



महाराजा सूरजमल बृज विश्वविद्यालय  
भरतपुर (राज.)

**SYLLABUS**

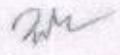
**Faculty of Education**

**B.Ed. Integrated Programme (Four Year)**

**3<sup>rd</sup> Year B.Sc. – B.Ed.**

**Session (2020-21)**

Only For Session  
2020-21

  
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**NOTICE**

1. Change in syllabus/ordinance/rules/regulations/ syllabi and books may from time to time, be made by amendment or remaking and a candidate shall, accept in so far as the university determines otherwise comply with any change that applies to years he/she has not completed at time of change.
2. All court cases shall be subject to the jurisdiction of Maharaja Surajmal Brij University head quarter Bharatpur only and not any other place.

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B.Sc. B.Ed PART - IV

CONTENTS

SCHEME OF EXAMINATION

SYLLABUS

SCHEME OF EXAMINATION

SYLLABUS

1. ENVIRONMENTAL STUDIES (COMPULSORY PAPER)\*
2. CREATING AND INCLUSIVE SCHOOL
3. UNDERSTANDING DISCIPLINES AND SUBJECT
4. PHYSICAL EDUCATION AND YOGA(G-A)
5. GENDER, SCHOOL AND SOCIETY
6. ASSESSMENT FOR LEARNING
8. (a/b) PEDAGOGY OF A SCHOOL SUBJECT (PART - 3) Ist AND IIInd YEAR  
(CANDIDATE SHALL BE REQUIRED TO OFFER ANY TWO PAPERS  
FROM THE FOLLOWING FOR PART - 3 AND OTHER FOR PART - 4) -  
08(a/b)
  - CHEMISTRY
  - BIOLOGY
  - PHYSICS
  - MATHEMATICS
  - GENERAL SCIENCE

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**Ordinance and Regulations related to the Integrated B.Sc.B.Ed. Degree**

01. The Objective and the Learning outcomes of the Integrated B.Sc.B.Ed. Degree are-

**Objectives:**

- To promote capabilities for inculcating national values and goals as mentioned in the constitution of India.
- To act as agents of modernization and social change.
- To promote social cohesion, international understanding and protection of human rights and right of the child.
- To acquire competencies and skills needed for teacher.
- To use competencies and skills needed for becoming an effective teacher.
- To become competent and committed teacher.
- To be sensitive about emerging issues such as environment, population general equality, legal literacy etc.
- To inculcate logical, rational thinking and scientific temper among the students.
- To develop critical awareness about the social issues & realities among the students.
- To use managerial organizational and information & technological skills.

**Learning 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 foster growth and development.
4. Ability to use-
5. Individualized instruction
6. Dynamic methods in large classes.
7. Ability to examine pupil's progress and effectiveness of their own teaching through the use of proper evaluation techniques.
8. Equipment for diagnosing pupil progress and effectiveness of their own teachings through the use of proper evaluation techniques.
9. Readiness to spot talented and gifted children and capacity to meet their needs.

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भारतीय विश्वविद्यालय

10. Ability to organize various school programmes, activities for pupil.
11. Developing guidance point of view in educational, personal and vocational matters.
12. Ability to assess the all round development of pupils and to maintain a cumulative record.
13. Developing certain practical skill such as:
- Black board work
  - Preparing improvised apparatus
  - Preparing teaching aids and ICT.
14. Interest and competence in the development of the teaching profession and education. Readiness to participate in activities of professional organizations.

**Integrated Programme of B.Sc.B.Ed. Degree Shall Consist of**

- First Year B.Sc.B.Ed.
- Second Year B.Sc.B.Ed.
- Third Year B.Sc.B.Ed.
- Final Year B.Sc.B.Ed.

**Duration of the Course - Four Years**

**Examination after each session in theory papers**

Scheme of Examination against each subject separately.

**Compulsory Papers:**

Year	Paper
Ist Year	Gen. English
IInd Year	Gen. Hindi
IIIrd Year	Elementary Computer Application (ICT)
IVth Year	Environmental Studies

\* ELIGIBILITY CRITERION ON PASSING MARKS BUT MARKS SHALL NOT BE INCLUDED IN DIVISION.

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**Group - A: - Subject Specialisation :**

Year	Paper
Ist Year	Instructional System & Educational
IInd Year	Peace Education
IIIrd Year	Guidance and Counselling in School
IVth Year	Physical Education & Yoga

**Group-B:** Content of Science Subject: - A Student has to opt any three optional subject (papers) from group B which two must be the school teaching subjects.

Chemistry	I, II & III
Botany	I, II & III
Zoology	I, II & III
Physics	I, II & III
Mathematics	I, II & III

**Group C:** Pedagogy of School Subject 08 A/B: Pedagogy of a School Subject IIIrd Year and IVth Year (candidate shall be required to offer any two papers from the following, for part-III & part-IV).

Pedagogy of Chemistry
Pedagogy of Biology
Pedagogy of Physics
Pedagogy of Mathematics
Pedagogy of General Science

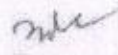
- ❖ In all the subjects the student has to study a minimum of 12 papers in Ist year, 12 Paper in IInd Year. 12Paper in IIIrd Year and 7 Paper in IVth Year ( Total 43Papers).
- ❖ Each theory paper will carry 100 marks and content base paper 05, 06; 07 (G-B) will carry 150 marks. (With practical part). Distribution of marks in mathematics is according to their marking scheme in page no. 7.

**Scheme of Instruction for B.Sc. B.Ed Courses**

Details of course and scheme of study, titles of the papers, duration etc. for B.Sc.B.Ed Course are provided in Tables given below :-

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महाराष्ट्र (अ.प्र.)

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**Four Years Integrated Course  
Scheme of B.Sc.-B.Ed. 1st Year**

Subject	Course Code	Title of the Paper	Evaluation			Total
			External	Internal	Practical	
01	B.Sc.-B.Ed. 01	Gen. English(Compulsory)*	100	-	-	100
02	B.Sc.-B.Ed. 02	Childhood and Growing Up	80	20	-	100
03	B.Sc.-B.Ed. 03	Contemporary India and Education	80	20	-	100
04	B.Sc.-B.Ed. 04	Instructional System & Educational Evaluation	80	20	-	100
05(i,ii,iii),06(i,ii),07(i,ii),08	B.Sc.-B.Ed.05,06 & 07	Content (PCB & PCM Group) (Select any Three)				
		1. Chemistry (I,II,III)	33+33+34		50	150
		2. Botany (I,II,III)	33+33+34		50	150
		3. Zoology(I,II,III)	33+33+34		50	150
		4. Physics (I,II,III)	33+33+34		50	150
		5. Mathematics(I,II,III)	40+40+40		30	150
						780

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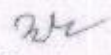
**Four Years Integrated Course  
Scheme of B.Sc.-B.Ed. IInd Year**

Subject	Course Code	Title of the Paper	Evaluation			Total
			External	Internal	Practical	
08	B.Sc.-B.Ed. 08	Gen. Hindi(Compulsory)*	100	-	-	100
09	B.Sc.-B.Ed. 09	Knowledge and curriculum	80	20	-	100
10	B.Sc.-B.Ed. 10	Learning and Teaching	80	20	-	100
11	B.Sc.-B.Ed. 11	Peace Education	80	20	-	100
12(i,ii,iii), 13(i,ii,iii), 14(i,ii,iii)	B.Sc.-B.Ed 12,13,14	<b>Content (PCB &amp; PCM Group) (Select any Three)</b> 1. Chemistry(I,II,III) 2. Botany (I,II,III) 3. Zoology(I,II,III) 4. Physics (I,II,III) 5. Mathematics(I,II,III)	33+33+34 33+33+34 33+33+34 33+33+34 40+40+40		50 50 50 50 30	150 150 150 150 150
15 <b>Practico m</b>	B.Sc. - B.Ed (Practicum)	<b>OPEN AIR / SUPW CAMP</b> i. Community Service ii. Survey (Based on social and educational events) iii. Co-Curricular Activities iv. Health and Social awareness programme (DISASTER MANAGEMENT AND CLEANNESS)		25 25 25 25		100
						750+100

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**Four Years Integrated Course  
Scheme of B.Sc.-B.Ed. IIIrd Year**

Subject	Course Code	Title of the Paper	Evaluation			Total
			External	Internal	Practical	
16	B.Sc.-B.Ed. 16	Information & Communication (ICT)(Compulsory)*	100	-	-	100
17	B.Sc.-B.Ed.17	Language Across the Curriculum	80	20	-	100
18	B.Sc.-B.Ed-18	Guidance and Counseling in School	80	20	-	100
19(i,ii,iii), 20(i,ii,iii), 21(i,ii,iii)	B.Sc.-B.Ed 19,20,21	Content (PCB & PCM Group) (Select any Three) 1. Chemistry(I,II,III) 2. Botany (I,II,III) 3. Zoology(I,II,III) 4. Physics (I,II,III) 5. Mathematics(I,II,III)	33+33+34 33+33+34 33+33+34 33+33+34 40+40+40		50 50 50 50 30	150 150 150 150 150
22	B.Sc.-B.Ed 22	Pedagogy of a School Subject (candidate shall be required to offer any one papers from the following) 1. Mathematics 2. Physics 3. Chemistry 4. Biology 5. General Science	80	20		100
Practicum 23	B.Sc.-B.Ed 23	Special Training Programme • Micro Teaching • Practice Lesson • Observation Lesson • Technology Based Lesson • Criticize Lesson • Attendance /Seminar/ Workshop			10 50 05 05 20 30	100
24	B.Sc.-B.Ed 24	Final Lesson	100			100
730+100+100						

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**Four Years Integrated Course  
Scheme of B.Sc.-B.Ed. IVth Year**

Subject	Course Code	Title of the Paper	Evaluation			Total
			External	Internal	Practical	
25	B.Sc.-B.Ed. 25	Environmental Education(Compulsory)*	80	20	-	100
26	B.Sc.-B.Ed. 26	Creating and inclusive school	80	20	-	100
27	B.Sc.-B.Ed. 27	Understanding Disciplines and Subject	80	20	-	100
28	B.Sc.-B.Ed. 28	Physical Education & Yoga	80	20	-	100
29	B.Sc.-B.Ed. 29	Gender, School and Society	80	20	-	100
30	B.Sc.-B.Ed. 30	Assessment for Learning	80	20	-	100
31	B.Sc.-B.Ed. 31	Pedagogy of a School Subject (candidate shall be required to offer any one papers from the following) 1. Chemistry 2. Biology 3. Physics 4. Mathematics 5. General Science	80	20	-	100
Practicum 32	B.Sc.-B.Ed. 32	1. Practice teaching 2. Block Teaching (Participation in School Activities Social Participation in Group) 3. Report of any feature of school / case study/action research 4. Criticism Lesson		30 20 10 20		100
33	B.Sc.-B.Ed. 33	Final Lesson	100			100
						1000-1000 1000

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Four Years Integrated Course  
Scheme of B.Sc.-B.Ed.

