advances in teaching physical chemistry*. American Chemical Society.
- Herron, J. D. (1996). *The Chemistry Classroom: Formulas for Successful Teaching*. American Chemical Society, Product Services Office, 1155 16th Street NW, Washington, DC 20036 (cloth: ISBN-0-8412-3298-8; paperback: ISBN-0-8412-3299-7).
- Nadendla, R. R. (2007). *Principles of organic medicinal chemistry*. New Age International.
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Pedagogy of Biology
(CODE: BSCBED-354-IV)

Maximum Marks: 50 **External Marks: 35**

Internal: 15 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: After completion of the course, student-teachers will be able to:-

- Develop insight on the meaning and nature of biological science for determining aims and strategies of teaching- learning.
- Appreciate that science is a dynamic and expanding body of knowledge.
- Appreciate the fact that every child possesses curiosity about his/her natural surroundings.
- Identify and relate everyday experiences with learning of biological science.
- Appreciate various approaches of teaching- learning of biological science.
- Explore the process skill in science and role of laboratory in teaching- learning.
- Use effectively different activities / experiments/ demonstrations / laboratory experiences for teaching-learning of biological science.
- To understand meaning, concept and various types of assessment.
- Integrate the biological science knowledge with other school subjects.
- Analyze the contents of biological science with respect to pots, process skills, knowledge organization and other critical issues.
- Develop process-oriented objectives based on the content themes/units.
- Identify the concepts of biological science that are alternatively conceptualized by teachers and students in general.

Unit - I Nature and Scope of Biology

- Concept, Nature, Need & Importace of Biological science & Biology Teaching.
- Science as a domain of enquiry, dynamic body of knowledge and as a process of constructing knowledge: Biological science for environment and health, peace, equity: history of biological science, its nature and knowledge science independent of human application: origin of life and evolution, biodiversity, observations and experiments in biological sciences: interdisciplinary linkages, biological sciences and society.
- Photosynthesis, factors affecting the process of photosynthesis, respiration in plants and animal, transportation in plants, phytoplankton and zooplankton.

Practicum work

- Conduct a health awareness programme in community with the help of student (Programme may be based on knowledge of biological science.
- Poster presentation/drama on origin of life and evolution for awareners about biodiversity.
- Planning and organizing events on special days related to biological science such as earth day, environmental day, cancer and DIV AID & science day.
- Examine the water samples for qualitative Analyse of phytoplankton and zooplankton.
- Organize and plan excursions with school students of scientifically significant local areas.
- Participation in health-related national campaign such as pulse polio campaign.

Unit- II Teaching-learning of Biology

- Scientific attitude and scientific temper: Nurture the natural curiosity, aesthetic senses and creativity in biology: essential skills, methods and process that lead to exploration: Generalization and validation of scientific knowledge in biological science.
- Team teaching, project method, problem solving method, programme instruction, investigatory approach, concept mapping, collaborative learning, and experiential learning in biological science: Facilitating learners for self-study.

Practicum work

- Organization of exploratory activities to develop scientific attitude and temper.
- Talk to the students about Indian tradilional sanskar and find out the scientific basis or hidden concern for life and preservation of environment.
- Collection and identification of common plants and animals around the locality to construct food chain and food web.
- Conduct a programme with students for nurturing natural curiosity of observation and drawing conclusions.
- Conduct any activity among students for linking child's natural curiosity with natural phenomena like weather, flora and fauna; contexts.

Unit-III ICT & Materials in Teaching-learning of Biology

- Use of ICT: Video clips, Power points presentations, films etc.
- Dale cone of experience, Planning, preparation and presentation of Instructional Material.
- Techniques: Using textbooks, using audio-visual aids, CDs, multimedia and internet; case study approach.
- Planning, Organisation and activity of science club.

Practicum work

- Preparation/ designing programme instruction to facilitate learners for self study.
- Prepare a lesson plan by using fusion method of teaching, give logic or reasoninig your view why it is the best method. Write a report on its effectiveness.
- Organize activities with school level students to discuss their experiences of life; pupil teacher will give only clues and prompt them to enhance their activities.
- Teacher-learner will design learning experiences using each of these approaches.
- Prepare a low cost or waste material based experiement for secondary/ senior secondary schools.

Unit -IV Teaching-learning Resources in Biology

- People as resource: the significance of oral data.
- Types of primary and secondary sources: data from field, textual materials, journals, magazines, newspapers, etc.
- Using the library for secondary sources and reference material, such as dictionaries and encyclopedias.
- Various teaching aids, audio- visuals & online resourses.

Practicum/Field Work

- Make five different teaching materials using different type of teaching aids (e. I. chart, atlas, model & PowerPoint, etc) at school subject.

- Conduct a training program on use of digital library especially for secondary sources and reference material, such as dictionaries and encyclopedias.
- Going beyond the textbook; Getting children to craft little nuggets of History from primary sources.
- Observation of skills relating to primary and secondary data; Observing coins, inscriptions (if available), the material remains of the past and visuals; Helping children to read passages from primary sources; Thinking about what all these sources might or might not reveal.

Prepare a report on entire activity.

- Analyse the non-print material of biological science, which may be valuable supporting material for secondary to senior secondary level teachers.
- Content Analyse of the syllabus of biological science in the light of peace values.

Unit-V Assessment and Evaluation

- Meaning, concept and construction of Achievement test, diagnostic and remedial test.
- Blue print: Meaning, concept, need and construction.
- Continuous and Comprehensive Evaluation (CCE)
- Characteristics of Assessment

Practicum/Field Work

- Construct, administer and interpret an achievement test for any standard of school.
- Make a diagnostic test of your subject and apply it in school, after discussion with concerning teacher and give remedial measure, too.
- Mark the student with less than 60% in biology, diagnose the difficulties and give appropriate remedial measure, too.
- Assessment of project work in work in biology (both in the laboratory and in the field)

References

- Agarwal, D.D (2004). *Modern methods of Teaching Biology:* Saruk &Sons (saruklooks. com)
- Brown, C. R. (2014). *The effective teaching of biology*. Routledge.
- Choudhary S.(2010). *Teaching of biology*.New Delhi: APH Publishing Corparation.
- Dowdeswell, W. H. (1981). *Teaching and Learning Biology*. London WC1B 3HH: Heinemann Educational Books Ltd.
- Kampourakis, K., & Reiss, M. J. (Eds.). (2018). *Teaching biology in schools: global research, issues, and trends*. Routledge.
- Lloyd, F. E., & Bigelow, M. A. (1914). *The teaching of biology in the secondary school*. Longmans, Green, and Company.
- Miller, David F. & blaydes, Gllenn W. (1938). *Methods and materials for teaching biological sciences*.New York and London: McGRAW Hill Book Company Inc.
- Rao, K., Raghavendra, A., & Reddy, K. (2006). *Physiology and molecular biology of stress tolerance* (pp. 1-14). Springer: Dordrecht, Nertherlands.
- Sood, J.K. (1987). *Teaching of life science*. Chandigarh: Kohli Publishers.
- Wallace, R. A., Sanders, G. P., & Ferl, R. J. (1996). *Biology, the science of life*. New York: HarperCollins.
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Pedagogy of Physics

(CODE: BSCBED-354-V)

Maximum Marks: 50 **External Marks: 35**

Internal: 15Marks (in which **two tests** of 5-5 marks each are included)

Learning outcome: After completion of the course, student-teachers will be able -

- Gain insight on the meaning and nature of Physics science for determining aims and strategies of teaching-learning.
- Identify and relate everyday experiences with learning Physics;
- Appreciate various approaches of teaching-learning of Physics;
- Use effectively different activities/demonstrations/laboratory experiences for teaching-learning of Physics;
- Integrate in Physics knowledge with other school subjects;

Unit -1 Nature and Scope of Physics

- Meaning, Concept, Nature, Scope, Needs, Aims, Objective and Importance of Physics Teaching.
- Corelation of Physics with other School Subjects.
- Ohm's law, Magmatic field, reflecting in of light, Retraction of light.

Practicum/Field Work

- Write a report on physical issues and concerns of the present-day, after analysis of News from News Papers, TV, and Radio etc.
- Observation, recording and interpretation of physical and social features and phenomena of your area / district / city).
- Identify and interpretate news related to positive social changes or initiation for improvement of physical environment.
- Prepare a practical file after conducting any two experiments on Ohm's Law/ reflection of light etc.

Unit –II Teaching-learning of Physics

- Scientific attitude and scientific methods: concept, components and steps.
- Aims and general objectives of teaching physics, Bloom's Digital Taxonomy, Vis-a Vis the objectives of school education; writing specific objectives.
- Team teaching, project method, problem solving method, Inductive deductive, investigatory approach, concept mapping and experiential learning in Physics: Facilitating learners for self-study.

Practicum/Field Work

- Prepare a lesson plan based on team teaching and execute it in school.
- Role playing activities in relation to solving problems of everyday life.
- Practical work with the help of low-cost material in schools.
- Make any two teaching aids with the help of low-cost material.

Unit -III ICT & Materials in Teaching-learning of Physics

- Use of ICT: Video clips, Power points presentations, films etc.
- Dale cone of experience, Planning, preparation and presentation of Instructional Material.
- Techniques: Using textbooks, using audio-visual aids, CDs, multimedia and internet; and

online recourses.

Practicum/Field Work

- Field projects related to Physics to develop knowledge of scientific methods in learners.
- Group discussion in peer groups, on the problems related to Physics.
- Make a lesson plan based on power point presentation and execute it inschool.

Unit -IV Teaching-learning Resources in Physics

- Types of primary and secondary sources: data from field, textual materials, journals, magazines, newspapers, etc.
- Using the library for secondary sources and reference material, such as dictionaries and encyclopedias.
- Various Teaching Aids, Audio-Visuals, Online Recourses.
- Lesson plan and Unit plan.

Practicum/Field Work

- Conduct a training program on use of digital library especially for secondary sources and reference material, such as dictionaries and encyclopedias.
- Observation of skills relating to primary and secondary data;

Unit - V Assessment and Evaluation

- Meaning, concept and construction of Achievement test, diagnostic test and remedial teaching.
- Blue print: Meaning, concept, need and construction.
- Continuous and Comprehensive Evaluation: Meaning, concept, importance and limitations.

Practicum/Field Work

- Construction, administration and interpretation of an achievement test of any standard of school.
- Make a diagnostic test of your subject and apply it in school, after discussion with concerning teacher and give remedial measure.
- Mark the student with less than 60% in physics, diagnose the difficulties and give appropriate remedial measure.

Reference

- Arons, A. B., & Redish, E. F. (1997). *Teaching introductory physics* (p. 362). New York: Wiley.
- Swartz, C. E. (1996). *Teaching introductory physics: a sourcebook*. Springer.
- Lewis, J. L. (1972). Teaching School Physics. A UNESCO Source Book.
- Christian, W., & Belloni, M. (2000). *Physlets: Teaching physics with interactive curricular material*. Prentice Hall PTR.
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- Das, R.C, (2000). *Science teaching in schools*. New Delhi: Sterling Publishers Private Limited.
- राठौड़, मुदित. (2006). *भौतिक विज्ञान षिक्षण* .जयपुरः षिक्षा प्रकाषन.
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- नेगी, जे.एस. (2008). *भौतिक विज्ञान षिक्षण.* आगराः विनोद पुस्तक मन्दिर.
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BSCBED III
Group B: Core Courses

CC-1 Physics-I
CC-1(I) Paper-I: Solid State Physics, Solid State Devices and Electronics
(CODE: BSCBED-355 a I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to-

- Understand thermal properties and band structure.
- Apply law of motion and semiconductors.
- To explain Semiconductor devices.
- Explain the overview of **c**rystalline and glassy forms, liquid crystals, glass transition**.**
- Discuss on general principles of operation, classification, distortion of Small Signal Amplifiers.

Unit - 1

- **Overview:** Crystalline and glassy forms, liquid crystals, glass transition.
- **Structure:** Crystal structure, periodicity, lattices and bases, Miller indices, unit cell, Wigner-seitz cell, allowed rotations, lattice types, lattice planes, common crystal structures.
- Laue's theory of X-ray diffraction, Bragg's law, Laue patterns.
- **Bonding:** Potential between a pair of atoms, Lennard-Jones potential, concept of cohesive energy, covalent, Van der walls, ionic, and metallic crystals.
- **Magnetism:** Atomic magnetic moment, magnetic susceptibility, Dia-, Para- and Ferro-magnetism, Ferromagnetic domains, hysteresis.

Unit-II

- **Thermal properties:** lattice vibrations, simple harmonic oscillator, second order expansion of Lennard-Jones potential about the minimum, vibrations of one-dimensional monatomic chain under harmonic and nearest neighbour interaction approximation, concept of phonons, density of modes (1-D), Debye model; lattice specific heat, low temperature limit, extension (conceptual) to 3-D.
- **Band structure:** Electrons in periodic potential, nearly free electron model (qualitative), energy bands, energy gap, metals, insulators, semiconductors.
- **Motion of electrons:** Free electrons, conduction electrons, electron collisions, mean free path, conductivity and Ohm's law, Density of states, Fermi energy, Fermi velocity, and Fermi-Dirac distribution.

Unit III

- **Semiconductors:** Intrinsic semiconductors, electrons and holes, Fermi level, Temperature dependence of electron and hole concentrations, Doping, impurity states, n and p type semiconductors, conductivity, mobility, Hall effect, Hall coefficient.
- **Semiconductor devices:** Metal-semiconductor junction, p-n junction, majority and minority carriers, diode, Zener and tunnel diodes, light emitting diode, transistor, and solar cell.

- **Advanced Materials:** Superconductors, fullerenes, carbon nanotubes, graphenes, and nanomaterials.

Unit IV Electronics

- **Circuit analysis:** Networks- some important definition, loop and nodal equation, Kirchhofs laws, driving points and transfer impedance, four terminal netwok parameters. Networks theorems- Superposition, Thevenin, Norton, Maximum power transfer and miller theorems
- **Rectification and Power supply:** Half wave and full wave rectifier, Ripple factor, efficiency and regulation, bridge rectifier, filters, Voltage regulation and voltage stabilization, Zener diode, voltage, voltage multiplier circuit, characteristics of a transistor in CB, CE and CC mode, graphical analysis of the CE configuration, low frequency equivalent circuits, h-parameters, bias stability, thermal runaway.
- **Field effect transistors:** Basic construction of JFET and MOSFET, Drain and transfer characterstics of JFET, operating regions and pinch off voltage.

