SECOND YEAR

Course No.	Nomenclature
Course 11	Learning & Teaching
Course 12	Pedagogy of School Subject I
Course 13	Pedagogy of School Subject II
Course 12 & 13	1. Pedagogy of General Science
	2 Pedagogy of Physics

	3. Pedagogy of Chemistry	
	4. Pedagogy of Zoology	
	5. Pedagogy of Botany	
	6. Pedagogy of Mathematics	
Course 14	**Pre-Practice Teaching** **(Internal Assessment)**	
	a) Practicing teaching Skill	
	b) T.L.M. Workshop in each Subject	
	c) Simulated teaching	
Course 15	**Open Air Session / SUPW Camp**	**(Internal Assessment)**
Course 16	**Core Subject***	
	Elementry Computer Application	
	Practical	

Course 17	Physics I
	Physics II
	Physics III
	Physics Practical
Course 18	Chemistry I
	Chemistry II
	Chemistry III
	Chemistry Practical
Course 19	Zoology I
	Zoology II
	Zoology III
	Zoology Practical
Course 20	Botany I
	Botany II
	Botany III
	Botany Practical
Course 21	Mathematics I
	Mathematics II
	Mathematics III

LEARNING AND TEACHING

Objectives:- After completing this course, the student-teachers will be able to :

1. Understand the process of learning and different approaches to the teaching learning process.
2. Apply psychological principles in the teaching learning process.
3. Understand the concept of motivation and strategies to develop motivation and use the motivational devices during teaching learning process.
4. Apply transfer of learning to foster maximum positive transfer.
5. Identify and cater to the educational needs of children with learning difficulties.
6. Develop an understanding of cognitive processes.
7. Understand various factors that influence learning.
8. Understand the concept, principles of teaching and models of teaching.
9. Develop an understanding of various approaches of teaching.
10. Understand the management of teaching.
11. Understand the role of professional organizations in professional development of teachers.

COURSE CONTENT

UNIT-I Learning and Motivation

1. Learning- Concept and Factors Affecting Learning.
2. (a) Approaches to Learning:
   Cognitive : Gestalt (Werthimier, Kofka, Kohler)
   Behaviorist : (Pavlov, Thorndike, Skinner)
   Social Cognitive: Bandura
   (b) Relevance and the applications of the above approaches to learning.
3. Transfer of Learning – Meaning, Types of Transfer and Teaching for Transfer.
4. Motivation– Concept and Significance, Types of Motivation (Intrinsic and Extrinsic), Maslow's Hierarchy of Needs and Motivational Devices for Classroom Teaching.

UNIT- II Individual Differences and Cognitive Processes

1. Individual differences – Nature, Types, Causes, Accommodating individual differences in classroom.
2. Understanding differences based on cognitive abilities in children with learning difficulties (for instance, slow learner, dyslexic).
3. Cognitive Processes-Sensation, Perception, Attention, Memory, Concept formation and Problem Solving in Learning.

UNIT- III Teaching and Teaching Process

1. Teaching:

1. Concept and Nature of Teaching.
2. Relationship between Teaching and Learning.
3. Principles of Teaching.
4. Levels and phases of teaching.
5. Components of Teaching: Teacher, Student, Teaching-Learning material and Classroom climate.
6. Interrelatedness of objectives, teaching learning experiences and evaluations.
7. Content analysis and Task analysis.

2. Teaching Process:

1. Teaching Technology: Concept, Assumptions, Characteristics and Components – Planning, Organisation and Evaluation.
2. Approaches to teaching- Participatory, Child Centered, Constructivist and Investigatory – Their meaning, characteristics and use in teaching.
3. Criterion of effective teaching, Methods of assessment of teaching (Classroom observation, Peer assessment, Self reporting and Evaluation by a supervisor).
4. Teacher behaviour during Teaching: Flander's Interaction Analysis System.

UNIT- IV Models of Teaching
1. Concept of models of teaching.
2. Elements of Models of Teaching.
3. Families of Models of Teaching.
4. Types of Models of Teaching - Richard Suchman's Inquiry Training Model, Glaser's Basic Teaching Model, Information Processing Model and Concept Attainment Model

UNIT-V Teaching as a Profession
1. Definition and characteristics of a profession.
2. Teaching as a Profession: why and how.
3. Professional Ethics for Teachers.
4. Strengthening Teaching Profession
a) Role of Teachers Organizations at state and national level.
b) Role of Educational Organizations in the professional development of teachers (UGC, NCTE, NCERT, Universities and SIERT)
c) Role of Teacher Education Institution in the professional development of teachers.
d) Role of School and Community in enriching Teaching Profession
5. Balancing personal aspirations and professional obligations by teachers.

SESSIONAL WORK
The student teachers shall undertake any two of the following activities (one from each

section)

I –Section-A
1. Preparing a teaching plan based on constructivist approach / child centered approach / activity based learning.
2. Case study of a child with learning difficulties.
3. A comparative study of learning of children belonging to different socio-cultural background.

II-Section-B:
1. Study and report on pressures on school teachers.
2. Observation of one student-teacher's behavior during one teaching period (using Flander's Interaction Analysis System).
3. Collection of few success stories of teachers.
4. A case study of a professional organisation of teachers.

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Course 12&13 - PEDAGOGY OF GENERAL SCIENCE

Objectives:-After completion of the course the student teachers will be able to :-

1. Develop understanding of the nature of science.

2. Develop understanding of the concept of General Science, its importance and its correlation with other subjects.

3. Appreciate the contribution of Indian and foreign scientists in development of Science.

4. Develop scientific attitude and scientific creativity among students.

5. Develop an understanding of aims and objectives of General Science.

6. Develop an ability of preparing annual plan, unit plan and daily teaching plan.

7. Develop ability to use various methods and approaches of teaching General Science.

8. Develop an ability to construct an achievement test

9. Use continuous and comprehensive evaluation.

COURSE CONTENT

UNIT – I Nature of Discipline

1. Science as a domain of enquiry and characteristics of a scientific enquiry Observation, steps in

scientific method.

2. Science as a dynamic body of knowledge

3. Values developed through Science

4. Contributions of Eminent Indian and western Scientists. – Jagdish Chandra Bose, Dr. Hargobind Khorana, Birbal Sahani, Salim Ali, Darwin, Mendel Watson & Crick and Alfred Nobel,

UNIT –II General Science as a Subject in School Curriculum

1. Place and importance of General Science in school curriculum.

2. Correlation of General Science with other subjects.

3. Changing trends and goals of teaching General Science with references to NCF-2005 (position

paper).

UNIT – III Pedagogy of General Science

1. Aims and objectives of teaching General Science.

2. Writing objectives in behavioral terms.

3. Developing scientific attitude, scientific temper and creativity through teaching of General Science.

4. Content cum Pedagogical analysis of following topics of General Science.

5. Matter in our surrounding; Natural resources; Our environment; Natural disasters

UNIT – IV Planning and Strategies of Teaching-learning General Science-

1. Preparation of annual plan, unit plan and daily teaching plan.

2. Inquiry approach, constructivist approach, investigatory approach, Computer assisted learning,

concept mapping, collaborative learning.

3. Lecture cum demonstration method, Laboratory method, Heuristic method, Project method, problem solving method, Inductive –deductive method, Panel discussion.

UNIT – V Assessment and evaluation in General Science

1. Concept of Evaluation.

2. Types of items.

3. Construction of achievement test.

4. Home assignment – Planning and evaluation.

5. Importance and construction of diagnostic test, remedial program.

6. Concept and advantages of – Continuous and Comprehensive Evaluation (CCE)

PRACTICUM / SESSIONAL WORK

Any two of the following:-

1. Life sketch and contribution of any one prominent biological Scientist.

2. Make a scrap Book on any Environmental issue.

3. Planning, conducting and reporting of an investigatory project.

4. Abstract of two papers related to General Science published in reputed journals

5. Identify the difficulties of students in conducting General Science practical.

6. Identify weak students of General Science and plan a diagnostic and remedial programe for them.

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Course 12&13- PEDAGOGY OF PHYSICS

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

1. Understand the nature of Science as discipline and Physics as a branch of Science

2. Appreciate the contribution of Indian and Foreign Physicists in the development of Physics.

3. Acquire the understanding of the methods and processes of science that lead to exploration, generation and validation of knowledge in science/physics.

4. Appreciate the issues at the interface of science, technology and society

5. Develop the skill of planning teaching learning activities.

6. Develop competencies in

(a) Selection and use of teaching methods, approaches and devices.

(b) Selection, preparation and use of cost effective teaching aids.

(c) Inculcation of scientific attitude, scientific temper and science related values.

7. Understand role and limitations of language in physics

8. Organise interactive child centered teaching learning by understanding of the learner

9. Conduct pedagogical analysis for planning of instruction

10. Prepare teaching plan using process skills.

11. Prepare, administer and analyze achievement tests for evaluation of learning outcomes of Physics

COURSE CONTENT

UNIT -I Nature of Science as Discipline

1. Nature of Science: as a domain of enquiry, as a dynamic and expanding body of knowledge, as a process of constructing knowledge.

2. Pedagogical shift from science as a fixed body of knowledge to process of constructing knowledge.

3. Scientific Literacy as universal goal of science education : meaning, functions

4. Objectives of teaching science as given by AAAS, NCF-2005,NCERT

5. Relationship of Science, Technology and Society

6. Teacher's role in training students in scientific method, critical thinking and developing scientific attitude, scientific temper and using these for solving problems of everyday life, nurturing natural curiosity and creativity in science

7. Application of the knowledge of physics for human welfare

8. Values and ethics of science as discipline

UNIT -II Nature and Objectives of Teaching Learning Physics

1. Nature of Physics as a branch of science

2. Facts, Concepts, Principles, laws and Theories-their characteristics in context of Physics (citing examples for each)

3. Place and importance of Physics in school curriculum

4. Development of Science Process Skills through learning of Physics(Teacher Educator will illustrate each taking examples from specific content of Physics).

5. Interdisciplinary fields of Physics viz. Biophysics, Geophysics, Metro physics, Psychophysics etc.

6. Major milestones in the history of development of physics as a branch of science.

7. Contributions of Eminent Physicists: C.V.Raman,Vikram Sarabhai,Homi Jehangir Bhabha,A.P.J.Abdul Kalam ,Albert Einstein, Issac Newton,Stephen Hawkins

8. impact of physics on modern Indian society with reference to issues related with Environment,

Globalization, Industrialization, Information Technology and Peace

9. Taxonomy of educational objectives: meaning and use of classification, aims and objectives of

teaching physics.

10. Developing Feeling and Values(Affective aspect of science) through teaching of Physics.

UNIT- III Exploring Learner

Motivating learners to bring his/her previous knowledge gained in physics through classroom/environment/parents and peer group; Cultivating in teacher-learner the habit of listening to child; Generating discussion, involving learners in teaching-learning process; Encouraging learners to raise questions, appreciating dialogue amongst peer group; helping learner to develop the attitude of rational problem solver Encouraging learners to collect materials from local resources, and to develop/fabricate suitable activities in Physics (individual or group work)

Children's conceptualization of scientific phenomenon with focus on physics at upper primary and

secondary levels with linkages to primary level

Role of language and its contribution towards expression, articulation and understanding of Physics

UNIT-IV Approaches and Strategies of Learning Physics:

1. Concept approach – meaning of concept, concept formation with reference to J. Bruner and Hilda Taba

2. Process approach – teaching science as a process, scientific method, problem solving method.

3. Cooperative learning approach

4. Activity based approach – investigatory approach, project method, laboratory method

5. Individualized instruction, computer assisted instruction

6. Demonstration-cum-discussion method

7. Presentation (Lecture) method by using advance organizers

8. Constructivist approach Use of different approaches to develop scientific attitude and important values through teaching of Physics

UNIT- V Pedagogical Analysis, Planning for Instruction and evaluation.