Compulsory subjects

Year	Subjects
Ist Year	Gen. English
II Year	Gen. Hindi
III Year	Computer Application (ICT)
IV Year	Environmental Education

Group - A	Group - B (PCB & PCM Group) (Select any Three subjects)
1. Instructional System & Educational 2. Peace Education 3. Guidance and Counseling in School 4. Physical Education & Yoga	1. Chemistry(I,II,III) 2. Botany (I,II,III) 3. Zoology(I,II,III) 4. Mathematics(I,II,III) 5. Physics(I,II,III)

Group C: Pedagogy of School Subject: Pedagogy of a School Subject IIIrd Year and IVth Year(candidate shall be required to offer any one papers in both year in following subjects ).

Chemistry
Botany
Zoology
Physics
Mathematics

- ❖ In all the subjects the student has to study.7 subjects (1-7)in 1st year, 8 subjects(8-15) in IInd Year.9 subjects( 16-24)in IIIrd Year and 9 subjects(25-32) in IVth Year.
- ❖ Each theory paper will carry 100 marks and content based paper will carry 150 marks.(including practical part).

Scheme of Instruction for B.Sc. - B.Ed Courses

Details of courses and scheme of study, titles of the papers, duration etc. for B.Sc.-B.Ed Courses are provided in Tables given below :-

Years	Subject	Marks
I Year	6 subjects (2-7)+Practical	600 +150= 750
II Year	6subjects(9-14)+Practical + SUPW(15)	600 +150+100= 850
III Year	6 subjects(17-22)+Practical + Practicum(23) +Final Lesson (24)	600 +150+ 100 +100= 950
IV Year	6 subjects(26-31) + Practicum (33)+Final Lesson (33)	600+ 100 +100= 800
Total	33 subjects)	2400 +450+300 +200= 3350

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O.321 The objectives of the practical work prescribed for the Integrated Programme of B.Sc.-B.Ed. Degree (Four Year) are follows:

**PART II**  
**Practical Work**

**Objectives:**

To develop the ability and self-confidence of pupil teachers:

1. To be conscious of sense of values and need for their inculcation in children through all available means including one's own personal life.
2. Possess a high sense of professional responsibility.
3. Develop resourcefulness, so as to make the best use of the situation available.
4. Appreciate and respect each child's individuality and treat him as independent and integrated personality.
5. Arouse the curiosity and interest of the pupils and secure their active participation in the educative process.
6. Develop in the pupil's capacity for thinking and working independently and guide the pupils to that end.
7. Organize and manage the class for teaching learning.
8. Appreciate the dynamic nature of the class situation and teaching techniques.
9. Define objectives of particular lessons and plan for their achievements.
10. Organize the prescribed subject matter in relation to the needs, interest and abilities of the pupils.
11. Use the appropriate teaching methods and techniques.
12. Prepare and use appropriate teaching aids, use of the black board and other apparatus and material properly.
13. Convey ideas in clear and concise language and in a logical manner for effective learning.
14. Undertake action research.
15. Give proper opportunity to gifted pupils and take proper care of the back-ward pupils.
16. Co-relate knowledge of the subject being taught with other subjects and with real life situations as and when possible.
17. Prepare and use assignments.
18. Evaluate pupil's progress.

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- 19. Plan and organize co curricular activities and participate in them.
- 20. Co-operates with school teachers and administrators and learns to maintain school records and registers.

**Practical skill to teach the two school subjects offered under Theory papers, 19/20/21**  
and the following:

- 1. Observation of lesson delivered by experienced teachers and staff of the college.
- 2. Planning units and lessons.
- 3. Discussion of lesson plans, unit plans and lessons given (including criticism lesson)
- 4. Organization and participation in co-curricular activities.
- 5. Setting follows up assignment.
- 6. Evaluation in terms of educational objectives use of teachers made tests & administration of standardized tests.
- 7. Black-board work.
- 8. Practical work connected with school subjects.
- 9. Preparation and use of audio visual aids related to methods of teaching.
- 10. Experimental and laboratory work in sciences, home-science, Geography and other subjects of experimental and practical nature.
- 11. Study of the organization of work and activities in the school.
- 12. Observation and assistance in the health education programme.
- 13. Observation and assistance in the guidance programme.
- 14. Maintenance of cumulative records.
- 15. Techniques of teaching in large classes.

**O.322** A candidate has to deliver at least 40 lessons (20 Lessons of one teaching subject in 3rd year & 20 Lessons of other teaching subject in 4th year) in a recognized school under the supervision of the staff of the college shall be eligible for admission to the examination for the degree of B.Sc.-B.Ed.

**Notes :-**

- i. Teaching subject means a subject offered by the candidate at his/her running B.Sc. B.Ed. course either as a compulsory subject or as an optional subject provided that the candidate studied it for at least two years. Thus the qualifying subjects like General English, General Hindi, General Education, History of Indian Civilization and Culture. Prescribed for running B.Sc.- B.Ed. course of the University or a subject dropped by candidates at the part I stage of the degree course shall not be treated as teaching subjects.

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- ii. Only such candidate shall be allowed to offer Social Studies for the B.Sc.-B.Ed. Examination as have taken their running B.Sc.-B.Ed. course with any two subjects out of History, Political Science/Public Administration, Economics, Geography, Sociology, Philosophy / Psychology.
- iii. A candidate who has offered Political Science or Public Administration at his Bachelor's or the Master's Degree Examination shall be deemed eligible to offer Civics as a teaching subject in the Integrated B.Sc.-B.Ed. Examination.

**O.323** No candidate shall be allowed to appear in the Integrated B.Sc./B.Ed examination I,II,III & IV Year unless he/she has attended (80% for all course work & practicum, and 90% for school internship).

**O.324** The examination for Integrated B.Sc.-B.Ed. for Four Year shall be in two parts- part 1st comprising theory papers & part 2 practice of teaching in accordance with the scheme of examination laid down from time to time.

**O.325** Candidates who fail in Integrated B.Sc.-B.Ed examination in part 1 or part 2 the theory of education may present themselves for re-examination there in at a subsequent examination without attending a further course at an affiliated training college.

**Provided** that a candidate who fails in any one of the theory papers and secures at least 48% marks in the aggregate of the remaining theory papers may be allowed to reappear in the examination in the immediately following year in the paper in which he/she fails only. He/she shall be declared to have passed if he secures minimum passing marks prescribed for the paper in which he appeared and shall be deemed to have secured minimum passing marks only prescribed for the paper (irrespective of the marks actually obtained by him) for the purpose of determining his division in accordance with the scheme of examination. The candidate shall have to repeat the whole examination in subsequent year in case he fails to clear the paper in which he failed.

**O.326** Candidates who fail in the Integrated B.Sc.-B.Ed. examination part 1 and part 2 only in the practice of teaching may appear in the practical examination in the subsequent year provided that they keep regular terms for four calendar months per year and give at least 40 lessons (20 in part 1 & 20 in part 2 supervised lessons).

**O.326 A:** A candidate who complete a regular course of study in accordance with the provision laid down in the ordinance, at an affiliated teacher's training college for four academic year but for good reasons fails to appear at the Integrated B.Sc.-B.Ed. examination may be admitted to a subsequent examination as an Ex-student as defined in O.325 or O.326 Above.

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**Organization evaluation of practice teaching:**

1. Every candidate will teach at-least 40 lessons (20 in III Year & 20 in IV Year) during practice teaching session. At least ten lessons in each subject should be supervised.
2. 40(20|20) lessons as desired in the syllabus should be completed as full period class room lesson. Micro teaching lesson to be used in addition to those 40 lessons for developing certain teaching skills.
3. A minimum of ten lessons in each subject will be supervised evaluated by the subject specialist or a team of specialists of the subjects.
4. By and large, the evaluation of the performance in the practical teaching will be based on the last ten lessons in the subject when the student has acquired some competence and skills of teaching.
5. The internal assessment in practice of teaching will be finalized by the principal with the help of members of the teaching staff and the same will be communicated to the university before the commencement of the practical each year.
6. At Integrated B.A-B.Ed III Year each candidate should be prepared to teach one lessons at the final practice examination. At the Integrated B.A-B.Ed IV year exam candidate should be prepared to teach two lessons (one in each subject). The external examiners may select at least 10% of the candidates to deliver two lessons in Integrated B.A-B.Ed IV Year.
7. There will be a board of Examiners for the external examination for each college which will examine each candidate in at least one lesson and a minimum of 15% in two lessons (one in each of the two subjects).
8. The board of Examination will consist of:
  - (a) The principal of the college concerned.
  - (b) A principal or a senior and experienced member of the teaching staff of another training college, affiliated to University of Rajasthan.
  - (c) An external examiner from outside the University of Rajasthan or a senior member of the teaching staff of an affiliated training college.
  - (d) The board as far as possible will represent Social science, language and science.
9. Approximately 50 lessons will be examined by the board each day.

**Working out the result and awarding the division:**

- (1) A candidate in order to be declared successful at the Integrated B.A-B.Ed. I, II, III & IV Year Examination shall be required to pass separately in Part I (Theory) and Part II (Practice of Teaching).
- (2) For a passing in Part I (Theory) a candidate shall be required to obtain at-least
  - (a) 30 percent marks in each theory paper and sessionals (24 marks out of 80

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and 6 marks out of 20); (b) 30% marks in each theory paper and sessional (11 marks out of 35 & 4 marks out of 15) (C) 36 percent marks in the aggregate of all the theory papers.

(3) For passing in Part II (school internship Practice of Teaching) a candidate shall be required to obtain separately at-least

- \* 40 percent marks in the external examination.
- \* 40 percent marks in internal assessment.

(4) The successful candidates at Integrated B.A.-B.Ed Four Year Examination obtaining total marks will be classified in three divisions and shall be assigned separately in theory and school internship Practice of teaching as follows:

Division	Theory	Practice of Teaching
I	60%	60%
II	48%	48%
Pass	36%	40%

The practical work record shall be properly maintained by the college and may be made available for work satisfaction of external examiner in school internship (practice teaching), those are expected to submit a report regarding this separately.