Unit V

- **Small Signal Amplifiers:** General principles of operation, classification, distortion, RC coupled amplifier, gain, frequency response, input and output impedance, multistage amplifiers, transformer coupled amplifiers, Equivalent circuits at low, medium and high frequencies, emitter follower, low frequency common-source and common-drain amplifier, Noise in electronic circuits.
- **Operational amplifier:** Characterstics of OP-AMP, differential amplifier, CMRR, inverting and non-inverting configuration, Application of OP-AMP: Unity gain buffer, Adder, Subtractor, Integrator and Differentiator.
- **Digital circuit:** Number systems, logic fundamentals, AND, OR, NOT, NOR, NAND, XOR gates, Boolean theorems, circuit realization using DTL and TTL logic.

Textbooks and References

1. Ashcroft, N. W., & Mermin, N. D. (1976). *Solid state physics* [by] Neil W. Ashcroft [and] N. David Mermin.
2. Balabanian, N. (1958). *Network synthesis*. Prentice-Hall.
3. Kittel, C., & McEuen, P. (1976). *Introduction to solid state physics* (Vol. 8). New York: Wiley.
4. Millman, J., & Grabel, A. (1987). *Microelectronics*. McGraw-Hill, Inc.
5. Ryder, J. D. (1964). *Electronic fundamentals and applications*. (Book on solid state, vacuum and gaseous forms of electronic devices). Englewood Cliffs, N. J., Prentice-Hall.
6. Singh, N. B., Singh, R. J., & Singh, N. P. (1994). Organic Solid-State Reactivity. *Tetrahedron*, *50*(22), 6441-6493.
7. Srivasatava, J. P. (2014). *Elements of solid-state physics*. New Delhi: PHI Learning Pvt. Ltd.
8. Stanley, W. D. (1989). *Electronic Devices: Circuits and Applications*. Prentice Hall.
9. Streetman, B. G., & Banerjee, S. (1995). *Solid state electronic devices* (Vol. 4). Englewood Cliffs, NJ: Prentice hall.
10. Truell, R., Elbaum, C., & Chick, B. B. (2013). *Ultrasonic methods in solid state physics*. Academic press.

CC-1 Physics-II

CC-1 (II) Paper-II: Quantum Mechanics and Statistical Physics

(CODE: BSCBED-355 a II)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- Understand the Origin of the quantum theory.
- Get familiar with the statistical basis of thermodynamics and laws of universal.
- Explain the Quantum Mechanics and Maxwellian distribution of speeds in an ideal gas.
- Discuss on the statistical basis of thermodynamics.
- Apply the Wave-particle duality and uncertainty principle.
- Apply the principle of quantum mechanics in further study.

Unit-I Quantum Mechanics

- **Origin of Quantum theory:** Failure of classical Physics to explain the phenomenon such as black body spectrum. Planck's radiation law. Photoelectric effect and Einstein explanation. Compton Effect, "de-Broglie" hypothesis, evidence for diffraction and interference of particles. Uncertainly principle and its consequences: diffraction at a single slit, particle in a box and its applications (i) Non existence of electron in nucleus, (ii) Ground state energy of H-atom (iii) Ground slate energy of harmonic oscillator. Energy-time uncertanity, Bohr's quantization of angular momentum and its application to hydrogen atom, limitations of Bohr's theory.

Unit- II

- **Schrodinger equation:** Time dependent and Time independent form. Physical significance of the wave function & its interpretation. Probability current density, Operators in quantum mechanics, linear and Hermitian operators. Expectation values of dynamical variables, the position, momentum, energy, fundamental postulates of quantum mechanics, eigen function and eigen value, degeneracy. Orthogonality of eigen functions, commutation relations. Ehrenfest theorem, concept of group and phase velocities, wave packet.

Unit- III

- **Applications of quantum mechanics:** Particle in a one dimensional and three-dimensional box, harmonic oscillator, reflection at a step potential, transmission across a potential barrier.
- **Hydrogen atom:** Natural occurrence of n, 1 and m quantum numbers, the related physical quantities, comparison with Bohr's theory, Wave functions, Probabilistic interpretation.

Unit- IV Statistical Physics

- **The statistical basis of thermodynamics:** Probability and thermodynamic probability, principle of equal a-priori probabilities, probability distribution and its narrowing with increase in number of particles, the expressions for average properties, Constraints, accessible and inaccessible states, distribution of particles with a given total energy into a discrete set of energy states. The monoatomic ideal gas and barometric relation.

- **Some universal laws:** The mu space representation, division of mu space into energy sheets and into phase cells of arbitrary size, application to one-dimensional harmonic oscillator and free particles, Equilibrium between two systems in thermal contact, bridge with macroscopic physics, Probability and entropy, Boltzmann entropy relation, Statistical interpretation of second law of thermodynamics, Boltzmann canonical distribution law and its applications, rigorous form of equipartition of energy. Partition function and its applications.

Unit -V

- Maxwellian distribution of speeds in an ideal gas, Distribution of speeds and of velocities, experimental verification, distinction between mean, rms and most probable speed values, Doppler broadening of spectral lines.
- **Transition to quantum statistics:** h‘as a natural constant and its implications, cases of particle in a one-dimensional box and one-dimensional harmonic oscillator, indistinguishability of particles and its consequences, Bose-Einstein and Fermi-Dirac conditions, applications to liquid helium, free electrons in a metal and photons in blackbody chamber, Fermi level and Fermi energy.

Textbooks and References

1. Reif, F. (2009). *Fundamentals of statistical and thermal physics*. Waveland Press.
2. Huang, K. (2009). *Introduction to statistical physics*. CRC press.
3. Mandel, L., & Wolf, E. (1965). Coherence properties of optical fields. *Reviews of modern physics*, *37*(2), 231.
4. Richtmyer, F. K., Kennard, E. H., & Cooper, J. N. (1955). *Introduction to modern physics* (Vol. 747). New York: McGraw-Hill.
5. Ghatak, A. K., & Lokanathan, S. (2004). *Quantum mechanics: theory and applications*. Macmillan.
6. Lifshitz, E. M., & LD and Sykes Landau (JB). (1965). *Quantum Mechanics; Non-relativistic Theory*. Pergamon Press.

PHYSICS PRACTICALS

Duration: 4 hrs **Max. Marks: 50**

Any twelve of the following experiments are to be performed. Few more experiments may be set at the institutional level. In examination two experiments are to be performed taking at least one from each section.

The distribution of marks in the practical examination will be as follows:

(i) Two experiments	30 Marks
For each experiment, distribution of marks will be as follows:	
Figure:	2
Formula/Theory:	2
Observation:	7
Calculation and Result:	3
Precautions:	1
(ii) Viva voce	10
(iii) Records	10
Total	**50 Marks**

LIST OF EXPERIMENTS

- Study the characteristic of a given transistor PNP/NPN (CE, CB and CC configuration) and determine alpha and beta values.
- Study the characteristic of junction diode & Zener diode.
- Designs a Zener regulated power supply and study the regulation with various loads.
- Study of Half wave & Full wave rectification and application of L and P section filters.
- Study the characteristics of a field effect transistor (FET) and design and study of amplifier of finite gain.
- Study the characteristics of a unijunction transistor (UJT).
- Determination of Stefan's constant.
- Study the frequency responses of a transistor amplifier (bipolar/FET) obtain the input and output impedance of the amplifier.
- To study hysteresis by B-H curve using CRO.
- Using discrete component, study OR, AND, NOT logic gates, compare with TTL integrated circuits IC's.
- Application of operational amplifier as: (i) Inverter (ii) Non-Inverter (iii) differentiator (iv) Integrator.
- Design and study of an R-C phase shift oscillator.
- Study of a RC transmission line at 50 Hz.
- Study of LC transmission line at fixed and variable frequency.
- Study of RC circuits as integrating and differentiating systems with square input.
- To study the Networks theorems.
- To study the characteristics of a thermister.

CC-2 Chemistry-I
CC-2 Paper I: Organic Chemistry
(CODE: BSCBED-355 b I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to-

- Develop an understanding of chemistry of hydrocarbons and their halogenated derivatives.
- Get familiar with chemistry of main group elements.
- Apply the principles of Alcohols classification and nomenclature in real life situation.
- Apply the knowledge of Ultraviolet (UV) and Infrared (IR) absorptionspectroscopy to explain natural physical phenomena.
- Define the characteristics of carbonyl compounds, Carboxylic Acids and its derivatives.

Unit- I Chemistry of hydroxy compounds

- Alcohols classification and nomenclature.Monohydric alcohols-nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols.
- Dihydric alcohols-nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$ and HlO_4] and pinacol-pinacolone rearrangement.
- Trihydric alcohols- nomenclature and methods of formation, chemical reactions of glycerol.
- **Phenols**: Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols-electrophilic aromatic substitution, acylation and carboxylation. Mechanism of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben-Hooesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.
- **Ethers and Epoxides:** 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.

Unit- II Carbonyl compounds

- **Aldehydes and Ketones:** Nomenclature and structure of carbonyl group.Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1, 3-dithianes, synthesis of ketones from nitriles and from carboxylic acid, 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, Witting reaction, Mannich reaction.
- Use of acetals as protecting group, Oxidation of aldehydes, Baeyer-villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen, Wolff-kishner, LiAlH4 and $NaBH_4$ reductions, Halogenation of enolizable ketones.
- Introduction to unsaturated aldehydes and ketones.

Unit - III Carboxylic Acids and its derivatives

- **Carboxylic 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-Zelinsky reaction. Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation.
- Methods of formation and chemical reactions of unsaturated monocarboxylic acids.
- Dicarboxylic acids: Methods of formation and effect of heat and dehydrating agents.
- **Carboxylic Acid Derivatives**: Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives, chemical reactions, mechanisms of esterification and hydrolysis (acidic and basic).

Unit IV Nitrogen containing compounds and Enolates

- **Nitroalkanes and Nitroarenes**: Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes.
- Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid. Halonitroarenes: Reactivity.
- **Amines**: Structure and nomenclature of amines, physical properties. Stereochemistry of amines, Separation of a mixture of primary, secondary and tertiary amines, Structural features effecting basicity of amines, Amines salts as phase-transfer catalysts, Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds, Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactions of amines: Electrophilic aromatic substitution in aryl amines, reaction of amines with nitrous acid. Synthetic transformation of aryl diazonium salts, azo coupling.
- **Organic Synthesis via Enolates**: Acidity of hydrogens. Synthesis of ethyl aceto acetate by Claisen condensation and Synthesis of diethylmalonate. Keto-enol tautomerism in ethyl acetoacetate. Synthetic applications of ethyl acetoacetate and diethylmalonate. Alkylation of 1, 3-dithianes.

Unit V Electromagnetic Spectrum: Absorption Spectra

- **Ultraviolet (UV) absorption spectroscopy:** absorption laws (Beer-Lambert law), molar absorptivity, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones. Woodward Fieser rules for calculation of absorption maxima in dienes and unsaturated carbonyl compounds.
- **Infrared (IR) absorption spectroscopy:** molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, fingerprint region, characteristic absorption of various functional groups and interpretation of IR spectra of simple organic compounds.

Text Books and References

- Atkins, R. C., & Carey, F. A. (1997). *Organic chemistry: a brief course*. McGraw-Hill Science, Engineering & Mathematics.
- Atkins, R. C., & Carey, F. A. (1997). *Organic chemistry: a brief course*. McGraw-Hill Science, Engineering & Mathematics.
- Bahl, A., & Bahl, B. S. (1968). *A textbook of organic chemistry*. S. Chand & Company.
- Bruckner, R. (2001). *Advanced organic chemistry: reaction mechanisms*. Elsevier.
- Kalsi, P. S. (2000). *Organic reactions and their mechanisms*. New Delhi: New Age International.
- Kalsi, P. S. (2007). *Organic Reactions: Stereochemistry and Mechanism*. New Delhi: New Age International.
- Kalsi, P. S. (2008). *Stereochemistry conformation and mechanism*. New Delhi: New Age International.
- Lowry, T. H., & Richardson, K. S. (1987). *Mechanism and theory in organic chemistry* (pp. 60-71). New York: Harper & Row.

CC-2 Chemistry-II
CC-2 (II) Paper-II: Physical Chemistry
(CODE: BSCBED-355 b II)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- Understand the Elementary Quantum Mechanics and Chemical Bonding.
- Get familiar with Molecular Orbital Theory.
- Define the Rotational and Vibrational Spectrum.
- Apply the Fundamentals of Spectroscopyin real life situation.

Unit - I Elementary Quantum Mechanics

- Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects, Compton effect, De Broglie hypothesis, the Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in 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 - II Molecular Orbital Theory

- Basic ideas, criteria for forming M.O from A.O, construction of M.O's by LCAO-H_2^+, ion, calculation of energy levels from wave functions, physical picture of bonding and anti bonding wave functions, concept of orbitals and their characteristics. Hybrid orbitals- sp, sp^2, sp^3, calculation of coefficients of A.O.'s used in these hybrid orbitals.
- Introduction to valence bond model of H_2, comparison of M.O. and V.B. models.

Unit- III Fundamentals of Spectroscopy-I

- **Spectroscopy:** Introduction: electromagnetic radiation, regions of thespectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.
- **Rotational and Vibrational Spectrum:** Diatomic molecules, Energy levels of a rigid rotor(semi-classical principles), selection rules, spectral intensity, distribution using population distribution (Maxwell-Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotor, isotope effect.
- **Vibrational Spectrum:** Infrared spectrum: energy levels of simple harmonicoscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.

Unit -IV Fundamentals of Spectroscopy-II

- **Raman Spectrum**: Concept of polarisability, pure rotational and pure vibrationl Raman spectra of diatomic molecules, selection rules, energy levels and the respective transitions.

- **Electronic Spectrum:** Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Frank-Condon principles.Qualitative description and their energy levels and the respective transitions.

Unit - V Photochemistry and physical properties of matter

- **Photochemistry:** Interaction of radiation with matter, difference between thermal and photochemical processes. Law of photochemistry: Grothus-drapper law, Stark-Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).
- **Physical properties of matter**: Optical activity, polarization (Clausius–Mossotti equation), orientation of dipoles in an electric field, dipole, moment, induced dipole moment, measurement of dipole moment temperature method and refractivity method, dipole moment and structure of molecules, magnetic properties-paramagnetism, diamagnetism and ferromagnetics.

