

Reaccredited Grade 'A' by NAAC&Categorized 'A' by MHRD

Jain VishvaBharati Institute

(Deemed University)



Acharya KaluKanyaMahavidyalaya

Ladnun-341 306 (Raj.)

Syllabus

NEW EDUCATION POLICY-2020

&

CHOISE BASED CREDIT SYSTEM (C.B.C.S.)

B.Sc. (Bachelor of Science)

(Four Years)

DEPARTMENT OF EDUCATION
JAIN VISHVA BHARATI INSTITUTE, LADNUN
Bachelor of Science
Four Years Integrated Regular Programme

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

1. Introduction:

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

Duration: The B.Sc programme is full time four years integrated programme.

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

Objectives:

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

Programme Outcome of B.Sc. (4 Years Integrated Programme)

The department of education runs the B.Sc. programme which is recognized by NCTE, New Delhi since 20015. B.Sc. is Bachelor of Science and it is an undergraduate level degree course in the field of science. It has many different specializations like Zoology, Chemistry, Botany, physics Microbiology, Mathematics, and many more. B.Sc. in PCM Physics, Chemistry Mathematics, and CBZ that are Chemistry, Botany, and Zoology, are a combined course which teaches about all the three subjects in detail. Candidates learn about the science of matter in more specialized manner and learn about its composition, structure, behavior, properties, and the changes it undergoes during any chemical reaction. They also learn about plant

biology which includes study about algae, fungi, their growth, reproduction, development, chemical properties, structure, metabolism, etc. as a part of Botany.

The Zoology branch of the course deals with the topics like animal kingdom, their structure, embryology, classification, evolution, etc for both living and extinct animals. Physics: Career Prospects. On successful completion of this course, the candidates are open to working in wide range of employment areas like agriculture research areas, astronomy, aviation industry, colleges, construction firms, cryptography, demolition squads, education firms, hospitals, labs, etc.

Mathematical arguments in a logical manner. and statistics, chosen by the student from the given courses. Understand, formulate and use quantitative models arising in social science, Business and other contexts.

Initially, establishing a study and robust base for scholars in concepts when it comes to the combination of biology and technology manipulation for human benefit. This course consists of implementing the required talent and ability based on sound practical and theoretical expertise that embarks up the development of modern society

Programme Specific Outcomes (PSO) of B.Sc. (4 Years integrated programme)

1. Professional growth in order to develop and inspire the influence of professional growth.
2. Perceive and identify the analysis and planning of problem solving strategies with the aid of good computation skills.
3. Teaching students to work as a team as it plays an essential role in multidisciplinary dimension.
4. Academic administration to identify and make the scholar ready for new tasks emerging from the development of global society.
5. Developing new and enhancing conversational skills that lead to not only to good communication but also to the excellent drafting abilities linked with technical reports and presentations.
6. Students will develop the basic capability required to evaluate and illustrate basic scientific data.
7. Eventually making the student aware about the skills and qualities indeed required for being a good entrepreneur.
8. Increment in practical knowledge and skills related to the theories of biotechnology subjects.
9. Consciences inspired with legal ethics of professionalism.

Scheme of Examination

1. Hindi/English shall be medium of instruction of examination.
2. Examination shall be conducted at the end of each semester as per the academic/examination calendar notified by the Institute.
3. Each theory paper will be valued as per marks division given in the prospectus which will include semester end theory exam. Practical (wherever applicable) and continuous internal assessment (CIA).
4. CIA will include the following components : (Education Subject)

▪ Attendance regularity	10 marks
▪ Class Tests	05 marks
▪ Assignments	10 marks
▪ Class Presentation/Seminar	05 marks
Total	30 marks

CIA will include the following components- (Only Science Subject)

The CIA comprises of attendance, participation in co-curriculum activities and group discussion etc. The marks distribution will be as follows-

- (1) Attendance - 5 marks
 (2) Participation in co-curriculum activities, Prayer, Behavior of candidate, etc.) - 5 marks
 (3) Group discussion/Presentation/desk work - 5 marks
 Total - 15 Marks

5. Distribution of Marks- (Only Science Subject)

- A. Theory - 60 Marks
 B. Practical - 25 Marks
 C. Continuous Internal Assessment - 15 Marks

Total = 100 Marks

Paper Pattern Only Science Subject :

Type of Questions	Number of Questions	Marks of Each Question	Maximum Marks
Objective type questions	10	½ mark for each question	05
Short answer type questions	4	2 marks for each question	08
Essay type questions	2	3½ marks	07
Total Marks			20
Total sum			20X3 = 60

Evaluation Panel:

CIA Concerned Two Subject teacher nominated by the HOD of the Department.

Acharya Kalu Kanya Mahavidhyalaya, Jain Vishva Bharati Institute, Ladnun
Semester-I

Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
-	Student Induction Programme	Two Week Student Induction Programme					
BBSC101 MJ	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25 Practical	
BBSC102 MJ	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25 Practical	
BBSC103 MN	Disciplinary/Inter disciplinary Courses	Mathematics-I	CE	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25 Practical	
BBSC104 MJ	Disciplinary/Inter disciplinary Courses	Botany-I	CE	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25 Practical	
BBSC105 MN	Disciplinary/Inter disciplinary Courses	Zoology-I	CE	4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	
BJVB101SE		Personlity Development & Yoga (Practicle)	Skills	2	15	35	100
BJVB102VA		Personlity Development & Yoga (Theory)	Common Value Added	2	15	35	100
BJVB103AE		General Hindi/Rajasthani/Pr akrit/Sanskrit	AEC	4	30	70	100
			Total	20	120	380	500

Note: Choice One Group (A,B &C)

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

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

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

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

(B.Sc.)
Semester-II
Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC201MJ	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25	
BBSC202MN	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25	
BBSC203MJ	Disciplinary/Inter disciplinary Courses	Mathematics-I	Select Any One Minor Course	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25	
BBSC204MN	Disciplinary/Inter disciplinary Courses	Botany-I	CE	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25	
BBSC205MJ	Disciplinary/Inter disciplinary Courses	Zoology-I		4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25	
BJVB201SE		Basics of Computer	Skill	4	30	50+20	100
BJVB202ID		Jain Culture & Life Values	Interdisciplinary	4	30	70	100
			Total	20	105	395	500

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

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

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

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

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

(B.Sc.) Semester-III
Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC301MN	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25	
BBSC302MJ	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25	
BBSC303MJ	Disciplinary/Inter disciplinary Courses	Mathematics-I	Select Any One Minor Course	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25	
BBSC304MJ	Disciplinary/Inter disciplinary Courses	Botany-I	CE	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25	
BBSC305MJ	Disciplinary/Inter disciplinary Courses	Zoology-I	CE	4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25	
BJVB301AE		General English	AEC	4	30	70	100
BJVB302ID		Ahimsha & Anuvrati	Interdisiplanry	4	30	50+20	100
			Total	20	105	395	500

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

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

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

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

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

(B.Sc.)
Semester-IV
Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC401MJ	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25 Practical	
BBSC402MJ	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25 Practical	
BBSC403MN	Disciplinary/Inter disciplinary Courses	Mathematics-I	Select Any One Minor Course	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25 Practical	
BBSC404MJ	Disciplinary/Inter disciplinary Courses	Botany-I	CE	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25 Practical	
BBSC405MN	Disciplinary/Inter disciplinary Courses	Zoology-I		4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	
BJVB401SE		Soft/Communication Skills	skills	2	15	35	50
BJVB402VA		Enviornmental Studies	Value Added	4	30	70	100
BJVB403VA		Preksha Introduction and Practice	Value Added	2	15	35	50
			Total	20	105	395	500

