

# THIRD YEAR

<b>B.Sc.B.Ed FOUR YEARS INTEGRATED COURSE</b>					
<b>III Year</b>					
<b>Cours No.</b>	<b>Paper Code</b>	<b>Nomenclature</b>	<b>Paper</b>	<b>Max. Marks</b>	<b>Min. Marks</b>
Course 22	9571	Assessment for Learning	Theory	100 (80+20)	36
Course 23	9572	Language across the curriculum (Including Reading & Reflecting on texts)	Theory	100 (80+20)	36
Course 24	9573	School Internship (Phase I, 4 weeks) Internal assessment Engagement with the field: Tasks and Assignment for courses 12 & 13.		150	60
Course 25	9574	External Assessment one lesson of Pedagogy of a School subject.		100	40
Course 26	9605	Core Subject*			
		General Hindi		50	18
Course 27	9541	Physics I	I	50	18
	9542	Physics II	II	50	18
	9543	Physics III	III	50	18
	9544	Physics Practical	Practical	50	18
Course 28	9545	Chemistry I	I	50	18
	9546	Chemistry II	II	50	18
	9547	Chemistry III	III	50	18
	9548	Chemistry Practical	Practical	50	18
Course 29	9549	Zoology I	I	50	18
	9550	Zoology II	II	50	18
	9551	Zoology III	III	50	18
	9552	Zoology Practical	Practical	50	18
Course 30	9553	Botany I	I	50	18
	9554	Botany II	II	50	18
	9555	Botany III	III	50	18

	<b>9556</b>	<b>Botany Practical</b>	<b>Practical</b>	<b>50</b>	<b>18</b>
<b>Course 31</b>	<b>9557</b>	<b>Mathematics I</b>	<b>I</b>	<b>50</b>	<b>18</b>
	<b>9558</b>	<b>Mathematics II</b>	<b>II</b>	<b>75</b>	<b>27</b>
	<b>9559</b>	<b>Mathematics III</b>	<b>III</b>	<b>75</b>	<b>27</b>

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## ASSESSMENT FOR LEARNING

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

1. Understand the historical aspect and current practices of Assessment.
2. Understand assessing children's progress in terms of psychological development and the criteria provided by the curriculum.
3. Explain cognizant of key concept related to assessment such as measurement, evaluation, assessment, Examination, Test, Formative and Summative evaluation etc.
4. Evolve realistic, comprehensive and dynamic assessment procedures that are able to keep the whole students in view.
5. Explore the use of wide range of assessment tool their selection and appropriate construction.
6. Develop critical understanding of issues in assessment for learning (from constructivist paradigm)
7. Use statistical techniques for interpretation of assessment data.
8. Understanding the critical role of assessment in enhancing learning.
9. Design, integrate and evaluate appropriate assessment tools as part of the learning process.
10. Develop assessment linked to student learning outcomes.
11. Understand and use assessment for improvement of teaching and learning.

### COURSE CONTENT

#### UNIT- I Overview concept of assessment

1. Concept and purpose of assessment
2. Perspective on assessment and evaluation for learning in a constructivist paradigm.
3. Clarification of the terms
  - a) Assessment, evaluation, test, examination, measurement
  - b) Formative and summative assessment
  - c) Continuous and comprehensive assessment
  - d) Grading
4. Distinction between terms
  - a) Assessment for learning
  - b) Assessment as learning
  - c) Assessment of learning
5. principles of assessment for learning
6. Critical review of current evaluation practices and their assumption about learning and development.

## **UNIT- II Assessment of Subject based learning**

1. Enlarging notions of subject based learning in a constructivist perspective.
2. Assessment tools
  - a) Kinds of task : project, assignments & performance
  - b) Observation of learning process by
  - c) Self
  - d) Peers
  - e) Teachers
  - f) Self and peer assessment
3. Assessment technique: Oral, Practical test, CAA(Computer Aided Assessment), Test, Exercise, Portfolio, Assignment, MCQ, Short Answer, Notes, Summary, Observing, interviewing and writing comprehensive profile of a student.

## **UNIT- III Context of assessment and evaluation**

1. Context of assessment: subject related, person related.
2. Steps in pedagogical analysis of content matter.
3. Preparation of test items, development of blue print.
4. Checking of answer script: subjective and objective.
5. Classification of assessment based on
  - a) Purpose: prognostic, diagnostic, formative, summative
  - b) Scope: teacher made, standardized
  - c) Attribute: achievement, attitude, aptitude, interest, personality, intelligence, creativity.
  - d) Information: qualitative, quantitative
  - e) Response: oral, written

## **UNIT- IV Data analysis & feedback**

1. Importance and use of educational statistics.
2. Statistical tools-frequency distribution, normal distribution, graphical representation, percentile, central tendency, deviation, rank difference and product moment coefficient of correlation and their interpretation.
3. Meaning and purpose of feed back in teaching learning process.
4. Types of teacher feedback (written, comments, oral, peer feed back)
5. Reporting on a learner profile in consolidated form .
6. Use of assessment for feedback and taking pedagogic decision.

## **UNIT V Reforms in assessment for learning**

1. Critical analysis of prevalent practices of assessment .
2. Commercialization of assessment i.e. tuition, coaching, study center etc.
3. Assessment for social selection and placement.
4. NCF-2005 & NCFTE-2009 on assessment reforms.
5. Improving quality and range of question in examination paper.
6. Role of ICT in Assessment.
7. De linking of school based assessment from examination: some possibilities and alternative practices.
8. Innovation in assessment practices.

## **SESSIONAL WORK**

**(Any two of following)**

1. A critical analysis of a question paper in any subject of RBSE/CBSE.
2. Prepare a diagnostic test and remedial programme of any subject at secondary level.
3. Organize a group activity (like: competition, story telling, reading, writing), evolve criteria for assessing the activity and present an assessment report of the activity.
4. School visits followed by presentation of a report on evaluation practices in school.
5. Construction, administration and interpretation of self made achievement test.

## **REFERENCES**

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2. Agarwal, Y.P.,(1990) Statistical Method: Concept, Application and Computation, Sterling Publisher Pvt. Ltd. New Delhi.
3. Angelo, Thomas A. and Patricia Cross. (1993). Classroom Assessment Techniques: A Handbook for College Teachers. (2nd edition). San Francisco: Jossey-Bass.
4. Banta, Trudy W. et al. (1996) Assessment in Practice: Putting Principles to Work on CollegeCampuses. San Francisco: Jossey-Bass.
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32. Verma Ramesh, Suresh K. Sharma (1990) : Modern Trends in Teaching Technology, Anmol Publication Pvt. Ltd. New Delhi.
33. Wiggins, Grant. (1998). Educative Assessment: Designing Assessments to Inform and Improve Student Performance. San Francisco: Jossey-Bass.

#### Websites link

- [http://www.aahe.org/assessment/assess\\_links.htm](http://www.aahe.org/assessment/assess_links.htm)  
A hefty site updated by the American Association of Higher Education. Has many links to assessment articles, sites and listserves.
- <http://www.duq.edu/~tomei/tomei/advancedsites.html>  
Another hefty site that includes many links to articles and sites on assessment, Bloom's taxonomy, learning styles, etc.
- <http://www.snow.utoronto.ca/Learn2/introll.html>  
Learning to Learn, a thinking and learning skills site, is for learners, teachers, and researchers to learn about the value of self-awareness as a critical part of learning. It was created for educators developing their assessment and instructional design skills.
- <http://www.ldcommunity.org/thesystem.html>  
Learning Disabilities Resource Community (LDRC) site that focuses on teaching and assessment including the Intelligent Tutoring and Assessment System that plans to focus on the navigational tools available to users, including perceptual modes.

- [http://www.sbctc.ctc.edu/Board/Educ/Outcomes/outcom\\_wag.htm](http://www.sbctc.ctc.edu/Board/Educ/Outcomes/outcom_wag.htm)  
Washington State Assessment Newsletter
- <http://www.wvu.edu/~assess/airlinks.htm>  
A site generated by Western Washington University that includes resources, articles and links to assessment sites.
- <http://trgmcbcr.haygroup.com/Products/learning/lsius.htm>  
An online version of David Kolb's Learning-Style Inventory. Material is not printable, but one can opt to pay for it, take it online or order copies for class use.
- <http://www.keirsey.com/>  
Links to Meyers Briggs information sites
- [http://pss.uvm.edu/pss162/learning\\_styles.html](http://pss.uvm.edu/pss162/learning_styles.html)
- <http://www.hcc.hawaii.edu/intranet/committees/FacDevCom/guidebk/teachtip/>
- [http://www.snow.utoronto.ca/Learn\\_2/mod3/tchstyle.html](http://www.snow.utoronto.ca/Learn_2/mod3/tchstyle.html) for a Multiple Intelligence Inventory, Thinking Styles Inventory, Teaching Styles Inventory, Learning Styles Inventories and Tests on the Web, and Learning Styles Links.