Text Books and References

- Banwell, C. N., & McCash, E. M. (1994). *Fundamentals of molecular spectroscopy* (Vol. 851). New York: McGraw-Hill.
- Chandra, A. K. (1994). *Introductory quantum chemistry*. Tata McGraw-Hill Education.
- Levine, I. N., Busch, D. H., & Shull, H. (2009). *Quantum chemistry* (Vol. 6). Upper Saddle River, NJ: Pearson Prentice Hall.
- Lewis, D., & Glasstone, S. (1960). *Elements of physical chemistry*. Macmillan.
- Linderberg, J., & Öhrn, Y. (2004). *Propagators in quantum chemistry*. John Wiley & Sons.
- Lowe, J. P., & Peterson, K. (2011). *Quantum chemistry*. Elsevier.
- Szabo, A., & Ostlund, N. S. (2012). *Modern quantum chemistry: introduction to advanced electronic structure theory*. Courier Corporation.

PRACTICAL

Duration- 4 Hrs. **Maximum Marks-50**

Note: The students should be given exposure of any research labs and instrumentation center/reputed university-lab/industry/ government labs of northern region.

Inorganic Chemistry

Ex. 1 Synthesis of an inorganic compound and gravimatric analysis 15

Organic Chemistry

Ex.2 Synthesis of Organic compounds 15

Physical Chemistry

Ex.4 Perform one of the experiments mentioned in the syllabus. 10

Ex.5 Vive-Voce 05

Ex.6 Practical-Record 05

A. Inorganic Chemistry

1. Synthesis and analysis

- Preparation of sodium tri oxalate ferrate (III), $Na_3[Fe(C_2O_4)_3]$ anddetermination of its composition by permaganometry.
- Preparation of coppertertraammine complex. $[Cu(NH_3)_4]SO_4$.
- Preparation of Ni-DMG complex, $[Ni(DMG)_2]$.
- d. d. Preparation of cis- and trans-bisoxalatodiaqua chromate (III) ion.

2. Gravimetric Analysis

- Cu as Copper thiocyanate.
- Ni as Nickel dimethylgloxime

B. Organic Chemistry

Synthesis of Organic Compounds

- Acetylating of salicylic acid, aniline, glucose and hydroquinone.
- Benzoylation of aniline and phenol.
- Aliphatic electrophilic substitution: Preparation of iodoform from ethanol/ acetone
- Aromatic electrophilic substitution:
- Nitration: Preparation of m-dinitrobenzene and p-nitroacetanilide
- Halogenation: Preparation of *p*-bromoacetanilide and 2, 4, 6-tribromophenol
- Diazotization/coupling: Preparation of methyl orange and methyl red
- Oxidation: Preparation of benzoic acid from toluene
- Reduction: Preparation of aniline from nitrobenzene and m-nitroaniline from m-dinitrobenzene.

C. Physical Chemistry

Electrochemistry

- pH metric: Acid-Base Titration.
- To determine the strength of the given acid conductometrically using standard alkali solution.
- To determine the solubility and solubility product of a sparingly solubility product of a sparingly soluble electrolyte conductometrically.
- To determine the ionization constant of a weak acid conductometrically.

- E. To titrate potentiometrically the given ferrous ammonium sulphate solution using $KMnO_4$/ $K_2Cr_2O_7$ as titrant and calculate the redox potential of $Fe2^+/Fe3^+$system on the hydrogen scale.

Chemical Kinetics

- To study the saponification of ethyl acetate kinetically.

CC-3 Zoology-I
CC-3(I) Paper-I: Developmental Biology
(CODE: BSCBED-355 c I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- Comprehend the modern concepts of developmental biology.
- Understand the developmental sequences in vertebrates.
- Compare the development of organs and systems.

COURSE CONTENT:

Unit - I Gametogenesis and Early Development

- **Concepts and seope of developmental biology**
- **Gametogenesis:** Differentiation of spermatozoa and oocyte in mammals, Different types of eggs-classification based on amount and distribution of yolk
- **Fertilization:** Approach of gamete, interaction of gametes, monospermy, polyspermy, Parthenogenesis and its significance
- **Cleavage:** Types of Cleavages-Holoblastic, Meroblastic, Radial, Spiral, Discoidal, Superficial. Planes of Cleavages-Meridional, Vertical, Equatorial, Latitudinal. Factors influencing Cleavage. Fate maps of Blastula of Frog and chick

Unit- II

- **Gastrulation**: Morphogenetic movement of cells, mechanism of gastrulation and change in cell shape
- **Neurulation:** Formation, position and fate of three germinal layers, role of microtubules and microfilaments in neurulation
- **Organizer-phenomenon:** Organizer concept of Spemann, chemical nature anddistribution of inductors-Competence, Determination and Differentiation, Outline of organogenesis.

Unit- III Development of frog

- Development of frog upto formation of advanced tadpole.
- Metamorphosis of tadpole
- Hormonal control of metamorphosis.

Unit –IV Development of Chick

- Embryogenesis of chick upto Neurulation
- Development of chick according to the hours of incubation- 18 hours, 21 hours, 24 hours, 33 hours, 48 hours, 56 hours, 72 hours and 96 hours.
- Extra embryonic membranes of chick- Development and functions.

Unit-V

- **Placenta in Mammals:** Structure, Classification, Physiology and Hormonal control of Placenta
- Parthenogenesis- Natural and artificial.
- **Regeneration**: Regeneration mechanism in animals, steps of limb regeneration in amphibians
- Teratogenesis aging and Senescence.

References

- Arora, Mohan (1985). *Chordate Embryology*-Atma Ram & Sons.
- Balinsky B.I. (1976). *Introduction to Embryology*-(W.B. Saunders, Philadelphia,
- Hopper, A.F. and N.H. Hart (1981). *Foundations of Animal Development*. New Yark: Oxford University Press.
- MacBride, E. W., & Sir, J. G. K. (1919). *Text-book of Embryology*. (Vol. 2). Macmillan and Company.
- Marshall, A. M. (1893). *Vertebrate embryology: a text-book for students and practitioners*. GP Putnam's sons.
- McEwen R.S. (1999). *Vertebrate Embryology*. New Delhi: Oxford & IBM Publishing CO.
- McEwen, R. S. (1923). *Vertebrate embryology*. H. Holt.
- Rugh R. (1998). *Laboratory manual of Vertebrate Embryology*-Allied Pacific Pvt. Ltd.
- Sastry K.V. & Shukla Vinita (2008). *Developmental Biology*. Rastogi Publications,
- Shumway, W. (2002). *Introduction to vertebrate embryology*. Daya Books.
- Verma, PS & Agarwal, VK (2002).*Chordate Embryology*. New Delhi: *S.* Chand & Co.

CC-3 Zoology-II

CC-3 (II) Paper-II: Environmental Studies, Ethology and Economic Zoology

(CODE: BSCBED-355 c II)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: - After completion of the course, student-teachers will be able to-

- To enable students to understand the energy sources, flow of energy and conservation;
- To understand the recycling of minerals and nutrients in ecosystem;
- To understand the dynamics of population; to understand causes of pollution;
- To comprehend origin of life, animal behavior and economic importance of animals with wild life protection.

Unit –I

- Environment: - Atmosphere, lithosphere and hydrosphere as habitats and ecological factors.
- Abiotic factors: - Light and Temperature as ecological factors, limiting factors,
- Liebig's law of minimum and Shelford Law of tolerance
- Ecosystem: Types, structure, functions and example, Dynamics of Ecosystem, Ecological Pyramids, energy in ecosystem, productivity,
- Biochemical cycle- water, nitrogen and sulphur cycles regarding of organic nutrients.
- Elementary-statistics: central tendency, test of significance.

Unit-II Pollution Types and Causes

- Air pollution: sources, acid rain, photochemical smog, prevention and control
- Water pollution: sources, prevention and control, eutrophication.
- Noise pollution: sources, prevention and control.
- Soil pollution: sources, prevention and control
- Thermal pollution.

Unit – III Green house effect and global warming

- Depletion of ozone layer.
- Natural Disaster – Earthquake, Tsunami
- Natural Resources and conservation – Non-Renewable and Renewable
- Biomagfications

Unit –IV Introduction and history of Ethology

- Behavior: - Innate (tropism, Texas, reference instincts) and Acquired (learning and reasoning)
- Motion: Classification of directional movements: - kinesis, tropism & taxes
- Communication: - Definition, types of signal (touch, sound, Chemical, and visual), meta-comunication) phenomenon
- Societies: characteristics and advantage with special reference to honey bee, and monkey

Unit –V

- Economic Importance of Invertebrates (Apiculture, Aquaculture, Sericulture).
- Insects as pests and their management (Locust, Termite, and Caterpiller)
- Economic Importance of vertebrates (Fish culture and Poultry culture.)

- Wild life of India, causes of depletion of wild life, modes of wild life conservation, Red data book. Environmental legislations (Wildlife Protection Act, Environment act. Bio divergent act). Wild life scenario in and around central foot hills of the Arawali and the thar.

Textbooks and References

- Agarwal, S. K. (2008). *Fundamentals of ecology*. APH Publishing.
- Bailer, A. J. (2020). *Statistics for environmental biology and toxicology*. Routledge.
- Chapman E (1988).*Ecology: Principle and Applications*–CambridgeUniversity Prss
- Coleman, D. C., Callaham, M. A., & Crossley Jr, D. A. (2017). *Fundamentals of soil ecology*. Academic press.
- Dash, M. C. (2001). *Fundamentals of ecology*. Tata McGraw-Hill Education.
- Kormondy, E. J., & Brown, D. E. (1998). *Fundamentals of human ecology*. Pearson College Division.
- Kumar HD (1986). *Modern concept of ecology* Vikas Publication House.
- Nobel, P. S. (2003). *Environmental biology of agaves and cacti*. Cambridge University Press.
- Odum, E. P., & Barrett, G. W. (1971). *Fundamentals of ecology* (Vol. 3, p. 5). Philadelphia: Saunders.
- Pawar.V. S, (1998). *Mammalian Endrocrinology and Animal Behavior*. Hindi Edition, Jaipur: College Book Centre.
- Sharma PD (1991).*Ecology and Environment*. Jaipur: Rastogi Publication.
- Soni, K.C. (1999). Animal Ecology and Biostatistics. Hindi Edition, Jaipur: College Book Centre.
- Woodward, F. I., & Sheehy, J. E. (2017). *Principles and measurements in environmental biology*. Elsevier.
- Verma, P. S., & Agarwal, V. K. (2003). *Environmental Biology: Principles of Ecology*. Chand.
- Vaccari, D. A., Strom, P. F., & Alleman, J. E. (2006). *Environmental biology for engineers and scientists* (Vol. 7, p. 242). New York: Wiley-Interscience.

PRACTICAL

Duration:4 hours **Max.Marks: 50**

Objectives: -

- To develop the skills of staining and mounting of embryos of chick/frog/insect as per UGC guidelines: to understand the development patterns of chick and frog. To enable students to analyses the physico-chemical and biological factors of water and soil sample; to identify and estimate quantitatively the aquatic organism and their adaptation; to observe the population growth patterns.

Practical work based of Paper I and II Course content-

- Study of different types of eggs (Insect, Frog, Hen)
- Study of eggs, cleavage, blastula, gastrula, neurula, tail bud, hatching, mature, tadpole larval metamorphic stages of toadle/forglet.
- Study of embryological slides of various stages of frog.
- Study of embryological slides of various stages of chick.
- Study of development of chick with the help of charts /CD/s /Video/ MM etc.
- Whole mounts: 18 hrs, 24 hrs, 33 hrs, 48 hrs, 56hrs, 72hrs, and 96 hrs, of incubation period embryos.
- Study of primitive streak stage in living embryo after removal of the blastoderm from the egg or though multimedia film etsc
- Study of the embryo at various stages of incubation in vivo by making a window in the egg shell.
- Frog embryology – Study of spawn, identification of different stages through model/charts/multimedia etc
- Simulation of an ecosystem in the laboratory.
- Determination of oxygen cotent of water sample by Winkler's method.
- Determination of chloride content of water sample
- Determination of sulphates content of water sample
- Determination of dissolved CO_2 content of water
- Determination of total solid content of water
- Determination of pH of soil sample
- Determination of water content in a given simple of soil
- Detection of salts i.e. phosphates, sulphates, nitrates and chlorides in a given sample of water.
- Exercise on mean, median, mode and test of significance
- Study and maintenance of Aquarium.
- Study of insect pests with respect to marks of identification, nature of damage and economic importance.
- Study of pest control appliances.
- Life cycle of honey bee, mouth parts, thoracic appendages (legs and wings) & sting apparatus of honey bee.
- Study of bee products, bee pests, bee enemies.
- Communication in honey bee.
- Study of life cycle of Bombyx mori.

- Study of any five equipments in sericulture.
- Submission of field visit report along with at least five photographs/sketch of insect pests.
- Visit of poultry culture/sericulture/apiculture.

Guidelines/Instructions for Practical Examination		
Max. Marks: 50		**Time allowed: 4 Hrs.**
S. No.	**Exercise**	**Marks**
1.	Temporary mounting * one (Staining, identification, sketch)	**3**
2.	Simulated ecosystem	**3**
3.	Permanent slides –four (Identification with reasons)	**8**
4.	Applied Zoology/Ethology	**8**
5.	Ecological experiment	**6**
6.	Statistical exercise	**5**
7.	Practical record and slides	**5**
8.	Viva	**4**
9.	Project report and assignment	**8**

*** As per UGC guidelines**

CC-4 Botany-I

CC-4(I) Paper-I: Structure, Development and Reproduction in Flowering Plants

(CODE: BSCBED-355 d I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- To acquaint students with the morphology, anatomy, reproduction and classification of flowering plants.
- To acquaint students with the structure, development and processes associated with Angiosperm embryology;
- To acquaint students with basic body plan of a flowering plant.

UNIT- I

- The basic body plan of a flowering plant; Types of Tissue and Tissue System.
- **The shoot system:** The shoot apical meristems and its histological organization, vascularization of primary shoot in monocotyledons and dicotyledons, formation of internodes, branching pattern, monopodial sympodial growth, canopy architecture, cambium and its functions, formation of secondary xylem, a general account of wood structure in relation to conduction of water and minerals, characteristics of growth rings, sapwood and heart wood, secondary phloem-structure, function relationships, periderm

UNIT – II

- **Leaf:** Origin, development, arrangement and diversity in size and shape; internal structure in relation to photosynthesis and water loss, adaptations to water stress, stomatal types and trichomes, senescence and abscission.
- **The Root System:** The root apical meristem and its organization, differentiation of primary and secondary tissues and their roles, structural modifications for storage, respiration, reproduction and for interaction with microbes.