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B.Sc. B.Ed.-Paper Code 16 (PART – III)

**INFORMATION & COMMUNICATION TECHNOLOGY (ICT)**

Max. Marks: 100

**Objectives:**

1. To enable the students to recognize understand and appreciate ICT as an assertive learning as a enormous functional support to teachers.
2. To know and understand different parts of computer and their functioning.
3. To understand the operating system of Computer.
4. To develop skill in the use of Internet.
5. To appreciate the concept of integration of information and communication Technology with education.
6. To make use of Modern Information and Communication Technology to improve teaching learning process.
7. To develop positive attitude towards handling of computers.

**Unit- I Information & Communication Technology in Education**

- ❖ Concept, Importance, Meaning & Nature of information & Communication Technology.
- ❖ Need of information & Communication Technology in Education.
- ❖ Scope of Information and Communication Technology areas; (Teaching Learning Process, Evaluation, Research and Administration), Trends in Information and communication and technology.
- ❖ Paradigm shift in education due to ICT content with special reference to curriculum, Role of Teacher, Methods of Teaching, Classroom Environment Evaluation, Procedure and Educational management.
- ❖ Challenges in interesting information communication Technology in school Education.

**Unit-II Introduction to computer**

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- ❖ General awareness about functioning of computer
  - Generation, Characteristics, Types of computers and uses of Computer.
  - Brief introduction of working computer using the block diagram.
- ❖ Hardware
  - Input Device- Key Board, Mouse, Scanner, Microphone and digital camera.
  - Out device- Monitor, Printer, speaker and screen image projector.
  - Storage device - Hard Disk, CD & DVD and Mass storage Device (Pen Drive)

**Unit-III Software of Computer**

- ❖ Software
  - Operating System- Concept and function
  - Application software (its uses of education)
  - Word Processors
  - Power Point Presentation
  - Spread Sheet
  - Viruses & their management

**Unit- IV - ICT Supported teaching/Learning strategies, Internet and Intranet**

- ❖ CAL- Computer Assisted Learning
- ❖ PBL- Project Based Learning
- ❖ Technology - Aided Learning
- ❖ E-Learning- Concept & Nature
- ❖ Web Based Learning
- ❖ Virtual Classroom
- ❖ Concept, need & Importance

**Unit- V - Internet and Intranet uses in Education**

- ❖ Facilities available for communication
  - Email, Chat and online conferencing
  - E-Library, Websites, blog, Wikipedia
- ❖ Search Engines- Concept and uses

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 भद्रपुर (राज.)

**Reference:**

1. Shukla, Satish S. (2005) basics of information Technology for teaching Trainees, Ahmedabad: Varishan Prakashan.
2. Singh, V.P. and Singh, Meenakshi (1999), Computer- terms and Definition, New Delhi
3. Rajsekar, S. (2010), Computers in Education, ND: Neelkamal Publication Pvt. Ltd.
4. Roblyer, M:D. (2008) Intergating Educational Technology into Teaching New Delhi: Perason Education, South Asia, India.
5. Singh, KamalD., & Kaur, D. (2008). Using Computers in Education, New Delhi: Dhanpat Rai Publishing Company (Pvt.) Limited.
6. बाबा मुरली सविथा (1996) कम्प्यूटर विज्ञान एक परिचय , विकास पब्लिशिंग हाउस प्रा० लि०, नई दिल्ली।
7. वेणुगोपाल एवं अन्य: प्रारम्भिक कम्प्यूटर अनुप्रयोग, हिमांशु पब्लिकेशन, उदयपुर।
8. सिन्हा, आर.के. : कम्प्यूटर फण्डामेन्टलस वी.पी.वी. पब्लिकेशन्स, नई दिल्ली।
9. सिंह, डॉ० रजनीश कुमार, गौतम साहूकार (2014): शिक्षा में सूचना एवं संचार प्रौद्योगिकी, राखी प्रकाशन, आगरा।
10. Kulsum, Dr. Umme (2014) : Information Communication Technology in Teacher Education, H.P. Bhargava, Agra
11. Bhargava, Rajshri, Bhargava Piyush (2012): Information and Communication Technology, H.P. Bhargava House, Agra.

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B.Sc, B.Ed. - Paper Code 17 PART- III  
Language across the curriculum

Max. Marks- 80

**Objectives:**

This course will enable the pupil teacher to-

1. Understand the language background of students as the direct or seen language users.
2. Create sensitivity to the language diversity that exists in the class room.
3. Understand the nature of classroom discourse and develop strategies for using oral language in classroom.
4. Understand that nature of reading comprehension and writing in specific content areas.
5. Understand interplay of language and society.
6. Understand function of language
7. Understand language and speech disorder and make remedial measure too.

**Unit 1**

Meaning, Nature, scope, role, importance, function of language, language background, language and region, language and religion, language and class, ~~role of literature in~~

**Unit- 2**

Home language (mother tongue) and school language/second language.

(3) oral and written language – meaning, Principal, objectives, Importance, relation, differences.

**Unit- 3**

A) Oral aptitude in language, theoretical speech of oral aptitude, development of oral expression/Speech in pupil teacher, Classroom, discourse, Discussion as a tool of learning, questioning in the class room, developing reading skill through text book,

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problems and remedies to incorrect pronunciation.

B) Language Skills- (LSWR-Listening, Speaking, Writing Reading) Meaning Concepts, importance, co-relation, methods and techniques, Language Laboratory- need, Importance, Use in teacher's training.

#### Unit-4

A) Listening Skill- Pronunciation, Intonation, Stress, Pitch, Rhythm and Oral Aptitude.

B) Speaking Skill- Pronunciation, Intonation, Stress, Pitch, Rhythm and Oral Aptitude.

C) Writing Skill – Aspects of writing shapes, sounds, meanings, punctuation marks, word, Sentences; Expression in writing, mechanics of writing.

D) Reading Skill- Consonants, Vowels, words, sentences, Recognition, Understanding, Silent reading, Imitation reading and loud reading.

#### Unit-5

Language Text Book- Criteria of selection and critical analysis of language text book, children's literature and teachers handbooks method of evaluation. Understanding the relationship between curriculum syllabus and textbook;

#### Internal Test and Assignment:-

(20 Marks)

1. Class test (10 Marks)
2. Any one (10 Marks)
  - Discuss with students and find out the different language they speak, prepare a plan to use multilingualism as a teaching strategy.
  - Identify speech defects of a primary level students and make remedial strategy.

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- Organizing an activity based game to motivate students for creative questioning
- Close and critical reading/discussion in small groups.
- Conduct a survey in secondary school to study academic achievement in overall or in specific subject of diverse linguistic students.
- Review of a text of any language subject.

**Reference :**

1. Agnihotri, R.K. (1995) Multilingualism as a class room resource. In K. heugh, a siegruhn, P. Pluddemann (Eds) multilingual education for south Africa 9pp. 3 heinemann educational books.
2. Anderson, R.C. (.984) role of the readers schema in comprehension, learning and memory. In R.C. Anderson, J.Asrlrom & R.J. Tierney (Edu) learning to read in American schools: based readers and content teats psychology.
3. Bansal R.K. and Harrison J.B.- (1990) spoken English for Indian orient Longman LTD Madras.
4. Ladson, billings G (1995) towards a theory of cultwally relevant pedagogy American Educational research journal.
5. NCERT (2006) position paper national focus group on teaching of Indian language (NCF 2005) New Delhi.
6. Paliwal Dr. A.K. (2002) communicative language teaching Sumtri publication, Jaipur.

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B.Sc. B.Ed. – Paper Code 18 PART- III  
GUIDANCE AND COUNSELING IN SCHOOL

OBJECTIVES :-

Max. Marks – 80

The course will enable the student teachers to-

- Understand the concept, need and meaning of guidance.
- Get acquainted with the principles, issues, problems and procedure of guidance.
- Develop understanding about the role of school in guidance.
- Develop the various areas, tools and techniques in guidance.
- Understand the concept need and meaning of counseling.
- Get acquainted with the principles and process of counseling.
- Understand the tools and techniques in counseling.

UNIT-1 GUIDANCE IN SCHOOL

- Concept, need and meaning of guidance.
- Principles of Guidance.
- Procedure of Guidance (Steps)
- Issues and problems of Guidance.

UNIT-2 AREAS, TOOLS AND TECHNIQUES IN GUIDANCE

- Personal, Educational and vocational Guidance.
- Tools:- Records of students
- Cumulative record.
- Questionnaire and inventories
- Techniques in Guidance (a) Observation, (b) Interview, (c) Sociometry

UNIT-3 COUNSELING IN SCHOOL

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- Concept, need and meaning of counseling.

- Counseling process and role.

- Qualities and role of a school counselor.

#### UNIT-4 TOOLS AND TECHNIQUES IN COUNSELING

- Individual counseling and group counseling.
- Lectures, discussions and Dramatics as techniques in counseling.
- Counseling for the children with special needs

#### UNIT-5 GUIDANCE AND COUNSELING FOR SPECIAL NEEDS POPULATION GUIDANCE OF CHILDREN WITH SPECIAL NEEDS.

- Problems and needs.
- Guidance of the gifted and creative students.
- Guidance of under achiever.
- Guidance of learning disabled, Drug addicts and alcoholics.

- Need for research and reforms in guidance and counseling.

#### Internal Tasks and Assignment

(20 Marks)

1. Class Test 10 Marks
  2. Any one 10 Marks
- Interview of a school counselor.
  - Visit to a guidance or counseling centre and write a report.

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- Administration of an individual test and preparing a report.

**References:-**

1. Anastasi A, Differential Psychology, New York: Macmillan Co, 1996.
2. Arbuckle Dugland, Guidance and Counseling in the classroom, Allyn & Bacon Inco, 1985.
3. Baqrki. B.G. Mukhopadhyaya. B., Guidance and Counseling; A manual, New Delhi: Stanley Publishers, 1990.
4. Crow & Crow, An Introduction to Guidance, New Delhi: Eurasia Publishing House, 1992.
5. Freeman E.S. Theory and Practice of Psychological testing, New Delhi: Henry Holt 1992.
6. Jones. A.J, Principles of Guidance, New Delhi, New Delhi: McGrew Hills Publishers, 1970.
7. Kochhar S.K. Educational and vocational Guidance in secondary schools, New Delhi, sterling publishers Pvt. Ltd. 1990.
8. Kolher, S.K. Educational and Vocational Guidance, New Delhi: Practice Hall India Ltd., 1995. 9 NCERT, Guidance and Counseling in Indian Education, New Delhi: NCERT, 1978.