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

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

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

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

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

Semester-V (B.Sc.)
Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC501MJ	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25	
BBSC502MN	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25	
BBSC503MJ	Disciplinary/Inter disciplinary Courses	Mathematics-I	Select Any One Minor Course	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25	
BBSC504MN	Disciplinary/Inter disciplinary Courses	Botany-I	CE	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25	
BBSC505MJ	Disciplinary/Inter disciplinary Courses	Zoology-I	CE	4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25	
BJVB502MJ		Projects Formation and Presentation	Core Elective	4	30	50 Project Formation+ 20 Presentation	100
BJVB503SI		Internship		4	30	70	100
			Total	20	90	410	500

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

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

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

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

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

Semester-VI
Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC601MN	Disciplinary/Inter disciplinary Courses	Chemistry-I	Select Any Two Major Course CE	4	15	20	100
		Chemistry-II				20	
		Chemistry-III				20	
		Chemistry Practical				25 Practical	
BBSC602MJ	Disciplinary/Inter disciplinary Courses	Physics-I	CE	4	15	20	100
		Physics-II				20	
		Physics-III				20	
		Physics Practical				25 Practical	
BBSC603MJ	Disciplinary/Inter disciplinary Courses	Mathematics-I	CE	4	15	20	100
		Mathematics-II				20	
		Mathematics-III				20	
		Mathematics Practical				25 Practical	
BBSC 604MJ	Disciplinary/Inter disciplinary Courses	Botany-I	CE	4	15	20	100
		Botany-II				20	
		Botany-III				20	
		Botany Practical				25 Practical	
BBSC 605MJ	Disciplinary/Inter disciplinary Courses	Zoology-I	CE	4	15	20	100
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	
		Zoology-II				20	
		Zoology-III				20	
		Zoology Practical				25 Practical	
BJVB601MJ		System of Indian Philosophy		4	30	70	100
BJVB602MJ		Indian culture		4	30	70	100
			Total	20	105	395	500

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

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

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

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

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

Semester VII
Distribution of Papers, Marks and Credit

Course Code	Curricular Component	Course Title	Course Category	Credit	C.I. A.	Theory+Practical	Total
BBSC701MN	Disciplinary/Inter disciplinary Courses	Chemistry	CC	4	15	60+25	100
BBSC702MJ	Disciplinary/Inter disciplinary Courses	Physics	CC	4	15	60+25	100
BBSC703MJ	Disciplinary/Inter disciplinary Courses	Mathematics	CC	4	15	60+25	100
BBSC 704MJ	Disciplinary/Inter disciplinary Courses	Botany	CC	4	15	60+25	100
BBSC 705MJ	Disciplinary/Inter disciplinary Courses	Zoology	CC	4	15	60+25	100
BJVB701 MJ		Research Methodology	Common Paper	4	30	70	100
BJVB702MN	Interdisciplinary (Minor) (Any One)	Value Education and Spirituality	Interdisciplinary (Minor)	4	30	70	100
BJVB703MN		Preksha Meditation and Self Management		4	30	70	100
BJVB704MN		Informational Technology and Computer		4	30	70	100
BJVB705MN		The Use of English		4	30	70	100
BJVB706MN		Non-violence and Peace		4	30	70	100
BJVB707MN		Introduction to Prakrit		4	30	70	100
BJVB708MN		Introductions to Jainism		4	30	70	100
BJVB709MN		Introduction to Sanskrit		4	30	70	100
			Total	20	105	320	500

Semester VIII
Distribution of Papers, Marks and Credit

Course Code	Course Title	Course Category	Credit	C.I. A.	Theory+Practical	Total
BBSC801MN	Chemistry	CC	4	15	60+25	100
BBSC802MJ	Physics	CC	4	15	60+25	100
BBSC803MJ	Mathematics	CC	4	15	60+25	100
BBSC 804MJ	Botany	CC	4	15	60+25	100
BBSC 805MJ	Zoology	CC	4	15	60+25	100
BJVB801MN	Review of Literature/Research Proposal (Minor)	Common Paper	4	15	35+ DP-50	100
BJVB802RP	Paper Publication/Presentation of Paper at National Level Seminar/Conference	Common Paper	4		PP-50+ PUB-50	100
BJVB803RP	Research Project/Dissertation	Common Paper	4		100 Dissertation	100
BJVB804RP	Research Project/Dissertation (Viva-Voce)	Common Paper	4		100 (Viva-Voce)	100
		Total	20	45	455	500

Semester-I

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 101	Chemistry-I	Any Three CC	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

Chemistry-Paper-I : Inorganic chemistry

Objectives:

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

Unit 1 : Atomic structure

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

Unit2 : Periodicity of p-block elements & Chemistry of noble gases

Comparative study of p-block elements: group trends, electronic configuration, atomic and ionic radii, ionization energy, electron affinity, electronegativity, oxidation states, inert pair effect. Introduction of noble gases, Chemical properties of the noble gases, compounds of noble gases, chemistry of xenon, structure and bonding of xenon compounds.

Unit 3 : Chemical Bonding Part I

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

Unit 4 : Chemical Bonding Part II

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

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

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

Chemistry-Paper-II : Organic chemistry

Objectives:

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

Unit-I : Mechanism of organic reaction

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

Unit-II : Alkanes & Cycloalkanes

IUPAC nomenclature of branched and unbranched alkanes. The alkyl group. Isomerism in alkanes sources, methods of formation (with special reference of Wurtz reaction, Kolbe reaction, Corey House reaction and decarboxylation of carboxylic acids.) Physical properties and chemical reactions of alkanes, Mechanism of free radical halogenation of alkanes, orientation, reactivity and selectivity. Nomenclature, method of formation, chemical reactions, Baeyer strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings.

Unit-III : Alkenes & Cycloalkenes

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

Unit-IV Dienes & Alkynes

Nomenclature and classification of dienes, isolated, conjugated and cumulated dienes, Structure of allenes and butadiene, methods of formation, polymerization, chemical reactions, 1,2 and 1,4-additions, Diels-Alder reaction. Nomenclature, structure and bonding in alkynes, methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, Hydroboration-oxidation, metal-ammonia reduction, oxidation and polymerisation.

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

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

Chemistry-Paper-III :Physical Chemistry

Objectives:

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

Unit I : Mathematical Concepts and Computer

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

Unit II : Gaseous States1

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

Unit-III : Gaseous States2

Critical phenomenon: PV isotherm of real gases, continuity of state, the isotherms of Vander Waals equation, relationship between critical constant and Vander-Waals constant, the law of corresponding states, reduced equation of state. Root mean square, average and most probable velocity. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquification of gases.

Unit-IV : Liquid state

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

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

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

PRACTICALS

Inorganic chemistry

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

Physical chemistry

Viscosity, Surface Tension

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

Viva-Voce and Record

Suggested Reading:

1. कार्बनिक रसायन, सुरेश आमेटा, एच.के. पाण्डे, एच.एस. शर्मा, पीकी बी. पंजाबी एवं भूपेन्द्र शर्मा हिमांशु पब्लिकेशन्स, उदयपुर
2. अकार्बनिक रसायन, ओझा, भोजक, कोठारी, चतुर्वेदी, एवं वी.के. स्वामी, रमेश बुक डिपो, जयपुर
3. प्रायोगिक रसायन, भार्गव, लवानिया, ओझा, रमेश बुक डिपो, जयपुर
4. भौतिक रसायन, शर्मा, भार्गव, गुप्ता, रमेश बुक डिपो, जयपुर
5. कार्बनिक रसायन, विजयश्री मनोज छंगाणी, अल्का पब्लिकेशन, अजमेर
6. अकार्बनिक रसायन, विजयश्री कोठारी छंगाणी, अल्का पब्लिकेशन, अजमेर
7. प्रायोगिक रसायन, छंगाणी, विजयश्री, खण्डेलवाल, अल्का पब्लिकेशन, अजमेर
8. अकार्बनिक रसायन, जी.के. रस्तोगी, यशपाल सिंह, कॉलेज बुक हाऊस, जयपुर
9. भौतिक रसायन, वी.के. गोयल, आर.एस. पीतलिया, कॉलेज बुक हाऊस, जयपुर
10. प्रायोगिक रसायन, वी.के. गोयल, आर.एस. पीतलिया, कॉलेज बुक हाऊस, जयपुर
11. अकार्बनिक रसायन, लवानिया, गुप्ता, ओझा, बंसल, रमेश बुक डिपो, जयपुर