UNIT – III

- **Flower:** A modified shoot, development, structure and function of anther and pistil, Development of male and female gametophytes, Types of ovules & embryosac micro and megasporogenesis, Types of pollination, attractions and rewards for pollinators

UNIT – IV

- **Pollen-pistil interaction:** Sexual incompatibility, Genetic, physiological and biochemical basis of rejection reaction, methods to overcome incompatibility. **Fertilization:** Double fertilization, Apomixis, Parthenocarpy

UNIT – V

- **Embryo:** Embryo development in Dicots and monocots, structure and function of suspensor, Polyembryony.
- **Endosperm:** Types, development, structure and functions of endosperm, haustorial and ruminate endosperm.
- **Fruits:** Development and types of fruits.

Reference

- Johri, B.M. (1984). *Embryology of Angiosperms.*Berlin: Springer-Verlag.
- Pandey, A.K. (1997). *Introduction to Embryology of Angiosperms*. New Delhi: CBS Publishers & Distributors.
- Shivanna, K.R. (2003). *Pollen Biology and Biotechnology*. New Delhi: Oxford & IBH Publishing Co.
- Singh, P.C. Pande, D. & Jain, K. (2005). *A Textbook of Botany: Structure, Development and Reproduction in Angiosperms.* Meerut: Rastogi Publications.
- Paula Rudall, (2007). *Anatomy of flowering plants*: *an introduction to structure and development*. New York: Cambridge University Press Cambridg,
- Bouman, (1978). *Development of ovule and seed coat structure in angiosperms*.New Delhi: Today & Tomorrow's Printers & Publishers,

Botany-II

CC-4(II) Paper-II: Plant Physiology

(CODE: BSCBED-355 d II)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to-

- To acquaint students with the sub-cellular physiological phenomena in plants.
- To understand the water relations in plants.
- To understand the functioning of plant from the physiological point of view.
- To understand various facets of growth, differentiation and physiology of flowering in angiosperms.

UNIT-I

- **Plant-water relations**: Importance of water to plant life, physical properties of water, diffusion and osmosis, DPD and water potential concept, absorption and transport of water, Transpiration and mechanism of opening and closing of stomata, Factors affecting transpiration.
- **Translocation of organic substances**: mechanism of phloem transport, source-sink relationship, factors affecting translocation.

UNIT – II

- **Photosynthesis:** Historical aspects, photosynthetic pigments, action spectra and enhancement effect, concept of two photosystems, photophosphorylation, C_3 cycle, C_4 cycle, CAM cycle, photorespiration, factors influencing photosynthesis, C_3 & C_4 plants, Significance of photosynthesis.

UNIT – III

- **Respiration:** Aerobic and anaerobic respiration, respiratory substrates, Glycolytic pathway of glucose degradation to pyruvic acid, tricarboxylic acid cycle, electron transport mechanism (chemi-osmotic theory), redox potential, oxidative phosphorylation, pentose phosphate pathway, Factors affecting respiration.

UNIT – IV

- **Mineral nutrition**: criteria of essentiality of elements, essential macro and micro-elements and their role, mineral uptake, deficiency and toxicity symptoms, water culture technique, foliar nutrition.
- **Nitrogen and lipid metabolism:** Biology of nitrogen–fixation, importance of nitrate reductase and its regulation, ammonium assimilation, structure and function of lipids, fatty acid biosynthesis, □-oxidation, saturated and unsaturated fatty-acids, storage and mobilization of fatty acids.

UNIT –V

- **Growth and development:** Definitions, phases of growth and development, Growth Curve, kinetics of growth, seed dormancy, seed germination and factors of their regulation, plant movements, the concept of photoperiodism, physiology of flowering, florigen concept, biological clocks; physiology of senescence, fruit ripening; plant hormones auxins, gibberellins, cytokinins, abscisic acid and ethylene, history of their discovery, biosynthesis and mechanism of action, photomorphogenesis, phytochromes and cryptochromes, their discovery, physiological role and mechanism of action.

Suggested Readings

- Hopkins W.G. (1995). *Introduction to Plant Physiology*, John Willey & Sons, New York USA.
- Salisbury F.B. & Ross C.W. (1992). *Plant physiology*, Widsworth Publishing Co. California, U.S.A.
- Taiz L. & Zeiger E, (1998). *Plant Physiology (Second Edition*) Sinauer Associates Inc. Publishing U.S.A.

PRACTICALS

Duration: 4 hours **Maximum Marks: 50**

Course Content

The following experiments are to be conducted:

- Anatomy of primary and secondary growth in monocots and dicots using hand sections (or prepared slides). Structure of secondary phloem and xylem. Growth rings in wood. Microscopic study of wood in T.S., T.L.S. and R.L.S. Anomalous Sec. growth in *Boerhaavia, Nyctanthus* and *Dracaena*
- Anatomy of leaf and Peel mount for stomatal types/trichomes.
- Anatomy of the root. Primary and secondary structure.
- Examination of a wide range of flowers available in the locality and methods of their pollination.
- Structure of anther, microsporogenesis (using slides) and pollen grains (using whole mounts). Pollen viability using *in vitro* pollen germination.
- Structure of ovule and embryo sac development (using serial sections).
- Simpleexperimentstoshowvegetativepropagation:leafcuttingsin
- Bryophyllum, Sansevieria, Begonia; stem cuttings in rose, salix, money plant, sugarcane and Bougainvillea.
- Germination of non-dormant and dormant seeds.
- To demonstrate osmosis using egg membrane, onion/tomato peels, potato osmoscope.
- To study the effect of temperature and alcohol on the permeability of membranes.
- To demonstrate plasmolysis.
- To compare the water holding capacity of soils (clay, peat and sand).
- To demonstrate transpiration, pull.
- To compare the rates of transpiration in different environmental conditions.
- To demonstrate the evolution of oxygen during photosynthesis.
- To compare the rates of photosynthesis under different environmental conditions.
- To demonstrate the necessity of light, CO2 and chlorophyll for photosynthesis.
- Separation of photosynthetic pigments by paper chromatography.
- Demonstration of aerobic respiration.
- Demonstration of anaerobic respiration.
- To demonstrate the liberation of CO2 during aerobic respiration.

CC-5 Mathematics-I
CC-5 (I) Paper-I: Complex Analysis
(CODE: BSCBED-355 e I)

Maximum Marks: 75 **External Marks: 60**
Internal: 15 Marks (in which **two tests** of 7.5-7.5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to-

- To acquaint students with the Complex number and integration.
- To understand the Harmonic functions, Construction of an analytic function;
- Apply the various theorem & modulus principle in further study.
- Know about the Residue theorem, residue at a pole, residue at infinity computation of residue, Rouche's theorem, fundamental theorem of algebra.

Unit I

Complex numbers, function of a complex variable, limits, Cauchy Riemann equations(Cartesian & polar forms), continuity, differentiability of a function. Analytic functions,

Unit II

Harmonic functions, Construction of an analytic function Conformal mapping, Bilinear transformation, and its properties, Elementary maps. $F\ (z)\ =\ ½\ (z + 1/z), z^2, 2z, Sin\ z$ and $Log\ z$

Unit III

Complex integration, Complex line integrals, Cauchy's integral theorem, Indefinite integral, Fundamental theorem of Integral calculus, Derivative of an analytic function, Liouville's theorem, Poisson's integral formula.

Unit IV

Morera's theorem, Taylor's & Laurent's series, Maximum, modulus principle, Schwarz's Lemma, Singularities, Zeros of an analytic function, branch point, Meromorphic functions and Entire functions, Riemann's theorem, Casorati Wierstrass theorem,

Unit-V

Residue theorem, residue at a pole, residue at infinity computation of residue, Rouche's theorem, fundamental theorem of algebra, mittag-leffet expansion theorem, evaluation of real definite integrals by contour integration.

Textbooks and References

1. Ahlfors, L. V. (1973). *Complex Analysis*.McGraw Hill
2. Conway, J. B. (2012). *Functions of one complex variable II* (Vol. 159). SpringerScience & Business Media.
3. Stein, E. M., &Shakarchi, R. (2003). *Princeton lectures in analysis*. PrincetonUniversity Press.
4. Stein, E. M., &Shakarchi, R. (2005). *Real Analysis, Princeton Lectures in AnalysisIII*.
5. Stein, R. Shakarchi (2003) *Complex Analysis: Princeton Lectures in Analysis*.Princeton University Press
6. Purohit and Goyal (2005). *Complex Analysis*, JPH.
7. Vasishtha, A. R. (2010).*Complex Analysis:* Krishna Prakashan Media (P) Ltd., Meeruth,11thed,
8. Rudin, W. (2006). *Real and complex analysis*. Tata McGraw-hill education.
9. Rudin, W. (1970). *Real and Complex Analysis P. 2*. McGraw-Hill.

CC-5 Mathematics-II
CC-5 (II) Paper-II: Mechanics
(CODE: BSCBED-355 e II)

Maximum Marks: 75 **External Marks: 60**
Internal: 15Marks (in which **two tests** of 7.5-7.5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to-

- To acquaint with the concept of Forces in three dimensions, Velocities andaccelerations.
- To understand Impact, Direct and oblique, Central forces;
- Apply the Analytical conditions of equilibrium in further study
- Know about Kepler's laws of planetary motion.

Unit I

Analytical conditions of Equilibrium of Coplanar Forces, Virtual Work, Catenary,Center of Gravity.

Unit II

Forces in Three Dimensions, Poinsot's Central Axis, Wrenches, Nulllines and planes, Stable and unstable Equilibrium.

Unit III

Velocities and Accelerations along radial and transverse directions, and along tangential and normal directions, Simple Harmonic Motion, Rectilinear Motion undervariable laws.

Unit IV

Motion in Resisting Medium, Hooke's law related problems on horizontal and vertical Elastic Strings. Constrained Motion, Circular and Cycloidal motion.

Unit V

Impact, Direct and Oblique, Central forces, Central orbits, p-r equation, Apses, Timein an orbit, Kepler's laws of planetary motion.

Textbooks and References

1. Biarez, J., &Hicher, P. Y. (1994). *Elementary mechanics of soil behaviour: saturatedremoulded soils*. AA Balkema.
2. De Gennes, P. G. (1985). Wetting: statics and dynamics. *Reviews of modern physics*,*57*(3), 827.
3. Hansson, S. O. (2012). *A textbook of belief dynamics: Theory change and databaseupdating*. Springer.
4. Loney, S. L. (1914). *The Elements of Statics and Dynamics*. University Press.
5. Nguyen, Q. S. (2000). *Stability and nonlinear solid mechanics*.
6. Poinsot, L. (1847). *The elements of statics*. University Press.
7. Synge, J. L. (1960). Classical dynamics. In *Principles of Classical Mechanics andField Theory/Prinzipien der Klassischen Mechanik und Feldtheorie* (pp. 1-225). Springer, Berlin, Heidelberg.

Phase-I: Internship (4 weeks)

	Assessment is based on the following activities –	
Planning	Content Analysis and mode of transaction (Assignment in teaching subject)	**5**
	Creating and maintaining teaching learning material for the school (which can become valuable resource for the regular teachers of the school). a) TLM in any teaching subject	**5+5=10**
	Make lesson plan using 10- different methods in which 5 must involve, student could develop their own method (fusion based) with the help on teacher educator.	**5**
Planning & Execution	Identify a problem of action research and draft proposal on it.	**5**
	*Innovative Micro Teaching (5 Skills) (Teaching Subjects at secondary to senior secondary level)	5
Execution	One-week, regular observation of regular teacher (at the beginning of practice teaching.)	**5**
	Delivery of Four lessons based on model of teaching. (After each lesson of practice teaching student teacher need to discuss with subject teacher on their pedagogy and new practices it must be seconded.)	5
Assessment & Evaluation	Draft a report based on: - continuously and comprehensively evaluating students' learning for feedback into curriculum and pedagogic practice.	5
Regularity and involvement in different school activities	Observation of day-to-day * school activities and report of an in- depth study of four activities.	5
	TOTAL MARKS	**50**

* Note: Any of the above activity may be replaced as per the need of the course.

SUGGESTED SCHOOL ACTIVITIES: -

Select any one activity from each group given below: -

A Group

- Organization of cultural activities,
- Organization of literary activities
- Organization of games/sports.
- Framing of time table.
- Water resource management through traditional methods.
- Prepare a report after interview of effective/good teachers.

B Group

- Attending and organizing morning assembly
- Maintenance of classroom discipline
- Review of School Records
- Guidance and Counseling
- Gardening

CGroup

- Organizing science fair, exhibition, science club, nature study
- Maintenance of School library
- Maintenance of School laboratories.
- Health and hygiene.
- Study on role of community for school improvement
- School mapping

D Group

- Sensitization for environmental problems.
- Cleaning campaigning in school.
- School climate/Environment (any one aspect)
- Voluntary services.
- Mass awareness of social evils and taboos.
- Any other activity/s decided by the institute.

FOURTHYEAR –IV

Course code	**Title of the course**	**EVALUATION**			
		External	**Internal**	**Practical**	Total
BSCBED-450	Environmental Studies*	**70**	**30**	**-**	**100**
BSCBED-451	Assessment for Learning	**70**	**30**	**-**	**100**
BSCBED-452	Agriculture	**35**	**15**	**-**	**50**
BSCBED-453	**Pedagogy of school subject-II**			**-**	
BSCBED-453 I	Mathematics	**35**	**15**	**-**	**50**
BSCBED-453 II	General Science	**35**	**15**	**-**	**50**
BSCBED-453 III	Chemistry	**35**	**15**	**-**	**50**
BSCBED-453 IV	Biology	**35**	**15**	**-**	**50**
BSCBED-453 V	Physics	**35**	**15**	**-**	**50**
BSCBED-454	Content: (PCB & PCM)			**-**	
BSCBED-454 a I	Physics I	**40**	**10**	**50**	**100**
BSCBED- 454 b I	Chemistry I	**40**	**10**	**50**	**100**
BSCBED- 454 c I	Zoology I	**40**	**10**	**50**	**100**
BSCBED- 454 d I	Botany I	**40**	**10**	**50**	**100**
BSCBED- 454 e I	Mathematics I	**80**	**20**	**-**	**100**
	CCA			-	**25**
Prayer, Yoga, Meditation & Festival etc				**-**	**25**
BSCBED- 455	**Internship (16 weeks)**				**200**
Total					**750**

***Marks of compulsory subject shall not be added in the total marks.**
Internship (16weeks) included in total marks.

Environmental Studies (EVS)
(CODE: BSCBED-450)

Maximum Marks: 100 **External Marks: 70**

Internal: 30 Marks (in which two tests of 7.5-7.5 marks each are included)

Learning outcome: After completion of the course, student-teachers will be able -

- To understand background of EVS as a composite area of study that draws upon the science, social science and environs mental education.
- To develop understanding about various ecosystems and biodiversity.
- Helping student to develop the ability to plan comprehensive units for environmental management and conservation.
- Understanding about the issues of conservationandenvironmentalregenerationhave beeninfusedat appropriate places inallthe textbooks.
- To analyze and understand environment concerns through the process of inquiry.
- To develop a sense of awareness about the environment hazards and its causes and remedies.