*PAPER CODE-9572*

## **LANGUAGE ACROSS THE CURRICULUM**

### **(Including reading and reflecting on text)**

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

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

## **COURSE CONTENT**

### **UNIT –I Language and society**

1. Relationship between language and society.



2. Multilingualism- concept, status of Indian classroom language.
3. Deficit theory and discontinuity theory.
4. Social stimulation- gestures, emotional and facial expressions, postures and movements, articulate speech, physiognomy.

#### **UNIT- II Language development**

1. Theories of language development
2. Language development in different stages.
3. Speech defects: lispings, slurring, stuttering and stammering and role of teachers in its resolution.
4. Language acquisition: stages, language and thought.
5. Meta- linguistics: concept, meaning, listening, speaking, reading, comprehension and writing for varying context, language proficiency for teacher.

#### **UNIT- III Classroom and language**

1. Classroom discourse- nature, meaning and medium.
2. Questioning in the classroom- type of questions, why and how of asking of questions, teachers role and control during questioning, encouraging questioning by students.
3. Functions of language within and outside the classroom.
4. Classroom as a language lab.
5. Role of literature in language learning.

#### **UNIT- IV Reading and writing**

1. Reading skills- purpose and methods.
2. Reading in the content areas- science, social science and Mathematics.
3. Reading strategies- note making, summarizing.
4. Process writing- analysis of children's writing to understand their conception and personality, writing with a sense of purpose, writing to learn and understand.

#### **UNIT –V Reading and Reflecting on text**

1. Nature of texts- expository v/s narrative texts, transactional v/s reflective texts
2. Scheme theory- text structures and examining content area.
3. Kinds of text-Textbooks, narratives, autobiographies, field notes, ethnographies.
4. Some practical activities to be conducted in a class -.....
  - a. Read a text and prepare a summary

- b. Read a document and organize a discussion on it
- c. Expressing views on an editorial of a news paper

### **SESSIONAL WORK**

#### **Any two of the following:**

1. Find out the different languages spoken by the students and prepare a plan to use multilingualism as a teaching strategy.
2. Identify speech defects of a student and make a remedial strategy.
3. Organize an activity based game to motivate students for creative questioning and present its report.
4. Read any empirical, conceptual, historical work or a policy document or studies about schools, teaching, learning or different people's experiences and submit reading reflections.
5. Plan a participatory transaction strategy for language acquisition.
6. Prepare abstracts of any two articles published in reputed Journals.

### **REFERENCES**

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## Course : 24 INTERNSHIP PROGRAMME (School Intership Phase-I)

School Internship is designed to lead to the development of broad repertoire of perspectives, professional capacities, teacher dispositions, sensibilities and skills. During the internship, a student-teacher shall work as a regular teacher and participate in all the school activities, including planning, teaching and assessment, interacting with school teachers, community members and children.

Objectives –

After completion of the Internship the student - teachers will be able to –

1. Develop the understanding of the school and its management.
2. Develop the ability to plan and manage the class-room teaching.
3. Develop the sensibility towards diverse needs of learners in school.
4. Develop ability to discharge various responsibilities expected from a teacher.
5. Organize and conduct the co- curricular activities.
6. Get acquainted with various school records maintained by the school.
7. Maintain records expected from a teacher.
8. Develop skills of conducting community contact programmes.
9. Get acquainted with the functioning of SMC.

### Execution of the Internship Programme

The internship programme shall be divided into 2 years. In the first year, 4 weeks will be allotted. This will include one week of school observation and three weeks of practice - teaching during which each student - teacher has to teach 2 periods per day (one period each for 2 pedagogy subjects). Besides teaching, the student - teacher has to complete his/her tasks and assignments related to the courses mentioned in the first year. The three weeks practice teaching will also include the delivery of criticism lessons (one in each pedagogy subject) and also observation of 5 lessons of peers of each of the two subjects. This practice of teaching programme is adopted so as to give a proper training of teaching skills and thorough guidance to the student-teachers by the subject lecturer.

## Practice Teaching

S. No.	Activity	Marks
1.	Practice Teaching in both the pedagogy subjects in Schools (for three weeks) (At least 13 lessons in each subject)	50+50=100
2.	Peer Group Lesson Observation(ordinary+criticism-5 lesson in each round (5+5)	5+5=10
3.	Criticism Lessons (1-1 in both pedagogy subjects)	10+10=20
4.	Test (Blue print + question paper + Evaluation Key+Remedial Teaching)	10+10=20
	<b>Total Marks</b>	<b>150</b>

**PAPER CODE-9574**

### **Course: 25 EXTERNAL ASSESSMENT**

ONE FINAL LESSON OF PEDAGOGY OF A SCHOOL SUBJECT

**[I YEAR]**

4. The weightage of final lesson will be 100 marks. Final lesson will be conducted at the end of first academic year i.e. after the completion of 1<sup>st</sup> phase of internship.
5. During the final practical examination each candidate will have to teach one Lesson in any one of the two teaching subjects. However, he shall have to prepare lesson plan in both the teaching subjects and should be prepared to deliver lesson in both the subjects if required.
6. The Board of examiners for external examination will consist of:
  - d) The Principle of the college concerned.
  - e) One senior member of the college.
  - f) Two external examiners appointed by the university.

Note: - The selection of the faculty member and two examiners be such that, as far as possible, Board of Examiners represent all the three faculties-Humanities, Languages and Science

S. No.	EXTERNAL EVALUATION	Marks
	[I Year]	
1.	Course 11- Final Lesson (Final Practical Exam)	100
	<b>Total Marks (I Year)</b>	<b>100</b>

**Paper Code 9605**

### Course-26 सामान्य हिन्दी

**पाठ्य पुस्तकें –**

1. गद्य-वीथी : संपादक – डॉ. ओमप्रकाश शर्मा  
प्रकाशक – माया प्रकाशन मंदिर, त्रिपोलिया बाजार, जयपुर
  2. कथा दशक – संपादक – डॉ. परमानंद पांचाल  
प्रकाशक – राजस्थान प्रकाशन, 28-29, त्रिपोलिया बाजार, जयपुर
  3. हिन्दी भाषा ज्ञान – संपादक – डॉ. हरिचरण शर्मा  
प्रकाशक – अनुभा प्रकाशन, शालीमार बाग, जयपुर
- पाठ्य विषय – पाँच इकाइयों में विभक्त होगा।

**इकाई – I**

गद्य-वीथी पुस्तक से संक्षेपण एवं 'कथादशक' पुस्तक से पल्लव संबंधी ज्ञान।  
दोनों पुस्तकों से सामान्य तथ्यात्मक प्रश्नों का ज्ञान।

**इकाई – II**

शब्द ज्ञान  
शब्द पर्याय और विलोम शब्दों का ज्ञान।  
अनेकार्थी एवं समश्रुत शब्दों का ज्ञान।

**इकाई – III**

पत्र लेखन और पत्रों के प्रकार संबंधी ज्ञान।  
अंग्रेजी से हिन्दी अनुवाद का ज्ञान।  
हिन्दी में पदनाम संबंधी ज्ञान। (अंग्रेजी से हिन्दी पदनाम)

**इकाई – IV**

मुहावरे – लोकोक्तियाँ  
शब्द शुद्धि और वाक्य शुद्धि  
पारिभाषिक शब्दावली  
अनेक शब्दों के लिए एक शब्द।

इकाई – V

देवनागरी लिपि की विशेषताएँ  
देवनागरी लिपि एवं वर्तनी का मानक रूप  
कम्प्यूटर में हिन्दी का अनुप्रयोग – एक प्रारंभिक परिचय।

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**PAPER CODE-9541**

**THIRD YEAR T.D.C., SCIENCE**

**(Effective from session 2016-17)**

**PHYSICS**

Paper Code Paper & Title Hrs/week Max. Marks

3161 I: Quantum Mechanics, Atomic and Molecular Physics 2 50

3162 II: Electrodynamics, Electromagnetic Waves and Relativity 2 50

3163 III: Solid State, Nuclear and Particle Physics 2 50

3164 IV: Practical 4 75

**Note:**

1. Each theory question 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 one or few words. **(Total: 5 Marks)**

**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. **(Total 25 Marks)**

**Section C** shall contain four descriptive questions covering all units and candidates have 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. **(Total 20 Marks)**

**Paper-I: 3161, Quantum mechanics and Atomic & Molecular Physics**

**Unit-I**

**Introductory Schrodinger theory :**

Rise and fall of Plank-Bohr quantum theory Duality of radiation and matter, de Broglie's hypothesis, justification for the relation , experimental confirmation Phase and group velocities of a wave ; formation of a wave packet, illustrations. Uncertainty principle relating to position and momentum, relating to energy and time, application complimentarity principle, photon interpretation of two slit interference, Einstein-de-Broglie relations as a link between particle and wave properties, general equation of wave propagation, propagation of matter waves, time dependent and time independent schrodinger equations, physical meaning of  $\psi$ , conditions to be satisfied by schrodinger equation as an operator equation. Postulatory approach to wave mechanics, operators, observable and measurements. Operators, eigen values and eigen functions; linear operators, product of two operators, commuting and non commuting operators, simultaneous eigen functions, orthogonal functions. Hermitian operators, their eigen values, Hermitian adjoint operators, expectation values of an operator.