Semester-I

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 102	Physics-I	CE*	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Practical				25 Practical	

Physics-Paper-I:MECHANICS – I

Objectives:

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

UNIT-I Physical Laws and Frames of Reference:

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

UNIT-II Special Theory of Relativity:

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

UNIT-III Conservation Laws:

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

UNIT-IV Rigid Body Dynamics:

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

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

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

Suggested Readings :

1. Berkeley Physics Course Vol. 1, Mechanics (Mc Graw-Hill)
2. The Feynman Lectures on Physics, Vol. 1, R.P. Feynman R.B. Ligton and M.Sands (Narosa Publishing House)
3. P.Khandelwal - Oscillation and Waves, (Himalaya Publishing House, Mumbai)
4. R.S. Gambhir - Mechanics (CBS Publishers and Distributors, New Delhi)

5. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, 2015–16, यांत्रिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली

Physics-Paper-II :MECHANICS – II

Objectives:

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

UNIT-I Centre of mass frame:

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

UNIT-II Motion under central forces:

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

UNIT-III Elasticity-I:

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

UNIT-IV Elasticity-II:

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

Suggested Readings :

1. Berkeley Physics Course Vol. 1, Mechanics (Mc Graw-Hill)
2. The Feynman Lectures on Physics, Vol. 1, R.P. Feynman R.B. Ligton and M.Sands (Narosa Publishing House)
3. P.Khandelwal - Oscillation and Waves, (Himalaya Publishing House, Mumbai)
4. R.S. Gambhir - Mechanics (CBS Publishers and Distributors, New Delhi)
5. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, 2015-16, यांत्रिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली

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

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

Physics-Paper-III:ELECTROMAGNETISM – I

Objectives:

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

UNIT -I Vector Fields:

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

UNIT -II Curl and the Field of Stationary Charge:

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

UNIT -III The Field of Moving Charge:

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

UNIT – IV The Magnetic Field:

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

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

- ❖ Describe the basic mathematical concepts related to electromagnetic vector fields.
- ❖ Discuss about the principles of electrostatics.
- ❖ Applies the principles of magneto statics.

- ❖ Differentiation between electric field and electric potential.
- ❖ Calculate boundary conditions.

Suggested Readings :

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, 2015–16, विद्युत चुम्बकत्व, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली

Physics Practical: I

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

Suggested Readings :

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

Semester-I

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 103	Mathematics-I	CE*	4	15	20	100
	Mathematics-II				20	
	Mathematics-III				20	
	Mathematics Practical				25 Practical	

Mathematics -Paper-I : Discrete Mathematics-I

Objectives:

- ❖ Discuss about the set, Relation and function-Binary Relation.
- ❖ To aware about the Boolean Algebra- Lattices and Algebraic Structure.
- ❖ Understand the Logic and Propositional Calculation.
- ❖ To discuss about duality.

Unit 1 : Sets, Cardinality, Principal of inclusion and exclusion, Mathematical induction. Relations and Functions- Binary relations, Equivalence relations and Partitions, Partial ordered relations and Lattices, Chains and Antichains, Pigeon Hole principle.

Unit 2: Boolean Algebras- Lattices and Algebraic structure, Duality, Distributive and Complemented Lattices. Boolean Lattices, Boolean functions and expressions.

Unit 3 ; Fundamental theorem of arithmetic, divisibility in $\mathbb{Z}$, Congruences, Chinese Remainder Theorem, Euler's function, primitive roots.

Unit 4: Logic and Propositional Calculus, Propositions, Simple and compound, Basic Logical $\neg, \vee, \wedge$ operations, Truth tables, Tautologies and contradictions Propositional Functions. quantifiers.

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

- ❖ Classify the terms set, Relation and function-Binary Relation.
- ❖ Interpret the Boolean Algebra- Lattices and Algebraic Structure.
- ❖ Solve the Fundamental Theorem of Arithmetic, Euler's Function.
- ❖ Calculate the Logic Problem.
- ❖ Describe the duality property.

Suggested Reading :

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

Mathematics -Paper-II : Differential Calculus

Objectives:

- ❖ To understand the series and type of series.
- ❖ To aware the concept of curvature.
- ❖ To develop knowledge about the partial differentiation.
- ❖ To give information about the conic section.

Unit I: Series — Infinite series and Convergent series. Tests for convergence of a series — Comparison test, D'Alembert's ratio test, Cauchy's n-th root test, Raabe's test, De-Morgan-Bertrand's test, Cauchy's condensation test, Gauss's test, (Derivation of tests is not required). Alternating series. Absolute convergence. Taylor's theorem. Maclaurin's theorem.

Unit 2: Derivative of the length of an arc. Pedal equations. Curvature — Various formulae, Centre of curvature and Chord of curvature.

Unit 3 Partial differentiation. Euler's theorem for homogeneous functions. Chain rule of partial differentiation. Total differentiation, Differentiation of implicit functions.

Unit 4: Envelopes and evolutes, Maxima and Minima of functions of two variables. Lagrange's method of undetermined 'multipliers. Asymptotes. Multiple poants. Curve tracing of standard curves (Cartesian and Polar curves).

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

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

Suggested Reading:

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

Mathematics -Paper-III : Analytic Geometry I

Objectives:

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

Unit I : Polar equation of conics, Polar equation of tangent, normal and asymptotes,

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

Unit 3: Sphere, Cone,

Unit 4 ; Cylinder

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

- ❖ Discuss on the Concept of Polar Equation of Conics.
- ❖ To understand the 2-D & 3-D Geometry of Sphere and Cone.
- ❖ To identify the Polar Equation of Tangent.
- ❖ To understand the 2-D & 3-D Geometry of cylinder

Suggested Reading :

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

Semester-I

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 104	Botany-I	CE*	4	15	20	100
	Botany-II				20	
	Botany-III				20	
	Botany Practical				25 Practical	

Botany -Paper-I : MICROBIOLOGY

Objectives:

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

UNIT I: History and development of Microbiology

History and development of Microbiology; contribution of eminent scientists (Antony Van Leeuwenhoek, Louis Pasteur, Robert Koch, Elie Metchnikoff, Paul Ehrlich, Alexander Flemming, Selman A. Waksman, Edward Jenner), spontaneous generation, biogenesis, germ theory of disease, vaccination and discovery of antibiotics, concept of quorum sensing and biofilms, microbial nutrition and scope of microbiology

UNIT II: Bacteria

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

UNIT III: Viruse and Mycoplasma

Discovery, classification and structural component of Viruses, replication, lytic and lysogenic cycle, Bacteriophages, Structure and reproductive cycle of TMV and Pox virus, Transmission of viruses, Mycoplasma: Occurrence, morphology, reproduction and importance.