1. Pedagogical Analysis:

a) Content Analysis: Identification of units, themes ,concepts ,generalizations ,problems or issues

,knowledge organization in CBSE/RBSE Text books of upper primary and secondary levels. Identification of concepts and teaching points, themes or issues through which scientific attitude or important values can be developed

b) Concept Mapping of the lesson ,unit or theme to be taught

c) Pedagogical Analyses of the following units: Mechanics, Sound, Electricity,Heat and Light with content analyses, expected learning outcomes(Specific Objectives in Behavioral Terms) , Teaching-Learning experiences and activities to be conducted ,evaluation techniques

2. Developing Yearly Plan, Unit Plan and daily teaching Plans on different approaches

3. Evaluation of learning of Physics:

a. Meaning and significance of formative, summative, continuous and comprehensive evaluation.

Continuous assessment - developing learner profiles and portfolios; participatory and peer Assessment

b. Construction of test items of different types to assess factual knowledge ,higher order mental

processes, critical thinking and creativity

c. Preparation of blue print and achievement test, administration and item analysis.

d. Diagnostic testing and remedial teaching in physics.

e. Using assessment feedback to improve teaching of and learning of Physics,

f. analyses of question papers of Physics set by State/CBSE boards

SESSIONAL WORK

Any two of the following:

1.Prepare list of famous Physicists in chronological order from all over the world, starting from Galileo and write major contributions of any one these physicists.

2. Life history and contribution in Physics of one noble prize winner in Physics

3. An essay on impact of Physics on modern Indian society with reference to issues related with

Environment, Globalization, Industrialization, Information Technology and Peace.

4. Report of an experimental project to be completed.

5. Collection of current issues related to science from news papers with comments.

6. Identify weak students in Physics of any one class and prepare a diagnostic test of physics and plan for remedial teaching

7. Construction, administration, scoring and item analyses of examination Paper of Physics set on Board Pattern.

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Course 12 & 13 - PEDAGOGY OF CHEMISTRY

Objectives: After completion of the course the student teacher will be able to-

1. Develop an understanding of the Nature of Science.

2. Develop an understanding of the nature of Chemistry and its correlation with other subjects.

3. Develop scientific attitude and scientific Literacy

4. Develop an understanding of Pedagogy of Chemistry

5. Appreciate recent achievement of chemistry and the contribution of Indian and Foreign Scientists in development of Science.

6. Develop an understanding of aims and objectives of Chemistry teaching.

7. Develop an ability of preparing annuals plan, unit plan and lesson plan.

8. Develop an ability to plan and conduct innovative projects in chemistry.

9. Organize co-curricular activities related to chemistry teaching.

10. Develop an ability to construct and use an achievement test, diagnostic test and remedial measures in Chemistry.

11. Use continuous and comprehensive evaluation.

12. Develop skills related to teaching of chemistry such as Observation, Demonstration, Experimentation, Handling Scientific Apparatuses etc.

13. Use appropriate learning resources.

14. Involve learners in listening, interacting, discussion, dialogue etc.

COURSE CONTENT

UNIT-I Nature of Discipline

1. Nature of Science

2. Developmental perspectives of science.

3. Process skills in Science such as Observation, Demonstration, Experimentation, Handling Scientific Apparatuses etc.

4. Scientific attitude, Scientific Literacy, role of Science in removing ignorance and superstitions.

5. Impact of Science on Society and Vice Versa

6. Contribution of eminent Indian and Foreign Scientific viz Neel Bohr, Marry Curie, C.V. Raman, S.S. Bhatnagar, J.C. Bose, Newton, Einstein, Hargovind Khurana

UNIT-II Chemistry as a Subject in school Curriculum

1. Essential Characteristic of Chemistry as a subject

2. Aims and Objectives of Teaching learning chemistry

3. Importance of Chemistry in School Curriculum

4. Correlation of Chemistry with other subjects

5. Recent Scientific achievements in Chemistry (God Particle Boson, New elements in periodic table. Fuel form Bio-waste, Liquid air as a fuel)

6. Chemistry in daily life.

UNIT-III Pedagogy of Chemistry

1. Content cum Pedagogical analysis of following topics of Chemistry Atomic Structure; Nuclear Chemistry; Chemical Bonding; Periodic Table; Hard and Soft water; Aromatic Compounds

2. Important skills for classroom teaching - Listening the child, bringing previous knowledge gained through parents, peer group in learning process and interaction, Generating discussion, Encouraging questions of students and dialogue amongst peer group.

3. Methods of Teaching Chemistry Lecture cum demonstration method; Inductive – deductive method; Heuristic method; Scientific method; Project method; Computer Aided Instruction; Constructivist approach; Brain storming; llaborative learning

(3) Projects in Chemistry

UNIT- IV Learning Resources

1. Science Lab. – Structure and design of Chemistry laboratory.

2. Low cost apparatus, use of local resources.

3. Alternative resources for challenged learners

4. Teaching – Learning material viz charts, models, flannel board, OHP, Computer, Projector.

UNIT-V Assessment and Evaluation

1. Concept of continuous and comprehensive evaluation, Formative and Summative Evaluation

2. Different types of questions, Blue print and construction of Achievement Test.

3. Diagnostic and Remedial measures

4. Self Evaluation, Peer Group Evaluation and Teacher Evaluation

5. Assessment Indicators of practical examination in Chemistry Such as Handling of Apparatus,

following Systematic Approach, Correct Conclusion, Understanding Cause Effect Relationship of

given Experiment, Viva-Voce and Reporting.

PRACTICUM/SESSIONAL

Any Two from following –

Practicum No. 1 is compulsory for all

1. Preparation of kit for Demonstration of five experiments on any Topic related to chemistry covered in the syllabus of class VI to X.

2. Preparation of a low cost apparatus/Improvised apparatus. (Other than submitted during internship)

3. Analysis of a given Salt – Identifying Acid and Basic Radicals

4. Identification of Protein, Carbohydrate, Fat in a given substance.

5. Identification of Adulteration in some food article such as Ghee, Oil, Milk, Red Chilli powder, Turmeric powder and Pulses etc.

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- *PAPER CODE-9494*

Course 12&13 - PEDAGOGY OF BIOLOGY

Objectives: - After completion of the course the student teachers will be able to:-

1. Develop understanding of the nature of science.

2. Develop understanding of the concept of Biology, its importance and its correlation with other

   subjects.

3. Appreciate the contribution of Indian and foreign Biologists in development of Biology

4. Develop scientific attitude and scientific creativity among students.

5. Develop an understanding of aims and objectives of Biology.

6. Develop an ability of preparing annual plan, unit plan and daily teaching plan.

7. Develop ability to use various methods and approaches of teaching Biology.

8. Develop an ability to construct an achievement test

9. Use continuous and comprehensive evaluation.

COURSE CONTENT

UNIT – I Nature of Discipline

1. Science as a domain of enquiry and characteristics of a scientific enquiry. Observation, steps

   in scientific method.

2. Science as a dynamic body of knowledge

3. Values developed through Science

4. Contributions of Eminent Indian and western Biologists. – Jagdish Chandra Bose, Dr. Hargobind Khorana, Birbal Sahani, Salim Ali, Darwin, Mendel and Watson & Crick.

UNIT –II Biology as a Subject in School Curriculum

1. Place and importance of Biology in school curriculum.

2. Correlation of Biology with other subjects.

3. Changing trends and goals of teaching Biology with references to NCF-2005 (position paper).

UNIT – III Pedagogy of Biology

1. Aims and objectives of teaching Biology.

2. Writing objectives in behavioural terms.

3. Developing scientific attitude, scientific temper and creativity through teaching of Biology.

4. Content cum Pedagogical analysis of following topics of Biology.

        a) Diversity of living organism

        b) Biological Classification

        c) Genetics and Evolution

        d) Ecology and Environment

UNIT – IV Planning and Strategies of teaching-learning Biology-

1. Preparation of annual plan, unit plan and daily teaching plan.

2. Inquiry approach, constructivist approach, investigatory approach, Computer assisted learning,

  concept mapping, collaborative learning.

3. Lecture cum demonstration method, Laboratory method, Heuristic method, Project method, problem solving method, Inductive –deductive method, Panel discussion.

UNIT –V Assessment and evaluation in Biology

1. Concept of Evaluation.

2. Types of items.

3. Construction of achievement test.

4. Home assignment – Planning and evaluation.

5. Importance and construction of diagnostic test, remedial program.

6. Concept and advantages of – Continuous and Comprehensive Evaluation (CCE)

PRACTICUM / SESSIONAL WORK

Any two of the following:-

1. Life sketch and contribution of any one prominent biological Scientist.

2. Make a scrap Book on any Environmental issue.

3. Planning, conducting and reporting of an investigatory project.

4. Abstract of two papers related to Biology published in reputed journals

5. Identify the difficulties of students in conducting biology practical's.

6. Identify weak students of biology and plan a diagnostic and remedial programme for them.

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Paper code - 9495

Course 12 & 13 - PEDAGOGY OF MATHEMATICS

Objectives: After completion of course the students will be able to-

1. Gain insight into the meaning, nature, scope and objectives of mathematics education.

2. Appreciate mathematics as a tool to engage the mind of every student.

3. Understand the process of developing the concepts related to Mathematics.

4. Appreciate the role of mathematics in day to day life.

5. Learn important mathematics: mathematics more than formulas and mechanical procedures.

6. Pose and solve meaningful problems.

7. Construct approriate assessment tools for evaluating mathematics learning.

8. Understand methods and techniques of teaching mathematics.

9. Perform pedagogical analysis of various Topics in mathematics at secondary level.

10. Understand and use I.C.T. in teaching of mathematics.

11. Understand and use continuous and comprehensive evaluation, diagnostic testing and remedial teaching in Mathematics.

COURSE CONTENTS

UNIT-I Nature of Mathematics as a Discipline

1. A Mathematics is not merely subject of computations skill , it is much more, it has a logical structure.

2. Nature of mathematics- building blocks of mathematics (Concept, objectives, variables, function & relation, symbolization)

3. Important processes of mathematics-estimation , approximation, understanding or visualizing pattern representation, reasoning & proof, making connections, mathematical communication.

4. Historical development of mathematics as a discipline Contribution of western and Indian mathematicians like Ramanujan, Aryabhatt, Bhaskarcharya, Pythogorous and Euclid.