**Unit – II**

Simple one dimensional problem ; particle in a box with rigid walls. Concept of a potential well. Wave functions and energies for the ground and excited states ; quantization of energy qualitative discussion of the solutions for a shallow potential well. Application of Operator methods ; Simple harmonic oscillator, step-up and step-down operators, eigen functions and eigen values of the ground state and excited state, zero point energy probability density and its variations with degree of excitation ; orthogonality of wave functions. Other one dimensional problems ; step potential, penetration through rectangular barrier. Transmission coefficients, barriers of special shapes, quantum mechanical tunneling, particle in of three dimensional cubical box, degeneracy.

**UNIT-III**

## **Angular momentum and spin**

Central force ; orbital angular momentum, operators for its cartesian components, commutation relations, mutual as well as with  $L^2$  , operators  $L_+$  and  $L_-$ , their interpretation as step operators eigen values of  $L^2$  , half integral values for quantum numbers. Angular momentum operators in spherical polar coordinates ; evaluation of their eigen functions explicitly in terms of the coordinates, their degeneracy. Schrodinger equation for hydrogen atom in spherical polar coordinates ; separations into radial and angular variation, qualitative discussion of spherical harmonics. Angular momentum and magnetic moment of electron due to orbital motion Bohr magneton.

## **Unit – IV**

### **Mono valent and divalent atoms**

Back ground from quantum theory : The four quantum numbers ; spectral terms arising from L-S coupling, s,p,d,f, notation, selection rules. Half life of excited states, width of a spectral line. Spectra of mono and divalent atoms : Doublet fine structures of hydrogen lines ; screening constant for monovalent atoms, series limits, doublet structure for alkali spectrum. Spectra of helium and alkaline earth atoms, singlet and triplet series. Effect of magnetic field on energy levels : Gyromagnetic ratios for orbital and spin motions ; vector model, Lande g factor, strong and weak field effects, illustrative cases of H, Na, Ca and Hg. X-ray spectra : The continuous x-ray spectrum, Duane and Hunt limit. Characteristic x-rays : Mosley's law, doublet fine structure, H-like character of x-ray states, x-ray absorption spectra, absorption edges.

## **Unit – V**

Sharing of electrons : formation of molecular orbitals,  $H_2^+$  ions  $H_2^-$  molecule, electronic levels, singlet and triplet characters. Rotational energy levels, internuclear distance.

Vibrational energy levels, force constants, anharmonicity dissociation energy, isotope effects on rotational and vibrational energies. Raman effect (brief study).

Spectra of diatomic molecules : Pure rotation spectra ; selection rules, vibrationrotation spectra, selection rules, vibration-rotation spectra ; selection rules, P, Q and R branches.

Electronic band systems, sequences and progressions Frank-Condon principle. (Statement only, no derivation)

Recent developments in Physics including discussion of Nobel prizes in Physics (no questions to be set in the theory examination).

Text books:

1. Quantum mechanics : S.P. Singh, M.K. Bagde and Kamal Singh (S.Chand and Co)
2. Quantum Mechanics by G.R. Chatwal and Anand SK, Himalaya Publishing Co.

### **Reference books**

1. Quantum Mechanics Alistair I M Rac. ELBS (Low Drice edition)
2. Quantum mechanics , S. N. Biswas, Books and Allied, Calcutta (P) Ltd.
3. Atomic and Nuclear Physics ; A.B. Gupta, mew central book agency pvt. Ltd.

**PAPER CODE-9542**

**PAPER-II: 3162, ELECTRODYNAMICS, ELECTROMAGNETIC WAVES**



## AND RELATIVITY

### UNIT – I

Motion of charged particles in  $\mathbf{E}$  and  $\mathbf{B}$  fields: Case of cathode ray oscillograph, positive ray parabola, velocity selector, magnetic focusing, mass spectrography. Faraday's law for electromagnetic induction: Faraday's law integral and differential forms; self-inductance of a solenoid and of a straight conductor, energy stored in an inductor and in the magnetic field. Displacement current; modified Ampere's law, Maxwell's equation for time-dependent electromagnetic field in vacuum and in material media, boundary conditions.

### UNIT – II

Electromagnetic potentials: Magnetic vector potential  $\mathbf{A}$  and scalar potential  $\Phi$ . Poisson's equation for  $\mathbf{A}$  in terms of current density, solutions for line surface currents. Coulomb and Lorentz gauge transformations, Lorentz law in terms of potentials.

Maxwell's equations and electromagnetic waves: Plane-wave solution for Maxwell's equation; orthogonality of  $\mathbf{E}$ ,  $\mathbf{B}$  and propagation vector. Poynting vector; energy and momentum propagation, reflection and transmission at dielectric boundaries (normal incidence), polarization by reflection, Brewster's angle.

### UNIT – III

Electromagnetic waves in conductors: Modified field equation; attenuation of the wave, reflection at and transmission through a conducting surface. Total internal reflection Radiation from accelerated charges: Modification (Conceptual only) of Coulomb's law to include velocity and acceleration dependent terms in  $\mathbf{E}$  field. Radiation from an oscillating dipole and its polarization. Radial and spherical power of electromagnetic radiation, Radiation pressure equation in free space and medium

### UNIT – IV

The Lorentz transformations: Galilean transformations; Newtonian relativity, instances of their failure; electromagnetism, aberration of light, Michelson-Morley experiment; Einstein's basic postulates and geometric derivation of Lorentz transformations; invariance of Maxwell's equations, length contraction, simultaneity, synchronization and time dilation, Einstein's velocity addition rule, Doppler effect in light. Relativistic gravitational Red Shift

### UNIT – V

Relativistic dynamics: Variation of mass with velocity, mass energy equivalence, relativistic formulae for momentum and energy.

The structure of space-time: Four vectors; invariance of an interval, time-like, spacelike and light-like intervals, Minkowski space.

Relativistic electrodynamics: Electric field of a point charge in uniform motion; transverse components, magnetism as a relativistic phenomenon, transformation of  $\mathbf{E}$  and  $\mathbf{B}$  fields.

Recent developments in Physics including discussion of Nobel prizes in Physics (no questions to be set in the theory examination).

**Text and Reference books:**

1. D.J. Griffiths: Introduction to Electrodynamics, Prentice Hall of India, 1989.
2. Reitz and Milford: Introduction to Electrodynamics, Addison-Wesley.
3. A.M. Portis: Electromagnetic Fields
4. J.B. Marion: Classical Electromagnetic radiation (Academic Press)
5. R.P. Feynmann, R.B. Leighton and M. Sands: The Feynmann lectures in physics, Vol. II (B.I. Publications).
6. B. Saraf et al. : Physics through experiments Vol. I – EMF, constant and varying, Vikas Publishing House.
7. D.R. Corson and P. Lorrain: Introduction to Electromagnetic fields and waves, Freeman-Taraporevala, Bombay, 1970.
8. E.C. Jordan and K.G. Balmain: Electromagnetic waves and radiating systems, 2nd Ed., Prentice Hall of India, New Delhi, 1971.
9. Eletrodynamics ,Electromagetec Waves and Relativity (In Hindi) Kalra,Kakani and Bhandari

**PAPER CODE-9543**

**Paper-III: 3163, SOLID STATE, NUCLEAR AND PARTICLE PHYSICS**

**UNIT – I**

Crystal geometry: crystal lattice, crystal planes and Miller indices, unit cells. Typical crystal structures, coordination number, packing fraction, symmetry elements, rotation, inversion and reflection, point groups and crystal classes, space groups.

Crystallography: Bloch functions, Bloch's theorem, diffraction of X-rays by a crystal lattice. Laue's formulation of X-ray diffraction, reciprocal lattice, Brillouin zones, Laue spots, rotating crystal and Debye-Scherrer methods  
Introduction to nano particles, Definition, length scales, Importance of nanoscale and Technology.

**UNIT – II**

Types of binding in solids: covalent binding and its origin, ionic binding, energy of binding, transition between covalent and ionic binding, metallic binding, Van der Waal's binding, hydrogen bond.

Conduction in metals : Drude's theory, DC conductivity, AC conductivity, plasma frequency, thermal conductivity of metals, Fermi-Dirac distribution, thermal properties of free-electron gas, Sommerfeld's theory of conduction in metals.

**UNIT – III**

Conduction in semiconductor: Bands in solids, metals, insulators and semiconductors. Motion of free electrons on a chain of atoms, effective mass, electrons and holes, donor and acceptor impurities, donor impurity levels. Thermal excitation of carriers, electrical conductivity. Elementary ideas of Hall effect in metals and semiconductors and magnetoresistance. Charge transport in semi-conductors: Ionization energy of impurity atoms, carrier concentration in doped semiconductors at high and low temperatures, control of conductivity of semiconductors by impurities and current flow in semi-conductors.

**UNIT – IV**

Structure of nucleus: discovery of the nucleus, composition. Basic properties: charge, mass, size, spin, magnetic moment, electric quadrupole moment, binding energy, binding energy per nucleon and its observed variation with

mass number of the nucleus. Coulomb energy, volume energy, surface energy, other corrections, explanation of the binding energy curve. Liquid drop model of the nucleus.