Unit – I Introduction to Environmental Studies

- Environmental studies: Historical background, concept, Nature and scope of EVS
- Natural and social environment: concept, its components, and relationship, man& Environment, man on environment,
- Disciplinary and Multidisciplinary approach of EVS

Practicum/Field Work

- Visit a natural or man-made site (park/forest/zoo/KVK/forest department etc) then discuss with student about their perception on natural environmental and its relation with social environmental.
- Conduct a play in school on man and environmental relationship for awareness about environmental protection among students, teachers and local people.
- Conduct awareness campaigning for plantation of *Tulsi, Neem*, and *Khejri* etc.

UNIT – II Eco-systems-

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, Consumers and decomposers.
- Energy flow in ecosystem.
- Ecological Succession.
- Food Chain, Food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem-
- Forest ecosystem.
- Grassland ecosystem.

Practicum/Field Work

- Celebrate Important relevant days related to environmental conservation (such as earth day, world environmental days etc) in school or out of school with the help of students and make a systematic report on entire activities or work
- Make a bulletin board material on “role of individual in prevention of pollution” and

analyse its impact on students and teachers of schools.

- Draft a report after analyse the scientific basis of Environment related to Indian traditional days present this report in class.(Basant Panchmi, Hariyali Amavasya etc.)

Unit- III Biodiversity, Its Conservation-

- Introduction – Definition: genetic, species and ecosystem diversity.
- Value of Biodiversity & Biodiversity at global, National & local levels.
- Hot-Spots of Bio-diversity.
- Threats to Bio-diversity: Habitat loss, poaching of wild life, man wild life conflicts.
- Conservation of Bio-diversity: In-situ and Ex-situ conservation of Bio-diversity.

Practicum/Field Work

- Conduct an activity in school, in which ask students to get opinion of their grandparents in changing life style and their merits and demerits/or collect their ideas on local products which can be helpful in heathy life style the pupil teacher will compile their experiences and draft a report then present it in class.
- Conduct a seminar in your village/ district /town in which invite local people of various socio-economic/socio cultural backround to present their experiences on sustainable agriculture.

Unit – IVEnvironmental Issues: -

- Meaning, concept, process, effects and preventive action of Acid rain, Global warming and cooling.
- Natural & Manmade disasters.
- Meaning, concept, Effects and preventive action of
- Water pollution.
- Air Pollution.
- Noise Pollution.
- Land or Soil pollution.

Practicum/Field Work

- Conduct an orientation programme in rural / urban school on waste management.
- Organize a planned Visit to urban or rural area to study about waste produced by human, after visiting the site, present your report in local community to create awareness for resolution of the problem.

Unit –V Environmental conservation & management:

- Meaning, concept and importance of environmental conservation & management.
- Role of women in conservation: Chipko movement, Khejri Movement.
- Consumerism and waste generation and its management.
- Agricultural / urban waste: their impact and management.

Practicum/Field Work

- Analyse the direct or indirect message of Traditional Culture/folk songs of your area for social or natural environment enhancement.
- Plant at least one tree and cultivate it through out the years.
- Present the report of entire work in chopal / assembly/ of your school.

Reference

- Anijah-Obi, F. N. (2001). Fundamentals of environmental education and management. *Calaber: Clear lines*.
- Bahuguna, Sundarlal (1996). *Dharti ki Pukar*. Delhi: Radhakrishna Publication.
- Ferré, F., & Hartel, P. (Eds.). (1994). *Ethics and environmental policy: theory meets practice*. University of Georgia Press.
- Goel, M.K. (2006). *Paryavaran Addhyayan*. Agra: Vinod Pustak Mandir.
- Harper, C., & Snowden, M. (2017). *Environment and society: Human perspectives on environmental issues*. Taylor & Francis.
- Lash, S., Szerszynski, B., & Wynne, B. (Eds.). (1996). *Risk, environment and modernity: towards a new ecology*. Sage.
- Misra, H. N. (Ed.). (2014). *Managing Natural Resources: Focus on Land and Water*. PHI Learning Pvt. Ltd.
- Newman, M. K., Lucas, A., LaDuke, W., Berila, B., Di Chiro, G., Gaard, G., ... & Sze, J. (2004). *New perspectives on environmental justice: Gender, sexuality, and activism*. Rutgers University Press.
- Sharma, P.D. (2001). Sharma, P. D., & Sharma, P. D. (2012). *Ecology and environment*. Rastogi Publications.

Assessment for Learning
(CODE: BSCBED-451)

Maximum Marks: 100 **External Marks: 70**

Internal: 30 Marks (in which two tests of 7.5-7.5 marks each are included)

Learning outcome: After completion of the course, student-teachers will be able -

- To understand assessing children's progress, both in terms of their psychological development and the criteria provided by the curriculum.
- To provide broad outlook to go beyond the limited context of syllabus-based achievement testing, achievement scores in a subject linked with the child's overall development.
- Introduce student teachers to the history of evaluation and current practices.
- Understand the different dimensions of learning and related Evaluation procedures, tools and techniques. Analyse, Manage and interpret assessment data.
- Understanding the policy perspectives on examination and evaluation and their implementation practices. Assessment for culturally responsive in diverse classroom.
- Develop critical understanding of issues in evaluation and explore, realistic, comprehensive and dynamic assessment process which is culturally responsive for use in the classroom.
- Develop enabling processes which lead to better learning and more confident and creative learners.

Unit - I Concept of Evaluation

- Meaning & concept of assessment, Measurement & Evaluation and their Interrelationship, Purpose of Evaluation (Prognostic, Monitoring of Learning, Providing Feedback, Promotion, Diagnosing. Principles of Assessment, and Perspectives.)

Practicum/Field Work

- Observe the teaching learning process in class room and prepare a report and feedback on it.
- Prepare a diagnostic test of any subject and apply it on students there give suggestions for improvement.

Unit – II Type of Evaluation

- Classification of assessment: Base on purpose (Prognostic, Formative, Diagnostic and Summative), Scope (Teacher made, Standardized) Attribute measured (Achivement, Aptitude, Attitude, etc), Nature of information gathered (Qualitative, Quantitative) Mode of response (Oral and written, Nature of interpretation (norm referenced, criteria referenced).
- Evaluation of cognitive learning: Types and levels of Cognitive learning, understanding and application, thinking skills – convergent, divergent, critical, problem solving and decision making, items and procedures for their assessment.

Practicum/Field Work

- Assess thinking skills of students and suggest plan for improvement to their parents and teachers.
- Conduct a competition amongst students, giving them any topic and asking-them to make a response oral or written. On the basis of response evaluate their personality or skills, ask them to take remedial measure, too measures.
- Presentation of papers on examination and evaluation policies.

Unit- III Continuous and Comprehensive Evaluation

- Meaning, concept need and process and characteristics of CCE.
- Assessment of affective learning: attitude and values, interest, self – concept items and procedures for their assessment.
- Grading: Concept, types and Application, Indicators for grading Psycho-Social and Political dimensions.
- School visits followed by presentation on evaluation practices in schools

Practicum/Field Work

- Prepare a plan for continuous and comprehensive evaluation of students.
- Conduct a summary to express the feeling of students about parents, teacher and peers.

Unit –IV Evaluation Divices

- Use of projects, Assignments, Worksheet, Practical Work, and Performance based activities, seminars and reports as assessment devices.
- Evaluation of Group Processes – Cooperative Learning and Social Skills.
- Self, Peer and Teacher Assessment.
- Commercialization of assessment.
- Participatory assessment and community monitoring critical analysis of prevalent practices of assessment.
- Typology of questions, Activities and tasks (open-ended questions, MCQ, true and false etc.) Reflecting - Problemsolving, creativeandcritical thinking, enhancing imagination and environmental awareness.
- Feedback to/from students, parents and teachers.

Practicum/Field Work

- Organise a group activity (like competition/story telling/reading/writing) and get it assessed by self, peer and teacher.
- Draft a report on variation among assessment.
- School Visits followed by presentation on evaluation practices in schools.
- Conduct a community work with involvement of children, students, teachers and society, and evaluate the work.
- To assess self concept of the students in class room and provide them feedback for it.
- Draft a feedback form about overall performance of students from parents and teacher, evaluate its effectiveness too.

Unit- V Evaluation Practices

- Construction and Selection of items, Guidelines for Construction of test items, assembling the test items, Guideline for administration.
- Scoring procedure – Manual and e-assessment.
- Analysis and interpretation of student's performance processing test, performance, calculation of percentage, central tendency measurement, graphical representations.
- Recording and reporting of forums for engagement with community work.
- Relationship of assessment with self esteem; motivation and identity as learner, assessment of fixed and growth mindsets.

Practicum/Field Work

- Debate on merits and demerits of manual and electronic scoring procedure.

- Construction, administration and interpretation of self-made achievement text.

References

- अस्थाना, विपिन (2009). *मनोविज्ञान और षिक्षा में मापन एवं मूल्यांकन.* आगराः अग्रवान प्रकाषन.
- पाल, हंसराज एवं शर्मा, मंजूलता (2009). *मापन आकलन एवं मूल्यांकन.* जयपुरः षिक्षा प्रकाषन.
- Bersin, J. (2008). *The training measurement book: Best practices, proven methodologies, and practical approaches*. John Wiley & Sons.
- Earl, L. M. (2012). *Assessment as learning: Using classroom assessment to maximize student learning*. Corwin Press.
- Gardner, J. (Ed.). (2012). *Assessment and learning*. Sage.
- Phillips, J. J., & Phillips, P. P. (2016). *Handbook of training evaluation and measurement methods*. Routledge.

Agriculture
(CODES: BSCBED-452)

Maximum Marks: 50 **External Marks: 35**

Internal: 15 Marks (in which two tests of 5-5 marks each are included)

Learning outcomes: -

On completion of the course, the student teacher will be able to

- Understand the meaning and scope of agriculture.
- Understand all about seeds, imported weed, manures etc.
- Acquire skills to practices of seed sowing, planting materials etc.
- Understand practices of different ornamental and horticulture crops.
- Recognise different field practices like earthing, hoeing, weeding watering etc.
- Inculcate healthy values related to work culture.

Unit I

Agriculture: Meaning, definition, scope, history, branches and objectives.

Unit II

Soil Science: Definition of pedology, soil management, soil erosion, soil conservation practices; structure of soil, soil profile; soil fertility and productivity, essential plant nutrients. Fertilizers and manures including bio-fertilizers. Identification of manures and fertilizers.

Unit III

Irrigation: Definition, method of irrigation, systems of irrigation, drainage, irrigation pattern of India.

Unit IV

Horticulture: Definition, branches of horticulture, layout of orchards, propagation by seeds and by vegetative means; Pot filling technique; Planning, planting and maintaining lawn; Practice related to landscaping.

Unit V

Agricultural practices: Preparation of land, selection of seeds, watering, thinning, hoeing and weeding, harvesting of crop, identification of important agricultural tools, trees and crop plants. Minor project preparation on agriculture.

<u>Practicum/Field Work(any two of the following)</u>

Identification of an agronomy of following crops: Wheat, Bajra,Maize, Rose etc.

Agricultural Processes:Irrigation, TrainingandPruning,Hoeing andWeeding, SeedBed

Suggested Readings:

- Bleasdale, J. K. A. (1973). *Plant physiology in relation to horticulture*. Macmillan International Higher Education.
- Dubey, D. K. (2008). *Fruit Production in India.*Meerut: Rama Publishing House.
- Edmond, J. B., Senn, T. L., Andrews, F. S., & Halfacre, R. G. (1975). *Fundamentals of horticulture* (No. 4th ed.). McGraw-Hill, Inc.
- Panda, S. C. (2005). *Agronomy*. Agrobios. Varanasi:Kushal Publications and Distributors.
- Sing, Jaiveer (2002).*Plant Propagation & Nursery Husbandry*. Meerut: Rama Publishing House.
- Singh, J. (2014). *Basic Horticulture*. New Delhi" Kalyani publishers.

(Part II)
PEDAGOGY COURSES
Pedagogy of Mathematics
(CODE: BSCBED-453-I)

Maximum Marks: 50 **External Marks: 35**

Internal: 15 Marks (in which two tests of 5-5 marks each are included)

Learning outcome: After completion of the course, student-teachers will be able -

- Develop insight into the meaning, nature, scope and objective of mathematics education.
- Learn important mathematics: mathematics is more than formulas and mechanical procedures.
- See mathematics as something to talk about, to communicate through, to discuss among them-selves to work together on; Pose and solve meaningful problems.
- Appreciate the importance of mathematics laboratory in learning mathematics.
- Stimulate curiosity, creativity and inventiveness in mathematics.
- Develop competencies for teaching-learning mathematics through various measures.

Unit -I Nature and Scope of Mathematics

- Meaning, Nature and Scope of Mathematics teaching.
- History of mathematics teaching and contribution of mathematician with reference to – Bharkaracharya, Aryabhatta, Ramanujan, Euclid, Pythogores,
- Importance of Aims and Objectives of Mathematics Teaching.
- Nature of mathematical propositions, truth values, compound propositions,

Practicum/Field Work

- Prepare a model of Pythagoras Theorem/Cube, Cuboid, and Cone etc.

Unit -II Aims and Objectives of Teaching School Mathematics

- Nature of concepts, concept formation and concept assimilation, concept mapping.
- Aims and general objectives of teaching mathematics, Bloom's Digital Taxonomy, Vis-a Vis the objectives of school education; writing specific objectives and teaching points of various content areas in mathematics like algebra, geometry, trigonometry, etc.
- Approaches to teaching of mathematics – Analytic, Synthetic, Inductive-Deductive, Heuristic, Concept mapping, Project and Laboratory; using various techniques of teaching mathematics viz, oral, written, drill, assignment, supervised study and programmed learning.

Practicum/Field Work

- Draft a report on role of mathematics Teachers' association and its utility for rural teacher. After report writing conducts an awareness programme in rural area (or lab school) under mathematics teachers association.

Unit - III ICT & Materials in Teaching-learning of Mathematics

- Use of ICT: Video clips, Power points presentations, films etc.
- Dale cone of experiences, Planning, preparation and presentation of Instructional Material.
- Techniques: Using textbooks, using audio-visual aids, CDs, multimedia and internet; case study approach.