UNIT IV: Economic importance of bacteria and Viruses

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

Learning Outcomes: After completion the course student would able to

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

Suggested Readings:

- Agrawal, K. and Sharma, J. 2014. A Text book of Mycology, Microbiology and Plant Pathology. CBH publisher, Jaipur.
- Aneja, K. R. 2003. Experiment in Microbiology, Plant Pathology and Biotechnology. New age international (P) Ltd. Publishers, New Delhi.
- Biswas, S. B. and Biswas, A. 2000. An introduction of Viruses. Vikas publications, New Delhi.
- Dubey, R. C. and Maheshwari, D. K., 2002. A Text Book of Microbiology. S. Chand and Co., New Delhi.
- Kumar, H. D. and Kumar, S. 1998. Modern Concepts of Microbiology. Vikas publishing house Pvt. Ltd., New Delhi.
- Madahar, C. L. 2001. Introduction of Bacteria. Mc Graw Hill Edu. Pvt. Ltd., London.
- Mckane, L. and Judy, K. 1996. Microbiology: Essentials and Applications. McGraw Hill, New York.

- Pandey, S. N. and Trivedi, P. C. 2005. A text book of Fungi, Bacteria and Virus. Vikas Publishing House, New Delhi.
- Pelczar, M.J. Microbiology. 5th edition, Tata Mc Graw-Hill Co., New Delhi.
- Prescott, L., Harley, J. and Klein, D. 2005. Microbiology. 6th edition, Tata Mc Graw-Hill Co., New Delhi.
- Purohit, S. S. 2002. Microbiology. Agro. Bot. Publication, Jodhpur.
- Sharma, P. D. 2003. Microbiology and Pathology. Rastogi Publication, Meerut.
- Singh, V. and Srivastava, V. 1998. Introduction of Bacteria. Vikas Publication, New Delhi.
- Singh, R. P. 2010. Microbiology. Kalyani Publishers, New Delhi.

Botany -Paper-II : ALGAE AND LICHENS

Objectives:

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

UNIT I: Basics of algae

General characters, classification of algae (Fritsch, Smith), diversity in habitat, range of vegetative thallus organization, cell structure photosynthetic pigments and reserve food material, Reproduction: vegetative, asexual and sexual, evolution of sex in algae, types of life cycles.

UNIT II: Chlorophyceae and Xanthophyceae

Chlorophyceae: General characteristics, thallus organization, cell structure, reproduction and life cycle of *Chlamydomonas*, *Volvax*, *Chara*.

Xanthophyceae: General characteristics, *Vaucheria*: Thallus organization, cell structure, reproduction and life cycle.

UNIT III: Phaeophyceae and Rhodophyceae:

Phaeophyceae: General characteristics, *Ectocarpus*: Thallus organisation, cell structure, reproduction and life cycle.

Rhodophyceae: General characteristics, *Polysiphonia*: Thallus organisation, cell structure, reproduction and life cycle.

UNIT IV: Lichens

Economic importance of algae, isolation and culture of algae. Lichens: General characters, types, structure, multiplication, reproduction and economic importance, its importance as colonizers and indicators of environment.

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

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

Suggested Readings:

1. Bold, H. C. and Wayne, M. J. 1996. Introduction to Algae. 2nd Edition. Prentice Hall, Inc. Englewood Cliffs, New Jersey.

- Ghemawat, M. S., Kapoor, J. N. and Narayan, H. S. 1976. A Text book of Algae. Ramesh Book Depot., Jaipur.
- Gilbart, M. S. 1985. Cryptogamic Botany. Vol. I and II second edition. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
- Kumar, H. D. 1998. Introductory Phycology. Affiliated East-West Press Ltd., New York.
- Lee, R.E. 2008. Phycology. Fourth Edition, Cambridge University Press, USA.
- Sambamurthy, A.V.S.S. 2006. A Textbook of Algae. I. K. International Pvt. Ltd., New Delhi.
- Singh, V., Pandey, P. C. and Jain, D. K. 2001. A Text book of Botany. Rastogi Publication, Meerut.
- Thakur, A. and Bassi, S., 2007. Diversity of microbes and Cryptogams. S. Chand and Co., New Delhi.
- Van den Hoek, C., Mann, D.J. and Jahns, H.M. 1995. Algae: An introduction to Phycology. Cambridge Univ. Press., England.
- Vashitha, B. R. 2002. Botany for degree students (Algae and Bryophytes). S. Chand and Co. Ltd., New Delhi.

Botany -Paper-III: Mycology and Plant Pathology

Objectives:

- ❖ To understand general characteristics, classification, structure, reproduction of fungi.
- ❖ To learn about general diseases caused by fungi, bacteria, viruses in plants
- ❖ To know general characteristics of oomycetes, zygomycetes
- ❖ To gain knowledge about other classes i.e. ascomycetes, basidiomycetes and deuteromycetes with examples.
- ❖ To understand the general characteristics of deuteromycetes

UNIT I:

Fungi : General characteristics, classification (Alexopoulos and Mims's), thallus, cell structure, nutrition, asexual, sexual reproduction, homothallism, heterothallism and heterokaryosis.

Plant disease: Biotic and abiotic diseases, important symptoms caused by fungi, bacteria, virus and MLOs (Blight, mildew, Downy mildew and green ear, rust, smut, canker, mosaic, little leaf, gall) etc.

UNIT II:

General account of class chytridiomycetes, general characteristics, structure and life cycles/disease cycles of members of oomycetes and zygomycetes with special reference to the genera: *Albugo* (white rust disease), *Sclerospora* (Downy mildew/Green ear disease).

UNIT III:

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

UNIT IV:

General characteristics and structure and life cycle of class Deuteromycetes with special references to *Alternaria* (early blight of potato disease), sex degeneration in fungi and economic importance of fungi.

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

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

Suggested Readings:

- Alexopoulos, C.J. and Mims, C.V. 1988. Introductory Mycology. John Wiley and Sons, New York.
- Dubey, H.C. 1989. Fungi. Rastogi publication, Meerut.

- Pandey, S. N. and Trivedi, P. S. 1994. A text book of Fungi, Bacteria and Virus. Vikas Publishing House, New Delhi.
- Sarabhai, R.C. and Saxena, R.C. 1990. A textbook of Botany. Rastogi publication, Meerut.
- Vashishta, B. R. 2001. Botany for degree student's Fungi. S. Chand and company, New Delhi.
- Webster, J. and Weber, R. 2007. Introduction to Fungi. 3rd edition, Cambridge University Press, Cambridge.

PRACTICAL I

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

Semester-I

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 105	Zoology-I	CE*	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25 Practical	

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

Objectives:

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

Unit I: Principles of Taxonomy:

- 1.1 Nomenclature system, Binomial nomenclature, Trinomial nomenclature, Rules of nomenclature
- 1.2 Concept of five kingdoms, Levels of Organisation, Basis of classification (Number of Cells, Symmetry, Coelom, Embryogeny, Segmentation)

Unit II:

2.1 Phylum Protozoa

Salient features and classification of Protozoa up to Class

Type study – Paramecium (Salient Features, Locomotion, Nutrition and Reproduction)

2.2 Phylum Porifera

Salient features and classification of Porifera up to Class

Type study- Sycon Canal system of Sponges Skeletal System

Unit III

3.1 Phylum Coelenterata

Salient features and classification of Coelenterata up to Class

Type study – Obelia(External Features, Nutrition, Excretion, Reproduction)

Polymorphism in Coelenterates

UNIT IV

4.1 Phylum Platyhelminthes

Salient features and classification of Platyhelminthes up to Class Type study- Taenia(External features and life cycle)

Type study- Fasciola (External Features and Life Cycle)

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

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

- ❖ Describe salient features & classification of coelenterate up to class

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

Objectives:

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

Unit I:

1.1 Annelida:

General characters and outline classification up to classes with examples.

Type-study: Morphology, Digestive, Excretory, & Reproductive systems of leech

1.2 Arthropoda:

General characters and outline classification up to classes with examples.

Type Study: Prawn: -Morphology, Digestive, Excretory, & Reproductive systems.

Unit II:

2.2 Mollusca:

General characters and outline classification up to classes with examples.

Type Study: Pila: External characters, Skeletal, Digestive, Respiration, & Reproductive systems.