Nuclear forces: two-nucleon system, deuteron problem, binding energy, nuclear potential well, results of p-p and n-p scattering experiments, meson theory of nuclear forces e.g. Bartlett, Heisenberg, Majorana forces and potentials (No derivations)

Radioactivity: decay constant and half-life, spectra of emitters, Geiger-Nuttal law, Gamow's explanation. Beta decay: elementary Fermi's theory (No derivations). Antineutrino. Nuclear radiation, energy levels.

#### **UNIT – V**

Detectors for charged particles: Ion chamber, Geiger counter, resolving time, cloud chamber.

Accelerators: Need for accelerators; cyclic accelerators, cyclotron, betatron, synchrocyclotron, variable energy cyclotron, phase stability. Brief introduction to Accelerator facilities in India.

Rutherford scattering formula, different types of nuclear reactions. Artificial radioactivity: Nuclear fission, neutron reactions, Fermi and transuranic elements, chain reaction, criticality, moderators. Brief discussion of Reactor facilities in India Discovery of cosmic rays: hard and soft components, discovery of muon, pion, heavy mesons and hyperons, mass and life time determination for muon and pion. Primary cosmic rays: Extensive air showers, solar modulation of primary cosmic rays, effect of earth's magnetic field on the cosmic ray trajectories.

Elementary particles: Discovery and important properties, Standard Model Strangeness, conservation of strangeness in particle interactions, quark hypothesis, high energy electron scattering from protons, basic interactions of quarks and leptons, interrelation between particle physics and cosmology. Big Bang theory (Brief study. No derivations) Brief introduction to Larger Hadron Collider "Big Bang" experiments at CERN Recent developments in Physics including discussion of Nobel prizes in Physics (no questions to be set in the theory examination).

#### **Text Book**

1. Nuclear Physics, Brijlal & Subramannian
2. Solid State Physics, Charles Kittel
3. Solid State Physics, Nuclear Physics and Particle Physics (In Hindi) Kalra, Kakani and Mandot

#### **Reference books:**

- 1 D.J. Griffiths: Introduction to Electrodynamics, Prentice Hall of India, 1989.
- 2 Reitz and Milford: Introduction to Electrodynamics, Addison-Wesley.
- 3 A.M. Portis: Electromagnetic Fields
- 4 J.B. Marion: Classical Electromagnetic radiation (Academic Press)
- 5 R.P. Feynmann, R.B. Leighton and M. Sands: The Feynmann lectures in physics, Vol. II (B.I. Publications).
- 6 B. Saraf et al. : Physics through experiments Vol. I – EMF, constant and varying, Vikas Publishing House.
- 7 D.R. Corson and P. Lorrain: Introduction to Electromagnetic fields and waves, Freeman-Taraporevala, Bombay, 1970.

## THIRD YEAR B.Sc CHEMISTRY 2018-19

### 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

**Hard and Soft Acids and Bases (HSAB)** : Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electro-negativity and hardness and softness.

**Metal-Ligand Bonding in Transition Metal Complexes** : Limitation of valence bond theory, an elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters, John- Teller effect.

#### UNIT II

**Magnetic Properties of Transition Metal Complex** : Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of  $m$  and  $m_{eff}$  values, orbital contribution to magnetic moments, application of magnetic moment data for 3d- metal complexes.

**Electronic Spectra of Transition Metal Complexes** : Types of electronic transitions, selection rule for d-d transitions, spectroscopic ground states, spectro-chemical series. Orgel-energy level diagram for  $d^1$  and  $d^9$  states, discussion of the electronic spectrum of  $[Ti(H_2O)_3]^3$  complex ion.

#### UNIT III

**Bioinorganic Chemistry** : Essential and trace elements in biological processes, metallo-porphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to  $Ca^{2+}$ .

**Electro analytical Methods** : EMF measurements, pH,- determination using hydrogen, glass, quinhydrone, antimony and calomel electrodes, potentiometric titrations.

**Volumetric Estimation** : Theory of oxidation - reduction titrations. Theory of complexometric titrations.

#### UNIT IV

**Organometallic Chemistry** - Definition, nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyl and aryl of Li, Al, Hg, Sn and Ti, a brief account of metal

- ethylenic complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

**Thermodynamic and Kinetic Aspects of Metal Complexes** - A brief outline of thermodynamic stability of metal complexes and factors affecting the, stability, Substitution reactions of square planar complexes.

## UNIT V

**Molecular Symmetry and Group Theory** : Symmetry elements, molecular point groups, group theory and basic properties, similarity transformation and classes, orthogonality theorem, multiplication tables and characters tables of  $C_{2v}$  and  $C_{2v}$  groups.

**Mathematical Techniques** : Least square treatment applied to linear equation  $y = mx + c$ , correlation coefficient,  $S_m$  and  $S_c$ .

**Recent Developments in Inorganic Chemistry**: Question will not be asked from the recent development section.

### BOOKS RECOMMENDED

1. Group theory and its chemical applications : P.K. Bhattacharya.
2. Inorganic chemistry : J.E. Huysse, Principles of Structure and Reactivity, 3rd Ed.
3. Selected topics in inorganic chemistry : W.U. Malik, G.D. Tuli and R. Madan.
4. Principles of Inorganic Chemistry : D. Banerjee.
5. Modern Aspect of Inorganic Chemistry : H.J. Emeleus and A.G. Sharpe.
6. Inorganic Chemistry (Hindi ed.) : Ameta, Sharma and Metha.

**PAPER CODE-9546**

## PAPER II : ORGANIC CHEMISTRY

### UNIT I

**Electromagnetic Spectrum : Absorption Spectra** : Ultraviolet (UV) absorption spectroscopy- absorption laws (Beer-Lambert Law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transition, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones.

Infrared (IR) absorption spectroscopy- molecular vibrations, Hooke's, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

**Nuclear Magnetic Resonance (NMR) spectroscopy** : Proton Magnetic Resonance (PMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1, 1,2 - tribromoethane, ethyl acetate, toluene and acetophenone.

Problem pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

### UNIT II

**Heterocyclic compounds** : Introduction, molecular orbital picture and aromatic characteristics of pyrrole, furane, thiophene and pyridine, method of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives, comparison of basicity of pyridine, piperidine and pyrrole.

Introduction to condensed five and six membered heterocycles, preparation and reactions of indole, quinoline and isoquinoline with special reference to Fischer Indole synthesis, Skraup's synthesis and Bischler - Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

**Photochemistry:** Principles: electronic excitation, excited states, modes of dissipation of energy, energy transfer and quantum efficiency, photoreduction and photochemistry of butadienes

### UNIT III

**Organic synthesis via Enolates** - Acidity of alpha hydrogen, alkylation of diethylmalonate and ethylacetoacetate, synthesis of ethyl acetoacetate, Claisen condensation. Keto - Enol tautomerism of ethyl acetoacetate, alkylation of 1,3-dithianes, alkylation and acylation of enamines.

**Carbohydrates** - Classification and nomenclature, monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses, configuration of glucose and fructose, erythro and threo diastereomers. Conversion of glucose into mannose, formation of glycosides, ether and esters. Determination of ring size of glucose and fructose, Cyclic structure of D (+) - glucose. Mechanism of mutarotation.

An introduction to disaccharide (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

### UNIT IV

**Amino Acids, Peptides, Proteins and Nucleic Acids** - Classification, structure and stereochemistry of amino acids, acid-base behavior, isoelectric point and electrophoresis. Preparation and reactions of  $\alpha$ -amino acids.

Structure and nomenclature of peptides and proteins, classification of proteins, peptide structure determination, and group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Structures of peptide and proteins. Levels of protein structure. Protein denaturation! renaturation.

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

**Fats, Oils and Detergents** - Natural Fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils, saponification value, iodine value, acid value, soaps synthetic detergents, alkyl and aryl sulphates.

### UNIT V

**Synthetic Polymers** - Addition or chain-growth polymerization, free radical vinyl polymerization, ionic - vinyl polymerizations Ziegler-Natta polymerization and vinyl polymers. Condensation or step-growth polymerization, polyesters, polyamides, phenol formaldehyde resins, urea-formaldehyde resins, epoxy resins and polyurethanes. natural and synthetic rubbers.

**Synthetic Dyes** - Colour and constitution (electronic concept), classification of dyes. Chemistry and synthesis of methyl orange, Congo red, Malachite green, Crystal violet, Phenolphthalein, Fluorescein, Alizarin and Indigo.

**Recent Developments in Organic Chemistry:** Question will not be asked from the recent development section.

#### BOOKS RECOMMENDED

1. Organic Chemistry, Vol. I and II, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd.
2. A Text Book of Organic Chemistry, Vol. I and II, K.S. Tewari, S.N. Mehrotra and N.K. Vishnoi.
3. Organic Chemistry, M.K. Jain and S. Sharma.
4. A Text Book of Organic Chemistry, Vol. I and II, O.P. Agarwal.
5. A Text Book of Organic Chemistry, Raj. K. Bansal.
6. Organic Chemistry, Vol. I and II, I.L. Finar.
7. Organic Reaction and their Mechanisms, P.S. Kalsi.
8. Introduction of Petrochemicals, Sukumar Maiti.
9. Organic Chemistry (Hindi Ed.) Suresh Ameta, Punjabi and Sharma.
10. Organic Chemistry, Morrison and Boyd, Prentice Hall.
11. Fundamentals of Organic Chemistry, Solomons, John Wiley.
12. Organic Chemistry, P.L. Soni.
13. A Text Book of Organic Chemistry, V.K. Ahluwalia and Maduri Goyal, Narosa Publishing House Pvt. Ltd.