Practicum/Field Work

- Prepare and present a lesson through power point presentation on any topic of your choice. Organize maths fair with the help of school students.
- Make five different teaching materials using different type of teaching aids at school level.

Unit -IV Teaching-learning Resources in Mathematics

- Types of primary and secondary sources: data from field, textual materials, journals, magazines, newspapers, etc.
- Using the library for secondary sources and reference material, such as dictionaries and encyclopedias.
- Mathematics laboratories, online resources. Unit and lesson plan.

Practicum/Field Work

- Using low-cost material – preparation of various activities, such as verification of algebraic identities, surface areas and volumes of cube, cuboids, cylinder, cone, sphere, conic sections, etc.
- Encouraging learner to examine a variety of methods of assessment in mathematics so as to assess creativity, problem-solving and experimentation/activity performance; appreciating evaluation through overall performance of the child; self and peer evaluation.

Unit -V Assessment and Evaluation

- Meaning, concept and construction of Achievement test, diagnostic test and remedial teaching.
- Blue print: Meaning, concept, need and construction.
- Continuous and Comprehensive Evaluation: Meaning, concept, importance and limitations.

Practicum/Field Work

- Construction, administration and interpretation of an achievement test of any standard of school.
- Make a diagnostic test of your subject and apply it in school, after discussion with concerning teacher and give remedial measure.
- Mark the student with less than 60% in Mathematics, diagnose the difficulties and give appropriate remedial measure.

Reference

- Gates, P. (Ed.). (2002). *Issues in mathematics teaching*. Routledge.
- Huang, R., & Li, Y. (Eds.). (2017). *Teaching and learning mathematics through variation: Confucian heritage meets western theories*. Springer.
- Johnston-Wilder, S., & Pimm, D. (2004). *Teaching secondary mathematics with ICT*. McGraw-Hill Education (UK).
- Posamentier, A. S., Smith, B. S., & Stepelman, J. (2010). *Teaching secondary mathematics: Techniques and enrichment units*. Allyn & Bacon.
- Servais, W., & Varga, T. (1971). *Teaching School Mathematics*. A UNESCO Source Book.
- Sliva, J. A., & Spitzer, J. S. (2004). *Teaching inclusive mathematics to special learners, K-6*. Corwin Press.
- धाकड़, परषुराम एवं त्रिवेदी, षिल्पा (2009). *गणित षिक्षण विधियाँ.* जयपुरः साहित्यागार चोड़ा रास्ता.
- मंगल, एस.के. (2005). *गणित षिक्षण.* नई दिल्लीः आर्य बुक डिपो.
- शर्मा, एच. एस. (2005). *गणित षिक्षण.* आगराः राधा प्रकाषन मन्दिर.
- नेगी, जे. एस. (2007). *गणित षिक्षण.* आगराः विनोद पुस्तक मन्दिर.
- सिंह, योगेष कुमार (2010). *गणित षिक्षण आधुनिक पद्धतियाँ*. नई दिल्लीः.ए.पी.एच.पब्लिषिंग कॉरपोरेषन.
- कुलश्रेष्ठ, अरूण कुमार (2013). *गणित षिक्षण.* मेरठः आर.लाल.बुक डिपो.

Pedagogy of General Science

(CODE: BSCBED-453-II)

Maximum Marks: 50 **External Marks: 35**

Internal: 15 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: After completion of the course, student-teachers will be able to:-

- Develop insight on the meaning and nature of General science for determining aims and strategies of teaching- learning.
- Appreciate that science is a dynamic and expanding body of knowledge.
- Appreciatethefactthateverychildpossessescuriosityabouthis/hernatural surroundings.
- Identify and relate everyday experiences with learning of science.
- Appreciate various approaches of teaching- learning of science.
- Explore the process skill in science and role of laboratory in teaching- learning.
- Use effectively different activities / experiments/ demonstrations / laboratory experiences for teaching-learning of science.
- Integrate the science knowledge with other school subjects.
- Analyze the contents of sciencewithrespecttopots, branches, processskills, knowledge organization and other critical issues.
- Develop process-oriented objectives based on the content themes/units.
- Identify the concepts of science that are alternatively conceptualized by teachers and students in general.

Unit I: Nature and Scope of General Science

- Concept, Nature, Need& Importace of Science & Science Teaching.
- Main discoveries and development of science (special reference to ancient India) Science as a domain of enquiry, as a dynamic and expanding body of knowledge, science as a process of constructing knowledge. Science as interdisciplinary area of learning (Physics, chemistry, biology etc) science for environment, health, peace & equity, science and society. Fact, concept, principles, laws and theories- their characteristics in context of general science.

Practicum/ Field Work

- Visit a KVK/ Ayurveda college/ science labs to address their working process and draft a report on their contribution to prosperity.
- Discussion on development of New theories/ Principles.
- Instruct students to make use of her/his previous knowledge in science gained through classroom / environment / parents and peer group.
- Planning and organizing events on special days related to science such as earth day, environmental day, cancer and DIVAID& day.

Unit II: Teaching-learning of General science

- Scientific attitude and scientific temper: Nurture the natural curiosity, aesthetic senses and creativity in biology: essential skills, methods and process that lead to exploration: Generalization and validation of scientific knowledge in biological science.

- Team teaching, project method, problem solving method, program instruction, investigatory approach, concept mapping, collaborative learning, and experiential learning in science: Facilitating learners for self-study.

Unit III: ICT & Materials in Teaching-learning of General Science

- Use of ICT: Video clips, Power points presentations, films etc.
- Dale cone of experience, Planning, preparation and presentation of Instructional Material.
- Techniques: Using textbooks, using audio-visual aids, CDs, multimedia and internet; case study approach.
- Planning, Organization and activity of science club.

Practicum/ Field Work

- Prepare and present a lesson through power point presentation on any topic of your choice.
- Organize and plan excursions with school students of scientifically significant local areas.
- Designing programme instruction to facilitate learners for self-study.
- Conduct at least two activities related to science club with a report.

Unit IV: Teaching-learning Resources in General Science

- Types of primary and secondary sources: data from field, textual materials, journals, magazines, newspapers, etc.
- Using the library for secondary sources and reference material, such as dictionaries and encyclopedias.
- Various teaching aids, Audio-visuals & online resources.

Practicum/Field Work

- Make five different teaching materials using different type of teaching aids (e. I. chart, atlas, model & PowerPoint, etc) at school science subject.
- Conduct a training program on use of digital library especially for secondary sources and reference material, such as dictionaries and encyclopedias.
- Going beyond the textbook; Getting children to craft little nuggets of History from primary sources.
- Observation of skills relating to primary and secondary data; Observing coins, inscriptions (if available), the material remains of the past and visuals; Helping children to read passages from primary sources; Thinking about what all these sources might or might not reveal. Prepare a report on entire activity.

Unit V: Assessment and Evaluation

- Meaning, concept and construction of Achievement test, diagnostic and remedial test.
- Blue print: Meaning, concept, need and construction.
- Continuous and Comprehensive Evaluation (CCE) in Sciences.
- Characteristics of Assessment in Sciences.

Practicum

- Construction, administration and interpretation of an achievement test.
- Make a diagnostic test of your subject and apply it in school, after discussion with concerning teacher and give remedial measure.
- Mark the student with less than 60% in Mathematics, diagnose the difficulties and give appropriate remedial measure.
- Conduct a programme with students for nurturing natural curiosity of observation and drawing conclusions.

References:

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- Lawson, A. E. (1995). *Science teaching and the development of thinking*. Belmont, CA: Wadsworth.
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Pedagogy of Chemistry
(CODE: BSCBED-453-III)

Maximum Marks: 50 **External Marks: 35**

Internal: 15 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: After completion of the course, student-teachers will be able to:-

- Gain insight on the meaning and nature of chemistry for determining aims and strategies of teaching-learning.
- Appreciate that science is a dynamic and expanding body of knowledge.
- Appreciate the fact that every child possesses curiosity about his/her natural surroundings.
- Identify and relate everyday experiences with learning chemistry.
- Appreciate various approaches of teaching-learning of chemistry.
- Understand the process of science and role of laboratory in teaching-learning situations.
- Use effectively different activities/*demonstration*/laboratory experiences for teaching-learning of chemistry.
- Integrate in chemistry knowledge with other school subjects.

Unit- I Nature and scope of chemistry

- Concept, Nature, scope, &importance of chemistry & chemistry Teaching.
- Relation of chemistry to the environment (natural environment, artifacts and people issues at the interface of science technology and society, imbibe the values (honesty, integrity, cooperation, concern for life and preservation of environment, solving, problems of everyday life) facts and principles of chemistry its application consistent with the stages of cognitive development of learners. (e.g. Heat, carbon and its compound, acid, basis and salts, Thermodynamics, physical and chemical changes, stages of liquid nature and states of matter, rectal, and non-metal. etc.) Specific objective of different content areas in science (Physics and Chemistry).
- Planning, organizing and conducting of small community survey.

Practicum work

- Drama or role plays activity in class on life sketch & their contribution of any chemistry scientist.
- Prepare anyone of the following related to environment
  (1) Poster (2) article (3) story (4) play.

Unit-II Teaching-learning of Chemistry

- Scientific attitude and scientific temper: Nurture the natural curiosity, aesthetic senses and creativity in biology: essential skills, methods and process that lead to exploration: Generalization and validation of scientific knowledge in biological science.
- Team teaching, project method, problem solving method, programme instruction, investigatory approach, concept mapping, collaborative learning, and experiential learning in chemistry: Facilitating learners for self-study.

Practicum work:-

- Conducting two experiments useful at Sec/ Sr. sec level, ex-physical and chemistry changes, heat, acid, basis and salts.

- Make a project based on survey of 10 families nearby/their horse of using various types of fuels.

Unit-III ICT& Materials in Teaching-learning of Chemistry

- Use of ICT: Video clips, Power points presentations, films etc.
- Dale cone of experiences, Planning, preparation and presentation of Instructional Material.
- Techniques: Using textbooks, using audio-visual aids, CDs, multimedia and internet; case study approach.

Practicum work

- Lesson presentation by different methods e.g. OHP, Transparences slides, project, power point, working model etc.,
- Organize tram teaching, workshop, seminar. Debate demonstration (experiment) on different topic.
- Description & design of any improvised apparatus.

Unit -IV Teaching-learning Resources in Chemistry

- Types of primary and secondary sources: data from field, textual materials, journals, magazines, newspapers, etc.
- Using the library for secondary sources and reference material, such as dictionaries and encyclopedias.
- Various teaching aids, audio-visuals & online resources

Practicum work-

- Content Analyse of science books of class X chemistry study and chemistry as an experimental approach and preparation of reports.
- Pilot study
- Construct a science lab (based on primary, upper, middle, sec, Sr, sec)

Unit- V Assessment and Evaluation

- Meaning, concept and construction of Achievement test, diagnostic and remedial test.
- Blue print: Meaning, concept, need and construction.
- Continuous and Comprehensive Evaluation.

Practicum/Field Work

- Construct an achievement test of any standard of school and administer and interpretate its findings.
- Make a diagnostic test of your subject and apply it in school, after discussion with concerning teacher and give remedial measure, too.
- Mark the student with less than 60% in chemistry, diagnose the difficulties and give appropriate remedial measure, too.

References

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Pedagogy of Biology
(CODE: BSCBED-453 IV)

Maximum Marks: 50 **External Marks: 35**

Internal: 15 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: After completion of the course, student-teachers will be able to:-

- Develop insight on the meaning and nature of biological science for determining aims and strategies of teaching- learning.
- Appreciate that science is a dynamic and expanding body of knowledge.
- Appreciate the fact that every child possesses curiosity about his/her natural surroundings.
- Identify and relate everyday experiences with learning of biological science.
- Appreciate various approaches of teaching- learning of biological science.
- Explore the process skill in science and role of laboratory in teaching- learning.
- Use effectively different activities / experiments/ demonstrations / laboratory experiences for teaching-learning of biological science.
- To understand meaning, concept and various types of assessment.
- Integrate the biological science knowledge with other school subjects.
- Analyze the contents of biological science with respect to pots, process skills, knowledge organization and other critical issues.
- Develop process-oriented objectives based on the content themes/units.
- Identify the concepts of biological science that are alternatively conceptualized by teachers and students in general.

Unit - I Nature and Scope of Biology

- Concept, Nature, Need & Importace of Biological science & Biology Teaching.
- Science as a domain of enquiry, dynamic body of knowledge and as a process of constructing knowledge: Biological science for environment and health, peace, equity: history of biological science, its nature and knowledge science independent of human application: origin of life and evolution, biodiversity, observations and experiments in biological sciences: interdisciplinary linkages, biological sciences and society.
- Photosynthesis, factors affecting the process of photosynthesis, respiration in plants and animal, transportation in plants, phytoplankton and zooplankton.

Practicum work

- Conduct a health awareness programme in community with the help of student (Programme may be based on knowledge of biological science.
- Poster presentation/drama on origin of life and evolution for awareners about biodiversity.
- Planning and organizing events on special days related to biological science such as earth day, environmental day, cancer and DIV AID & science day.
- Examine the water samples for qualitative Analyse of phytoplankton and zooplankton.
- Organize and plan excursions with school students of scientifically significant local areas.
- Participation in health-related national campaign such as pulse polio campaign.

Unit- II Teaching-learning of Biology

- Scientific attitude and scientific temper: Nurture the natural curiosity, aesthetic senses and creativity in biology: essential skills, methods and process that lead to exploration: Generalization and validation of scientific knowledge in biological science.
- Team teaching, project method, problem solving method, programme instruction, investigatory approach, concept mapping, collaborative learning, and experiential learning in biological science: Facilitating learners for self-study.

Practicum work

- Organization of exploratory activities to develop scientific attitude and temper.
- Talk to the students about Indian tradilional sanskar and find out the scientific basis or hidden concern for life and preservation of environment.
- Collection and identification of common plants and animals around the locality to construct food chain and food web.
- Conduct a programme with students for nurturing natural curiosity of observation and drawing conclusions.
- Conduct any activity among students for linking child's natural curiosity with natural phenomena like weather, flora and fauna; contexts.

Unit-III ICT & Materials in Teaching-learning of Biology

- Use of ICT: Video clips, Power points presentations, films etc.
- Dale cone of experience, Planning, preparation and presentation of Instructional Material.
- Techniques: Using textbooks, using audio-visual aids, CDs, multimedia and internet; case study approach.
- Planning, Organisation and activity of science club.

Practicum work

- Preparation/ designing programme instruction to facilitate learners for self study.
- Prepare a lesson plan by using fusion method of teaching, give logic or reasoninig your view why it is the best method. Write a report on its effectiveness.
- Organize activities with school level students to discuss their experiences of life; pupil teacher will give only clues and prompt them to enhance their activities.
- Teacher-learner will design learning experiences using each of these approaches.
- Prepare a low cost or waste material based experiement for secondary/ senior secondary schools.