Unit III:

3.1 Echinodermata:

General characters and outline classification up to classes with examples.

Type Study: Asterias (External characters, Skeletal, Digestive, Respiration, & Reproductive systems)

Unit IV:

4.1 Hemichordata:

General characters and outline classification up to classes with examples.

Salient features of Balanoglossus

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

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

Zoology- Paper-III: Cell Biology

Objectives

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

Unit – I

1.1 Introduction to cell: Size, shape, ultra structure and characteristics of prokaryotic and eukaryotic cell, Cell theory

1.2 Endoplasmic reticulum: Types, Ultra structure and functions

1.3 Golgi complex: Ultra structure and functions

Unit – II

2.1 Structure and Function of mitochondria;

2.2 Lysosome: Structure, polymorphism and functions

Unit – III

3.1 Cytoskeleton: Organization and functions of Centrosome, Cilia and Flagella

3.2 Cell- communication: types of Cell Junctions

3.3. Cell proliferation: Events in different phases of cell cycle

Unit – IV

4.1 Ribosome: Structure, Types, Lake's model and functions

4.2 Mitosis (Different Phases and Significance)

4.3 Meiosis (different phases and significance)

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

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

Practical

Zoology: PRACTICAL Based on paper I, II and III

Notes:

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

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

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

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

- I. Protozoa: Euglena, Volvox, Elphidium (Polystomella), Foraminiferous shell, Monocystis, Opalina, Paramecium, Paramecium showing Binary fission, Paramecium Conjugation, Balantidium, Nyctotherus, Vorticella
- II. Porifera: Sycon, Leucosolenia, Hyalonema, Euplectella, Spongilla
- III. Coelenterata : Obelia Colony & Medusa, Millepora, Physalia, Vellela, Aurelia, Alcyonium, Gorgonia, Pennatula, Metridium, Stone Corals
- V. Aschelminthes : Ascaris, Dracunculus, Ancylostoma, Wuchereria

2. Study of Permanent Slides

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

3. External features and Anatomy through audio visual presentation

- I. Cockroach: External features, Mouth parts, Digestive, nervous and reproductive system
- II. Earthworm: External Features, Digestive, nervous and reproductive system

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

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

- I. Annelida: Nereis, Heteronereis, Aphrodite, Chaetopterus, Arenicola,
- I. Arthropoda: Peripatus, Lepus, Palemon, Eupagurus (hermit Crab), Carcinus (Crab), Scolopendra, Julus, Scorpion, Spider, Limulus, Cysticera/Locust, Dragonfly, Queen Termite, Cymax, Moth/ Butterfly,
- II. Mollusca : Chiton, Dentalium, Cypraea, Pila, Aplysia, Mytilus, Pinctada, Loligo, Sepia, Octopus, Nautilus
- III. Echinodermata: Antedon, Asterias, Ophiothrix, Echinus, Holothuria
- IV. Hemichordata: Balanoglossus

2. Study of permanent slides

- I. Annelida: Parapodia of Nereis, T.S. of Leech through Buccal Cavity and Crop
- II. Arthropoda: Crustacean Larvae- Nauplius, Zoea, Metazoea, Megalopa, Mysis
- III. Mollusca: Veliger and Glochidium larvae, T.S. of Unio Shell
- IV. Echinodermata: T.S. of arm of star fish
- V. Hemichordata: Balanoglossus through collar and proboscis

3. Audiovisual demonstration

- I. Prawn: Appendages, digestive, Nervous and Reproductive system, Statocyst, Hastate Plate
- ii. Pila: Nervous system, Osphradium, Gills, Radula

Paper III: Cell Biology

- 1. Study of pictures of ultra structure of prokaryotic cell & eukaryotic cell
- 2. Demonstration of mitosis cell division in onion root tips by squash method
- 3. Demonstration of meiosis through audio visual Presentation
- 4. Study of mitochondria in Buccal Epitheli

Suggested Reading:

Life and Diversity of Animals – Non Chordates-I & II

- 1. Barnes, R. (1981). Invertebrate zoology. *W. B. Saunders Co*
- 2. Barrington, E. W. J. (1969). Invertebrate structure and function. *ELBS*
- 3. Barradaile L.A. & Potts F.A. The Invertebrate
- 4. Jordan, E. L. & Verma, P. S. Invertebrate Zoology. *S. Chand & Co.*
- 5. Kotpal, Agrawal & Khetrapal. Modern Text Book of Zoology - Invertebrates,
- 6. Puranik P.G. & Thakur R.S. Invertebrate Zoology
- 7. Majumuria T.C. Invertebrate Zoology
- 8. Dhami & Dhami. Invertebrate Zoology
- 9. Parker & Hashwell, Textbook of Zoology Vol. I (Invertebrates) A.Z.T.B.S. Publishers
- 10. R.L. Kotpal, 2007, Phylum Protozoa to Echinodermata (series), Rastogi and Publication, Meerut
- 11. Vidyarthi – Text Book of Zoology, Agrasia Publishers, Agra
- 12. Marshal & Williams. Text book of zoology.
- 13. Boolotin & Stiles. College zoology. MacMillan
- 14. Kohli, Triguranayati, 2007, Invertebrate, R.B.D. Publishing House, Jaipur

Practical Books

- 1. A manual of Practical Zoology Invertebrates – P. S. Verma
- 2. Dr. S.S. Lal Practical Zoology Invertebrates 9th edition, Rastogi Publication Meerut & Distributors, New Delhi

Suggested Reading: Cell Biology:

- 1. Alberts et al (2001). Molecular biology of the cell. Garland publications.
- 2. De Robertis, E. D. P. & De Robertis, E. M. F. (1987). Cell and molecular biology. Lea & Febiger Intl. ed.
- 3. Powar, C. B. (1986). Cell biology. Himalaya Publ.
- 4. Burke, J. D. C. (1970). Cell biology. *William & Wilkins Co*
- 5. Dr. S.P. Singh, Dr. B.S. Tomar., Cell Biology 9th revised edition, Rastogi Publication, Meerut
- 6. Gupta P.K., Cell and Molecular Biology, Rastogi Publication, Meerut
- 7. Veer Bala Rastogi. Introduction to Cell Biology, Rastogi Publication, Meerut
- 8. Verma and Agrawal. Concepts of Cell Biology
- 9. Narendra Jain, Maya Singh, Shikha Patni, S.K. Singh, 2016, Cell Biology and Genetics, College Book Center, Jaipur
- 10. K.C. Soni, 2008, Cell Biology and Genetics, College Book Center, Jaipur

Course Code	Course Title	Course Category	Credit	Practicle	Total
BJVB101SE	Personality Development and Yoga (Practical)	Skill	2	50	50

Semester-I

उद्देश्य :

- 1- विद्यार्थियों को व्यक्तित्व के विभिन्न आयामों की जानकारी देना।
- 2- विद्यार्थियों को प्रबन्धन के विभिन्न पहलुओं की जानकारी देना।

इकाई I

व्यक्तित्व विकास और प्रबन्धन – लक्ष्य प्रबन्धन, समय प्रबन्धन, स्वास्थ्य प्रबन्धन, तनाव प्रबन्धन, संवेग प्रबन्धन।

प्रयोग—आसन—ताड़ासन, वृक्षासन, सम्पादासन

प्राणायाम—दीर्घ श्वासप्रेक्षा, समवर्ती श्वास प्रेक्षा,

प्रेक्षाध्यान के प्रयोग—कायोत्सर्ग।

इकाई II

व्यक्तित्व और क्षमता का विकास – कार्य—क्षमता का विकास, सकारात्मक सोच का विकास, स्मृति—क्षमता का विकास, नेतृत्व—क्षमता का विकास, अभिव्यक्ति का विकास।

प्रयोग—आसन—नटराज आसन, त्रिकोण आसन, शशांकासन

प्राणायाम—चन्द्रभेदी, सूर्यभेदी, अनुलोम विलोम

प्रेक्षाध्यान के प्रयोग—कायोत्सर्ग

अनुप्रेक्षा—धैर्य, सहिष्णुता

उद्देश्य :

- 1- विद्यार्थी व्यक्तित्व के विभिन्न आयामों की जानकारी प्राप्त करेंगे।
- 2- विद्यार्थी को प्रबन्धन के विभिन्न पहलुओं की जानकारी प्राप्त कर सकेंगे।

संदर्भ ग्रंथ

1. व्यक्तित्व विकास और योग, लेखक – डॉ. समणी ऋजुप्रज्ञा, प्रकाशक : जैन विश्वभारती संस्थान, लाडनूँ-341306 (राज.)
2. व्यक्तित्व विकास और स्व-प्रबन्धन, लेखक – मुनि धर्मेश कुमार, , प्रकाशक : जैन विश्वभारती संस्थान, लाडनूँ-341306 (राज.)