**PAPER CODE-9547**

## PAPER III : PHYSICAL CHEMISTRY

Time : 3 Hrs.

M.M. 50

### UNIT I

**Elementary Quantum Mechanics** : Black-body radiation, Planck's radiation law, photo-electric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects, Compton effect. Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in one-dimensional box.

Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance hydrogen like wave functions, radial wave functions, angular wave function.

Molecular orbital theory, basic ideas- criteria for forming M. O. from A. O., construction of M. O's by LCAO- H<sub>2</sub> ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of s, s, p p<sup>4</sup>' orbitals and their characteristics. Hybrid orbitals- sp, sp<sup>2</sup>, sp<sup>3</sup>, calculation of coefficients of A.O's used in these hybrid orbitals.

Introduction to valence bond model of H<sub>2</sub>, M.O. and V. B. models.

### UNIT II

**Spectroscopy** - Introduction: electromagnetic radiation, regions of the spectrum basic features of different spectrometers statement of the Born- Oppenheimer approximation degrees of freedom.

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

**Vibrational Spectrum** - Infrared spectrum, energy level of simple harmonic oscillator, selection rules, pure vibrational spectrums intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.

Raman spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

**Electronic Spectrum** - Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck Condon principle. Qualitative description of s, p and n M.O., their energy levels and the respective transitions.

### UNIT III

**Photochemistry** - Interaction of radiation with matter, difference between thermal and photochemical processes, laws of photochemistry, Grotthus - Drapper law, Stark - Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence non-radiative process (internal conversion, intersystem crossing), high and low quantum yields, photosensitization photochemical equilibrium, photoionization photodimerisation of anthracene, photoinhibition. chemical actinometry.

**Solutions, Dilute Solutions and Colligative Properties** : Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution: colligative properties. Raoult's law, relative lowering of vapour pressure, molecular weight determination, Osmosis, law of osmotic pressure and its measurement.

Determination of molecular weight from osmotic pressure, elevation of boiling point and depression of freezing point, thermodynamic derivation of relation between molecular weight and elevation in boiling point and

depression in freezing point, experimental methods for determining various colligative properties, abnormal molar mass, degree of dissociation and association of solute, Vant-Hoff factor.

#### UNIT IV

**Ionic Conductance** - Electrical transport, conduction in metal and electrolytes, solutions, specific conductance, equivalent conductance and molecular conductance, effect of dilution on conductance, migration of ions, Kohlraush's law and its applications, transport numbers and its determination by Hittorfs method and moving boundary methods, ionic mobility, application of conductivity measurement, conductometric titrations.

#### UNIT V

**Chemical Kinetics** and Catalysis - Rate of reaction, factors influencing the rate of reaction, concentration, temperature, pressure, solvent, light and catalysis, order of a reaction, zero-order, first order and second order reaction, half life and mean life, conductometric, potentiometric, polarimetric and spectrophotometric methods of determination of order of reactions, method of integration, half life method and isolation method, experimental methods of kinetics, elementary idea about opposing, parallel, consecutive and chain reaction, effect of temperature on reaction rates. Arrhenius equation, concept of activation energy and its measurement, simple collision's theory (hard sphere model), transition state theory (equilibrium hypothesis) limitation's.

Theory of unimolecular reactions, catalysis, theory and mechanism, classification of catalysis, enzyme catalysis and its mechanism.

**Recent Developments in Physical Chemistry:** Question will not be asked from the recent development section.

#### 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-9548**

### THIRD YEAR CHEMISTRY PRACTICALS 2018-19

**Time : 5 Hrs (One day)**

**M.M. 50**

#### Distribution of Marks

Exercises		Marks
1.	Synthesis of Inorganic complex and organic compound	10
2.	Analysis by Colorimetry/Solvent extraction/Ion exchange method	7
3.	Qualitative analysis : Organic mixture analysis	7
4.	One Physical experiment	10
5.	Vice-voce	8
6	Records	8
<b>Total</b>		<b>50 marks</b>

#### LIST OF EXPERIMENTS

##### 1. **Synthesis of Inorganic complexes and organic compounds**

Any one of the following preparation may be asked in the examination keeping in view that not more than five students are given the same preparation in a batch of 20 students and nature of preparation should be equally distributed both from the organic and inorganic list.

##### **Inorganic Complexes**

- (a) Preparation of sodium trisoxalato ferrate (III)



- (b) Preparation of Ni-DMG complex.
- (c) Preparation of cis-and trans-bisoxalato diaquo chromate (III) ion.
- (d) Cuprous chloride
- (e) Sodium thiosulphate
- (f) Ferrous sulphate from Kipp's waste
- (g) Mercury tetrathiocyanate

### Organic Synthesis

- (a) Acetylation of salicylic acid, aniline, glucose and hydroquinone, benzylation of aniline and phenol.
  - (b) Aliphatic electrophilic substitution : Preparation of iodoform from ethanol and acetone.
  - (c) Aromatic electrophilic substitution ;
    - Nitration -
      - Preparation of m-dinitrobenzene from nitrobenzene.
      - Preparation of p-nitroacetanilide from acetanilide.
    - Halogenation -
      - Preparation of p-bromoacetanilide from acetanilide.
      - Preparation of 2,4,6-tribromophenol from phenol.
  - (d) Diazotization/coupling - Preparation of methyl orange and methyl red.
  - (e) Oxidation : Preparation of benzoic acid from toluene
  - (f) Reduction : Preparation of aniline from nitrobenzene.  
Preparation of m-nitroaniline from m-dinitrobenzene.
2. (i) **Analysis by Colorimetry**
- (a) Job's method (b) Mole - ratio method
    - Adulteration - Food stuffs
    - Effluent analysis, water analysis
  - (ii) **Solvent Extraction** : Separation and estimation of Mg (II) and Fe (II).
  - (iii) **Ion Exchange** : Separation and estimation of Mg (II) and Zn (II).
3. **Qualitative Analysis** : Analysis of an organic mixture containing two solid components separable by water, dil. NaHCO<sub>3</sub> and dil. NaOH.
4. **Physical Chemistry Experiment** : Any one of the experiments may be given in the examination.

### Chemical Kinetics

Study the kinetics of the following reactions.

*Initial rate method:* Iodide-persulphate reaction

*Integrated rate method:*

- a. Acid hydrolysis of methyl acetate with hydrochloric acid.
- b. Saponification of ethyl acetate.
- c. Compare the strengths of HCl and H<sub>2</sub>SO<sub>4</sub> by studying kinetics of hydrolysis of methyl acetate

### Conductometry

- (i) To determine the strength of the given acid conductometrically using standard alkali solution.
- (ii) To determine the solubility and solubility products of a sparingly soluble electrolyte conductometrically.
- (iii) To study the saponification of ethyl acetate conductometrically.
- (iv) To determine the ionization constant of a weak acid conductometrically.

### Potentiometry

- (i) To titrate potentiometrically the given ferrous ammonium sulphate solution using KMnO<sub>4</sub>/K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> as titrate and calculate the redox potential of Fe<sup>3+</sup>/Fe<sup>2+</sup> system on the hydrogen scale.

- (ii) To determine the strength of a given solution of HCl/CH<sub>3</sub>COOH by titrating with standard NaOH solution potentiometrically/pH metrically.

#### **Refractometry, Polarimetry**

- (i) To verify law of refraction of mixtures (e.g. of glycerol and water) using Abbe's refractometer.  
(ii) To determine the specific rotation of a given optically active compound.

#### **Colourimetry**

- (i) To verify Beer - Lambert law for KMnO<sub>4</sub>/K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and determine the concentration of the given solution of the substances.  
(ii) Estimation of iron colorimetrically.  
(iii) Estimation of phosphate colorimetrically.

#### **Virtual Experiments: (any two)**

1. Preparation of inorganic/ organic compounds.
2. Kinetic study of acid/base catalyzed hydrolysis of esters.
3. Mechanochemical solvent free reactions.
4. Determination of optical rotation by Polarimetry.\
5. Instrumentation Techniques in spectroscopy (UV, IR, NMR etc)
6. Water Softening
7. Demineralized water
8. 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.