Unit -IV Teaching-learning Resources in Biology

- People as resource: the significance of oral data.
- Types of primary and secondary sources: data from field, textual materials, journals, magazines, newspapers, etc.
- Using the library for secondary sources and reference material, such as dictionaries and encyclopedias.
- Various teaching aids, audio- visuals & online resourses.

Practicum/Field Work

- Make five different teaching materials using different type of teaching aids (e. I. chart, atlas, model & PowerPoint, etc) at school subject.
- Conduct a training program on use of digital library especially for secondary sources and

reference material, such as dictionaries and encyclopedias.

- Going beyond the textbook; Getting children to craft little nuggets of History from primary sources.
- Observation of skills relating to primary and secondary data; Observing coins, inscriptions (if available), the material remains of the past and visuals; Helping children to read passages from primary sources; Thinking about what all these sources might or might not reveal.

Prepare a report on entire activity.

- Analyse the non-print material of biological science, which may be valuable supporting material for secondary to senior secondary level teachers.
- Content Analyse of the syllabus of biological science in the light of peace values.

Unit-V Assessment and Evaluation

- Meaning, concept and construction of Achievement test, diagnostic and remedial test.
- Blue print: Meaning, concept, need and construction.
- Continuous and Comprehensive Evaluation (CCE)
- Characteristics of Assessment

Practicum/Field Work

- Construct, administer and interpret an achievement test for any standard of school.
- Make a diagnostic test of your subject and apply it in school, after discussion with concerning teacher and give remedial measure, too.
- Mark the student with less than 60% in biology, diagnose the difficulties and give appropriate remedial measure, too.
- Assessment of project work in work in biology (both in the laboratory and in the field)

References

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Pedagogy of Physics

(CODE: BSCBED-453-V)

Maximum Marks: 50 **External Marks: 35**

Internal: 15Marks (in which **two tests** of 5-5 marks each are included)

Learning outcome: After completion of the course, student-teachers will be able -

- Gain insight on the meaning and nature of Physics science for determining aims and strategies of teaching-learning.
- Identify and relate everyday experiences with learning Physics;
- Appreciate various approaches of teaching-learning of Physics;
- Use effectively different activities/demonstrations/laboratory experiences for teaching-learning of Physics;
- Integrate in Physics knowledge with other school subjects;

Unit -1 Nature and Scope of Physics

- Meaning, Concept, Nature, Scope, Needs, Aims, Objective and Importance of Physics Teaching.
- Corelation of Physics with other School Subjects.
- Ohm's law, Magmatic field, reflecting in of light, Retraction of light.

Practicum/Field Work

- Write a report on physical issues and concerns of the present-day, after analysis of News from News Papers, TV, and Radio etc.
- Observation, recording and interpretation of physical and social features and phenomena of your area / district / city).
- Identify and interpretate news related to positive social changes or initiation for improvement of physical environment.
- Prepare a practical file after conducting any two experiments on Ohm's Law/ reflection of light etc.

Unit –II Teaching-learning of Physics

- Scientific attitude and scientific methods: concept, components and steps.
- Aims and general objectives of teaching physics, Bloom's Digital Taxonomy, Vis-a Vis the objectives of school education; writing specific objectives.
- Team teaching, project method, problem solving method, Inductive deductive, investigatory approach, concept mapping and experiential learning in Physics: Facilitating learners for self-study.

Practicum/Field Work

- Prepare a lesson plan based on team teaching and execute it in school.
- Role playing activities in relation to solving problems of everyday life.
- Practical work with the help of low-cost material in schools.
- Make any two teaching aids with the help of low-cost material.

Unit -III ICT & Materials in Teaching-learning of Physics

- Use of ICT: Video clips, Power points presentations, films etc.
- Dale cone of experience, Planning, preparation and presentation of Instructional Material.
- Techniques: Using textbooks, using audio-visual aids, CDs, multimedia and internet; and

online recourses.

Practicum/Field Work

- Field projects related to Physics to develop knowledge of scientific methods in learners.
- Group discussion in peer groups, on the problems related to Physics.
- Make a lesson plan based on power point presentation and execute it inschool.

Unit -IV Teaching-learning Resources in Physics

- Types of primary and secondary sources: data from field, textual materials, journals, magazines, newspapers, etc.
- Using the library for secondary sources and reference material, such as dictionaries and encyclopedias.
- Various Teaching Aids, Audio-Visuals, Online Recourses.
- Lesson plan and Unit plan.

Practicum/Field Work

- Conduct a training program on use of digital library especially for secondary sources and reference material, such as dictionaries and encyclopedias.
- Observation of skills relating to primary and secondary data;

Unit - V Assessment and Evaluation

- Meaning, concept and construction of Achievement test, diagnostic test and remedial teaching.
- Blue print: Meaning, concept, need and construction.
- Continuous and Comprehensive Evaluation: Meaning, concept, importance and limitations.

Practicum/Field Work

- Construction, administration and interpretation of an achievement test of any standard of school.
- Make a diagnostic test of your subject and apply it in school, after discussion with concerning teacher and give remedial measure.
- Mark the student with less than 60% in physics, diagnose the difficulties and give appropriate remedial measure.

Reference

- Arons, A. B., & Redish, E. F. (1997). *Teaching introductory physics* (p. 362). New York: Wiley.
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- Joshi, S.R (2008). *Teaching of science*. New Delhi: A.P.H Publishing Corporation.
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BSCBED–IV
Group B: Core Courses (CC)
CC-1 Physics
Atomic, Molecular and Nuclear Physics
(CODE: BSCBED-454 a I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to:-

- Understand atomic and molecular physics.
- Apply Theory of Nuclear Fission and fusion in futher study.
- To explain Structure of Nuclei and Elementary Particles.

Unit – I

- **Atomic Physics:** Spectra of hydrogen, Frank-Hertz experiment and discrete energy states, Stern and Gerlach experiment, deuteron and alkali atoms, spectral terms, doublet fine structure, screening constants for alkali spectra for s, p, d and f states, selection rules, L-S and J-J couplings, Atoms in a magnetic field, Zeeman effect, Zeeman splitting.
- **Weak spectra:** continuous X-ray spectrum and its dependence on voltage, Duane and Hunt's law, Characteristics X-rays, Moseley's law, doublet structure of X-ray spectra, X-ray absorption spectra.

Unit II

- **Molecular Physics:** Discrete set of electronic energies of molecules, quantisation of vibrational and rotational energies, determination of internuclear distance, pure rotational and rotational-vibrational spectra, Dissociation limit for the ground and other electronic states, transition rules for pure vibrational and electronic vibrational spectra. Raman effect, Stokes and anti-Stokes lines, complimentary character of Raman and infrared spectra, experimental arrangements for Raman spectroscopy.
- **Spectroscopic techniques:** Sources of excitation, prism and grating spectrographs for visible, UV and IR, absorption spectroscopy, double beam instruments, different recording systems.

Unit III

- **Structure of Nuclei:** Rutherford theory of alpha paticle scattering, properties of nucleus quadrupole moment and nuclear ellipticity. Quadrapole moment and nuclear spin parity and orbital angular momentum, nuclear mass and mass spectroscopy. Nuclear potential, Mass defect and Binding energy, Theory of Nuclear forces and properties of nuclear forces.
- **Radioactive decay:** Beta decay, range of alpha particles, Geiger-Nuttall law, Gamow's explanation of alpha decay, gamma decay, continuous and discrete spectra.
- **Elementary Particles:** Classification of Elementary Particles, Fundamental interactions, Unified Approach (basic ideas), The Conservation laws, Quarks (basic ideas), Charmed and Colour Quarks, Higgs Boson, Large Hadron Collider.

Unit IV

- **Nuclear Model:** Liquid drop model, Semi-emperical mass formula, condition of stability, Fermi gas model, Magic Numbers, Basic assumption of shell model.
- **Nuclear Fission and Fusion:** Theory of Nuclear Fission, Barrier Penetration-Theory of Spontaneous Fission, Nuclear Fission as a source of Energy, The Nuclear Chain reaction, Condition of controlled Chain Reaction, The Principle of Nuclear Reactors, Classification of Reactors, Power of Nuclear Reactors, Uncontrolled chain reaction, Nuclear fusion, Energy released in Nuclear Fusion, Fusion in stars. The Plasma: The fourth state of the matter**.**

Unit V

- **Accelerators:** Ion sources, Cockcroft-Walton high voltage generators, Van de Graaff generators, Drift tube, Linear accelerators, Wave guide accelerators, Magnetic focusing in Cyclotron, Synchrocyclotron, Betatron, The electromagnetic induction Accelerator, Electron synchrotron, Proton Synchrotron.
- **Detectors:** Interaction of charged particles and neutrons with matter, working of nuclear detectors, Geiger-Muller counter, proportional counter and scintillation counter, cloud chambers, spark chamber, emulsions.

Textbooks and References

1. Barrow, G. M., & Barrow, G. M. (1964). *The structure of molecules: an introduction to molecular spectroscopy*. WA Benjamin.
2. Brehm, J. J., & Mullins, W. J. (1989). *Introduction to the structure of matter: a course in modern physics* (p. 960).
3. Carroll, B. W., & Ostlie, D. A. (2017). *An introduction to modern astrophysics*. Cambridge University Press.
4. De Fornel, F. (2001). *Evanescent waves: from Newtonian optics to atomic optics* (Vol. 73). Springer Science & Business Media.
5. Feymann, R., Leighton, R. B., & Sands, M. (1964). *The Feymann lectures on physics*, Vol. 2. MA.
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7. Haken, H., & Wolf, H. C. (2013). *Molecular physics and elements of quantum chemistry: introduction to experiments and theory*. Springer Science & Business Media.
8. Littlefield, T. A. (2012). *Atomic and nuclear physics: an introduction*. Springer Science & Business Media.
9. Rao, S. (Ed.). (2019). *Field theories in condensed matter physics*. CRC Press.
10. Richtmyer, F. K., Kennard, E. H., & Cooper, J. N. (1955). *Introduction to modern physics* (Vol. 747). New York: McGraw-Hill.
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12. Semat, H. (2012). *Introduction to atomic and nuclear physics*. Springer Science & Business Media.
13. Sharma, S. K. (2004). *Atomic and nuclear physics*. Pearson Education India.
14. Yang, F., & Hamilton, J. H. (2010). *Modern atomic and nuclear physics*. World scientific.

PHYSICS PRACTICALS

Duration: 4 hrs **Max. Marks 50**

Any twelve of the following experiments are to be performed. Few more experiments may be set at the institutional level. In examination two experiments are to be performed taking at least one from each section.

The distribution of marks in the practical examination will be as follows:

(i) Two experiments	30 Marks
For each experiment, distribution of marks will be as follows:	
Figure:	2
Formula/Theory:	2
Observation:	7
Calculation and Result:	3
Precautions:	1
(ii) Viva voce	10
(iii) Records	10
Total	**50 Marks**

LIST OF EXPERIMENTS

- Determination e/m by Thomson method.
- Determination e/m by Magnet Method.
- Measurement of Hall coefficient of given material.
- Verification of inverse square law by photo cell.
- Determination of Planck's costant by photo cell.
- Determination of Planck's constant using solar cell.
- To study V-I characteristics of Light Emitting Diode (LED).
- To find the magnetic susceptibility of paramagnetic solution using Quinck's method.
- Study of Magnetic Hysteresis parameters using a CRO.
- Study of characterstics of a GM counter and verification of inverse square law for the same strength of radioactive source.
- Study of resistance characteristics of semi-conductor Material using four probe method.
- Polarization of light by reflection, verify Brewster's law & Law of Malus.
- To determine the value of a High resistance by Leakage method.
- To determine small thickness by using thin film interference.
- The study of frequency response and phase relationship in a series LCR circuit.
- Measurement of magnetic susceptibility.
- Study of statistical distribution: Gaussian and Poisson's spectral distribution using dices.

CC-2 Chemistry
Advance Chemistry
(CODE: BSCBED- 454 b I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to-

- Understand the spectral and magnetic properties of transition meteal complexes.
- Get familiar with Heterocycles and Bioinorganic chemistry
- Explain the nuclear magnetic resonance (NMR) spectropy.
- Apply the principles of Acid-base behaviorisoelctric point and electrophoresis in real life.

Unit – I Electronic spectra of Transition Metal Complexes

- Types of electronictransitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series, Orgel-energy level diagram for d^1 to d^9 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.

Unit – II Magnetic Properties of Transition Metal Complexes

- Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula, L-S coupling, correlation of μs and μeff values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes.

Unit-III Heterocyclic Chemistry

- Introduction: Molecular orbital picture andaromatic characteristic of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole.

Unit-IV Bioinorganic Chemistry

- Essential and trace elements in biological processes, metalloporphyrins with special reference to hemoglobin and myoglobin. Biological role of alkali and alkaline earth metals ions with special reference to Ca^{2+}. Nitrogen fixation.

Unit-V Nuclear magnetic resonance (NMR) spectroscopy

- Proton magnetic resonance (^{1}H-NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, area of signals and proton counting, splitting of signals, spin-spin coupling and coupling constant, interpretation of NMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1, 1, 2-tribromoethane, ethyl acetate, toluene and acetophenone.
- Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and NMR spectroscopic techniques.

Reference: -

- Abraham, R. J., Fisher, J., & Loftus, P. (1998). *Introduction to NMR spectroscopy* (Vol. 2). New York: Wiley.
- Anslyn, E. V., & Dougherty, D. A. (2006). *Modern physical organic chemistry*. University science books.
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- Schwarzenbach, R. P., Gschwend, P. M., & Imboden, D. M. (2016). *Environmental organic chemistry*. John Wiley & Sons.
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- Sharma, Y. R. (2007). *Elementary organic spectroscopy*. S. Chand Publishing.
- Sharma, Y. R. (2009). Elementary organic spectroscopy, principles and chemical application. *Chand and Company Ltd, New Delhi, India*, *23*.
- Smith, M. B. (2020). *March's advanced organic chemistry: reactions, mechanisms, and structure*. John Wiley & Sons.
- Steed, J. W., Turner, D. R., & Wallace, K. (2007). *Core concepts in supramolecular chemistry and nanochemistry*. John Wiley & Sons.
- Vogel, A. I., Furniss, B. S., Hannaford, A. J., Smith, P. W., & Tatchell, A. R. (1989). *Vogel's textbook of practical organic chemistry* (Vol. 5). New York: Longman Scientific & Technical.
- Vollhardt, K. P. C., & Schore, N. E. (2014). *Organic Chemistry; Palgrave Version: Structure and Function*. Macmillan International Higher Education.