Course Code	Course Title	Course Category	Credit	C.I.A. (Continous Internal Assesment)	Theory	Total
BJVB102V A	Personality Development and Yoga (Theory)	Skill	2	15	35	50

Semester-I

उद्देश्य :

- 3- विद्यार्थियों को व्यक्तित्व के विभिन्न आयामों की जानकारी देना।
- 4- विद्यार्थियों को प्रबन्धन के विभिन्न पहलुओं की जानकारी देना।

इकाई I

व्यक्तित्व विकास और प्रबन्धन – लक्ष्य प्रबन्धन, समय प्रबन्धन, स्वास्थ्य प्रबन्धन, तनाव प्रबन्धन, संवेग प्रबन्धन।

इकाई II

व्यक्तित्व और क्षमता का विकास – कार्य-क्षमता का विकास, सकारात्मक सोच का विकास, स्मृति-क्षमता का विकास, नेतृत्व-क्षमता का विकास, अभिव्यक्ति का विकास।

उद्देश्य :

- 3- विद्यार्थी व्यक्तित्व के विभिन्न आयामों की जानकारी प्राप्त करेंगे।
- 4- विद्यार्थी को प्रबन्धन के विभिन्न पहलुओं की जानकारी प्राप्त कर सकेंगे।

संदर्भ ग्रंथ

3. व्यक्तित्व विकास और योग, लेखक – डॉ. समणी ऋजुप्रज्ञा, प्रकाशक : जैन विश्वभारती संस्थान, लाडनूँ-341306 (राज.)

व्यक्तित्व विकास और स्व-प्रबन्धन, लेखक – मुनि धर्मेश कुमार, , प्रकाशक : जैन विश्वभारती संस्थान, लाडनूँ-341306 (राज.)

Course Code	Course Title	Group	Course Category	Credit	C.I.A. (Continuums Internal Assessment)	Theory	Total
BJVB103AE	General Hindi	A	((AEC) Core Course	4	30	70	100

सेमेस्टर – I

उद्देश्य—

1. विद्यार्थियों को हिन्दी व्याकरण का सामान्य ज्ञान करवाना।
2. विद्यार्थी को निबन्ध लेखन एवं पत्र लेखन कला से परिचित करवाना।
3. विद्यार्थी को हिन्दी की गद्य एवं पद्य विधाओं से परिचित करवाना।

इकाई—I

1. संज्ञा
2. सर्वनाम
3. कारक
4. समास
5. तत्सम एवं तदभव
6. पर्यायवाची शब्द
7. शब्द—शक्ति
8. विलोम शब्द

इकाई—II

1. युग्म—शब्द
2. एक वाक्य के लिए एक शब्द
3. मुहावरे
4. लोकोक्तियाँ
5. पल्लवन
6. संक्षेपण
7. पत्र लेखन
8. आदर्श निबन्ध

इकाई—III

1. आत्माराम (कहानी) – मुन्शी प्रेमचन्द
2. बहिन सुभद्रा (रेखाचित्र) – महादेवी वर्मा
3. राखी (एकांकी) – हरिकृष्ण प्रेमी
4. मूल्यों का उलटफेर (व्यंग्य) – हरिशंकर परसाई

इकाई—IV

1. मैथिलीशरण गुप्त – मातृभूमि, आगे बढ़ो! ऊंचे चढ़ो!
2. जयशंकर प्रसाद – भारत महिमा
3. रामधारीसिंह दिनकर – जनतंत्र का जन्म
4. गिरिजाकुमार माथुर – पन्द्रह अगस्त

उपलब्धियाँ—

1. विद्यार्थियों के व्याकरण ज्ञान में वृद्धि होगी।
2. विद्यार्थी कार्यालय पत्र लिखने में समर्थ हो सकेंगे।
3. विद्यार्थी निबन्ध लेखन के महत्त्व, उसकी विशेषता आदि से अपने लेखन कौशल का विकास कर सकेंगे।

पाठ्यपुस्तक

1. साहित्य हिन्दी, प्रो. आनन्द प्रकाश त्रिपाठी, जैन विश्वभारती संस्थान (मान्य विश्वविद्यालय) लाडनूँ
2. सामान्य हिन्दी (गद्य संग्रह, काव्य संचय), कैलाश भट्ट 'आकाश' सम्पादक — डॉ. समणी शुभप्रज्ञा, जैन विश्वभारती संस्थान (मान्य विश्वविद्यालय) लाडनूँ

संदर्भ ग्रंथ—

1. काव्य संचय, संपादक— डॉ शम्भुनाथ पाण्डेय, अनुराग प्रकाशन, अजमेर
2. गद्य संग्रह, संपादक— डॉ विजय कुलश्रेष्ठ, अल्का पब्लिकेशन, अजमेर
3. हिन्दी व्याकरण तथा रचना, डॉ भोलानाथ तिवारी, नेशनल पब्लिशिंग हाउस, नई दिल्ली
4. हिन्दी व्याकरण—श्री हरदेव बाहरी
5. आधुनिक हिन्दी व्याकरण—वासुदेवानन्द प्रसाद
6. अच्छी हिन्दी—रामचन्द्र वर्मा

Semester-II

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 201	Chemistry-I	Any Three CC	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

Chemistry-Paper-I : Inorganic chemistry

Objectives:

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

Unit-I : Ionic Solids

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

Unit-II : Metallic Bond & Weak interactions

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

Hydrogen bonding and Vander Waals forces.

Unit-III : s-Block Elements

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

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

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

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

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

Chemistry-Paper-II : Organic chemistry

Objectives:

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

Unit I : Stereochemistry of organic compounds

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

Unit-II : Geometrical, Conformational isomerism & Arenes

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

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

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

Unit-III : Aromaticity & Aromatic electrophilic substitution

The Huckel's rule, aromatic ions.

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

Unit-IV : Alkyl and aryl halides & Polyhalogen compounds

Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanism of nucleophilic substitution, reaction of alkyl halides, SN^1 and SN^2 reaction with energy profile diagram.

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

Learning Outcomes: After completion of the course student would be able to:

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

Chemistry-Paper-III : Physical chemistry

Objectives:

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

Unit I: Solid state

Definition of space lattice, Unit cell. Law of crystallography (i) law of constancy of interfacial angles (ii) law of rationality of indices (iii) law of symmetry. Symmetry elements in crystals. X-ray diffraction by crystals. Derivation of Bragg's equation, Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).

Unit II : Colloidal state

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

Unit-III : Chemical Kinetics

Chemical kinetics and its scope, rate of reaction, factors influencing the rate of reaction, Concentration dependence of rates, mathematical characteristics of simple chemical reactions - zero order, first order, second order, pseudo order, half-life and mean life. Determinations of the order of reaction - differential method, method of integration, method of half-life period and isolation method. Theories of chemical kinetics, Effect of temperature on the rate of reaction, Arrhenius concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant and thermodynamic aspects.