### **THIRD YEAR T. D.C.SCIENCE, 2018-19**

#### **ZOOLOGY**

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

	<u><b>Marks</b></u>
<b>Paper-I: Animal Physiology, Biochemistry and Immunology</b>	<b>50</b>
<b>Paper-II : Ecology and Biostatistics</b>	<b>50</b>
<b>Paper-III : Ethology and Evolution</b>	<b>50</b>
<b>Practical :</b>	<b>50</b>

**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.

Helpstudentpoint.com

**THIRD YEAR TDC SCIENCE- 2018-19**

**ZOOLOGY**

**PAPER-I : ANIMAL PHYSIOLOGY, BIOCHEMISTRY AND IMMUNOLOGY**

**Duration : 3 hours**

**M.M.: 50**

**UNIT-I**

- 1 Histology and function of the gastro-intestinal tract, liver, pancreas, lungs, kidney, testis and ovary.
- 2 Histology, functions and disorders of endocrine glands – pituitary, pancreas, adrenal, thyroid and parathyroid.
- 3 Digestion and absorption of food in alimentary canal.

**UNIT-II**

- 4 Metabolism of carbohydrates: Glycolysis, decarboxylation of pyruvic acid, Krebs cycle, electron transport system and oxidative phosphorylation; glycogenesis and glycogenolysis.
- 5 Metabolism of proteins: Essential and non-essential amino acids, metabolism of amino acids, biosynthesis of glutamic acid..
- 6 Metabolism of lipids : Biosynthesis of saturated fatty acids and  $\beta$ -oxidative pathways of fatty acid,; formation of ketone bodies..

**UNIT-III**

- 7 Respiration: Mechanism of respiration, vital capacity of lungs, transport of gases, dissociation curve of oxyhaemoglobin and control of respiration, chloride shift.
- 8 Blood: structure and functions of blood cells, ABO blood groups and Rh factor, mechanism of blood clotting.
- 9 Ultrastructure of cardiac and skeletal muscles. Physiology of muscle contraction.

**UNIT-IV**

- 10 Excretion : Structure and function of nephron, control of renal function.

- 11 Nerve physiology: Ultrastructure of neuron, synapse, conduction of nerve impulse and neuromuscular junctions.
- 12 Reproductive physiology: Hormonal control of testicular and ovarian functions with reference to estrous and menstrual cycles.

#### **UNIT-V**

- 13 Immunology: Definition, types of immunity: innate and acquired, humoral and cell-mediated.
- 14 Cell of immunity: macrophages, lymphocytes (B and T types), T-helper cells, T-killer cells, plasma cells and memory cells.
- 15 Antibody : definition structure and functions of each class of immunoglobulins.
- 16 Antigen: antigenicity of molecules, haptens. Antigen – antibody reactions, precipitation reaction, agglutination reaction, neutralizing reaction, complementary and lytic reactions and phagocytosis.

*PAPER CODE-9550*

### **THIRD YEAR TDC SCIENCE- 2018-19**

#### **ZOOLOGY**

#### **PAPER-II : ECOLOGY AND BIostatISTICS**

**Duration : 3 hours**

**M.M.: 50**

#### **UNIT-I**

- 1 Terminology and scope of Ecology.
- 2 Habitat and niche
- 3 Ecosystem: Components of ecosystem, energy flow and nutrient cycles, food chain, food web and ecological pyramids.
- 4 General idea of population and community ecology

#### **UNIT-II**

- 5 Freshwater environment: Physico-chemical features and biotic communities, productivity and eutrophication.

- 6 Marine environment: Characteristics, zonation, fauna and their adaptation, deep sea and estuarine fauna.
- 7 Terrestrial environment: General characteristics of desert, grass land and forest ecosystems.

### **UNIT-III**

- 8 Environmental pollution: Biodegradable and non-biodegradable pollutants.
- 9 Air pollution: Source, nature, prevention and control, green house effect, ozone depletion and global warming.
- 10 Water pollution: Source, nature and abatement.
- 11 General account of noise pollution and radioactive pollution.

### **UNIT-IV**

- 12 Conservation of natural resources: Wild life management, brief idea of national parks and wild life sanctuaries of India. Threatened and endangered species of India.
- 13 Environmental planning and environmental impact assessment.
- 14 Brief account of environmental Acts and Legislations (enacted after 1970).

### **UNIT-V**

- 15 Concepts and applications of Biostatistics.
- 16 Frequency distribution, graphical presentation, mean, mode, median, standard deviation and standard error.
- 17 Correlation, T-test, Chi-square test.
- 18 Shanon and Weinner diversity index.

***PAPER CODE-9551***

**THIRD YEAR TDC SCIENCE- 2018-19**

**ZOOLOGY**

**PAPER-III : ETHOLOGY AND EVOLUTION**

**Duration : 3 hours**

**M.M. : 50**

**UNIT-I**

- 1 Introduction and history of Ethology.
- 2 Methods of studying behaviour.
- 3 Neuroanatomical, neurophysiological, neurochemical, focal and scan sampling techniques.
- 4 Evolutionary approach to behaviour, levels of natural selection.
- 5 Human Ethology, general aspects.
- 6 Orientation taxes and kinesis.
- 7 Brief idea of learning.

#### **UNIT-II**

- 8 Social organization with reference to dominance, hierarchy, social competition and territoriality.
- 9 Reproductive behaviour with reference to courtship, mating, parental investment and stickle back fish (sexual dimorphism).
- 10 Elementary idea of role of pheromones and hormones in insects and vertebrates in relation to behaviour.
- 11 Adaptation and behaviour of Tiger.

#### **UNIT-III**

- 12 Origin of life
- 13 History of evolutionary thought Lamarckism and Neo-Lamarckism
- 14 Darwinism and Neo-Darwinism
- 15 Evidences of organic evolution.
- 16 Concept of micro and mega -evolution

#### **UNIT-IV**

- 17 Variation: Kinds and sources, role in evolution.
- 18 Isolation and speciation, definition, isolating mechanism, origin of species and processes of speciation.
- 19 Adaptation: Definition, kinds of adaptations, adaptive radiation, convergence and divergence.

20 Geological time scale

### UNIT-V

21 Brief account of Zoogeographical regions of world

22 Fossils and their evolutionary significance.

23 Phylogeny of horse.

24 Evolution of man.

**PAPER CODE-9552**

### THIRD YEAR TDC SCIENCE, 2018-19

### ZOOLOGY - PRACTICAL

**Duration : 5 Hrs.**

**M.M. :50**

**S.No**

**Exercise**

1	Dissection	10
2	Ecology/ Ethology exercise	05
3	Physiological and Biochemical exercise	04
4	Spots (1-10)	15
5	Viva-voce	8
6	Record	8
<b>Total :-</b>		<b>50</b>

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

### **ETHOLOGY AND EVOLUTION.**

- 1 Habituation in earthworm/mosquito larvae.
- 2 Feeding behaviour of housefly/stored product pest.
- 3 Antennal grooming behaviour of cockroach.
- 4 Trial and error and latent learning in rat /mice.



- 5 Phototaxis and chemotactic behaviour in *Paramecium*.
- 6 Visit to a zoo/natural habitat of wild animals.
- 7 Demonstration of social behaviour by honey bee colony.
- 8 Adaptive modifications in the feet of birds.
- 9 Adaptive modification in the beak of birds.
- 10 Adaptive modification in the mouth parts of insects.
- 11 To study nests and nesting habits of the birds and social insects.
- 12 To study the phototaxis behavior in insect larvae.
- 13 Study of circadian functions in animals (daily eating, sleep and temperature patterns)

### **BIOCHEMICAL, PHYSIOLOGICAL AND ECOLOGICAL EXERCISES**

- 1 Various biochemical tests of
  - (a) Proteins
  - (b) Carbohydrates
  - (c) Lipids
- 2 Action of salivary amylase.
- 3 RBC and WBC counts.
- 4 Estimation of Haemoglobin.
- 5 Blood groups (ABO and Rh).
- 6 Measurement of blood-pressure.
- 7 Abnormal and normal values of constituents of urine.
- 8 Water analysis: pH, alkalinity, dissolved oxygen, chloride and transparency.
- 9 Soil analysis: texture, moisture, organic and inorganic contents.

### **DISSECTIONS:**

- **Digital animals:** Virtual dissection will be done (if facility of virtual is made available by University).
- Virtual dissection of Scoliodon cranial nerves and brain

### **MUSEUM SPECIMENS/ SLIDES SHOWING ADAPTATIONS :**

Students are required to write about specific adaptations of following animals in relation to habit and habitat only:

**Cursorial** : *Acinonyx jubatus, Equus caballus, Moschus moschiferous.*

**Flight** : *Columba livia, Pteropus, Draco, Exocoetus, Papilio.*

**Arboreal** : *Chamaeleon, Hyla, Presbytis.*

**Aquatic** : *Physalia, Chiton, Hydrophis, Labeo Anguilla, Notopterus*

**Fossorial** : *Pheretima, Teredo, Chaetopterus, Talpa, Lepus, Ichthyophis, Naja.*

**Parasitic** : *Taenia, Fasciola, Enterobius, Ascaris, Schistosoma, Hirudinaria, Pediculus, Ixodes.*

- 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):**

##### **ANIMAL PHYSIOLOGY :**

- 1 William S. Hoar, General and Comparative Physiology, Prentice Hall of India Pvt. Ltd.
- 2 Wood, D.W., Principles of Animal Physiology.
- 3 Prosser CL., Comparative Animal Physiology, Satish Book Enterprise.
- 4 Eckert, Animal Physiology. (W.H. Freeman).
- 5 Ganong : Review of Medical Physiology (Lange).