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**B.Sc. Part III, Session 2020-21**  
**Chemistry**

Scheme:

Max Marks: 150

	Duration (hrs.)	Max. Marks	Min. Pass Marks
Paper-I	3	33	
Paper-II	3	33	36
Paper-III	3	34	
Practical	5	50	18

**Note:** Ten (10) questions are to be set taking two (02) questions from each unit. Candidates have to answer any 5 questions selecting at least one question from each unit.

**CH-301 Paper-I : Inorganic Chemistry**  
**(2 hrs or 3 periods/week)**

**Unit-I**

**Hard and Soft Acids and Bases (HSAB):**

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

**Unit-II**

**Metal-ligand bonding in Transition Metal complexes:**

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

**Magnetic properties of Transition Metal Complexes:**

Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula, L-S coupling.

**Unit-III**

**Electron spectra of Transition Metal Complexes:**

Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energy level diagram for  $d^1$  and  $d^2$  states, discussion of the electronic spectrum of  $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$  complex ion.


**Unit-IV**

**Organometallic Chemistry:**

Definition, nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyls and aryls of Li, Al. a brief account of metalethylenic complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

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**Unit-V**

**Bioinorganic Chemistry:**

Essential and trace elements to Biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca<sup>2+</sup> Nitrogen fixation.

**CH-302 Paper-II : Organic Chemistry**

(2 hrs or 3 periods/week)

**Unit-1**

**Nuclear Magnetic Resonance (NMR) Spectroscopy:**

Proton magnetic resonance (1H-NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals. Interpretation of 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 NMR data.

**Unit-II**

**Heterocyclic Compounds Introduction:** Molecular orbital diagram and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Comparison of basicity of pyridine, piperidine and pyrrole.

Introduction to condensed five- and six-membered heterocycles. Preparation and reactions of indole quinoline and isoquinoline with special reference to Fisher-indole synthesis, Skraup synthesis.

**Unit-III**

Carbohydrates Classification and nomenclature, Monosaccharides, mechanism of osazone formation. Epimers, anomers and mutarotation. Interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Erythro and threo diastereomers. Conversion of glucose into mannose. Configuration of monosaccharides. Determination of ring size of monosaccharides. Formation of glycosides, ethers and esters. Cyclic structure of D(+)-glucose and fructose.

**Unit-IV**

**Amino Acids, Peptides, Proteins and Nucleic Acids**

Classification, structure and acid-base behaviour, isoelectric point and electrophoresis.

Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end-group analysis, selective hydrolysis of peptides.

Nucleic acids - Introduction, constituents of nucleic acids - and nucleotides.

**Unit-V**

**Organosulphur Compounds :** Nomenclature, structural features, methods of formation and chemical reactions of thiols, sulphonic acids, sulphonamides and

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Sulpha drugs: sulphaguanidine, sulphadiazine (sulphapyrimidine), sulphamethoxazole, sul-hacetamide.

**Synthetic Dyes :** Colour and constitution (electronic concept). Classification of dyes. Chemistry and synthesis of methyl orange, congo red, malachite green, crystal violet, phenolphthalein, fluorescein, alizarin and indigo.

### CH-303 Paper III: Physical Chemistry

(2 Hrs. or 3 periods/week)

#### Unit-I

##### Elementary quantum Mechanics:

Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's mode of hydrogen atom (no derivation) and its defects. Compton effect.

De Broglie hypothesis, the Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box.

Schrodinger wave equation for H-atom

#### 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 level from wave functions, physical picture of bonding and bonding wave functions, concept of  $\sigma$ ,  $\sigma^*$ ,  $\pi$ ,  $\pi^*$  orbitals and their characteristics. Hybrid orbitals -  $sp$ ,  $sp^2$ ,  $sp^3$ , calculation of coefficients of A.O.'s used in these hybrid orbitals.

#### Unit-III

##### Spectroscopy

**Introduction:** Electromagnetic radiation, spectrum, basic features of different spectrometers, statement of the Born-Openheimer approximation, degrees of freedom.

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

**Vibrational Spectrum:** Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies.

**Electronic Spectrum:** Concept of Potential Energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Frank Condon principle. Qualitative description of  $\sigma$ ,  $\pi$  and  $n$  M.O. their energy levels and the respective transitions.

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**Unit-IV**

**Photochemistry** Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus-Drapper law, Stark-Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes internal conversion, intersystem crossing).

**Unit-V**

**Solutions, Dilute Solutions and Colligative Properties:** Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity coefficient.

Dilute solution, colligative properties, Raoult's law, relative lowering of vapor 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 in freezing point. Thermodynamic derivation of relation between molecular weight and elevation of boiling point and depression in freezing point.

**Practical: CH-304: Laboratory Course - III**  
(6 hrs/week)

**INORGANIC CHEMISTRY****Synthesis and Analysis of:**

- Potassium trioxalatoferate (III),  $K_3[Fe(C_2O_4)_3]$
- Bis(dimethylglyoximate) nickel (II) complex,  $[Ni(DMG)_2]$
- Tetraamminecopper (II) sulphate,  $[Cu(NH_3)_4]SO_4$
- Potassium cis-diaquabis(oxalato)chromate (III) dihydrate,  $K[cis-Cr(H_2O)_2(C_2O_4)_2] \cdot 2H_2O$

**Instrumentation****Calorimetry**

- Job's
  - Mole-ration method
- Adulteration-Food stuffs  
Effluent analysis water analysis

**Solvent Extraction**

Separation and estimation of Mg (II) and Fe (II)

**Ion Exchange Method**

Separation and estimation of Mg (II) and Fe (II)

**ORGANIC CHEMISTRY****Laboratory Techniques****Steam Distillation**

Naphthalene from its suspension in water  
Clove oil from Clove  
Separation of o- and p-nitrophenols

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**Column Chromatography**

- Separation of fluorescein and methylene blue
- Separation of leaf pigments from spinach leaves
- Resolution of racemic mixture of (+) menthol

**Qualitative Analysis**

Analysis of an organic mixture containing two solid components using water,  $\text{NaHCO}_3$ , for separation and preparation of suitable derivatives.

**Synthesis of Organic Compounds**

- (a) Aliphatic electrophilic substitution

Preparation of iodoform from ethanol and acetone

- (b) Aromatic electrophilic substitution

Nitration

Preparation of m-dinitrobenzene

Preparation of p-nitroacetanilide

Halogenation

Preparation of p-bromoacetanilide

Preparation of 2, 4, 6-tribromophenol

- (c) Diazotization / coupling

Preparation of methyl orange and methyl red

- (d) Oxidation

Preparation of benzoic acid from toluene

- (e) Reduction

Preparation of aniline from nitrobenzene

Preparation of m-nitroaniline from m-dinitrobenzene.

**Stereochemical Study of Organic Compounds via Models**

R and S configuration of optical isomers.

E, Z configuration of geometrical isomers.

Conformational analysis of cyclohexanes and substituted cyclohexanes.

**PHYSICAL CHEMISTRY****Electrochemistry**

- (a) To determine the strength of the given acid conductometrically using standard alkali solution.
- (b) To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically.
- (c) To study the saponification of ethyl acetate conductometrically.
- (d) To determine the ionization constant of a weak acid conductometrically.
- (e) To titrate potentiometrically the given ferrous ammonium sulphate solution using  $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$  as titrant and calculate the redox potential of  $\text{Fe}^{2+}/\text{Fe}^{3+}$  system on the hydrogen scale.

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4. Inorganic Chemistry, D.E. Shriver P.W. Atkins and C.H. Langford, Oxford.
5. Inorganic Chemistry, W.W. Porterfield Addison Wesley.
6. Inorganic Chemistry, A.G. Sharpe, ELBS
7. Inorganic Chemistry, G.L. Miessler and D.A. Tarr, Prentice Hall.
8. Organic Chemistry, Morrison and Boyd, Prentice Hall.
9. Organic Chemistry L.G. Wade Jr. Prentice Hall.
10. Fundamentals of Organic Chemistry, Solomons, John Wiley.
11. Organic Chemistry Vol. 1, 11, III S.M. Mukherji, S.P. Singh and R.P. Kapoor. Wiley Eastern Ltd. (New Age International)
12. Organic Chemistry, F.A. Carey, McGraw Hill, Inc.
13. Introduction to Organic Chemistry. Streitwieser. Heathcock and Kosover. Macmillan.
14. Physical Chemistry, G.M. Barrow. International Student Edition, McGraw Hill.
15. Basic Programming with Application, V.K. Jain. Tata McGraw Hill.
16. Computers and Common Sense. R. Hunt and Shelly, Prentice Hall.
17. University General Chemistry, C.N.R. Rao, Macmillan.
18. Physical Chemistry, R.A. Alberty, Wiley Eastern Ltd.
19. The Elements of Physical Chemistry, P.W. Atkins, Oxford.
20. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wiley Eastern Ltd.

**Books Suggested (Laboratory Courses)**

1. Vogel's Qualitative inorganic Analysis, revised, Svehla, Orient Longman.
2. Vogel's Textbook of Quantitative Inorganic Analysis (revised), J. Bassett. R.C. Deney, G.H. Jeffery and J. Mendham. ELBS.
3. Standard Methods of Chemical Analysis. W.W. Scott. The Technical Press.
4. Experimental Inorganic Chemistry, W.G. Palmer, Cambridge.
5. Handbook of preparative Inorganic Chemistry. Vol I (& II, Brauer, Academic Press.
6. Inorganic Synthesis, McGraw Hill.
7. Experimental Organic Vol I & II, P.R. Singh, D.S. Gupta and K.S. Bajpai, Tata McGraw Hill.
8. Laboratory manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
9. Vogel's Textbook of Practical Organic Chemistry, RS. Furniss, Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.
10. Experiments in General Chemistry, C.N.R. Rao and U.C. Agarwal, East-West Press.
11. Experiments in Physical Chemistry, R.C. Das and B. Behra, Tata McGraw Hill.
12. Advanced Practical Physical Chemistry, J.