5. Constructivist approach in learning mathematics.

UNIT-II Mathematics as a School Subject

1. Importance of mathematics in school curriculum.

2. Aims and objectives of Teaching mathematics at secondary level. writing objectives in behavioural terms. Bloom's taxonomy (revised)

3. Correlation of mathematics with other school subjects.

4. Changing trends and goals of teaching mathematics with reference to NCF 2005

5. Concept mapping of themes related to mathematics.

UNIT-III Methodology of Teaching and Learning of Mathematics

1. Nature of concept, concept formation and concept assimilation.

2. Methods of teaching mathematics at secondary level

a. Lecture cum demonstration

b. Inductive-Deductive

c. Problem Solving

d. Project

e. Heuristic

f. Analytic & Synthetic

3. Techniques of teaching mathematics

a. Oral work

b. Written work

c. Drill work

d. Home assignment

UNIT-IV Pedagogical analysis and mode of learning engagement

1. Pedagogical analysis of the units with reference to concepts, learning outcomes, activities and

learning experiences and evaluation techniques of following content at secondary level

a. Number system

b. Measures of central tendency

c. congruency and similarity

d. Trigonometrical ratios and identities

e. Area and Volume

f. Profit, loss and partnership

g. Compound interest

h. Graphical representation of data

2. Modes of learning engagement in mathematics

a. Providing opportunities for group activities

b. Group/ Individual Presentation

c. Providing opportunities for sharing ideas

d. Designing different Working Models for concept formation

e. Teaching aids and activities in laboratory work

f. Reflective written assignments

UNIT-V Assessment & Evaluation of Mathematics learning

1. Assessment of critical thinking, logical reasoning and to discourage mechanical manipulation and rote learning

a. Planning of evaluation in mathematics

b. Formative, Summative and predictive evaluation in mathematics

c. continuous and compressive evaluation (CCE) in mathematics at secondary level

d. Diagnostic Testing, Remedial Teaching and enrichment programme for:

1. Gifted Learners

2. Slow Learners

3. Learners with Dyslaxcia

4. Difficulties Faced by the Teacher in Teaching of Mathematics and Suggestive Measures to overcome them.

2. Construction of achievement test/ question paper in mathematics

SESSIONALS /PRACTICUM

Any two of the following:

1. Preparing a Diagnostic or Achievement Test.

2. Preparing one innovative lesson plan.

3. Conduct at least one Experiment on any topic of mathematics.

4. Prepare Instructional Material for teaching one topic in Mathematics.

5. A term paper on a brief History of one mathematician.

6. Preparing a working model.

7. A project report on any project related to mathematics.

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66. Position Paper of NFG on Education and Peacs-2005, NCERT

Journals:

1. Teaching Children Mathematics(TCM), NCTM, USA

2. Mathematics Teaching in the Middle School(MTMS), NCTM, USA

3. Journal of Mathematics Teacher Education, Springer Netherlands

Web Links:

1. Mathematics Thinking and Learning. Philadelphia, USA

2. http://WWW. mathforum.org/dr.math

3. http://WWW. sakshat.ac.in

4. http://web.utk.edu

5. http://www.confluence.org

6. http://www.nationalmathtrail.org

7. http://www.qsh.org/lists/hilites.html

8. http://www.kn.pacbell.com./wired/bluewebn

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10. http://www.education-world.com

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Paper code -9484

Couse 14 : INTERNAL EVALUATION

[II YEAR]

Pre Practice Teaching

S. No.	Activity	Marks
1.	Practising Taeching Skill(Minimum 05)	20
2.	T.L.M. Workshop in Each Subject(5+5)	10
3.	Simulated Teaching (5 Lesson in each subject) (5+5)	10
4.	Blue Print & Test Preparation in Both Subject (5+5)	10
	Total Marks	**50**

Course 9- OPEN AIR SESSION / SUPW CAMP

Every college will organize 5 days camp in the first year of B.Ed. Course. Participation in such camp will

be compulsory for all students.

Performance of students will be evaluated internally.

Objectives of the camp will be as follows:-

1. To develop understanding about local environment and Community for connecting classroom teaching with outside world.
2. To develop sensitivity towards self, society and environment.
3. To develop feeling of togetherness and working collaboratively.
4. To develop organizational skills and leadership abilities.
5. To develop skill of conducting surveys.
6. To develop an understanding about sustainable future.
7. To develop dignity of labour through community service.

Suggested activities for Open Air Session/SUPW Camp

1. Study of the local environment/ socio cultural issues through survey.
2. Community awareness performance – cleanliness campaigns, plantation, value education, etc.
3. Participation in Health and Spiritual activities like morning Assembly, Yoga, P.T., Meditation, Silence hour.
4. Participation in Aesthetic and recreational activities.
5. Documentation and organization of exhibition for local community.
6. Productive and creative craft activities.

Note : Student teachers will participate in the above mentioned activities in collaborative manner (to develop the feeling of working and living together)

Guideline for assessment Max Marks 50

S. No.	Activity	Marks
1.	Participation in preparation of Camp	5
2.	Presentation of report of survey/ creative work	20
3.	Participation in Community Awareness Programme	15
4.	Participation in organizational process/community living/cultural and aesthetic activities	10
	Total Marks	50

PAPER CODE-9603

SYLLABUS
Elementary Computer applications

Common for Arts, Science & Commerce Faculties

1. **Information concepts and processing:**

    Definition of information, need quality and value of information, categories of information in business organisation level of information, storage and retrieval of data, comparison of manual and electronic storage of data, organisation of data as files ,data processing in govt. ,large business, multinational and private organisation.

2. **Elements of Computer Inter Processing System:**
   The electronic digital computer, the number systems (binary, digital, octal and hexadecimal and their conversions),character code(ASCII and EBCDIC),concept of hardware and software, the architecture of a computer system, CPU, memory and input/output devices, magnetic storage devices, optical device, printers and monitors, categories of software, system software, application software, packages.

3. Classification of Computers and Generation of Computers, parallel processing and component, RISC and CISC machines, development of Intel family processors.

4. **Operating System Concept:**
   The need of an OS(operating system),OS as resource processor and memory Manager, the various types of operating system, MS-DOS,WINDOWS 95/98,WINDOWS 2000,UNIX operating system.

5. **Computer and Communication:**
   Need for data transmission over distances, communication channels: twisted pair coaxial cable, microwave, radio wave, optical fiber and satellite: digital and analog transmission, 15 serial and parallel data transmission, Moderns, Networking of computers, LAN, WAN concepts.

6. **Programming Language:**
   Machine, Assembly and high level language, generation of language, 3 GL and 4 GL language, and graphics User Interfaces.

7. **Personal Computer Software**:
   Word processing packages, Spreadsheet Packages and Database Management Packages, Desktop Publishing, Computer Animation Packages introduction to MS-Office.

8. **Internet Technology:**
   Concept and how it wok, Email service, Internet Surfing, browsers and search engines, World Wide Web, Web Programming, HTML and JAVA Programming Concepts.

9. **E-Commerce:**

What is e-commerce and growth of e-commerce electronic payment systems security considerations, digital currencies, Credit cards, Cybercast, E-cash, smart card, supply chain management.

10. Benefits of electronic forms of data processing and management in education, commerce public delivery systems banking and other financial transactions, new developments in these areas.

Laboratory:

The laboratory exercise will be designed to help in the understanding of the concepts of computer and the utilization in the areas outlined in the theory syllabus. The emphasis should be on practical uses rather than on theoretical concepts only.

PHYSICS

COURSE CURRICULAM

- Paper Nomenclature		Lectures	Duration Of Exam	Max. marks	Min. marks
I	Kinetic Theory, Thermodynamics and Statistical Physics	60 hrs	3hrs	50	18
I I	Optics	60 hrs	3 hrs	50	18
III	Electronics	60 hrs	3 hrs	50	18
IV	Practical	120 hrs	6 hrs	50	27

Each theory paper in the annual examination shall have three sections.

Section A shall contain one compulsory question of 5 marks having 10 parts. Two parts shall be set from each unit. The candidate is required to answer each part in about 20 words.

Section B shall contain five compulsory questions of 5 marks each with internal choice .One question with internal choice will be set from each unit .The answer may be given in approximately 250 words.

Section C shall contain four descriptive questions covering all units and candidate has to answer any two questions of ten marks each. The answer may be given in approximately 500 words. There can be two parts in a question from this section.

In total the candidate has to answer eight questions in each theory paper.

SECOND YEAR T.D.C. SCIENCE

PAPER-I

KINETIC THEORY, THERMODYNAMICS AND

STATISTICAL PHYSICS

UNIT – I

Ideal Gas: Kinetic Model, Deduction of Boyle's law, Review of the kinetic model of an ideal gas, Interpre-tation of temperature, Brownian motion, Estimate of the Avogadro number, Equipartition of energy, specific heat of monatomic gas, extension to di and triatomic gases, Behaviour at low temperatures, Adiabatic expansion of an ideal gas. Application to atmospheric physics (derivation of barometric equation)

Real Gas: Van der Waals model; equation of state, nature of Van der Waals forces, comparison with experimental P-V curves. The critical constants, gas and vapour. Joule-Thomson expansion of an Ideal gas and Van der Waals gas; Constancy of U+pV, Joule coefficients, Estimates of J-T cooling, adiabatic expansion of an ideal gas.

Liquification of gases : Joule Expansion, Joule-Thomson and adiabatic cooling, Boyle temperature and inversion temperature, principles of regenerative cooling and cascade cooling, Liquification of hydrogen and helium, meaning of efficiency.

UNIT - II

Transport phenomena in gases: Molecular collisions, mean free path and collision cross-sections, Estimates of molecular diameter and mean free path, Experi-mental determination of mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.

Maxwellian distribution of speeds in gas: Derivation of distribution of speeds and velocities, experimental verification, distinction between mean, rms and the most probable speed values. Doppler broadening of spectral lines.

UNIT - III

The laws of thermodynamics: The Zeroth law, Various indicator diagrams, work done by and on the system, First law of thermodynamics, internal energy as a state function. Carnot cycle and its efficiency, Carnot theorem and the second law of thermo-dynamics, Different versions of the second law, Reversible and irreversible changes. Practical cycles used in internal combustion engines. Entropy, principle of increase of entropy. Thermodynamic scale of temperature; its identity with the perfect gas scale. Impossibility of attaining absolute zero; third law of thermodynamics.

Thermodynamic relationships: Thermodynamic variables; extensive and intensive, Maxwell's general relationships; applications to J-T cooling and adiabatic cooling in a general system, Van der Waals gas, and the Clausius-Clapeyron heat equation.

Thermodynamic Potentials: Relation to the thermo-dynamic variables, Equilibrium of thermodynamic systems, Cooling due to adiabatic demagnetization.

Statistical basis of the thermodynamics:

Probability and thermodynamic probability, principle of equal a *priori* probabilities, probability distribution and its narrowing with the increasing n, average properties, Accessible and inaccessible states, distri-bution of particles with a given total energy into a discrete set of energy states.

Phase space representation: The mu space; its division into sheets of energy, phase cells of arbitrary size, one-dimensional oscillator, free particles, the functions F(E) and W(E), definition of probability.

Black Body Radiation: Spectral distribution of BB radiation; pure temperature dependence, Stefan-Boltzmann law, Wien's displacement law, Rayleigh-Jeans law and the ultraviolet catastrophy, Pressure of radiation, Planck's hypothesis, mean energy of an oscillator and the Planck's law, complete fit with the experiment. Interpretation of specific heats of gases at low temperature.

UNIT-V

The bridge of Statistical physics with thermo-dynamics: Thermal equilibrium between two subsystems, beta parameter and its identity with $(kT)^{-1}$, probability and entropy, Boltzmann entropy relation, statistical interpretation of the second law of thermo-dynamics. Boltzmann canonical distribution law; rigorous form of equipartition of energy.

Transition to quantum statistics: 'h' as a natural constant and its implications, cases of particles in a box and simple harmonic oscillator, Setting phase-cell size as nature's constant (Planck's constant h); quantization of energy. 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.

Text and Reference Books :

1. B.B. Laud, "Introduction to Statistical Mechanics" (Macmillan 1981)
2. F. Reif, "Statistical Physics" (McGraw-Hill, 1988)
3. K. Huang, "Statistical Physics" (Wiley Eastern, 1988)

PAPER CODE-9442

PAPER-II

OPTICS

UNIT-I

Format's Principle : Principle of experiments path, the aplantic points of a sphere and other applications.