##### **BIOCHEMISTRY :**

- 6 Stryer, L : Biochemistry (Freeman)
- 7 Conn et al : Outlines of Biochemistry (Wiley)
- 8 R.K.Murray et al, Harpers Biochemistry, Lang Medical Book.

##### **IMMUNOLOGY**

- 9 Roitt I : Essential Immunology (ELBS)

10 Kuby : Immunology (W.H. Freeman).

**ECOLOGY**

11 Odum : Ecology (Amerind).

12 Odum : Fundamentals of Ecology (Saunders).

13 Ricklefy : Ecology (W.H.Freeman).

**BIOSTATISTICS :**

14 Green, R.H.Sampling design and statistical methods for environmental biologists. John Wiley and Sons New York.

15 Snedecor, G.W. and W.G. Cochran. Statistical methods. Affiliated East-West Press, New Delhi (Indian Ed.)

16 P.N.Arora and P.K.Malhan, Biostastics, Himalaya Publishing House, Bombay.

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## **ETHOLOGY**

- 17 Drickamer & Vessey: Animal Behaviour, Concepts, Processes and Methods (Wadsworth).
- 18 Grier : Biology of Animal Behaviour (Mosby College)
- 19 Immelmann : Introduction to Ethology (Plenum Press)
- 20 Lorenz : The Foundation of Ethology (Springer-Verlag)
- 21 Manning : An Introduction to Animal Behaviour (Addison-Wesley)
- 22 Reena Mathur : Animal Behaviour, Rastogi Publications, Merrut.

## **EVOLUTION :**

- 23 Dobzhansky, Ayala, Stebbins & Valentine : Evolution (WH Freeman)
- 24 Dobzhansky : Genetics and Origin of species (Columbia University Press)
- 25 Major : Population, Species and Evolution
- 26 White : Animal Cytology and Evolution.
- 27 Moody : Introduction to Evolution
- 28 Savage : Evolution (Holt, Reinhart and Winston).

## **PRACTICAL :**

- 29 Verma, PS, A manual of practical Zoology Vertebrates S.Chand and Co. Ltd., Ram Nagar, New Delhi(English and Hindi Editions).
- 30 Lal, SS : Practical Zoology Vertebrates, Rastogi Publication, Meerut (English and Hindi Editions).
- 31 Verma PS & Srivastava PC, Advanced Practical Zoology, S.Chand & Co.

***PAPER CODE-9553***

**THIRD YEAR B.Sc. Botany Effective from session 2016-17**

**PAPER I: Paper Code.....**

**ENVIRONMENTAL BIOLOGY AND PHYTOGEOGRAPHY**

**Unit-1**

Definition, scope and aims of ecological studies, relation with other sciences; factors affecting plant growth and distribution - climatic, edaphic, biotic and topographic. **-10 hours**

#### **Unit-2**

Plant population - natality, mortality, age and sex ratio, growth rate, biotic potential. Plant Community - concept and characters (qualitative and quantitative characters); Plant succession - xerosere, hydrosere. Ecosystem concept - structure and function : food chain, food web, trophic levels, ecological pyramids, energy flow and biogeochemical cycles. **-10 hours**

#### **Unit-3**

Pollution : air, water, land, noise and their control. Conservation and management of natural resources, endangered plants and their conservation; biosphere reserves, National Parks and sanctuaries; Chipko movement.

**-10 hours**

#### **Unit-4**

Biodiversity and its Conservation; Hotspots in India. Morphological, Anatomical and Physiological adaptations of hydrophytes, xerophytes and halophytes; natural vegetation of Rajasthan. Plant indicators. **-10 hours**

#### **Unit-5**

Phytogeography - definition, aims, objectives, scope and relation with other disciplines; phytogeographical regions of world and India; continuous and discontinuous distributions, endemism, continental drift theory, land bridges, age and area hypothesis, migration.

**-10 hours**

#### **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**

**THIRD YEAR B.Sc. Botany Effective from session 2016-17**

**PAPER II: Paper Code.....**

**PLANT PHYSIOLOGY AND BIOCHEMISTRY**

**Unit-1**

Different models of cell membrane to explain structure and function; water relations – osmosis, diffusion, diffusion pressure deficit (DPD), turgor pressure, wall pressure; concept of water potential. Mechanism and factors affecting transpiration, role of macro and micro elements, carrier concept of ion absorption. **-10 hours**

**Unit-2**

Photosynthesis - photosynthetic pigments; light absorption and mechanism of carbon fixation, C3 and C4 plants. Brief account of CAM, photorespiration, CO<sub>2</sub> compensation point. Factors affecting photosynthesis. Enzymes : general characteristics, traditional and modern methods of enzyme classification, mode of action. Isozymes. **-10 hours**

**Unit-3**

Respiration - glycolysis, Krebs cycle, electron transport system and oxidative phosphorylation, factors affecting respiration. Synthesis and degradation of fatty acids. **-10 hours**

**Unit-4**

Plant Growth Regulators : auxins, gibberellins, cytokinins, ethylene and abscisic acid, their physiological effects and application in agriculture and horticulture; Seed dormancy, senescence, photoperiodism and vernalization. **-10 hours**

**Unit-5**

Principles and use of following techniques : pH metry, centrifugation, colorimetry, chromatography. Microscopy: light and compound; scanning electron microscopy. **-10 hours**

**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-9555**

### **THIRD YEAR B.Sc. Botany Effective from session 2016-17**

**PAPER III: Paper Code.....**

#### **MOLECULAR BIOLOGY AND BIOTECHNOLOGY**

##### **Unit-1**

Bacterial genome. Methods of genetic recombination in bacteria (Transformation, Transduction and Conjugation). Principles of recombinant DNA technology. Basic tools and techniques. *Neurospora* genetics. Molecular aspects of biological nitrogen fixation. **-10 hours**

##### **Unit-2**

Structure, chemistry and types of nucleic acids. Replication of DNA. Central dogma, transcription and translation, genetic code. Gene regulation - operon model, twocomponent regulatory system. **-10 hours**

##### **Unit-3**

History of plant tissue culture, contribution made by Haberlandt, White, Nobecourt, Gautheret, Steward, Reinert, Morel and Vasil. Highlights of work done by Indian Scientists. Basic tools and techniques of plant tissue culture, maintenance of aseptic conditions, Laminar Air Flow Bench, Autoclave, Growth Chamber, methods of sterilization, culture media and their preparation. **-10 hours**

##### **Unit-4**

Explant types, initiation of cultures, maintenance of cultures, callus and liquid suspension culture, single cell culture, protoplast isolation, purification, culture and regeneration. Regeneration *in vitro* through organogenesis, somatic embryogenesis, androgenesis and haploid production. **-10 hours**

##### **Unit-5**

Methods of gene transfer in plants - microinjection, electroporation, particle - gun technology, *Agrobacterium*-mediated gene transfer. Plant tissue culture in Industry. Secondary plant products with special reference to alkaloids. Prospects of drug production in cell cultures and Bioreactor. **-10 hours**

##### **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-9557**

## **THIRD YEAR B.Sc. MATHEMATICS 2017-18**

### **PAPER – I**

### **REAL ANALYSIS**

**Duration: 3 Hours**

**Max. Marks: 50**

### **UNIT - I**

Real number system:

- (i) Field, ordered field, upper and lower bounds of a set in an ordered field. Supremum and infimum of a set and their properties. Completeness, Archimedean and denseness properties of an ordered field, the set  $Q$  of rational numbers as a non-complete dense Archimedean ordered field and the set  $R$  of real numbers as a complete dense Archimedean ordered field,
- (ii) Open interval, closed interval, neighbourhood of a number. Real line  $R$ -Interior points and limit points of a set in  $R$ , open sets and closed sets in  $R$  and their properties, Nested Interval property. Bolzano-Weierstrass theorem, Heine Boral theorem, Compact set and connected set and their properties.

### **UNIT - II**

- (i) Sequence, Bounded sequence, monotonic sequence, limit of a sequence, convergent sequence, properties of convergent sequence, Cauchy first and second theorems on limits, subsequence and it's properties, Cauchy sequence and it's properties, Cauchy general principle of convergence, Examples of convergent sequences.
- (ii) Series: Convergence and divergence of an Infinite series of real numbers, the necessary and sufficient conditions, various tests of convergence problems and their illustrations with regard to infinite series of positive terms. Series: Alternating series and Leibnitz test, absolute and semi (or conditional) convergence.

### **UNIT-III**



Riemann Integration: Upper and Lower Darboux sum, Upper and Lower Riemann integrals, Riemann integrability of a bounded function in a closed interval, the necessary and sufficient condition for R integrability in terms of Darboux sums, properties of R-integrable functions, Fundamental theorem of integral Calculus.

#### UNIT - IV

(i) Uniform convergence of sequences and series of functions, various tests including  $M_n$ -test and Weirstrass M-test, relations of uniform convergence with the continuity of the limit and the sum functions and also with term by term differentiation and term by term integration.