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
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13. Yadav, Goel Publishing House. 3. Advanced Experimental Chemistry, Vol. 1-Physical, J.N. Gurtii and R. Kapoor, S. Chand & Co.
14. Selected Experiments in Physical Chemistry, N.G. Mukerjee, J.N. Ghjose & Sons.
15. Experiments in Physical Chemistry, J.C. Ghosh, Bharati Bhavan. (Instructions to examiners)

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**B.Sc. Part-III  
BOTANY**

**Scheme:**

**Min. Pass Marks: 36**

Paper - I	3 Hrs duration	<b>Max Mark: 100</b>
Paper - II	3 Hrs duration	Max. Marks 33
Paper - III	3 Hrs duration	Max. Marks 33
Practicals Min. Marks :18	4 Hrs duration	Max. Marks 34
		Max. Marks 50
		3 hours
		4 hours

Duration of examination of each theory paper

Duration of examination of practicals

**Note:**

1. There will be 5 questions in each paper . All questions are compulsory. Candidate has to answer all questions in the main answer book only
2. Q.No. 1 will have 20 very short answer type Questions (not more than 20 words) of half marks each covering entire syllabus.
3. Each paper is divided into four units. There will be one question from each unit. These Q.No. 2 to 5 will have internal choice.

**B.Sc. Part-III**

**Paper-I : Plant Morphology And Anatomy**

**Unit-1**

The basic body plan of flowering plant- diversity of plant form in annuals, biennials and perennials; branching pattern; monopodial and sympodial growth; meristematic, simple, complex and secretory tissues.

**Unit-2**

Cambium and its functions, formation of secondary xylem; a general account of wood structure growth rings; sapwood and heartwood; secondary phloem-structure and function; periderm. Anomalous secondary growth.

**Unit-3**

The leaf: arrangement and diversity in size and shape: Stomata- Structure and types, stomatal index. Senescence and abscission.

The root system: structural modification and root microbial interaction.

**Unit-4**

Morphology and anatomy of seed ( monocotyledons and dicotyledons); Significance of seed suspended animation, dispersal strategies. Vegetative propagation.

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**Suggested readings:**

- Cutter, F.G. 1969 Part I cells and tissues Edward Arnold. London.
- Cutter.E.G. 1971 Plant Anatomy Experiment and interpretation, part II, Organs educated Arnold; London
- Esan. K. 1977 Anatomy of Seed Plants, 2nd edition John Wiley & Sons, New York
- Fahn. A. 1985 Plant Anotomy Pergamon Press Oxford.
- Hartman H.T. and Kestler, D.E. 1976 Plant Preparation Principles and of India Pvt. Ltd. New Delhi.
- Manseth.J.D. 1986 Plant Anatomy, The Benjamin/Cumming Publishing co. Inc. Mento Park. California, USA,

**Suggested Laboratory Exercises:**

1. Study of any Commonly occurring Plant to understand the body plan and modular type of growth.
2. Life forms exhibited by flowering plants visit to a forest or a garden)
3. L.S. of shoot tip to study the organization of meristem and origin of leaf primordial.
4. Monopodial and Sympodial types of branching in monocots & dicots.
5. Anatomy of Primary and Secondary growth in monocots and dicots using hand out sections of sunflower, maize, cucurbita stem and roots.
6. Anamolous secondary growth in stem, Salvadora. Bignonia. Bougainvillia. Bouhaenia myctanthes Leptadema, Deacena.
7. Study of diversity on leaf shape and size Internal structure of leaf-Dorsiventral and isobilateral leaves, study of stomatal types.
8. Examination of seed (monocot and dicots) Structure seed viability test.
9. Specimen study of modifications of plant parts for Negetive reproduction

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**B.Sc. Part-III**

**PAPER-II : Ecology and Economic Botany**

**Unit-I**

Plants and Environment: Atmosphere (four distinct zone viz. stratosphere, troposphere, mesosphere, and thermosphere). Adaptation (Morphological, anatomical and physiological responses) of plants to water (Hydrophytes and Xerophytes). Light (global radiation, photosynthetically active radiation. Zonation in water body: littoral, limnetic and profundal zones; Photoperiodism, heliophytes and sciophytes). Temperature (Raunker's classification of plants: megatherm, mesotherm, microtherm, heikistotherm; themoperiodicity and vernalisation). Soil (soil Profile, development-weathering and maturation). Soil texture, soil types, role of pH, organic matter (EPA remain).

**UNIT-II**

Population ecology, Community, Ecosystem and Phytogeography: Community characteristics: stratification, life forms and biological spectrum. Ecological succession: types (primary and secondary), mechanism, nudation, migration, eecis, reaction and climax, xerosere, hydrosere; Ecosystems; Structure- abiotic and biotic components, trophic level, food chain, food web, ecological pyramids, energy flow (Box and Pipe model of Odum). Vegetation types of Rajasthan. Endangered plants of Rajasthan.

**UNIT-III**

Basic concept of center of origin of cultivated plants. Food plants. Wheat, maize, sugarcane. Vegetables: general account with a note on radish, onion, garlic, cauliflower, cucumber, tomato, lady finger and pea. Fruits: General account with a note on banana, ber, mango, jamun, watermelon, guava and orange. Vegetable oil: Ground nut, mustard.

**UNIT-IV**

Spices: General account with an emphasis on those cultivated in Rajasthan (Cumin, Capsicum, Coriander). Beverages: Tea and Coffee. Medicinal plants: General account with an emphasis. Fibres: Cotton and jute. Rubber. Ethnobotany: A general account.

**Practical Exercise:**

1. Study frequency and density, abundance plant species of campus vegetation by quadrat method.
2. Variation in soil moisture in relation to depth.
3. To estimate bulk density of grassland and woodland soil.
4. To estimate the porosity of grassland and woodland soil sample.
5. To determine moisture content of grassland and woodland soil.

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6. To measure dissolved oxygen content in polluted and unpolluted water samples.
7. To measure temperature of different water bodies.
8. Water holding capacity of the soil.
9. Find out pH of soil sample by universal indicator method.
10. Find out pH of water sample by pH meter.
11. Find out transparency of waterbody by sechhidisk.
12. Study morphology (external and internally) of hydrophytes (Hydrilla stem, Typha leaf and Nymphaea/Eichhornia petioler and xerophytes (Calotropis, Capparis and Casuarina stem, Nerium leaf with reference to their adaptations.
13. Study following specimen with special reference to:
  1. Botany of the economically important part.
  2. processing, if any involved.
  3. Specimen of cereals, pulses, spices beverage (Tea & coffee) beans, sugar, or seeds (mustard, groundnut)
14. Study of starch grain in potato and pea histochemical test cellulose, lignin, starch Fat, protein and tannin.
15. Submits specimens of locally important medicinal Plants.

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**B.Sc. Part-III****PAPER-III : Angiosperm - Taxonomy and Embryology****UNIT-I**

Introduction of Taxonomy, Units of classification, Concept of genus and species, Botanical Nomenclature, International code of Botanical Nomenclature.

Types of systems of classification : Bentham and Hooker's, Engler's, Engler and Prantle's system.

Diversity of flowering plants illustrated by members and economic importance of the following families: Apiaceae and cucurbitaceae.

**UNIT-II**

Rubiaceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, Lamiaceae, Chenopoliaceae, Euphorbiaceae, Liliaceae.

**UNIT-III**

Structure of anther, Microsporogenesis, Tapetum-Types and functions, development of male gametophyte.

Types of ovules and Megasporogenesis, development of female gametophyte (Embryosac). Fertilization, double fertilization, significance of double fertilization.

**UNIT-IV**

Development of dicot and monocot embryo. Formation of embryo, Types of Embryo. Endosperm, Types of Endosperm, Endosperm haustoria. Polyembryony, Parthenocarpy.

Taxonomy

The following are suitable for study of families.

1. Ranunculaceae: Ranunculus, Delphinium
2. Fabaceae: Pisu - Sativum

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**B.Sc. Part III  
ZOOLOGY**

**Scheme:**

**Max Mark: 100**

**Min. Pass Marks: 36**

Paper - I	3 Hrs duration	33 Marks
Paper - II	3 Hrs duration	33 Marks
Paper - III	3 Hrs duration	34 Marks
Practical	4 Hrs duration	50 Marks

**NOTE:**

1. There will be two parts of every theory question paper with total duration of 3 hours. First part of question paper will comprise question No. 1 containing 9 (Paper I & II) or 10 (Paper (II)) very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.  
Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, i.e. three from each unit/section out of which candidate will be required to attempt any 4 question selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

**PAPER-I: Z-301**

**STRUCTURE AND FUNCTIONS OF CHORDATE TYPES**

**NOTE:**

1. There will be two parts of this theory question paper with total duration of 3 hours. First part of question paper will comprise question No. 1 containing 9 very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.  
Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part i.e. three from each unit section. Out of which candidate will be required to attempt any 4 question selecting at least one question from each unit/section Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

**Section - A**

**Chordates**

1. Habit, external features and anatomy of Herdmonia
2. Ascidian tadpole larva and its metamorphosis
3. Habit, habitat and salient features of Ammocoete larva

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**Section - B**

**Comparative Anatomy:**

1. Integument including structure and development of placoid scales, feathers and hair.
2. Alimentary canal
3. Heart and aortic arches.
4. Respiratory system.
5. Urinogenital system.
6. Brain.


**Section-C**

**Chordate Adaptation:**

1. Amphibia: Parental care.
2. Reptilia: Poisonous and non poisonous snakes, poison apparatus.
3. Aves: Flight adaptations, bird migration.

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PAPER-II : Z-302

ECOLOGY AND ENVIRONMENTAL BIOLOGY

NOTE:

1. There will be two parts of this theory question paper with total duration of 3 hours First part of question paper will comprise question No. 1 containing 9 very short answer (Maximum 25 words) type questions, each of 1 mark this part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus. Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part i.e. three from each unit section, out of which candidate will be required to attempt any 4 question selection at least one question from each unit section. Each question will carry 6 marks
2. The candidate has to answer all questions in the main answer book only.

Section - A

Ecology

1. Basic concepts in ecology, its meaning and history,
2. Concepts of limiting factors.
3. Ecosystem: Biotic and abiotic factors
4. Ecosystem: Production, consumption and decomposition in an ecosystem: Concepts of food-chain, food web, trophic structure, ecological pyramids.
5. Biogeochemical cycles of O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>O, N, P and role of microbes.
6. Ecosystem: Homeostasis, functional aspects, productivity concepts and determination, ecotone, edge effects, niche.
7. Population ecology: Density and methods of its measurement, natality, mortality, age ratio and distribution, pyramids, fluctuations, biotic potential, dispersal, growth forms, population interactions and propagation, brief idea of demography.
8. Ecological succession: Types and patterns, concept of climax, details of xerosere and hydrosere successions.