General theory of image formation : Cardinal points of an system; general relationship; thick lenses and lens combinations, telephoto lenses.

Aberration in images : Chromatic aberration ; achro-matic combination of lenses in contact and separated lenses. Monochromatic aberrations and their redu-ction; spherical mirrors and schmidt corrector plates; oil immersion objective, meniscus lenses.

Optical instruments : Entrance and exit pupils, need for a multiple lens eye pieces. Common type eye pieces.

UNIT – II

Interference of Light: The principle of superposition ; two slit interference, coherence requirement for the sources, localized fringes in this films, transition from fringes of equal thickness to those of equal inclination, Newton's rings, Michelson interferrometer its uses for determination of wavelength, wavelength difference and standari-zation of meter. Intensity distribution in multiple beam interference, Febry-Perot interferrometer and etalon. Lummer Gehrke plate, Lloyds mirror.

UNIT – III

Diffraction of light

Fresnel diffraction : Half period zones, circular aper-ture and obstacles; straight edge, explanation of recti-linear propagation, Zone plate with multi focii

Fraunhofer diffraction : Diffraction at a slit, a circular aperture and a circular disc, resolution of images; Rayleigh criterion. Resolving power of a telescope and microscope, outline of phase contrast microscopy.

Diffraction grating : Diffraction at N parallel slits, plane diffraction grating, concave grating resolving power of grating and prisms.

UNIT – IV

Polarization of light

Double refraction and optical rotations : Double refra-ction in uniaxial crystals, explanation interms of electromagneties theory, Malus Law, Phase retarda-tion plates, rotation of plane of polarization, origin of optical rotation in liquids and in crystals. Babinet Compen-sator, Polarimters and their applications in measure-ment of specific rotation.

Dispersion and Scattering : Theory of dispersion of light, absorption band and anomalous dispersion theory of Rayleigh Scattering.

UNIT - V

LASER

Laser System : Purity of spectral line; Coherence length and coherence time, spatial coherence of a source; Einstein's A and B coefficients; Coherence of induced emissions, conditions for laser action, exis-tance of a metastable state, population inversion by pumping and cavity. He-Ne and Ruby Laser

Application of lasers : Spatial coherence and direction-ality, estimates of Laser and non linear optics : Polari-zation P including higher order terms in E and gene-ration of harmonics. Momentum mismatch and choice of right crystal and direction for compensation.

Recommended Books

1. Principle of Optics : B. K. Mathur (IIIrd edition)
2. Text book of Optics : Subrahmanyam and Brijlal (S.Chand and Co.)
3. Optics : Jankins and White (McGraw Hill)
4. Text book of Optics : D. P. Khandelwal
5. Universities Optics Vol. I & II : Whittkar and Yarwood
6. Optics : Ajay Ghatak (Tata McGraw Hill)

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PAPER CODE-9443

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PAPER-III

ELECTRONICS

UNIT-I

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Basic circuit analysis:

Voltage and current sources, Open and Short Circuits, Kirchoff's laws, Voltage and current divider rules, Mesh and node analysis, Principle of superposition, Thevenin's and Norton's theorem, Maximum Power transfer theorem.

Semiconductor diodes:

p-n junction diodes, I-V characteristics, diode as a rectifier, half wave, full wave and bridge rectifiers, clippers and clampers, Zener, varactor diode and their applications, Optoelctronic diodes: LED and Photo-diodes.

Bipolar Junction Transistors (BJT) :

Basic construction of pnp and npn transistors and their operation, Input and output characteristics of CB, CE and CC configurations, Biasing methods, active, saturation and cutoff regions, load line concepts, Graphical analysis of CE configuration and phase relationship.

Field effect transistors:

Basic constructions of JFET and MOSFET, Drain characteristics of JFET, biasing of JFET, operating regions, pinch-off voltage.

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UNIT-II

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Small signal amplifiers:

General amplifier characteristics, Two port analysis of a transistor, definition of h- parameters, current gain, voltage gain and power gain of an amplifier, Input and output resistances, Analysis of CB, CE and CC amplifiers for current gain, voltage gain, input and output impedences using h – parameters, Decibel power, Classifications of amplifiers, class A, B, AB and C amplifiers (graphical treatment only), RC coupled transistor amplifier, Gain frequency response, and high frequency limitations. Transformer coupled amplifer.

UNIT III

Feed back amplifiers:

Basics of Negative feedback, Merits and demerits of negative feedback and its applications, Voltage series amplifier (Emitter follower) and Current series amplifier (CE amplifier with and without bypass capacitor).

Oscillators:

Positive feedback, Barkhausen criterion, Phase shift oscillator, Colpitt's and Hartley oscillators, and Crystal oscillator.

Operational Amplifiers:

Characteristics of Operational amplifiers, circuit symbols, ideal and practical op-amp, Inverting and noninverting configurations, Applications of OP-AMP as an adder, subtractor, inverter, scale changer, phase shifter, differentiator and integrator.

UNIT-IV

Digital Electronics:

Binary, Octal, decimal and hexadecimal numbers and their inter conversions, 1's and 2's compliments of binary numbers, addition and subtraction of binary numbers, OR, AND, NOT, NAND, NOR and XOR gates and their symbols and truth tables, Boolean algebra, DeMorgan's theorem, minterms and maxterms, sum of minterms and product of maxterms forms of Boolean functions, simplifications of Boolean function using Karnaugh's map (up to 4-variables).

UNIT-V

Modulation:

Basics of modulation, amplitude and frequency modu-lation, sidebands, Comparison between AM and FM, power of amplitude modulation and spectrum, AM and FM transmitters (Block diagram and principle of operation only).

Demodulation:

Demodulation of AM and FM waves, linear envelope detector, Hetrodyne and superhetrodyne receiver (Block diagram and principle of operation only).

Cathode Ray Oscilloscope:

Cathode ray tube-theory and construction, Cathode Ray Oscilloscope (Block diagram and operation), Appli-cation of CRO, wave form display, frequency, phase and amplitude determination, Lissajous figures.

Recommended Books:

1. Electronic Devices and Circuit theory by R. Boylestead and L. Nashelsky (Prentice Hall of India).
2. Foundations of Electronics by D. Chattopadhyaya, P.C. Rakshit, B. Saha and N.N. Purkait (New Age International (P) Limited Publishers).
3. Electronic Devices by Allan Mottershed (Prentice Hall of India).

4. Digital fundamentals by Thomas L Floyd (Unuited Book Stall, New Delhi).
5. Electronic fundamentals and applications by John D. Ryder (Prentice Hall of India).
6. Electricity and Magnetism by K.K. Tewari (S. Chand & Company Limited).

PAPER CODE-9444

PAPER-IV

PHYSICS PRACTICAL

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

(i) Two experiments   48 Marks

For each experiment, distribution of marks will be as follows:

Figure :	3
Formula/Theory :	3
Observation :	10
Calculation and Result :	6
Precautions :	2
(ii) Viva voce	12
(iii) Records	15
Total	**75 Marks**

MAX. MARKS :75

Students are expected to perform sixteen experiments in all taking eight from each section.. One experiment from Section A and one from Section B shall be set in the examination paper.

LIST OF EXPERIMENTS

Section-A

1. Determination of the size of the Lycopodium grains using Cornu's method.
2. Determination of wavelength of Mercury light using grating
3. Determination of resolving power of grating
4. Determination of dispersive power of the glass prism
5. Determination of wavelength of sodium light using Fresenel's biprism
6. Determination of wavelength of sodium light using Newton's rings
7. Determination of specific rotation of cane sugar solution using polarimeter.
8. Determination of wavelength of ultra sonic wave.
9. Determination of focal length of a high power microscope objective.
10. Measurement of absorption by a solution.
11. Study of aberrations of a thick lens.
12. Study of interference fringes in thin films of the following (not all)
(a) Thermal expansion of a crystal using interference fringes.

(b) Bending of a glass plate under load.

(c) Bending of a rod under load.

(d) Use of Newton's ring to determine the radii of curvature of surfaces.

(e) Use of fringes in wedge film .

13. Resolving limit of the eye and of a telescope with a variable aperture.

14. Fresnel diffraction at a straight edge and a slit.

15. Fraunhoffer diffraction at a single slit.

16. Resolving limits of grating and prism.

17. Study of polarization of the light by simple refle-ction.

18. Verification of Cauchy's relation using Prism and Gratting.

Section-B

1. To draw characteristic curves of Common emitter transistor and calculate its hybrid parameters.

2. To study gain and frequency response of a single stage Common emitter amplifier.

3. To determine varactor diode characteristics.

4. To draw characteristics of Zener diode and calcu-late voltage regulation factor.

5. To study ripple factor and internal resistance of a solid state power supply using LR,CR and Pi filter using a CRO

6. To find barrier height of a given solid state diode.

7. Use of p-n junction for the measurement of temperature.

8. Design and construction of phase shift oscillator.

9. Design, build and test of a lograithimic amplifier.

10. Study of a function generator using Operational Amplifier.

11. Study of NAND and NOR circuits (discrete and IC) XOR and De Morgans Theorem.

12 Study of multiplixures and demultiplexures.

13 Study of half adder and full adder circuit.

14. Study RS, D and JK flip - flops.

15. Study of Modulo- 3 , Modulo-5 and Modulo-7 binary counter circuits.

16. Study of characteristics of a thermistor.

17. Determination of solar constant or temperature of an oven through radiation measurement.

18. Resistance thermometry: temperature of a torch bulb filaments from R value, platinum resistance thermometry.

PAPER CODE-9445

SECOND YEAR B.Sc CHEMISTRY 2017-18
Effective from session 2016-17

The examination shall consist of three theory papers and one practical.

Paper & Course	Hrs/Week	M. Marks
Paper - I Inorganic Chemistry	2	50
Paper - II Organic Chemistry	2	50
Paper - III Physical Chemistry	2	50
Practical	4	50

PAPER I : INORGANIC CHEMISTRY

UNIT I

Chemistry of Elements of First Transition Series : Characteristic properties of d-block elements (colour variable valency, magnetic and catalytic properties and ability to form complexes). Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

Chemistry of Elements of Second and Third Transition Series : General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii oxidation states, magnetic behaviour, spectral properties and stereochemistry.

UNIT II

Oxidation and 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.

Coordination Compounds : Werner's coordination theory and its experimental verification, effective atomic number concept, nomenclature of coordination compounds, isomerism in coordination compounds valence bond theory of transition metal complexes, chelate and chelate effects.

UNIT III

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

Chemistry of Actinides : General feature and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and the later lanthanides.

UNIT IV

Gravimetric Analysis : Principles, solubility, formation and preparation of precipitation, colloidal properties, ageing and contamination of the precipitates, co-precipitation and post-precipitation.

Simple Organic Reagents used in Inorganic Analysis : 8-Hydroxyquinoline, Dimethylglyoxime, α-nitroso-β-naphthol, Anthranilic acid, Arsenic acid, Cupron and Cupferron.

UNIT V

Chromatography : Basic principles, instrumentation and application of adsorption and partition chromatography, ion exchange separation.

Errors in Quantitative Analysis : Accuracy and precision, determinate, indeterminate and accidental errors, precision of a single measurement, precision of mean rejection of result, errors in a derived result methods of checking the accuracy of analysis, significant figures, computation values.