Unit-IV : Solutions, Dilute solutions & Colligative properties

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

Learning Outcomes: After completion of the course student would be able to:

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

Practical's

Inorganic chemistry:

Quantitative analysis: Volumetric analysis

- Determination of acetic acid in commercial vinegar using NaOH.
- Determination of alkaline content of an acid tablet using HCl.

- (c) Estimation of calcium content in chalk as calciumoxalatebypermanganometry.
- (d) Estimation of hardness of waterbyEDTA.
- (e) Estimation of ferrous andferric bydichromatemethod.
- (f) Estimation of copper usingthiosulphate.

Organic chemistry:

(A) Laboratorytechniques

- (a) Determination ofm.p. ofnaphthalene, benzoic acid, urea etc. OR
- (b) Determination ofb. p. of ethanol , methanol, cyclohexane, etc

(B) Qualitative analysis

- (a) Detectionof extra elements(N, S.andhalogens) andfunctionalgroupse.g. (phenolic,alcoholic,carboxylic,carbonyl,ester,carbohydrate,amine,amide andnitro) insimple organic compounds

Viva voceandrecord

Suggested Reading:

1. कार्बनिक रसायन, सुरेश आमेटा, एच.के. पाण्डे, एच.एस. शर्मा, हिमांशु पब्लिकेशन्स, उदयपुर
2. अकार्बनिक रसायन, ओझा, भोजक, कोठारी, चतुर्वेदी, रमेश बुक डिपो, जयपुर
3. प्रायोगिक रसायन, भार्गव, लवानिया, ओझा, रमेश बुक डिपो, जयपुर
4. भौतिक रसायन, शर्मा, भार्गव, गुप्ता, रमेश बुक डिपो, जयपुर
5. कार्बनिक रसायन, विजयश्री मनोज छंगाणी, अल्का पब्लिकेशन, अजमेर
6. अकार्बनिक रसायन, विजयश्री कोठारी छंगाणी, अल्का पब्लिकेशन, अजमेर
7. प्रायोगिक रसायन, छंगाणी, विजयश्री, खण्डेलवाल, अल्का पब्लिकेशन, अजमेर
8. भौतिक रसायन, वी.के. गोयल, आर.एस. पीतलिया, कॉलेज बुक हाउस, जयपुर
9. अकार्बनिक रसायन, जी.के. रस्तोगी, यशपाल सिंह, कॉलेज बुक हाउस, जयपुर
10. प्रायोगिक रसायन, वी.के. गोयल, आर.एस. पीतलिया, कॉलेज बुक हाउस, जयपुर

Semester-II

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 202	Physics-I	CE*	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Practical				25Practical	

Physics-Paper-I : ELECTROMAGNETISM – II**Objectives:**

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

UNIT – I Magnetic Fields in Matter:

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

UNIT –II Electric Field in Matter:

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

UNIT –III Dielectric:

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

UNIT -IV Transient behavior and Maxwell's Equations:

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

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

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

Suggested Readings:

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना,, विद्युत चुम्बकत्व, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015–16

Physics-Paper-II: OSCILLATIONS AND WAVES –I

Objectives:

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

UNIT -I Oscillations:

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

UNIT -II Damped Oscillator:

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

UNIT -III Driven Oscillator:

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

UNIT – IV Coupled Oscillator:

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

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

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

Suggested Readings:

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, दोलन तथा तरंग, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015–16

Physics-Paper-III: OSCILLATIONS AND WAVES –II

Objectives:

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

UNIT -I Lattice dynamics:

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

UNIT – II Electrical Transmission Line:

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

UNIT –III Wave Motion:

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

UNIT – IV Electromagnetic Wave:

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

Learning Outcomes: After completion of the course student would be able to:

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

Suggested Readings :

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, दोलन तथा तरंग, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015–16

Physics Practical : II

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

Suggested Readings :

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

Semester-II

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 203	Mathematics-I	CE*	4	15	20	100
	Mathematics-II				20	
	Mathematics-III				20	
	Mathematics Practical				25 Practical	

Mathematics-Paper-I: Discrete Mathematics II

Objectives:

- ❖ To aware the Particular Solutions of Generating Function.
- ❖ To give information about the Graph.
- ❖ To Interpret the Eulerian and Hamiltonian Graphs.
- ❖ To give information about Trees.

Unit 1

Discrete numeric unctions and Generating functions. Recurrence relations and Recursive Algorithms — Linear Recurrence relations with constant coefficients.

Unit 2

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

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

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

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

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

Suggested Reading :

1. V.K.Balakrishnan, Introductory Discrete Mathematics, Prentice-Hall, 1996.
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill Book Co., 1995.
3. C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, 1986.
4. Kenneth H. Roson, Discrete Mathematics and Its Applications, Tata Mc-Graw Hiils, New Delhi, 2003.

5. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड़, जितेन्द्र सैनी, विविक्त गणित, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
6. जी.सी. गौखरु सैनी, विविक्त गणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics-Paper-II: Integral Calculus

Objectives:

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

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

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

Unit 3: Areas, Rectification,

Unit 4 ; Volumes and Surfaces of solids of revolution.

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

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

Suggested Reading :

1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड़. जांगीड़, जितेन्द्र सैनी,, समाकलन गणित, आर.बी. डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
2. जी.सी. गौखरु सैनी, समाकलन गणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics-Paper-III: Analytic Geometry II

Objectives:

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

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

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

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

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

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

- ❖ Classify the Central Conicoids.
- ❖ Discuss the Generating Lines of Hyperboloid of One Sheet and its Properties.

- ❖ Reduction of a General Equation of Second Degree in 3-D to Standard Forms.
- ❖ Discuss the tangent lines and tangent plans.

Suggested Reading :

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

Semester-II

Course Code	Course Title	CourseCategory	Credit	C.I.A.	Theory	Total
BSE 204	Botany-I	CE*	4	15	20	100
	Botany-II				20	
	Botany-III				20	
	Botany Practical				25Practical	

Botany-Paper-I : CELL BIOLOGY

Objectives:

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

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

History of cell and cell theory, microscopy, elementary idea on micrometry and cell fractionation, characteristics of prokaryotic and eukaryotic cell, chemistry, structure and function of cell wall and plasma membrane.

UNIT II: Structure of Cell Organelles

Ultra structure and function of Mitochondria, Chloroplast, Endoplasmic reticulum, Golgi complex, Peroxisome, Glyoxysome, Ribosome, Vacuoles.

UNIT III: Structure of Nucleus and chromosome

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

UNIT IV: Cell cycle and Cell division

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

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

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

Suggested Readings:

- Alberts, B., Johnson, A., Lewis, J., Roff, M., Roberts, K. and Walter, P., 2008. Molecular Biology of the Cell. Garland Publishers, New York.
- De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
- Gupta, P.K. 2009. Cytology, Genetics, Evolution and Plant breeding, Rastogi publication, Meerut.

- Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley and Sons. Inc. New Jersey, USA.
- Lodish, H., Berk, A., Matsudaira, P., Kaiser, C. A., Krieger, M., Scott, P.M., Zipursky, L. and Darnell, J. 2008. Molecular Cell Biology. W. H. Freeman and company, Macmillan publishers, London.
- Roy, S.C. and De, K.K. 1999. Cell biology. New central Book Agency (P) Ltd., Calcutta.
- Verma, P.S. and Agrawal, V.K. 2012. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand and Co. Ltd., New Delhi.

Botany-Paper-II : GENETICS AND PLANT BREEDING

Objectives:

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

UNIT I: Genetic inheritance

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

UNIT II: Chromosomal inheritance

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

UNIT III: Genes and Mutations

Concept of gene: Neurospora genetics- one gene one enzyme hypothesis. Brief account on fine structure of gene in eukaryotes and prokaryotes. Mutations- types of mutations, point mutation-transition, transversion and frame shift mutation. Physical and chemical mutagens.