Section - B

Environmental Biology-I

1. Environment and its concepts, global environment, hydrosphere, lithosphere and atmosphere.
2. Natural resources: Present status and future needs.
3. Conservation and management of natural resources: Renewable (forest, wildlife, water) and non renewable (soil, minerals and energy).
4. Environmental pollution I: General outline and various types of pollution of water, air, and soil.

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- 5. Environmental pollution II: Sources and remedies for noise, radiation, industrial chemicals, agrochemicals, insecticides, pesticides and household pollutants.
- 6. Green House effect, Ozone layer depletion, El-Nino and La Nina effects.

**Section - C**

**Environmental Biology - II**

- 1. Wildlife conservation: Vanishing and threatened animals and plants with special reference in Rajasthan, Wildlife management efforts by Government and non Government organization (including wild life acts).
- 2. Impact of urbanization: Development and distribution of urban centers, factors, problems and solutions of urbanization, fauna of oriental region.
- 3. Space ecology: Space ecosystem, space problems and their solutions, colonization.

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PAPER-III : Z-303

APPLIED ZOOLOGY, ETHOLOGY AND BIOSTATISTICS

NOTE:

1. There will be two parts of this theory question paper with total duration of 3 hours. First part of question paper will comprise question No. 1 containing 10 very short answer (Maximum 25 words) type questions, each of 1 mark this part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus. Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part i.e. three from each unit /section. out of which candidate will be required to attempt any 4 question selecting at least one question from each unit/section. Each question will carry 6 marks
2. The candidate has to answer all questions in the main answer book only.

Section - A

Applied Zoology

Principles and Practices of the following:

1. Vermiculture.
2. Sericulture (including ericulture).
3. Lac culture.
4. Apiculture.
5. Pisciculture.

Economic Importance of the following:

1. Protozoa.
2. Helminthes.
3. Anthropods; Insects and their management

Section - B

Ethology

1. Introduction and history of Ethology.
2. Concepts of Ethology : Fixed action pattern, sign stimulus, innate releasing mechanism, action specific energy-motivation imprinting and learning.
3. Pheromones and their role in alarm spreading
4. Societies: Characteristics and advantage with special reference to honey bee, deer and monkey.
5. Methods of studying animal behavior.

Section - C

Biostatistics

1. Introduction, scope and application of Biostatistics.
2. Frequency distribution.
3. Graphical and tabular presentation of data.
4. Mean, median, mode and their significance.
5. Standard deviation, standard error and their significance.

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Zoology Practical  
4 Hrs. /Week

Max. Marks: 50

Min. Marks: 18

I. Anatomy:

(a) Study of Any edible fish ( Wallago, Labeo, etc.): External Features, General viscera, afferent and efferent branchial blood vessels, eye muscles and their innervations, brain, cranial nerves and internal ear.

(b) Rat : Blood vascular, urino-genital and nervous, system (brain, cranial nerves).  
CAL (Computer Assisted Learning may be used with software COMPURAT)

II. Study of the following through Permanent Slide preparations:

Striped muscle fibers; Smooth muscle fibers scales of edible fish hair of man, dog, goat and cow, blood film of any vertebrate.

III. Study of Microscopic Slides: whole mounts of oral hood, velum and pharyngeal wall of Amphioxus; T. S. of Amphioxus through various regions; tadpole larva of Asetidia; whole mounts of Salpa, Doliolum and Oikopleura, V. S. of skin of fish, V. S. of skin of bird, V. S. mammalian skin, T. S. mammalian liver, kidney, stomach, intestine, bone, spinal cord, lung, duodenum, pancreas, testis and ovary.

IV. Study of Museum Specimens: Ascidia, Ciona, Botryllus, Ammocoete larva, Petromyzon, Myxine or Bdellostoms, Zygaena (Sphyrna), Torpedo, Chimaera, Acipenser, Amia or Lepidosteus, Labeo, Clarias, Anguilla, Hippocampus, Exocoetus, Echeneis, any flat-fish, Protopterus, Ichthyophis or any blind-worm Proteus, Ambystoma, Axolotl, Siren, A lytes, Hyla, Testudo, Chelone, and Fresh Water Tortoise, Sphenodon, Hemidactylus Phrynosoma, Draco, Chameleon; Eryx, Hydrophis, Naja, Viper, Crocodilus, Alligator, Aorchaeopter, any Running Bird, Pavo cristatus, Ardeotis nigriceps, Ornithorhynchus, Tachyglossus, Didelphis, Macropus; Bat, Loris, Scaly antester.

V. Osteology: A comparative study of articulated and disarticulated bones of any reptile, bird and mammal with the help of models/ charts/ artificial skeleton.

VI. Environmental Biology:

Analysis of Environment:

1. Soil pH, Methods of ecological census of soil fauna
2. Water analysis: pH, alkalinity, acidity, dissolved O2 and free CO2, Salinity (Chloride) and Hardness.
3. Qualitative estimation of zoo-plankton in given sample of water.

VII. Ethology:

1. Study of any stored insect pest (food preference and response to light)
2. Antennal grooming in cockroach/Gryllus.
3. Habituation in spider

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- 4. Wing cleaning in house-fly.
- 5. Excursion / Visit to a Zoo/ Museum of Natural History / Water body / Wild life Sanctuary/ National Park/ Forest Reserve and any industry related to animals / or Study of local faunal biodiversity ( candidates are expected to submit a detailed report of such visits)

**VIII. Biostatistics:**

- 1. Construction of frequency table, histogram, frequency polygon and pie chart.
- 2. Exercises on mean, median and mode (direct, short-cut and step-deviation methods).
- 3. Standard deviation and standard error.

**Scheme of Practical Examination and Distribution of Marks**


Time: 4 hrs.	Min. Pass Marks: 18	Max. Marks: 50
	Regular	Ex./N.C. Students
1. Anatomy (any system);	3	4
2. Permanent Preparation	6	6
3. Environmental Biology	7	7
4. Ethology	3	5
5. Biostatistics	5	7
6. Identification and comments on Spots (1 to 8)	16	16
7. Viva Voce	5	5
8. Class Record	5	-
	<b>50</b>	<b>50</b>

**Notes:**

- 1. With reference to anatomy, study of prescribed types (charts/models), candidates must be well versed in the study of various systems. CD ROMs multimedia computer based simulations including computer assisted learning (CAL) and other soft wares may be used.
- 2. With reference to permanent preparations and microscopic slides, in case of non-availability, the exercise should be substituted with diagrams, photographs, models, charts, etc.

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3. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.
4. The candidates may be asked to write detailed methodology wherever necessary and separate marks may be allocated for the same.
5. Mounting material for permanent preparations would be as per the syllabus or as available through collection and culture methods.
6. It should be ensured that animals used in the practical exercises are not covered under the wild life act 1972 and amendments made subsequently Or Necessary permission from chief wild life warden be sought.

**Recommended Books:**

1. Ahsan J and Sinha SP: A Hand book on Economic Zoology. 9th edition S. Chand & Co. Ltd., 1981.
2. Alcock J: Animal Behavior: An Evolutionary Approach. Sinauer Associates 2013.
3. Animal Societies and Evolution. Scientific American Publications.
4. Alexander R. M: The Chordates, Cambridge University Press. 1975.
5. Bailey NTJ: Statistical Methods in Biology. English Universities Press, 1964.
6. Breed MD and Moore J: Animal Behavior. Academic Press. 2015.
7. Grizimek's Encyclopedia of Ethology.
8. Gurumani N: An Introduction to Biostatistics. MJP Publishers, 2011.
9. Hand book of Ethological Method. Laharen Publications Garland STPM Press.
10. Kotpal RL: Modern Text Book of Zoology: Vertebrates. Global Media Publications 2010.
11. MacFarland D: Animal Behavior: Psychobiology, Ethology and Evolution 3rd edition Longman 1998.
12. Mahajan BK: Methods in Biostatistics. 1st edition Jaypee Publishers, 2010.
13. Manning A, Dawkins MS: An Introduction to Animal Behavior. Cambridge University Press 2012.
14. Mathur R: Animal Behavior. Rastogi Publications 2010.
15. Odum: Fundamentals of Ecology. Thomson Books/Cole 2005.
16. Odum: Ecology: A Bridge Between Science and Society Sinauer Associates 1997.
17. Prasad SN and Kashyap V: A Textbook of Vertebrate Zoology. 13th edition Wiley Eastern Ltd. 2011.
18. Primrose S.B. and Twyman R.M: Principles of Gene Manipulation and Genomics. John Wiley & Sons. 2013
19. Rana S. V. S: Environmental Studies. 4th edition. Rastogi Publications 2012.
20. Rastogi VB Organic Evolution 6th edition Kedar Nath Ram Nath Publications. Meerut, Delhi. 1993.
21. Rastogi VB and Jayaraj MS Animal Ecology & Distribution of Animals Kedar Nath Ram Nath Publications, Meerut, Delhi, 1983.
22. Sharma P. D: Environmental Biology and Toxicology. 3rd edition Rastogi Publications, 2013
23. Sunder Rao PSS and Richard J: Introduction to Biostatistics and Research Methods. PHI Publishers, 2012.
24. Sharma P. D: Ecology and Environment. 12th revised edition, Rastogi Publications

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2014-2015.

25. Werlace RA: Animal Behavior. Good Year Publishing Co., Inc.
26. Young JZ: The Life of Mammals. Oxford University Press 1970.
27. Young JZ: The life of Vertebrates. 2nd edition Oxford University Press. London 1962.
28. Daniel, D.Chiras, Environment Science. Jones & Barlett Burlington.
29. Mishra, R. Ecology work book. Scientific Publishers Manual, Jodhpur.
30. Trigunayat, M.M. & Yitika Trigunayat, Prayogic Manual Part-3, Scientific Publishers, Jodhpur, Rajasthan.
31. Rastogi V.B. Chordata , Kadar nath , Ram nath, Meerut.
32. Lal, S.S. Practical Zoology (Chordata). Rastogi Publications, Meerut.
33. सुरेश सिंह: जीव जगत, उत्तरप्रदेश हिन्दी ग्रन्थ अकादमी।

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**B.Sc. B.Ed.-Paper Code 16 (PART – III)**  
**INFORMATION & COMMUNICATION TECHNOLOGY (ICT)**

**Max. Marks: 100**

**Objectives:**

1. To enable the students to recognize understand and appreciate ICT as an assertive learning as a enormous functional support to teachers.
2. To know and understand different parts of computer and their functioning.
3. To understand the operating system of Computer.
4. To develop skill in the use of Internet.
5. To appreciate the concept of integration of information and communication Technology with education.
6. To make use of Modern Information and Communication Technology to improve teaching learning process.
7. To develop positive attitude towards handling of computers.