BOOKS RECOMMENDED

1. Text Book of Quantitative Inorganic Analysis : A.I. Vogel (Chapter I, II and XXIII).
2. Text Book of Quantitative Inorganic Analysis : I.M. Kolthoff and E.R. Sandell.
3. Concise Inorganic Chemistry : J.D. Lee.
4. General Inorganic Chemistry : J.A. Duffy.
5. Principle of Inorganic Chemistry : B.R. Puri and L.R. Sharma.
6. Basic Inorganic Chemistry : Cotton and Wilkinson and Gaus. Willey.
7. Inorganic Chemistry (Hindi ed.) : Suresh Ameta, A. Sharma and M. Metha, Himanshu Pub.

PAPER II : ORGANIC CHEMISTRY

Time : 3 Hrs.   **M.M. 50**

UNIT I

Alcohols and Epoxides :

Unsaturated alcohols - Vinyl and Allyl alcohol.

Dihydric alcohol - Nomenclature, method of formation and chemical reactions of vicinal glycols.

Pinacol - Pinacolone rearrangement.

Trihydric alcohols - Formation and chemical reactions of glycerol.

Epoxides - Synthesis and reactions of epoxides, orientation of epoxide ring opening.

Phenols - Nomenclature, structure and bonding preparation of phenols, physical properties and acidic character, comparative acidic strength of alcohols and phenols, resonance stabilization of phenoxide ion.

Reactions of phenols - Electrophillic aromatic substitution, acylation and carboxylation, Mechanism of Fries rearrangement, Clasien rearrangement, Gatterman synthesis. Hauben=Hoesch reaction, Ledgerer Manasse reaction and Reimder-Tiemann reaction.

UNIT II

Aldehydes and Ketones : Synthesis, chemical and physical properties of aromatic aldehydes and ketones, mechanism of nucleophilic addition to carbonyl group with particular emphasis on Benzoin, Aldol, Perkin and Knoevenagel condensations, condensation with ammonia and its derivatives, Witting reation, Mannich reaction.

Use of acetals as protecting group, Oxidation of aldehydes, Baeyer, Villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmenson, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions, Halogenation of enolizable ketones.

UNIT III

Carboxylic Acids and their derivatives : Nomenclature, structure and bonding, acidity of carboxylic acids, effects of substituents on acid strength, mechanism of decarboxylation, Methods of formation, physical properties and chemical reactions of dicarboxylic acids, oxalic, succinic and phthalic acid.

Substituted Acids - Methods of formation and chemical reactions of halo acids, hydroxy acids, malic, tartaric, citric and salicyclic acids.

Unsaturated Acids - Acrylic and cinnamic acids.

Introduction to acids derivatives - Preparation, properties and uses of acid halides, amides, anhydrides and esters. Interconversion of acid derivatives by nucleophilic acyl substitution. Mechanism of HVZ reaction, Hofmann - bromamide reaction and ester hydrolysis.

UNIT IV

Organic Compounds of Nitrogen : Preparation and chemical reactions of nitroarenes. Reactivity of nitro substituted arenes.

Aromatic amines, classification, preparation, properties and uses of primary amino compounds aniline, acetanilide, nitroanilines.

Secondary amino compounds - diphenylamine and N-methylaniline.

Tertiary amino compounds - Triphenylamine and N,N-dimethylaniline.

Aryl alkyl amine - Benzylamine.

Basic strength of amines - similarities and differences between aliphatic and aromatic amines.

Diazonium salt - formation, properties and synthetic uses of benzene diazonium salt, Diazo coupling and its mechanism.

Organic Sulphur Compounds : Preparation and properties of thiols, sulphonic acid, sulphonyl chloride, saccharides, chloramine -T. dichloramine-T and sulphonamides.

UNIT V

Polynuclear Hydrocarbons : Nomenclature of naphthalene and anthracene derivatives, preparation and properties of napthalene, anthracene, naphthol, naphthylamine, naphthaquinone and anthraquinone.

Mechanism and orientation of electrophilic substitution reaction in naphthalene and naphthalene and anthracene.

Organic Compounds : Preparation, properties and synthetic uses of organo lithium and organo zinc compounds.

BOOKS RECOMMENDED

1. A Text Book of Organic Chemistry : K.S. Tiwari, S.N. Mehrotra and N.K. Vishnoi.
2. Modern Principles of Organic Chemistry : M.K. Jain and S.C. Sharma
3. A Text Book of Organic Chemistry : (Vol. I and II), O.P. Agarwal.
4. A Text Book of Organic Chemistry : B.S. Bahl and Arun Bahl.
5. A Text Book of Organic Chemistry : P.L. Soni.
6. Organic Chemistry : (Vol. I, II and III), S.M. Mukherji, S.P. Singh and R.P. Kapoor
7. Organic Chemistry (Hindi Ed.) : Suresh Ameta, P.B. Punjabi and B.K. Sharma, Himanshu Pub.

PAPER CODE-9447

PAPER III : PHYSICAL CHEMISTRY

UNIT I

Thermodynamics-I : Definition of thermodynamic terms system, surrounding, etc. types of systems, intensive and extensive properties, state and path functions, their differentials, thermodynamics 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 and dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

Thermo chemistry : Standard state, standard enthalpy of formation. Hess's law of heat summation and its applications, Heat of reaction at constant pressure and at constant volume, Enthalpy of neutralization, bond dissociation energy and its calculation from thermo chemical data, temperature dependence of enthalpy, Kirchhoff's equation.

UNIT II

Thermodynamics - II : Second law of thermodynamics : need for the law, different statements of the law, Carnot cycle and its efficiency, Carnot theory, thermodynamic scale of temperature.

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

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

Chemical Equilibrium : Equilibrium constant and free energy, thermodynamic derivation of law of mass action, distribution law and phase rule, Le Chatelier's principle, Nernst's distribution law for solute, principle of extraction of solute from solution and washing of precipitates.

Reaction isotherm and reaction isochore - Clapeyron equation and Clausius - Clapeyron equation, applications, partial molar quantities, partial molar volume and its distribution, chemical potential and its physical significance, Gibbs-Duhem equation.

UNIT III

Macromolecules : Nomenclature, classification, properties of polymer, mass of macro-molecules, number average and weight average molecular mass, determination of molecular weight by osmotic pressure. viscosity and light scattering and sedimentation (ultra centrifuge) methods.

Surface Chemistry : Sorption at surfaces, physical and chemical adsorption, Freundlich, Langmuir and Gibbs adsorption isotherms and their derivation, Streaming potential electrophoresis and electrosmosis.

UNIT IV

Phase Equilibrium : Statement and meaning of the terms - phase, component and degree of freedom, derivation of Gibb's phase rule, phase equilibrium of one component system- water CO_2 and S - system.

Phase equilibria of two component system - Solid - liquid equilibria, simple eutectic, Bi-Cd, Pb-Ag systems, desilverization of lead.

Solid solutions - Compound formation with congruent melting point (Mg - Zn) and incongruent melting point, (NaCl - H_2O), ($FeCl_3$ - H_2O) and ($CuSO_4$ - H_2O) systems, freezing mixtures, acetone - dry ice.

Liquid - liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law, Non -ideal system, azeotropes: HC1 - H_2O and ethanol - water systems.

Partially miscible liquids: phenol - water, trimethylamine - water, nicotine - water systems, lower and upper consolute temperature, effect of impurity on consulate temperature.

Immiscible liquids, steam distillation.

UNIT V

Electrochemistry : Types of reverse electrode : gas - metal ion, metal-metal ion, metal-insoluble salt - anion and redox electrodes, electrode reactions, Nernst - equation, derivation of cell E.M.F. and single electrode potential standard hydrogen electrode-reference electrodes - standard electrode potential sign conventions, electrochemical series and its significance electrolytic and Galvanic cells- reversible and irreversible cells, conventional representation of electrochemical cells. EMF of a cell and its measurements, computation of cell EMF. Calculation of thermodynamic quantities of cell reactions (AG, AH and K) polarization over potential and hydrogen over voltage. Concentration cell with or without transport, liquid junction potential application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.

Ionic Equilibria - Arrhenius theory of electrolyte and its application Ostwald's dilution law, its uses and limitations. Debye - Huckle theory of strong electrolytes, asymmetric electrophoretic. Debye- Falkenhagen and Wein effects, Activity coefficient, mean activity coefficient, ionic strength, Debye- Huckel limiting law.

BOOKS RECOMMENDED

1.   Principles of Physical Chemistry : B.R. Puri and L.R. Sharma.
2.   A Text Book of Physical Chemistry : A.S. Negi and S.C. Anand.
3.   A Text Book of Physical Chemistry : Kundu and Jain.
4.   Physical Chemistry (Hindi Ed.) : Suresh Ameta, R.C. Khandelwal, R. Ameta and J. Vardia, Himanshu Pub.

PAPER CODE-9448

SECOND YEAR CHEMISTRY PRACTICALS 2017-18

Time : 5 Hrs (One day)   **M.M. 75**

Distribution of Marks

	Exercises	Marks
1.	Volumetric Estimation OR Gravimetric Analysis	10
2.	Determination of R_1 values and identification of given organic compounds using thin layer/paper chromatography	7
3.	Identification of given organic compounds through functional group analysis	7
4.	Physical Chemistry Experiments	10
5.	Vice-voce	8
6	Records	8
	Total	50 marks

LIST OF EXPERIMENTS

1. **Volumetric Analysis** : Any one of the following exercise may be given in the examination :
    (a)   Determination of acetic acid in commercial vinegar using NaOH
    (b)   Determination of alkali content- antacid tablet using HC1.
    (c)   Estimation of calcium content in chalk as calcium oxalate using permanganate.
    (d)   Estimation of hardness of water by EDTA.
    (e)   Estimation of ferrous and ferric ions by dichromate methods.
    (f)   Estimation of copper using thiosulphate.
    (g)   Estimation of Mg_2, Ca_2 or $2\div$complexometrically.

    Gravimetric Analysis :
    Analysis of Cu as CuSCN and Ni as Ni (dimethylgioxime)
    *Note: **Candidates are required to prepare standard solutions by proper weighing.***

2. **Thin Layer Chromatography :**
    Determination of Rf values and identification of organic compounds.
    (a)   Separation of green leaf pigments (spinach leaves may be used)
    (b)   Preparation and separation of 2,4 dinitrophenyihydrazones of acetone, 2- butanol, hexane-2-and 3-ones using toluene and light petroleum(40: 60)
    (c)   Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5)

    Paper Chromatography: Determination of Rf values and identification of organic compounds in a mixture of amino acids / monosaccharides.

3. **Identification of Organic Compounds**:
    An organic compound from the following list be given for systematic identification:
    (i)   Carboxylic acids- Oxalic, Tartaric, Citric, Succinic, Benzoic, Cinnamic, Salicylic, Phthalic acids, Formic, Acetic, Propanoic and Butanoic acids.
    (ii)   Phenols- Phenol, Resorcinol, Hydroquinone, p-Cresol, α-Naphthol, β-Naphthol.
    (iii)   Alcohols- Methyl, Ethyl, Propyl, Isopropyl, n- butyl, isobutyl & tert. butyl alcohol.
    (iv) Carbohydrates- Glucose, Fructose, Cane sugar and Starch.
    (v)   Aldehydes- Formaldehyde, Acetaldehyde and Benzaldenyde.
    (vi)   Ketones- Acetone, Methyl ethyl ketone, Acetophenone and Benzophenone.
    (vii)   Nitro compounds - Nitrobenzene, p-Nitrotoluefle and m- Dinitrobenzene.
    (vii)   Amino compounds - Aniline, o-, m-and p-toluidine, α- Naphthylamine and β-Naphthylamine.