CHEMISTRY-PRACTICALS

Duration: 4 Hours **Max. Marks: 50**

Note: The students should be given exposure of any research labs and instrumentation center/reputed university lab/industry/government labs of northern region.

Inorganic Chemistry

Ex. 1 Estimation of given substance by volumetrically, iodometrically and total hardness of water. 15

Organic Chemistry

Ex.2 Prepartion and determination of an Organic compounds 15

Physical Chemistry

Ex.4 Perform one of the experiments mentioned in the syllabus. 10

Ex.5 Vive-Voce 05

Ex.6 Practical-Record 05

A. Inorganic Chemistry

- Quantitative estimation of one metal volumetrically from a given mixture.
- To estimate magnesium volumetrically from a mixture containing Ba^{2+} and Mg^{2+} Ions/ Zn^{2+} and Mg^{2+} ions.
- To estimate copper iodometrically from a given mixture containing Pb^{2+} and Cu^{2+} ions.
- Estimation of Glucose with the help of Fehling's solution.
- Determination of Total hardness of water.

B. Organic Chemistry

- Two stage preparation: p-nitroacetanilide from Aniline and p-Bromoacetanilide from Aniline.
- Determination of Iodine value of an oil/fat.
- Separation of two component mixture using water or $NaHCO_3$ solution & identification of the two components. Preparation of one derivative

C. Physical Chemistry

- **Colorimetry**
  - Determination of formula of complex by Job's method.
  - Verification of Beer-Lambert law for $KMnO_4/K_2Cr_2O_7$ and determine the concentration of the given solution of the substance.
- **Polarimetry**
  - Determination of the specific rotation of a given optically active compound and determination of the concentration of given solution of an optically active substance
- **Solvent Extraction**
  - Separation and estimation of Mg (II) and Zn (II)
- **Ion Exchange Method**
  - Separation and estimation of Mg (II) and Zn (II)

CC-3 Zoology
Molecular Genetics
(CODE: BSCBED-454 c I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes: -After completion of the course, student-teachers will be able to -

- To Comrehend the modern concepts and applied aspects of molecular genetics.
- Get familiar with the molecular structure of DNA and its cellular activities.

Unit – I

- Introduction, concept and development of Molecular Genetics & Genetic engineering.

Unit – II

- Nucletic acids: DNA (prokaryotic and eukaryotic)- Structure, forms, chemical composition functions and units of DNA, Genetic Code, Replication of DNA

Unit –III

- RNA: Genetic RNA, non-genetic RNAs (mRNA, tRNA, and rRNA) – Structure and functions.

Unit –IV

- Gene mutation: nature of mutation, types of mutation and causes of mutation.
- DNA repair: mismatch repair, direct repair, base-excision, nucleotide-excision repair and other types of DNA repair. Genetic diseases and faulty DNA repair.

Unit –V

- Gene expression: Transcription and translation of prokaryotes and eukaryotes.
- Regulation of gene expression in prokaryotes (Lac and tryptophan operon)

Textbooks and References

- Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2015). *Molecular biology of the cell*. Garland Science. *New York*, 1227-1242.
- Blomquist, G. J., & Bagnères, A. G. (Eds.). (2010). *Insect hydrocarbons: biology, biochemistry, and chemical ecology*. Cambridge University Press.
- Conklin, K. F., Doerfler, W., Grafstron, R. H., Groudine, M., Hamilton, D. L., Jaenisch, R.& Langner, K. D. (2012). *DNA methylation: biochemistry and biological significance*. Springer Science & Business Media.
- Gupta, P. K. (2005). *Cell and molecular biology*. Rastogi Publications.
- Karp, G. (2007). *Cell and Molecular Biology*. John Wiley & Sons Incorporated.
- Karp, G. (2009). *Cell and molecular biology: concepts and experiments*. John Wiley & Sons.
- Kotpal, R. L. (1967). *Annelida*. Jaipur: Rastogi Publications.
- Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Scott, M. P., Bretscher, A.& Matsudaira, P. (2008). *Molecular cell biology*. Macmillan.
- Rosen, F. S., Steiner, L., & Unanue, E. (1989). *Macmillan dictionary of immunology*.
- Tripathi, G. (2010). *Cellular and Biochemical Science*. IK International Pvt Ltd.
- Wilson, E. B. K., & Walker, J. (2005). *Biochemistry and Molecular Biology*. *Kuudes painos*.

ZOOLOGY-PRACTICALS

Duration: 4 Hrs. **Max. Marks - 50**

Objectives: To develop the molecular and biotechnological techniques and to develop skills of preparing media, separation of nucleic acids and culture of animal cells.

Course Contents-

- Study of DNA by Fulgent reaction in the salivary gland chromosomes.
- Isolation of genomic DNA
- Molecular separations by chromatography, electrophoresis, precipitation etc.
- Isolation of milk protein from the milk sample.
- Separation of serum by using centrifuge
- Estimation of protein by Biuret Method.
- Separation of plasma by centrifugation.
- Separation of biomolecules by Course and gel chromatography.
- Preparation and use of culture media for microbes.
- Preparation and use of culture media for animal tissues.
- Media preparation media sterilization and inoculation.
- Cell culture techniques-Design and functioning of tissue culture laboratory, cell proliferation measurements, culture media preparation and cell harvesting methods.
- Isolation and staining of bacteria.
- Determination of pH value of different water samples, blood urine and saliva.
- Qualitative tests for carbohydrates.
- Qualitative test for proteins.
- Qualitative test for lipids.
- Effects of temperature on the activity of enzyme.
- Chart, model Power point/multimedia presentation preparation related to evidence of evolution Human /Horse evolution, Geographical time scale etc.
- Students are expected to visit different laboratories (RRL, CSIR, ICMR, Science centers etc).

Guidelines/Instructions for Practical Examination

Max. Marks: 50 Time **Allowed: 4 Marks.**

S. No.	Exercise*	Marks
1.	Molecular Biology Experiment	**4**
2.	Biotechnological Experiment	**6**
3.	Biochemical tests	**6**
4.	Bacteriological experiment	**5**
5.	Instrumentation-major	**7**
6.	Instrumentation - minor	**3**
7.	Practical record	**5**
8.	Viva	**4**
9.	Project report	**10**

* as per UGC guidelines

CC-4 Botany

Genetic Engineering, Biotechnology, Ecology & Economic Botany

(CODE: BSCBED-454 d I)

Maximum Marks: 50 **External Marks: 40**

Internal: 10 Marks (in which **two tests** of 5-5 marks each are included)

Learning outcomes

- Understand plant tissue culture, genomics and proteomics
- Get familiar with concept of cellular totipotencey
- Explain the concept of genetic engineering
- Implement the application of biotechnology in real life.

Unit –I

- Tools and Techniques in Plant Tissue Culture, Media Preparations, Solid media, Liquid media, sterilization techniques, sterilization of glasswares and medium, Aseptic manipulation and Culture maintenance, Inoculation and Sub culture.
- Concept of Cellular totipotency, Methods of application of micro propagation, Haploid production, Zygotic embryo culture, Endosperm Culture, Somatic embryogenesis and Synthetic Seeds.

Unit-II

- An Overview of Genetic Engineering, Tools & Techniques of genetic engineering, recombinant DNA technology, Methods and applications in agriculture, horticulture, pharmaceuticals, Genetic markers, PCR.
- Concept of genomics and proteomics, application of biotechnology.

Unit III

- Atmosphere (gaseous composition), Climatic factors, Edaphic factors, morphological, anatomical and physiological, responses of plants to water, temperature light and Salinity.
- Population ecology with special reference to Growth Curves, ecotypes, ecads and plant Indicators.
- Community ecology with special reference to life forms, biological spectrum, ecological succession.

Unit IV

- Ecosystem, Structure and function, Abiotic & biotic components, food chain, food Web ecological pyramids, energy flow, biogeochemical cycles of carbon, nitrogen & phosphorous.
- General vegetation of India
- Intellectual property Rights (IPR) and Patent.

Unit V

- Economic Botany:- Origin, Cultivation and value-added products of following: Cereals: Rice, Wheat and Maize
- Oil Yielding Plants: Mustard, Groundnut and Coconut, Fiber Yielding Plants: Cotton, Sun-hemp
- Spices: Cardamom, Fennel, Cumin, Coriander, Medicinal plants: Opium, Cinchona, Sarpagandha. Beverages: Tea & Coffee
- Rubber: General Account

Suggested Readings

- Brintnall, S. B., & Molly, C. O. (1986). *Economic Botany: Plants in our world*. New Delhi: McGraw Hill.
- Kochhar, S. L. (2016). *Economic botany*. Cambridge University Press.
- Vasil, I. K., & Thorpe, T. A. (Eds.). (2013). *Plant cell and tissue culture*. Springer Science & Business Media.

BOTANY-PRACTICALS

Duration- 4 Hours **Maximum Marks - 50**

- Basic requirements of a tissue culture laboratory.
- (a) Common Glassware, (b) test tubes, culture tubes and screw-capped tubes, (c) Petridish (d) Pipette (e) Pasteurpipet (f) Erlenmeyer flask (g)Volumetric flask (h) Cleaningglassware (i)Inoculation needle and inoculation loop (j) Bunsen burner (Spirit-lamp), (k) water baths (l) Autoclaves. (m) Laminar air flow (n) Incubator (o) Hot air oven (p) Colony counter (q) pH meter (r) Electric balance (s) Spectro photometer (t) Centrifuse (u) binocular Microscope.
- Method of using balance Preparation of temporary cotton plug Preparation of permanent cotton plugs. Preparation of culture media
- Preparation of liquid medium (broth)
- Preparation of Solid media (PDA medium and plates)
- Preparation of agar slants.
- Preparation of agar deep tubes.
- Methods of Sterilization.
- Demonstration of the techniques of micro-propagation by using different explants, e.g. axillary buds, shoot meristems etc.
- To determine the minimum size of quadrate by species area curve method.
- To determine the minimum number of quadrates to be laid down in field under study.
- To study the vegetation structure through profile diagram
- To determine moisture content and water holding capacity of different types of soil
- To determine the dust holding capacity of different types to leaves.
- **Fibres:** Study of cotton flowers, sectioning of the cotton ovules/developingseeds to trace the origin and development of cotton fibres. Microscopic study of cotton and test for cellulose. Sectioning and staining of jute stem to show the location and development of fibres. Microscopic structure. Tests for lignocellulose.
- **Spices:** Examine Coriander, Fennel and Cumin (hand sections) and openedfruits of cardamom and describe them briefly.
- **Preparation of an** illustrated **inventory of 5 medicinal plants used in indigenous systems of medicine or allopathy:** Write their botanical andcommon names, parts and diseases/disorders for which they are prescribed.

CC-5 Mathematics
Numerical Analysis
(CODE: BSCBED-454 e I)

Maximum Marks: 100 **External: 80**

Internal: 20 Marks (in which **two tests** of 10-10 marks each are included)

- **Note: -**The Course is divided in five independent units. Two questions will be setfrom each unit. The candidates are required to attempt one question from each unit.

Unit- 1

- Error - its sources, propagation and analysis, Numerical solution of system of linear equations, Direct methods-The matrix inversion method. Gauss elimination method, Gauss-Jordan method, lterative methods: Gauss-Jacobi Method, Gauss Siedel method.

Unit-2

- Differences, Relation betweendifference and derivatives, Differences of polynomials, Newton's formula for forward and backward interpolation Divided differences and simple differences, Newton's general interpolation formula, Lagrange's interpolation formula, Error in interpolation.

Unit-3

- Numerical differentiation and numerical integration- Simpson's Weddle's and Trapezoidal rules, Newton's Cotes Quadrature formula, Gauss Quadrature formula.

Unit-4

- Root finding for nonlinear equations (Transcendental and Algebraic equations), Iterative method, Bisection method, Regula-Falsi method, Newton Raphson's method order of convergence.

Unit-5

- Numercial solution of first and second order differential equations, Euler's Method picard's Method, Taylor's series approximation, Runge-Kutta Method.

Textbooks and References

- Sastry, S. S. (2012). *Introductory methods of numerical analysis*. PHI Learning Pvt. Ltd.
- Ralston, A., & Rabinowitz, P. (2001). *A first course in numerical analysis*. Courier Corporation.
- Gautschi, W. (1997). *Numerical analysis*. Springer Science & Business Media.
- Phillips, G. M., & Taylor, P. J. (Eds.). (1996). *Theory and applications of numerical analysis*. Elsevier.
- Hildebrand, F. B. (1987). *Introduction to numerical analysis*. Courier Corporation.
- Ortega, J. M. (1990). *Numerical analysis: a second course*. Society for Industrial and Applied Mathematics.
- Gerald, C. F. (2004). *Applied numerical analysis*. Pearson Education India.
- Conte, S. D., & De Boor, C. (2017). *Elementary numerical analysis: an algorithmic approach*. Society for Industrial and Applied Mathematics.
- Atkinson, K. E. (2008). *An introduction to numerical analysis*. John wiley & sons.

Internship (16 weeks)

Teaching Practice and Practical Work

Planning & Execution	Preparation, administration & analysis of diagnostic test (s) followed by remedial teaching any selected lesson.	**10**
Execution	Execution of action research project	**10**
	Observation and preparation of report	**10**
	Working with community project of social welfare. (submission of report)	**10**
	Exhibition of TLM in school prepared by student teacher	**10**
	Regular classroom teaching delivery of 70 lessons	**5+5=10**
Assessment & Evaluation	Two Criticism Lesson in teaching subject	**10+10=20**
	5 Lessons to be observe by teacher educator.	**5+5=10**
	Final Lesson (External evaluation)	**50**
Regularity & involvement in different school activities	Student teachers function in liaison with the regular teachers in the school in all day-to-day functioning along with teaching-learning by mentor teachers	**05**
	Participating in various 'out of classroom activities' in school Organizing events	**5**
	Participation in any two co-curricular activity and preparation of report	**10**
	Study (and preparation) of school calendar, time table, assessment schedule, library and laboratory.	**5**
	Portfolio, including detailing of teaching-learning plans, resources used, assessment tools, student observations and records.	**10**
	Exhibition of critical observations of work done by the students during the internship programme. (Seeking reactions of students, headmasters/ principals/ cooperating teachers and supervisors)	**05**
	Preparation and maintenances of feedback diary	**10**
	A journal by student teacher in which he/she records one's experiences, observations, and reflections.	**10**
	TOTAL MARKS	**200**