**Unit-I Information & Communication Technology in Education**

- ❖ Concept, Importance, Meaning & Nature of information & Communication Technology.
- ❖ Need of information & Communication Technology in Education.
- ❖ Scope of Information and Communication Technology areas; (Teaching Learning Process, Evaluation, Research and Administration), Trends in information and communication and technology.
- ❖ Paradigm shift in education due to ICT content with special reference to curriculum, Role of Teacher, Methods of Teaching, Classroom Environment Evaluation, Procedure and Educational management.
- ❖ Challenges in interesting information communication Technology in school Education.

**Unit-II Introduction to computer**

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- ❖ General awareness about functioning of computer
  - Generation, Characteristics, Types of computers and uses of Computer.
  - Brief introduction of working computer using the block diagram.
- ❖ Hardware
  - Input Device- Key Board, Mouse, Scanner, Microphone and digital camera
  - Out device- Monitor, Printer, speaker and screen image projector.
  - Storage device - Hard Disk, CD & DVD and Mass storage Device (Pen Drive)

**Unit-III Software of Computer**

- ❖ Software
  - Operating System- Concept and function
  - Application software (its uses of education)
  - Word Processors
  - Power Point Presentation
  - Spread sheet
  - Viruses & their management


**Unit- IV - ICT Supported teaching/Learning strategies, Internet and Intranet**

- ❖ CAL- Computer Assisted Learning
- ❖ PBL- Project Based Learning
- ❖ Technology - Aided Learning
- ❖ E-Learning- Concept & Nature
- ❖ Web Based Learning
- ❖ Virtual Classroom
- ❖ Concept, need & Importance

**Unit- V - Internet and Intranet uses in Education**

- ❖ Facilities available for communication
  - Email, Chat and online conferencing
- E-Library, Websites, blog, Wikipedia
- ❖ Search Engines- Concept and uses

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
  
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 भदवापुर (ग.ज.)

**Reference:**

1. Shukla, Satish S. (2005) basics of information Technology for teaching Trainees, Ahmedabad: Varishan Prakashan.
2. Singh, V.P. and Singh, Meenakshi (1999), Computer- terms and Definition, New Delhi
3. Rajsekar, S. (2010), Computers in Education, ND: Neelkamal Publication Pvt. Ltd.
4. Roblyer, M. (2008) Intergating Educational Technology into Teaching New Delhi: Perason Education, South Asia, India.
5. Singh, Kamal.D., & Kaur, D. (2008). Using Computers in Education, New Delhi: Dhanpat Rai Publishing Company (Pvt.) Limited.
6. बाबा मुरली सविथा (1996) कम्प्यूटर विज्ञान एक परिचय , विकास पब्लिशिंग हाउस प्राठ लि। नई दिल्ली।
7. वेणुगोपाल एवं अन्य: प्रारम्भिक कम्प्यूटर अनुप्रयोग, हिमांशु पब्लिकेशन, उदयपुर।
8. सिन्हा, आर.के. : कम्प्यूटर फण्डामेन्टलस वी.पी.वी. पब्लिकेशन्स, नई दिल्ली।
9. सिंह, डॉ० रजनीश कुमार, गौतम साहूकार (2014): शिक्षा में सूचना एवं संचार प्रौद्योगिकी, राधा प्रकाशन, आगरा।
10. Kulsum, Dr. Umme (2014) : Information Communication Technology in Teacher Education, H.P. Bhargava, Agra
11. Bhargava, Rajshri, Bhargava Piyush (2012): Information and Communication Technology, H.P. Bhargava House, Agra.

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**B. A./B. Sc. Part III Examination – 2021**

**Paper - I Modern Algebra (Topics to be deleted)**

- Unit-I: Index of a subgroup, Lagrange's theorem, Fermet's theorem, subgroups of cyclic group.
- Unit-II: Quotient group or Factor group, Fundamental theorem on homomorphism.
- Unit-III: Ring homomorphism, Embedding of ring and integral domain, Embedding of integral domain in a field, Field of quotients.
- Unit-IV: Vector subspaces, Direct sum of subspaces, properties of finite dimensional vector spaces.
- Unit-V: Matrices of linear maps, Matrices of composition maps, Invertible matrices, Similar matrices, Determinant of matrices and its computations.

**Paper-II Complex Analysis (Topics to be deleted)**

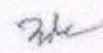
- Unit-I: Steriographic Projection. Convergence of power series- absolute convergence, Abel's theorem, Cauchy-Hadamard theorem, circle and radius of convergence of power series.
- Unit-II: Elementary mapping:  $w = \frac{1}{2}(z + 1/z)$ ,  $w = z^2$ ,  $w = e^z$ ,  $w = \sin z$ ,  $w = \cos z$ .
- Unit-III: Morera's theorem, Poisson integral formula, Liouville's theorem, Maximum Modulus Principal.
- Unit-IV: Taylor's theorem, Laurent's theorem, Argument principle, Rouché's theorem, Fundamental theorem of algebra.
- Unit-V: Residue at infinity.

**Paper -III Mechanics (Topics to be deleted)**

- Unit-I: Hooke's law, Horizontal Elastic String, Vertical Elastic String, Repulsion from a fixed point, Motion under Inverse Square Law.
- Unit-II: **Uniplanar Motion:** Projectile on an Horizontal Plane, Projection to pass through a given point, Projectile on an Inclined Plane.
- Unit-III: **Central Orbits:** p-r equation, Apses, time in a orbit, Kepler's law of planetary motion.
- Unit-IV: Reduction of System of Coplanar Forces into a Force and a Couple Equilibrium of body Under more than Three Forces. Least Force Required to pull a Body up and down on an inclined rough plane.

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Unit-V: Sag of Tightly Stretched Wire., Problems Related to a body or a Frame work resting on a Pags or on Inclined Plane.

Practicals (Topics to be deleted)

Group - A: Elementary programs on Matrix multiplication and to find inverse.

Group-B: Solution of some Numerical Analysis problems- Euler's method, Runge-Kutta's method using C-programming.

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**B.Sc. Part III**

**1. Physics**

Paper I	Exam. 3 Hours Duration	Max. Marks 33	Min. Pass Marks 12
Paper II	Exam. 3 Hours Duration	Max. Marks 33	Min. Pass Marks 12
Paper III	Exam. 3 Hours Duration	Max. Marks 34	Min. Pass Marks 12
Practical	Exam. 4 Hours Duration	Max. Marks 50	Min. Pass Marks 18

**Paper 1: Quantum Mechanics and Spectroscopy**

**Work Load: Two hours lecture per week**

**Examination Duration 3 hrs.**

Scheme of Examination Five question shall be set and all are compulsory First question shall contain 2 short answer type questions (3 questions from each unit) of one mark each with answer not exceeding 50 words. Candidates have to attempt any nine questions out of these 12 questions Remaining four questions will be of 6 marks each and will be set with one question from each unit Second to fifth questions will have 100% internal choice.

**Unit - 1 Evolution of quantum physics**

- Difficulties of classical mechanics to explain the black - body emission spectrum specific heat of solids Plank quanta concept and radiation law Photo electric effect and Einstein explanations, Compton effect.
- Uncertainty principle position and momentum angle and angular momentum, energy and time Application of uncertainty principle: (i) Ground state energy of hydrogen atom, (ii) ground state of simple harmonic oscillator, (iii) Natural width of spectral lines, (iv) Non-existence of electron in nucleus.
- Operators** : Linear operators, product of two operators, commuting and non commuting operators, simultaneous eigen function and eigen values, orthogonal wave functions, Hermitian operators, their eigen values, Hermitian adjoint operator eigen values and eigenfunctions, expectation values of operators position, momentum energy; Ehrenfest theorem and complementarity. Concept of group and phase velocity, wave packet.

**Unit II: Schrödinger wave equation and Its solutions**

- Schrodinger wave equation: general equation of wave propagation, propagation of matter waves, time dependent and time-independent Schrödinger equation, wave function representation( $\psi$ ), physical meaning of  $\psi$ . properties and conditions on  $\psi$ . postulates of wave/Quantum mechanics, operators, observable and measurements; probability current density.

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 अहमदनगर (महाराष्ट्र)

- 2. Time independent Schrodinger equation, stationary state solution, one dimensional problem, particle in one dimensional box, eigen functions and eigen values, discrete energy levels, generalization into three dimension and degeneracy of energy levels, concept of a potential well and barrier, step potential, penetration through rectangular barrier, reflection and transmission coefficients.

**Unit - III : Schrodinger equation solution in special cases**

- 1. Symmetric square well potential, reflection and transmission coefficients, resonant scattering, Bound state problems particle in one dimensional infinite potential well and finite depth potential well, energy eigen values and eigen functions, transcendental equation and its solution, Simple harmonic oscillator, Schrodinger equation for simple harmonic oscillator and its solution eigen function, eigen values, zero point energy.
- 2. Schrodinger equation in spherical coordinates, Schrodinger equation for one electron atom in spherical coordinates, separation into radial and angular variables, solution of radial equation and angular equation, series solution and energy eigenvalues, stationary state wave function. Orbital angular momentum and its quantization, commutation relation, eigenvalues and eigenfunctions.

**Unit - IV: H-atom, Atomic and Molecular spectroscopy**

- 1. Energy level derivation for H-atom, quantum features of hydrogen spectra and hydrogen like spectra, Stern-Gerlach experiment, electron spin, spin magnetic moments, spin-orbit coupling, qualitative explanation of fine structure, Franck-Hertz experiment, Zeeman effect, normal Zeeman splitting, Qualitative understanding about Stark effect.
- 2. Molecular spectroscopy concept of rigid rotator, rotational energy levels, rotational spectra, selection rules, intensity of spectral lines, isotopic effect; Vibrational energy levels, vibrational spectra, selection rules, isotopic effect, effect of anharmonicity in vibrational spectra.

**Reference books**

- 1. David J. Griffiths, Introduction to Quantum Mechanics, 2nd edition.
- 2. R. Shankar, Principles of Quantum Mechanics, 2d edition.
- 3. Arthur Beiser, Perspective of modern Physics, 6th edition.
- 4. A. K Ghatak and S Lokanathan; Quantum Mechanics: Theory and application.
- 5. HS Mani, GK Mehta, Introduction to modern Physics.
- 6. C.N. Banwell and E.M. McCash, Fundamental of Molecular Spectroscopy, 4th Edition.
- 7. HE White, Introduction to atomic physics.