(ix)   Anilides - Acetanilide and Benzanilide.

(x)   Amides - Acetamide, Benzamide and Urea.

(xi)   Esters - methyl acetate, Ethyl acetate.

(xii) Thioamide - Thiourea.

(xiii) Hydrocarbons - Benzene, Toluene, Naphthalene and Anthracene.

(xiv) Halogen containing compounds - Chloroform, Chloral hydrate, Iodoform, Chlorobenzene, p-Dichorobenzeen and p-Dibromobenzene.

4. **Physical Chemistry Experiments:**   Any one of the following experiments may be given in the examination.

Distribution Law

(i)   To study the distribution of iodine between water and CCl_4.

(ii)   To study the distribution of benzoic acid between benzene and water.

(iii) To study the distribution of acetic acid between benzene and water

Phase Equilibrium

(i)   To study 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.

(ii)   To construct the phase diagram of two components (e.g. diphenylamine- benzophenone) system by cooling curve method.

Adsorption :

(i)   To study the adsorption of acetic acid by activated charcoal and test the validity of Freundlichy or Langmuir adsorption isotherm.

(ii)   To study the adsorption of oxalic acid by activated charcoal and test the validity of Freundlich or Langmuir adsorption isotherm.

Analysis of sugars:

1. Action of salivary amylase on starch
2. Effect of temperature on the action of salivary amylase on starch.
3. Differentiation between a reducing and a nonreducing sugar.

Virtual experiments (any two)

(i)   Various type of titrations

(ii)   Chromatographic separation of compounds from leaf or flower extract / dyes / amino acid / saccarides etc.

(iii) Some photochemical reactions

(iv)   Isoelectric precipitation of proteins: casein from milk.

(v)   Any other virtual experiment related to the content of syllabus and availability of the experimental facilities.

BOOKS RECOMMENDED

1. Practical Chemistry - Giri, Bajpai and Pandey, S. Chand & Co. Ltd., New Delhi.
2. Laboratory Manual in Organic Chemistry, R.K. Bansal, Willey Eastern.

3. Experimental Organic Chemistry, Vol. I and II, P.R. Singh, D.S. Gupta and K.S. Bajpai, Tata McGraw Hill.
4. Experiments in Physical Chemistry - J.C. Ghose, Bharti Bhawan.
5. Experiments in General Chemistry, N.r. Rado and U.C. Agarwal, Eastern Press.
6. Practical Chemistry - Suresh Ameta and P.b. Punjabi, Himanshu Publication.

SECOND YEAR T. D.C.SCIENCE, 2018-19

ZOOLOGY

The second year TDC examination shall consist of three theory papers, each of three hours duration and a practical examination of five hours duration.

Marks

Paper-I:Life and Diversity of Animals-II (Vertebrates)   **50**

Paper-II : Genetics and Biotechnology   **50**

Paper-III :Applied Zoology and Microbiology   **50**

Practical :   **50**

Pattern of question paper in the annual examination and distribution of marks:

Each theory paper in the annual examination shall have three sections i.e. A,B, and C. In section A, total 10 questions will be set in the paper, selecting at least two from each unit. These questions to be answered in a word or so. All questions are compulsory. Each question carries 0.5 mark, total 05 marks.

In section B, there shall be total 10 questions, selecting two questions from each unit, five questions to be answered by the student selecting at least one from each unit. Answer should be given in approximately 250 words. Each question carries 05 marks, total 25 marks.

In section C, 04 descriptive type questions will be set in the examination paper from five units of the syllabus of the paper, selecting not more than one question from a unit. Each question may have two sub divisions. Students are required to answer any two questions approximately in 500 words. Each question is of 10 marks, total 20 marks.

SECOND YEAR TDC SCIENCE, 2018-19
ZOOLOGY
PAPER-I : LIFE AND DIVERSITY OF ANIMALS-II (VERTEBRATES)

Duration : 3 hours   **M.M. : 50**

UNIT-I

1   Characteristics and classification of Protochordates and Agnatha upto orders with examples emphasizing their biodiversity, economic importance and conservation.

2   Type study- *Herdmania.*

3   Affinities of *Amphioxus* and importance of Ammocoete larva.

UNIT-II

4   Characteristics and classification of Pisces (after Berg) and Amphibia upto orders with examples emphasizing their biodiversity, economic importance and conservation.

5   Type study- *Scoliodon,* Fish Migration, Parental care in Amphibian.

UNIT-III

6   Characteristics and classification of Reptiles upto orders with examples emphasizing their biodiversity, economic importance and conservation.

7   Type study- *Calotes.* Identification of poisonous and non-poisonous snakes, venom, antivenom, medicinal significance of venom.

8   *Sphenodon*: Characteristics and affinities.

UNIT-IV

9   Characteristics and classification of Aves upto orders with examples emphasizing their biodiversity economic importance and conservation.

10   Type study - *Columba,* flight adaptations, perching mechanism, types of feathers.

11   Bird migration.

UNIT-V

12   Characteristics and classification of Mammalia upto orders with examples emphasizing their biodiversity, economic importance and conservation.

13   Type study – *Rattus*, (Digestive, respiratory and urinogenital systems only).

14   Dentition, hair and thermoregulation; integumentary derivatives.

SECOND YEAR TDC SCIENCE, 2018-19
ZOOLOGY
PAPER-II : GENETICS AND BIOTECHNOLOGY

Duration : 3 hours   **M.M.: 50**

UNIT-I

1 Light and electron microscope structure of chromosome (from nucleosome to organization of chromatids. Morphological classification of chromosome).

2 Extra-chromosomal inheritance.

3 Chromosomal theory of sex determination, hormonal theory of sex determination, X and Y chromosomes, gynandromorphs.

UNIT-II

4 Brief history of genetics, mendelian laws and their significance.

5 Linkage and crossing over : kinds of linkage – complete and incomplete linkage, linkage groups, significance of linkage.

6 Genetic interaction: Complimentary gene, duplicate genes,supplementary gene and epistasis.

7   Multiple-gene inheritance, ABO blood group, Rh factor.

UNIT-III

8 Concept of gene, mucon, recon,cistron, gene expression -lac-operon and trip-operon.

9 Genetic engineering: Restriction enzymes, Palindrome sequences, cloning vehicle, C-DNA.

10   Applications of genetic engineering. Hybridoma technology.

UNIT-IV

11 Mutations: Definition, gene mutation, chromosomal mutation, chromosomal aberrations, somatic and germ mutations, numerical alterations of chromosomes, molecular basis of mutation, mutagenic agents

12 Polytene and lamp-brush chromosomes.

13 Eugenics and genetic counselling.

UNIT-V

14 Medicines and biotechnology: Microbes in medicine, antibiotics, vaccines, enzymes and antigens.

15 Food and dairy microbiology: Fermented food production, dairy products, food preservation, microbial spoilage, alcoholic beverages, and vinegar.

16 Role of Biotechnology in health care.

PAPER CODE-9451

SECOND YEAR TDC SCIENCE, 2018-19

ZOOLOGY

PAPER-III : APPLIED ZOOLOGY AND MICROBIOLOGY

Duration: 3 hours   **M.M.: 50**

1   History, general account and scope of sericulture. Distribution of mulberry and non-mulberry silkworm.

2   Life history of *Bombyx mori*.

3   Rearing techniques of silkworm

    (a)   Brief account of environmental conditions of rearing and programming of mulberry cultivation.

    (b)   Rearing of silk worm.

4   Reeling of silk yarn.

5   Brief idea of diseases of silk worm.

UNIT-II

6   History, scope and general practices of pearl culture.

7   Rearing of pearl oyster:

    (a)   Indigenous methods of pearl culture.

    (b)   Modern methods of pearl culture.

8   Economic Importance of pearl and pearl culture.

9   Brief idea of diseases and enemies of pearl culture.

UNIT-III

10   Fin-fish culture and fisheries:

    (a)   Culturable fresh water fishes of India.

    (b)   Inland, marine and estuarine fisheries.

    (c)   Preservation of fishes.

    (d)   Economic importance of fishing industry.

UNIT-IV

11   Concepts of basic microbiology and its significance, theory of spontaneous generation, gram theory of fermentation and disease, work of Louis Pasteur.

12   General account of classification, structural organization, physiology and multiplication of bacteria.

13 General account of classification, structural organization, physiology and multiplication of bacteria.

14 Brief idea of Industrial, Medical and Environmental microbiology.

UNIT-V

15 DNA and RNA viruses

16 **AIDS:** Causative agents, Transmission, Pathogenicity, Prevention and Laboratory diagnosis of infections and treatment

PAPER CODE-9452

SECOND YEAR TDC SCIENCE, 2018-19

ZOOLOGY - PRACTICAL

Duration : 5 Hrs.   **M.M. :50**

S.No.	Exercise	
1	Major dissection	10
2	Minor dissection/	05
3	Mounting/Applied Zoology exercise	04
4	Spots	15
5	Viva-voce	8
6	Record	8
	Total :-	**50**

Major Dissection marks will be given only if virtual dissection is available otherwise marks may be given according to availability of dissection alternate.

General survey of Vertebrates (Museum specimens)

A   Urochordata   :   *Ciona, Pyrosoma, Doliolum, Salpa,*

B   Cephalochordata   :   *Amphioxus*

C   Agnatha   :   *Petromyzon*, Ammocoete larva

D	Pisces	:	*Echeneis, Sphyrna, Torpedo, Pristis, Labeo, Clarias, Anabas, Hippocampus* (male and female), *Chimaera, Anguilla, Protopterus.*
E	Amphibia	:	*Ichthyophis, Axolotl* larva, *Salamander, Bufo, Rana, Hyla, Pipa, Amphiuma, Alytes.*
F	Reptilia	:	*Testudo, Trionyx, Hemidactylus, Draco, Calotes, Chamaeleon, Varanus, Phrynosoma, Heloderma, Naja, Vipera, Typhlops, Bungarus, Hydrophis, Eryx,* models of Dinosaurs.
G	Aves	:	*Columba, Psittacula, Passer, Bubo,* model of *Archaeopteryx*
H	Mammalia	:	*Pteropus, Rhinopoma, Felis, Erinaceous, Hystrix Crocedura, Manis.*

PREPARED SLIDES :

1	Cephalochordata	:	*Amphioxus*: T.S. through buccal region, T.S. through pharynx showing gonads, T.S. through caudal region.
2	Pisces	:	Placoid, cycloid and Ctenoid scales, V.S. of skin.
3	Amphibia	:	V.S. of skin, T.S. of testis, T.S. of kidney and T.S. of liver.
4	Reptilia	:	V.S. of skin and T.S. of stomach.
5	Aves	:	T.S. of intestine, T.S. of liver, T.S. of ovary, filoplume W.M.
6	Mammalia	:	T.S. of pancreas, T.S. of thyroid gland, L.S. of pituitary gland, T.S. of stomach, T.S. of intestine, L.S. of kidney, T.S. of testis and ovary and V.S. of skin, T.S. of lung.

PERMANENT PREPARATIONS: Unstained placoid scales, spicules of *Herdmania.*

DISSECTION (Virtual):   Virtual dissection will be done (if facility of virtual is made available by University

Herdmania	:	Neural complex.
Scoliodon	:	Alimentary canal, scroll valve *in situ*, afferent and efferent branchial arteries, eye muscles, internal ear.
Digital animals	:	Arterial, venous and urino-genital systems.