(ii) Fourier series representation of periodic functions which are even, odd and none of these in the full interval or half the interval.

#### UNIT - V

(i) Convergence of improper integrals - various tests and their applications, Evaluation of such integrals.

(ii) Equivalent sets and their examples, nature of the relations of equivalence. Denumerable and non numerable sets, countable and uncountable sets, Nature of subsets of a countable set and that of a denumerable (countable) sets, union of denumerable (countable) sets, Denumerability of the sets of integers and rational numbers and non denumerability of the closed unit interval  $[0, 1]$  and the sets of real numbers and irrational numbers.

#### References:

1. T. M. Apostol : Mathematical Analysis.
2. R. R. Goldbeg : Real Analysis
3. Walter Rudin : Principles of Mathematical Analysis
4. P.K. Jain & S. K. Kaushik : An introduction to Real Analysis.
5. D. Somasundaram & B. Chaudhary : A First Course of Mathematical Analysis.
6. G. F. Simmon : Introduction to Topology.
7. Bhargava & Goyal : Real Analysis.
8. Gokhroo & others : Real Analysis.
9. Sharma & Purohit : Elements of Real Analysis.

*PAPER CODE-9558*

### THIRD YEAR B.Sc. MATHEMATICS 2017-18

#### PAPER – II

#### ABSTRACT ALGEBRA

**UNIT – I**

Rings, definition and examples of various kinds of rings, integral domain, division ring, field, characteristic of a ring and integral domain, subring and subfield With examples. Left and right ideals with examples and properties, Principal ideal, principal ideal ring. Maximal, prime and Principal ideals in Commutative rings and their theorems.

**UNIT -II**

Quotient ring, Homomorphism and isomorphism in rings, kernel of homomorphism, Fundamental theorem of ring homomorphism. The three isomorphism theorems in rings, Embedding of a ring into a ring with unity and also into a ring of endomorphism of some abelian groups, Quotient field of an integral domain.

**UNIT - III**

Definition and various examples of vector spaces, subspaces and examples, Intersection, sum and direct sum of two subspaces, Linear span, Linear dependence, independence and their basic properties and problems.

**UNIT- IV**

Basis, Dimension and examples, Finite dimensional vector spaces, Existence theorem for a basis, Extension theorem, Invariance of the number of elements of a basis set, Existence of complementary subspaces of a subspace of a finite dimensional vector space, Dimension of sum (and direct sum) of two subspaces, Quotient space and its dimension.

**UNIT - V**

Linear transformations, Rank and Nullity of a linear transformation, Sylvester law of nullity, to obtain a matrix from a linear transformation and vice-versa and their problems relating to the same and different bases. The algebra of linear transformations, dual space and dual basis and dimension of dual space, bidual space and natural isomorphism (Reflexivity).

**References:**

1. Surjeet Singh and Quazi Zarneeruddin : Modern Algebra.
2. I.N.Herstein : Topics in Algebra.
3. R.S.Agrawal : Algebra.
4. Gokhroo, Saini : Advance Abstract Algebra.
5. Shanti Narayan : A Text-Book of Modern Abstract Algebra.

6. Hoffman and Kunze : Linear Algebra, (Second Edition).
7. Purohit, Pareek and Sharma : Linear Algebra.
8. Halmos, Paul R : Finite - Dimensional Vector spaces.

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**Paper –III (Optional): Any one of the following papers –**

*PAPER CODE-9559*

## **THIRD YEAR B.Sc. MATHEMATICS 2017-18**

### **PAPER -III (A)**

### **DISCRETE MATHEMATICS**

**Duration: 3 Hours**

**Max. Marks: 75**

#### **UNIT – I**

Sets and propositions – cardinality, Mathematical Induction, Principle of Inclusion and exclusion. Computability and formal language- ordered set. Language phrase structure Grammars. Types of Grammars and languages. Permutation and combinations: Simple problems.

#### **UNIT –II**

Relations and functions:- Binary Relations, Equivalent Relations and Partitions, Partial order relations and lattices, Pigeon Hole principle. Graphs and planar graphs: - Basic Terminology; Multigraphs, weighted graphs, paths and circuits shortest paths. Eulerian paths and circuits. Planar graphs.

#### **UNIT – III**

Trees: Rooted trees, Binary tree, Decision or sorting tree, spanning tree, minimal spanning tree. Pumping lemma. Finite state machine: Equivalent machines, Finite state machine as Recognizers. Analysing Algorithms– Time complexity, complexity of problems.

#### **UNIT –IV**

Recurrence Relations and Recursive Algorithms: Linear Recurrence Relations with constant coefficients, Homogeneous solutions, Particular solution, Total solution, Solution by the method of generating functions.

#### **UNIT – V**

Brief review of groups and Rings. Boolean Algebras – Lattices and Algebraic structures. Duality, Distribution and complemented Lattices, Boolean Lattice and Boolean Algebras, Boolean function and expressions, Propositional calculus, Design and Implementation of Digital network - Switching circuits.

#### **References:**

1. C.L. Liu : Elements of Discrete Mathematics
2. K.D. Joshi : Foundation of Discrete Mathematics

3. Mradula Garg & R. Panday : विविक्त गणित

4. Gokhroo et.al : विविक्त गणित

*PAPER CODE-9559*

## **THIRD YEAR B.Sc. MATHEMATICS 2017-18**

### **PAPER- III (B)**

#### **NUMERICAL ANALYSIS AND OPERATIONS RESERCH**

**Duration: 3 Hours**

**Max. Marks: 75**

#### **UNIT - I**

Differences, Relation between differences and derivatives, differences of Polynomial, Newton-Gregory formula for forward and backward interpolation, divided differences. Newton's General interpolation formula, Lagranges's interpolation formula.

#### **UNIT - II**

Gauss's central difference formula, Stirling's and Bessels interpolation formula, Inverse interpolation. Numerical differentiation, Derivatives from Interpolation formulae, Method of operators, Numerical Integration: Newton-cotes Quadrature formula, Trapezoidal, Simpson's one third, Simpson's three-eight rules.

#### **UNIT-III**

Gauss Quadrature formulae, Estimation of errors in quadrature formula, location of roots by Descarte's method of sign, Newtons theorem on multiple roots, Numerical solution of Algebraic and Transcendental equations, Bisection method, Regula-Falsi method, Method of integration .

#### **UNIT-IV**

Introduction to linear programming problems, Mathematical formulation Graphical method of solution of linear programming problems (Problems of two variables only), Theory of convex sets, Theory of Simplex method and its applications to simple linear programming problems.

#### **UNIT - V**

Concepts of duality in linear programming, formation of dual problems, Elementary theorems of duality. Assignment and transportation problems and their optimum solutions.

#### **References:**

1. C. E. Froberg : Introduction to Numerical Analysis
2. M. K. Jain, S. R. K. Iyenger and R.K. Jain : Numerical methods: Problems & solutions

3. G. Hadley : Linear Programming
4. Kanti Swaroop, P. K. Gupta and Man Mohan : Operation Research
5. H.C. Saxena : Numerical Analysis
6. Goyal, Mittal : Numerical Analysis
7. Goyal, Mittal : Numerical Analysis (Hindi ed.)
8. Goyal, Mittal : Numerical Analysis (Hindi ed.)
9. Goyal, Mittal : Operations Research
10. S.D.Sharma : Operations Research
11. Gokhroo, Saini, Jain : Operations Research (Hindi ed.)
12. Bhargava, Bhati, Sharma : Linear Programming (Hindi ed.)
13. Gokhroo, Saini, Jain : Linear Programming (Hindi ed.)

**PAPER CODE-9559**

## **THIRD YEAR B.Sc. MATHEMATICS 2017-18**

### **PAPER- III(C)**

### **MATHEMATICAL STATISTICS**

**Duration: 3 Hours**

**Max. Marks: 75**

#### **UNIT -I**

Probability: Definitions of Probability, Addition and Multiplication laws, Conditional probability , Independent events, Baye's Theorem.

#### **UNIT II**

Random variable, Distribution function, Probability mass & density functions, probability distribution, Joint, marginal and conditional probability functions.

#### **UNIT –III**

Mathematical expectation and Moments, Addition & Multiplication law, Covariance, Expectation and Variance of linear combination of two variables, Moment generating, cumulant generating & characteristic functions.

#### **UNIT –IV**

Theoretical Probability distributions- Binomial, Poisson and Normal distributions and their properties.

## UNIT –V

Curve fitting by the principle of least squares, fitting of straight line and parabola, Bivariate linear correlation and regression.

### Books Recommended:

1. Mathematical Statistics, J. N. Kapur & H.C. Saxana, S. Chand & Co., New Delhi.
2. Fundamentals of Mathematical Statistics, V. K. Kapoor & S.C. Gupta, Sultan Chand & Sons, New Delhi.
3. Mathematical Statistics by Dr. Gokhroo & Saini.

### NOTE:

Candidates who have offered Statistics as an optional subject will not be permitted to offer the paper III (B) and III (C). Candidates who have offered Computer science as an optional subject will not be permitted to offer paper III (B).

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