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अहमदाबाद यूनिवर्सिटी  
अहमदाबाद (सं.)

## Paper-II: Nuclear and Particle Physics

**Work Load: Two hours lecture per week**

**Examination Duration : Three hours**

Scheme of Examination Five questions shall be set and all are compulsory First equation shall contain 12 short answer type questions (3 questions from each unit) of one mark each with answer not exceeding 50 words. Candidates have to attempt any nine questions out of these 12 questions Remaining four questions will be of 6 marks each and will be set with one question from each unit Second to fifth questions will have 100% internal choice

### UNIT - 1

Properties of Nucleus Discovery of Nucleus, Rutherford Scattering. Constituents of the Nucleus, Mass Charge, Size, Nuclear Density. Charge Distribution.

Nuclear Angular momentum, Nuclear Magnetic, Dipole Moment Electric Quadrupole Moment, Spin, Isospin, Wave Mechanical Properties Parity and Statistics, Classification of Nuclei, Mass Defect and Binding Energy, Packing Fraction, Mass Spectrograph.

**Nuclear Forces:** Properties of Nuclear Forces, Yukawa Meson Theory, Nuclear Potential.

**Nuclear Models:** Segre Chart, Liquid Drop Model, Semi Empirical Mass Formula, Condition of Stability.

### UNIT - 2

Radioactive Decays: Alpha Decay-Basics of  $\beta$ -Decay Processes, Theory of  $\beta$  Emission Spectrum, Gamow Factor, Geiger Nuttal Law, Range of Alpha Particles.

Beta Decay Energy Kinematics for  $\beta^+$ -Decay Spectrum, Positron Emission, Electron Capture, Pauli's Neutrino Hypothesis.

Gamma Decay - Gamma Ray Emission and Kinematics, Internal Conversion Applications of Radioactivity. Nuclear Fission and Fusion: Nuclear Fission, Spontaneous Fission and Potential Barrier, its Explanation by liquid Drop Model, Chain reaction, Controlled chain reaction, Four Factor Formula, Nuclear Reactors, Classification of Nuclear Reactor, Uncontrolled Chain Reaction, Nuclear Fusion, Energy released in Nuclear Fusion, Fusion in stars.

### UNIT - 3

**Interaction of Nuclear Radiations with Matter :** Energy loss by Heavy Charged Particles in Matter, Interaction of Electrons with Matter, Range of Charged Particle, Bremsstrahlung. Cherenkov Radiation, Gamma Ray Interaction with Matter.

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**Radiation Detectors:** Gas filled detector, Avalanche, Geiger Discharge, Ionization Chamber, Proportional Counter, Geiger Muller Counter.

**Particle Accelerators.** Ion source, Cyclotron, Synchrocyclotron, Betatron, Proton Synchrotron.

#### UNIT-4

**Elementary Particles:** Necessity of high energy to discover elementary constituents, historical introduction to discovery of elementary particles (electron, positron, neutrinos, strange mesons, charm quark, intermediate vector bosons, bottom quark, top quark and Higgs boson) Elementary particles and their quantum numbers (charge, spin parity, isospin, strangeness, etc), elementary particles included in the standard model.

**Fundamental Interactions :** Four types of fundamental forces, Symmetries and conservation Laws.

**Quark Model:** Flavor symmetries, Gellmann Nishijima formula, the eightfold way, Quark model, Octet Diagram for Mesons and Baryons.

**Suggested Books :**

1. Nuclear and Particle Physics, WE Burcham and M lobes, Addison Wesley Longman Inc
2. Nuclear and Particle Physics, Brian R Martin John Wiley & Sons,
3. Introduction to Nuclear and Particle Physics, Das and Ferbal, World Scientific.
4. Elements of Nuclear Physics, Walter E. Meyerhof, McGraw Hill Book Company.
5. Introductory Nuclear Physics, Kenneth S, Krane, John Wiley & Sons.
6. Introduction to Elementary Particles, David J Griffiths, John Wiley & Sons.
7. Radiation Detection and Measurement, G.F Knoll (John Wiley & Sons).
8. Introduction to Nuclear and Particle Physics, V.K Mittal, R.C Verma, S. C Gupta, PHI
9. Concepts of Modern Physics, A. Beiser, McGraw Hill Book Company.

#### Paper - III (Solid State Physics)

**Work Load: Two hours lecture per week**

**Examination Duration: Three hours**

**Scheme of Examination:** Five questions shall be set and all are compulsory. First question shall contain 12 short answer type questions (3 questions from each unit) of one mark each with answer not exceeding 50 words. Candidates have to attempt any ten questions out of these 12 questions. Remaining four questions will be of 6 marks each and will be set with one question from each unit. Second to fifth questions will have 100% internal choice.

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**UNIT-I**

**Bonding in Solids and Crystal Structure:**

Force between atoms, Ionic bonds, Covalent and metallic bonds, Vander Waal's and Hydrogen bonding. Periodicity in lattices, Basis, lattice point and space lattice Translation vectors, Unit and primitive cell, Crystal systems, Packing fractions for Simple Cubic (SC), Body Centred Cubic (BCC), Face Centred Cubic (FCC) and Hexagonal lattice structures, Bravais space lattices.

**Crystallography and Diffraction:**

Direction, planes and Miller indices in a crystal lattice, Reciprocal lattice and its significance, Conversion of SC and FCC Structures in reciprocal lattice frame.

**UNIT - II**

**Band theory of Solids:**

Formation of bands, Periodic potential and Bloch Theorem, Number of states in the bands, Kronig Penny model, Brillouin zones, Crystal momentum and physical origin of effective mass, Negative Effective Mass and Holes, Energy dispersion relations: weak and tight binding.

**Semiconductors:**

Energy band Structure in Insulators, Conductors, Semi-conductors, Concept of Direct and Indirect band gap in semi-conductors, Generation and recombination of charge carriers, Mobility of current carriers, Hall Effect in semi-conductors: Hall coefficient, Mobility, Charge carrier concentration.

**UNIT -III**

**Thermal properties of Materials:**

Elastic waves, Phonon, Phonon dispersion relations in monoatomic and diatomic linear lattice. Lattice heat capacity, Classical theory of specific heat, Dulong-Petit's law, Einstein and Debye's theory of specific heat of solids and limitations of these models.

**Electrical Properties of Materials:**

Drude-Lorentz theory, Sommerfeld's Model, Thermal conductivity, Electrical conductivity. Wiedemann Franz relation.

**UNIT - IV**

**Magnetic Properties of Materials:**

Classification of Magnetic Materials, Origin of Atomic Magnetism, Classical Langevin Theory of dia - and Paramagnetic Domains, Quantum theory of Paramagnetism. Curie's Law, Weiss's Theory of Ferromagnetism.

**Superconductivity:**

Experimental features of superconductivity : Critical Temperature, Critical magnetic field, Meissner effect. Type I and Type II Superconductors, London's Equation and Penetration Depth Isotope effect.

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**Reference Books**

1. Introduction to Solid State Physics---Charles Kittel (Wiley Publication)
2. Elementary Solid state Physic-----M. Ali Omar (Pearson Education)
3. Elements of X-ray diffraction ----B.D. Cullity (Prentice Hall)

**Practical Work****Teaching: 4 hrs/per week****Examination Duration: 4 hrs****Minimum Pass Marks: 18****Max. Pass Marks: 50**

**Note:** Total number of Experiments to be performed by the students during the session should be 16 selecting any 8 from each section  
(Perform any six experiments for the session 2000-21)

**Section - A**

- 1.(A) Determination of Planck's constant with the help of a photo cell.
- 2.(A) To determine Planck's constant using solar cell.
- 3.(A) To determine the value of Stefan's constant.
- 4.(A) To Study the change in resistivity of any semiconductor with temperature by four probe Method.
- 5.(A) Study of absorption spectrum of Iodine.
- 6.(A) Study the characteristics of G.M. counter and hence verification of inverse square law/ for radioactive radiations.
- 7.(A) Determination of end point energy of  $\beta$  particles by using Geiger Muller counter and study of their absorption by aluminium.
- 8.(A) Determination of magnetic susceptibility of ferromagnetic / paramagnetic material by using Quinck's method and determination of ionic molecular susceptibility of ions and magnetic moment in terms of Bohr Magneton.
- 9.(A) Determination of modulus of rigidity of given material in the form of torsional oscillator using resonance method and study of dependence of modulus of rigidity on temperature.
- 10.(A) To study the polarization by reflection due to glass plate by using Nicol prism and photo cell and prove the Brewster and Mallus laws.
- 11.(A) To find  $e/m$  of electron by Helical method.
- 12.(A) Measurement of magnetic field of an electromagnet using a ballistic galvanometer, search coil and standard inductor. Study the variation of magnetic field of an electromagnet with the current.

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- 13.(A) To determine the frequency of unknown Ac Source by Lissajous figures.
- 14.(A) To study frequency response of R-C coupled double stage amplifier.
- 15.(A) To determine the charge of an electron by Millikan's oil drop experiment.

**Section - B**

- 1.(B) To study R-C Transmission line at 50 Hz.
- 2.(B) To study L-C Transmission line.
- 3.(B) Object Study of resonance in an LCR circuit (using air core Inductance and damping by metal plate). (i) at fixed frequency by varying C, and (ii) - by varying frequency
- 4.(B) To study the characteristics of given junction and zener diodes.
- 5.(B) Study of (i) Recovery time of a junction diode and a point contact diode. (ii) Recovery time as a function of frequency of operation and switching current.
- 6.(B) To design a zener regulated power supply and study the regulation with various loads
- 7.(B) (i) To Study and draw the characteristics curve of a given field effect transistor (FET).  
(ii) To design a FET amplifier and to study its gain frequency response.
- 8.(B) To study the gain frequency response of a transistor amplifier with (a) Resistive load, (b) Inductive load, (c) transformer load, and (d) to find its input and output impedance.
- 9.(B) To design and study an R-C phase shift oscillator.
- 10.(B) Study of voltage multiplier circuit and conversion of alternating current into direct current with it.
- 11.(B) Study of OR, AND and NOT logic gates by applying different components and hence their comparison with the gates formed with integrated circuits (IC's).
- 12.(B) (1) To Study the operational amplifier in (a) Inverting mode, and (b) Non inverting mode, (ii) Application of operational amplifier as (a) Adder amplifier, and (b) a Buffer amplifier for unit gain voltage measurement.

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