OSTEOLOGY :

Identification of disarticulated skeleton of *Rana*, *Varanus, Gallus* and *Oryctolagus*. Palates of birds.

GENETICS:

Drosophila : Life cycle and its culture. Identification of wild and mutant *Drosophila.*

APPLIED ZOOLOGY:

1   Identification of different stages (from egg to adult) of silkworm.

2   Tools used in silk worm rearing.

3   Mounting of mouth parts and sting apparatus of honey bee.

4   Identification of cultivable varieties of shell fish and fin fish.

5   Gram staining of microbes.

•   The teacher concerned will provide e-materials to practical in the form of video or demonstrations or written materials including dissections.

REFERENCE BOOKS (LATEST EDITIONS):

LIFE AND DIVERSITY OF ANIMALS (VERTEBRATES)

1   Ayyar, E.K. and T.N. Ananthakrishnan, Manual of Zoology, Vol.II (Chordata), S.Viswanathan (Printers and Publishers) Pvt. Ltd. , Madras.

2   Jordan, E.L. and P.S.Verma, Chordate Zoology and Elements of Animal Physiology, S. Chand & Co. Ltd., Ram Nagar, New Delhi (English and Hindi Editions).

3   Parker and Haswell, Text Book of Zoology, Vol.II (Chordata), A.Z.T.B.S. Publishers and Distributors, New Delhi- 110051.

4   Waterman, Allyn J. et.al., Chordate Structure and Function, Mac Millan and Co., New York.

5   Kotpal, RL, Modern Text Book of Zoology- Vertebrates, Rastogi Publications, Meerut (English and Hindi Editions).

6   Ganguly, BB, Sinha, AK and Adhikari, S : Biology of Animals, Vol.II, New Central Book Agency (P) Ltd. Kolkatta.

7   Alexander, R.M.: The Chordates (Cambridge University Press).

8   Monielth, A.R: The Chordates (Cambridge University Press).

9   Young, J.Z : Life of Vertebrates (Oxford University PressL)

10   Waterman, A.J: Chrodata - Structure and Function (Macmillan Co.).

GENETICS AND BIOTECHNOLOGY:

11   Verma, P.S. and V.K.Agarwal, Genetics, S.Chand & Co.

12   Lewis, C.D. and Lewin, R., Biology of Gene, McGraw Hill, Toppan Co. Ltd.

13   Gunther S. Stent, Molecular Genetics, macmillan Publishing Co. Inc.

14   Goodenough, V., Genetics, New York Holt, Rinchart and Winston.

15   Gardner, Principles of Genetics, Wiley Eastern Pvt., Ltd.

16   Winchester, Genetics, Oxford IBH Publications

17   Stickberger, Genetics, MacMillan Publications.

18   Pai, A.C., Foundations of Genetics, McGraw Hill Publications.

19   R.A.Meyers (Endocrinology.): Molecular Biology and Biotechnology, VCH Publishers.

20   Glick : Molecular Biotechnology.

21   R.W.Old and S.B. Primrose: Principles of Gene Manipulation and Introduction to Genetic Engineering.

22   Gupta PK : Elements of Biotechnology, Rastogi Publications, Meerut.

APPLIED ZOOLOGY AND MICROBIOLOGY :

23   Jhingran, VG, Fish and Fisheries of India. Hindustan Publishing Corporation, New Delhi.

24   Kovaleve, PA, Silkworm Breeding Stocks, Central Silk Board, Merine Drive, Bombay.

25   Roger, A. Morse, The ABC and XYZ of Bee Culture, A.I. Root and Co., Medina, Ohio 44256.

26   Metcalf CL and WP Flint, Destructive and Useful Insects, Tata McGraw Hill publishing Co. Ltd., New Delhi- 110051

27   Sharma PD, Microbiology, Rastogi Publications Meerut.

28   Shukla and Upadhyaya : Economic Zoology (Rastogi Publishers)

29   Venkitaraman : Economic Zoology (Sudarshana Publishers)

PRACTICAL:

30   Verma, PS, A manual of practical Zoology Vertebrates S.Chand and Co. Ltd., Ram Nagar, New Delhi (English and Hindi Editions).

31   Lal, SS : Practical Zoology Vertebrates, Rastogi Publication, Meerut (English and Hindi Editions).

SECOND YEAR SCIENCE

BOTANY

Papers	No. of Papers	No. of Periods per week	Maxi-mum Marks	Min. pass Marks
Paper I	3	3	50	
Paper II	3	3	50	54
Paper III	3	3	50	
PRACTICALS	6	5	50	27

There shall be three written papers of three hours duration each. The candidates will be required to pass

in theory and practical examinations separately.

THEORY

Paper I : Taxonomy and Embryology of

Angiosperms	50
Paper II : Anatomy of Angiosperms, Economic Botany and Ethnobotany.	50
Paper-III: Cytogenetics, Plant Breeding, Evolution and Biostatistics.	50

PRACTICALS :

Duration of each Theory Paper	3 hours
Duration of Practicals	5 hours

(in one day)

PAPER CODE-9453

PAPER-I

TAXONOMY AND EMBRYOLOGY OF

ANGIOSPERMS

Unit-1

Taxonomic categories; concept of species, genus and family; Herbarium techniques. Systems of classifi-cation of Bentham and Hooker, Engler and Prantl, Hutchinson and Takhtajan.

Unit-2

International rules of nomenclature, range of floral structure, floral variation, and economic importance of Ranunculaceae, Brassicaceae, Papaveraceae, Capparidaceae, Caryophyllaceae, Malvaceae, Ruta-ceae, Cucurbitaceae, Myrtaceae, Leguminosae, Rosa-ceae, Apiaceae (Umbelliferae).

Unit-3

Range of floral structure, floral variation and economic importance of Rubiaceae, Asteraceae, Primulaceae, Solanaceae, Asclepiadaceae, Convolvulaceae, Apocy-naceae, Acanthaceae, Lamiaceae, (Labiatae), Euphor-biaceae, Poaceae(Graminae).

Unit-4

Classical theory of morphology of flower; Primitive stamens and carpel; Microsporogenesis, Megasporo-genesis, Structure and development and male and female gametophytes, Fertilization, Nutrition of Embryo sac.

Unit-5

Structure, development and types of endosperm and embryo, Polyembryony, Apomixis, Experimental embryology; Culture of anther, endosperm and embryo.

Note :

The paper setter is required to set questions of 3 types contained in 3 Sections (**Section A-** 10 questions, **Section B-** 10 questions and **Section C-** 4 questions) from the 5 units of each paper. There will be 10 questions in **Section A** which will be asked from all the 5 units, i.e., 2 questions from each unit. These questions have to be answered in one word or a few words only. Each question will be of half mark . All the questions in **Section A** are compulsory. In **Section B,** 10 questions will be set from the 5 units, i.e., 2 questions from each unit. Students are required to attempt at least 1 question from each unit. Each question will carry 5 marks . The answers of each question should be given in about 250 words. In **Section C** there will be 4 descriptive type questions set from all the 5 units, not more than 1 question from each unit. These questions may also have sub-divisions. The students are required to answer 2 questions, each in approximately 500 words. Each question will carry 10 marks .

In short, pattern of question paper and distribution of marks for UG classes will be as under :

Section A : 10 questions, 2 questions from each unit, short answer, all questions compulsory.

Total marks **: 05**

Section B : 10 questions, 2 question from each unit, 5 question to be attempted, at least 1 from each unit, answer approximately in 250 words. Total marks : **25**

Section C : 04 questions (question may have sub-division), not more than 1 question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted. Total marks : **20**

PAPER CODE-9454

PAPER II

ANATOMY OF ANGIOSPERMS, ECONOMIC

BOTANY AND ETHNOBOTANY

Unit-1

Plant anatomy : Introduction, organization of meri-stems; theories related to their organization; cell wall gross microscopic structure and chemistry.

Unit-2

Tissue and tissue systems; Parenchyma, Collenchyma, Sclerenchyma, Xylem, Phloem, Secretory structures and periderm.

Unit-3

Primary and Secondary Structure : Structure of root, stem and leaf. Primary and secondary anomalous structure with special reference to *Aristolochia, Salva-dora, Bignonia, Achyranthes, Amaranthus, Boerhaavia, Mirabilis, Chenopodium Dracaena, Tinospora.*

Unit-4

Study the economic botany of the following :

Cereals	:	*Triticum, Zea*
Pulses	:	*Glycine max, Cajanus cajan*
Fibres	:	Classification; *Gossypium, Crotalaria, Corchorus;* artificial fibres.
Wood	:	Classification, mechanical properties; *Shorea, Tectona, Pinus, Cedrus.*
Paper	:	Raw materials and manufacture.
Sugar	:	Sugarcane, Beet.

Unit-5

Study of economic uses of the following :

Medicinal Plants	:	*Rauwolfia, Datura, Cinchona, Papaver.*
Beverages	:	Alcoholic; Non-alcoholic: tea and coffee.
Spices and Condiments	:	*Coriandrum, Cuminum, Ferula, Curcuma, Trigonella, Elettaria, Capsicum, Piper, Zingiber.*
Oil	:	*Arachis, Cocos, Helianthus*.
Ethnobotany	:	Introduction; Aims and Objectives; knowledge of important plants of various groups from Ethnobotanical point of view as food, fodder and Medicine with special reference to Rajasthan.

Note :

The paper setter is required to set questions of 3 types contained in 3 Sections (**Section A-** 10 questions, **Section B**-10 questions and **Section C**- 4 questions)

from the 5 units of each paper. There will be 10 questions in **Section A** which will be asked from all the 5 units, i.e., 2 questions from each unit. These questions have to be answered in one word or a few words only. Each question will be of half mark . All the questions in **Section A** are compulsory. In **Section B,** 10 questions will be set from the 5 units, i.e., 2 questions from each unit. Students are required to attempt at least 1 question from each unit. Each question will carry 5 marks . The answers of each question should be given in about 250 words. In **Section C** there will be 4 descriptive type questions set from all the 5 units, not more than 1 question from each unit. These questions may also have sub-divisions. The students are required to answer 2 questions, each in approximately 500 words. Each question will carry 10 marks .

In short, pattern of question paper and distribution of marks for UG classes will be as under :

Section A : 10 questions, 2 questions from each unit, short answer, all questions compulsory.

Total marks **: 05**

Section B : 10 questions, 2 question from each unit, 5 question to be attempted, at least 1 from each unit, answer approximately in 250 words. Total marks : **25**

Section C : 04 questions (question may have sub-division), not more than 1 question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted. Total marks : **20**

PAPER CODE-9455

PAPER-III

CYTOGENETICS, PLANT BREEDING,

EVOLUTION AND BIOSTATISTICS

Unit-1

Cell Biology - Structure of cell (of both prokaryotes and eukaryotes); membranes; cell organelles, ergastic substances. Chromatin- euchromatin, heterochro-matin. Chromosomes - Type and organization; morpho-logy, chemical constituents; Structural changes in chromosomes and their significance.

Unit-2

Cell Division - Amitosis, mitosis, meiosis; synepto-nemal complex; Linkage and crossing over. Gene (Chromosomal) mappping; Sex determination.

Unit-3

Mendel's laws of inheritance - Monohybrid and dihy-brid ratio, incomplete dominance; Modifications of dihybrid ratio; cytoplasmic inheritance (Inheritance of plastids and streptomycin resistance in *Chlamy-domonas*); Principles of plant breeding. Selection, introduction, clonal propagation, hybridization, mutation breeding.

Green Revolution, conservation of germplasm, centres of origin. Cytology in relation to taxonomy; Apomixis; Polyploidy; Breeding work on wheat.

Unit-5

Evolutionary theories, catastrophism, the Lamarck's theory, development of Darwin's theory, Evidences of evolution, adaptations, natural selection patterns of evolution, origin of species. Elementary study of bio-statistics; mean, mode, median, standard deviation.

Note :

The paper setter is required to set questions of 3 types contained in 3 Sections (**Section A-** 10 questions, **Section B-** 10 questions and **Section C**- 4 questions) from the 5 units of each paper. There will be 10 questions in **Section A** which will be asked from all the 5 units, i.e., 2 questions from each unit. These questions have to be answered in one word or a few words only. Each question will be of half mark . All the questions in **Section A** are compulsory. In **Section B,** 10 questions will be set from the 5 units, i.e., 2 questions from each unit. Students are required to attempt at least 1 question from each unit. Each question will carry 5 marks . The answers of each question should be given in about 250 words. In **Section C** there will be 4 descriptive type questions set from all the 5 units, not more than 1 question from each unit. These questions may also have sub-divisions. The students are required to answer 2 questions, each in approximately 500 words. Each question will carry 10 marks .

In short, pattern of question paper and distribution of marks for UG classes will be as under :

Section A : 10 questions, 2 questions from each unit, short answer, all questions compulsory.Total marks **: 05**

Section B : 10 questions, 2 question from each unit, 5 question to be attempted, at least 1 from each unit, answer approximately in 250 words. Total marks : **25**

Section C : 04 questions (question may have sub-division), not more than 1 question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted. Total marks : **20**

PAPER CODE-9456

PRACTICALS

The practical exercises have been divided into following two groups :

Group-I   :   Taxonomy, Embryology and Economic Botany.

Group-II :   Anatomy, Cytology and Statistics.

GROUP-I

(A) TAXONOMY

1. Ranunculaceae : *Ranunculus, Nigella, Delphinium*

2. Brassicaceae : *Brassica, Raphanus, Iberis*

3. Papaveraceae : *Argemone, Papaver.*

4. Capparidaceae : *Capparis, Cleome.*

5. Caryophyllaceae : *Stellaria, Spergula, Viscaria, Dianthus* (Single*), Gypsophylla.*

6. Malvaceae : *Hibiscus, Althaea*

7. Rutaceae : *Citrus, Ruta, Murraya*

8. Leguminosae : *Pisum, Crotalaria; Cassia, Caesalpinia, Bauhinia, Tamarindus; Acacia, Prosopis, Mimosa.*

9. Myrtaceae : *Callistemon, Eucalyptus*

10. Cucurbitaceae : *Citrullus, Cucumis*

11. Apiaceae : *Coriandrum, Foeniculum*

12. Rubiaceae : *Hamelia*

13. Asteraceae : *Helianthus, Tridax, Launaea, Ageratum.*

14. Primulaceae : *Anagallis.*

15. Apocynceae : *Catharanthus, Nerium, Thevetia.*

16. Asclepiadaceae : *Calotropis, Leptadaenia, Cryptostegia*

17. Solanaceae : *Solanum, Nicotiana, Petunia.*

18.	Acanthaceae	: *Barleria, Adhatoda, Justicia,*
		Peristrophe.
19.	Lamiaceae	: *Ocimum, Salvia*
20.	Euphorbiaceae	: *Euphorbia, Ricinus*
21	Poaceae	: *Triticum.*

The above list of plants is only suggestive and can be replaced depending on local availability.

(B) EMBRYOLOGY SLIDES :

1. Placentation   :   Types

2. Ovules   :   Types

(1) T.S. Anther

10. L.S. Mature Seed : Maize/Gram/Pea

11. L.S. bud with anther and gynoecium.

12. Pollinium whole mount.

13. V.S. Cyathium.

14. V.S. *Ficus* inflorescence.

(C) ECONOMIC BOTANY AND ETHNOBOTANY

All plants as prescribed in theory paper.

GROUP-II

(A) ANATOMY

1.	Stem	: *Boerhaavia, Achyranthes,*
		Bignonia, Chenopodium,
		Leptadaenia, Nyctanthes,
		Salvadora, Dracaena, Triticum,
		Mirabilis, Aristolochia,
		Amaranthus, Chenopodium.

2.   Root   : *Tinospora, Ficus.*

(B) CYTOLOGY

Smear preparation of root tips and onion bud for different stages of mitosis and meiosis.

(C) STATISTICS

Mean, Mode, Median, Standard Deviation. Monohybrid and Dihybrid crosses and test cross.

(D) EMASCULATION

MARKING SCHEME

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

		Students	
		Regular	**Ex**
(a)	An angiosperm material for anato-mical study with (i) double stained, labelled cellular sector diagram, identification and (iv) special (anatomical/ecological) character (2.5 marks each (i) to (iv).	10	13
2.	Economic/ Ethnobotany.	5	6
	Description in semi-technical language of given twig, (i) with diagrams, (ii) description and (iii) identification with characters.	12	14
4.	Embryology	05	05
5.	Smear preparation for two stages of cell division.	05	05
6.	Genetic exercise Or Emasculation technique.	05	06
7.	Statistical exercise.	05	06
8.	Spots five (At least one from each		

paper)	10	10
9.	Viva-voce	10	10
10.	Records and collection.	08	-
	Total	**75**	**75**

BOOKS SUGGESTED

Bhojwani, S.S. and Bhatnagar, S.P.: The Embryology of Angiosperms, Vikas Publishing House, Delhi, 1974.

Dutta, S.C.: Hand Book of Systematic Botany, Asia Publishing House, Bombay, 1979.

Gupta, P.K.: Cytology, Genetics and Evolution, Rastogi Publications.

Hill, A.H.: Economic Botany, McGraw Hill Book Co., 1952.

Mitra, J.N. : Elements of Systematic Botany of Angiosperms and Plant Ecology, The World Press Pvt. Ltd., Calcutta, 1977. Vikas Publishing House, Delhi.

Pandey, B.P.: Economic Botany, S. Chand And Co.Pvt. Ltd., 1988.

Tiagi, Y.D. and Kshetrapal, S. : An Introduction to Taxonomy of Angiosperms. Ramesh Book Depot, Jaipur, 1974.

P.K. Gupta : Genetics.

Sinha, U. and Sinha: Cytogenetics, Plant Breeding and Evolution.

Shukla and Chandel: Cytogenetics and Plant Breeding.

Choudhary, H.K. Elementary Principles of Plant Breeding.

PAPER CODE-9457

SECOND YEAR   B. Sc. MATHEMATICS   2016-17

PAPER – I

ADVANCED CALCULUS

Duration: 3 Hours   **Max. Marks: 50**

UNIT -I

Continuity: Cauchy definition of continuity of a function of one variable, Notion of limit and continuity of function of two variable (Not Theorems), discontinuous functions and their kinds, Properties of continuous functions at a point and in closed intervals.

Derivability: Differentiable functions and their properties including Darboux theorem, Examples of continuous and differentiable functions.

UNIT - II

Partial differentiations, envelopes and evolutes, Maxima and Minima of two variables and more than two variables including Lagrange's method of undetermined multipliers.

UNIT -III

Evaluation of double and triple integrals, Dirichlet's theorem and Liouville's extension, change of order of integration and volume and surface of solid of revolution.

UNIT - IV

Jacobians, change of independent variables. Vector Calculus: Direction of derivatives, gradient of scalar functions, irrotational Vectors, definition of gradient, divergence of a vector, curl of a vector, curl of the product of a scalar and vector, divergence of a vector product.

UNIT - V

Vector Integration: Gauss's theorem, divergence of the product of a scalar and a vector, Stoke's theorem, surface integral of the curl of a vector, Green's theorem (Excluding the proofs of the theorems)

References:

1. Gorakh Prasad   : Differential calculus, Pothishala Pvt. Ltd., Allahabad

2. Gorakh Prasad   : Integral calculus, Pothishala Pvt. Ltd., Allahabad.

3. Malik, S.C.   : Mathematical Analysis, Wiley Eastern Ltd., New Del

4. Shanti Narayan   : A Course of Mathematical Analysis, S. Chand and

                             Company, New Delhi.

5. Jain, P.K. and   : An Introduction to Real Analysis by, S. Chand and

                             Company, New Delhi.

6. Kaushik, S.K.   : Principles of Mathematical Analysis.

7. Walter Rudin : A first course in Real Analysis.

8. Sharma Purohit : Elements of Real Analysis.

9. Bhargava, Goyal : Real Analysis.

10. Sharma, Gokhroo : Real Analysis.

11. Spain, B. : Vector Analysis.

12. Bhargava, Banwari Lal : Sadish Kalan.

13. Gokhroo, Saini : Sadish Kalan.

SECOND YEAR B. Sc. MATHEMATICS 2016-17

PAPER – II

DIFFERENTIAL EQUATIONS

Duration: 3 Hours   **Max. Marks: 75**

UNIT - I

Exact differential equations and equations of special forms. Simultaneous differential equations. Total differential equations.

UNIT – II

Linear differential equations of second order and their solutions by:

(i) The method of finding an integral of the C.F. by Inspection,

(ii) Changing of independent variables,

(iii) Removal of the first derivative,

(iv) Operational factors,

(v) Undetermined coefficients and

(vi) Variation of parameters.

UNIT - III

Linear partial differential equations of first order: Lagrange's method, Integral surfaces passing through a given curve, orthogonal surfaces, Geometric description of Pp+Qq=R. Non-Linear partial differential equations of order one. Special methods of their solutions applicable to certain standard forms.

UNIT -IV

Charpit's method of solving non linear partial differential equations of first order, Monge's method of integration of equations Rr + Ss + Tt = V. Higher order homogeneous linear part of differential equation of the first order.

UNIT - V

Numerical solutions of ordinary differential equations: Introduction about initial value problem, boundary value problem, Euler's method, short comings. Euler's modified method. Picard's method of successive approximation and Picard's method for simultaneous equations.

References:

1.   Ray and Sharma   : Differential equation.

2.   Bansal, Dhami   : Differential equation (Vol. II).

3.   Raisinghania, M.D.   : Advanced differential equations.

4.   Murray A. Daniel   : Differential equation.

5.   Forsyth, A.R.   : A Treatise on Differential equation.

6.   Ian N. Sneddon   : Elements of Partial differential equations.,

                               Mc Graw–Hill Book Company.

7.   Gokhroo, Saini,   : Avkal Samikaran.
     Kumbhat

8.   Gokhroo, Saini, Ojha   : Partial differential equations.

9.   Codington, E.A.   : An introduction to ordinary differential
                               equation by, Prenticehall of India.

SECOND YEAR   B. Sc. MATHEMATICS   2016-17

PAPER – III

MECHANICS

Duration: 3 Hours   **Max. Marks: 75**

UNIT – I

Equilibrium of bodies under three or more forces, Friction, common category.

UNIT –II

Virtual work, Projectile on inclined plane and Impact.

UNIT – III

Velocity and Accelerations (Tangential, normal, radial, transversal), Rectilinear motion, Hooke's law and motion of horizontal and vertical strings.

UNIT –IV

Constrained motion (circular and cycloidal), motion under resisting medium (resistance varies as velocity and square of velocity).

UNIT –V

Fluid pressure and thrust on immersed plane surfaces. Center of pressure.

References:

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