Cytoplasmic inheritance: Maternal influence, shell coiling in snail, Kappa particles in *Paramecium*.

UNIT IV: Plant breeding

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

Learning Outcomes: After completion of the course student would be able to:

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

Suggested Readings:

- Brooker, R. J. 1999. Genetics: Analysis and Principles. Addison-Wesley, Boston.
- Choudhary, H. K. 1989. Elementary Principle of Plant Breeding. Oxford and IBM Publishing Co., New Delhi.
- De Robertis, E. D. P. and De Robertis, E. M. F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
- Dnyansagar, V. R. 1986. Cytology and Genetics, Tata Mc Graw - Hill Pub Co. Ltd., New Delhi.
- Gardner, E. J., Simmons, M. J. and Snustad, D. P. 2008. Principles of Genetics. 8th Edition, Wiley India.
- Gupta, P. K. 2009. Cytology, Genetics, Evolution and Plant Breeding, Rastogi Publication, Meerut.
- Miglani, G. S. 2000. Advanced genetics. Narosa Publishing House, New Delhi.
- Shukla, R. S. and Chandel, P. S. 2000. Cytogenetics, Evolution and Plant Breeding, S. Chand and Co. Ltd., New Delhi.
- Singh, R. B. 1999. Text Book of Plant Breeding. Kalyani publishers, Ludhiana.
- Snustad, D. P., Simmons, M. J. 2011. Principles of Genetics. V Edition. John Wiley and Sons Inc. New Jersey USA.

Botany-Paper-III: BRYOPHYTA**Objectives:**

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

UNIT I:

Bryophytes: General characteristic, origin, evolution, classification (Eichler and Proskauer), habitat range, thallus structure, reproduction, alternation of generation and economic importance.

UNIT II:

Habitat, structure, reproduction and life cycle of the following: Hepaticopsida; *Riccia* and *Marchantia*.

UNIT III:

Habitat, structure, reproduction and life cycle of the following: Anthocerotopsida; *Anthoceros*. Phylogenetic relationship with hepaticopsida and Bryopsida.

UNIT IV:

Bryopsida: Habitat, structure, reproduction and life cycle of *Funaria*. Sterilisation of sporogenous tissues in Bryophytes.

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

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

Suggested Readings:

- Chopra, R.N. and Kumar, P.K. 1988. Biology of Bryophytes. Wiley Eastern Ltd. New Delhi.
- Pandey, S.N., Mishra, S.P. and Trivedi, P.S. 1981. A text book of Botany vol. II, Vikas publishing House Pvt. Ltd, New Delhi.
- Parihar, N.S. 1965. An Introduction to Bryophyta. Central Book Depot, Allhabad.
- Puri, P. 1985. Bryophytes. Atmaram and Sons, Delhi.
- Smith, G.M. 1938. Cryptogramic Botany Vol. II. Bryophytes and Pteridophytes. Mc Graw Hill Book Company, London.
- Sporne, K.R. 1967. The Morphology of Bryophytes. Hutchinson University Library, London.
- Tyagi, A. and Saxena, M. 2014. Algae, Lichens and Bryophyta, CBH, Jaipur
- Vashishta, B. R., Sinha, A. K. and Kumar, A. 2011. Botany for degree students, Bryophyta. S. Chand and Co. New Delhi.
- Watson E.V. 1971. The structure and life of Bryophytes. Hutchinson University Library, London.

BOTANY PRACTICAL II

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

Semester-II

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 205	Zoology-I	CE*	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25	

Zoology-Paper-I :Developmental Biology

Objectives

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

UNIT-I

- 1.1History of embryology and Types
- 1.2Gametogenesis: Spermatogenesis, Structure of sperm, Oogenesis, Structure of egg, Types of eggs

UNIT-II

- 2.1 Fertilization-Type of Fertilization, Process of Fertilization
- 2.2 Parthenogenesis
- 2.3 Planes and Patterns of cleavage, Blastulation, Gastrulation,

UNIT-III

- 3.1Concept of embryonic induction; Primary organizers differentiation and competence.
- 3.2Extra embryonic membranes, Type and physiology of Placenta
- 3.3Structure of hen's egg, Development of chick up to 96 hrs stage.

UNIT-IV

- 4.1Stem cells: Sources, types and their use in human welfare; Cloning
- 4.2Elementary Idea of Teratogenesis
- 4.3Ageing and Sencescence, IVF, Embryo transfer-Test tube babies, GIFT, ZIFT and Bioethics

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

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

Zoology-Paper-II : Genetics

Objectives

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

Unit – I

- 1.1 Mendelism: Brief history of Genetics and Mendel's work, Mendelian Laws, their significance and current status

- 1.2 Genetic Interactions- Epistasis-dominant and recessive, codominance, incompleteness of dominance, complementary, supplementary, inhibitory, duplicate and Lethal genes
- 1.3 Multiple Allelic interactions: Inheritance of blood group and Rh factor

Unit –II

- 2.1 Linkage and crossing over: Basic concept, types and theories, elementary idea of Chromosome mapping
- 2.2 Sex determination – ZZ, XY, XO, ZW pattern, Sex determination in Human,

Unit – III

- 3.1 Chromosomes Number, size, shape, type structure, Lampbrush chromosomes,
- 3.2 Cytoplasm inheritance: Kappa particles in Paramecium, Chloroplast Genetics, Cytoplasmic Inheritance in Chlamydomonas

Unit –IV

- 4.1 Disorders related to chromosomal number- Turner syndrome, Klinefelter's syndrome and Down's syndrome
- 4.2 Elementary idea of Thalassemia, Sickle Cell Anaemia, Diabetes mellitus

Learning Outcomes: After completion of the course student would be able to:

- ❖ Understand the Mendelism & Multiple allelism.
- ❖ Understand the concept of gene & gene interaction, and Sex- linked Inheritance.
- ❖ Describe the Blood Group, RH Factor .
- ❖ Interpret the terms Chromosome , Thalassemia, Sickle cell anemia
- ❖ Describe sex determination in human

Zoology-Paper-III : Molecular Biology

Objectives

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

Unit – I

- 1.1 Interphase Nucleus: Organization, Ultrastructure and functions of Nucleus, Pore Complex, Nuclear Membrane
- 1.2 Nucleolus: Structure and functions
- 1.3 Chromosome: Ultrastructure and types, Chromosomal Organisation: Nucleosome Model, Solenoid Model,
- 1.4 Giant chromosomes: Lamp-brush and Polytene chromosome

Unit - II

- 2.1 DNA: Structure of DNA, Polymorphism of DNA (A, B, C, D and Z)
- 2.2 RNA: Structure of RNA, types of RNA, RNA as a genetic material

Unit - III

- 3.1 DNA replication: Meselson and Stahl experiments, Mechanism of replication –origin of replication, concept of replication, directionality of replication, Role of enzymes in replication
- 3.2 Bacterial DNA Structure
- 3.3 Replication in Bacterial DNA

Unit IV

- 4.1 Genetic code: Characteristics of genetic code, Wobble hypothesis
- 4.2 Protein synthesis: Central Dogma; Transcription Mechanism in Prokaryotes, Transcription in Eukaryotes, Enzyme: transcription;
- 4.3 Protein Synthesis: Elementary idea of the mechanism of translation

Learning Outcomes: After completion of the course student would be able to:

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

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

Paper-I: Developmental Biology

1. Study of development of chick with the help of

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

Paper-II: Genetics

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

Paper-III: Molecular Biology

1. Demonstration of salivary gland chromosome in Chironomous larva
2. Use of colchicine in arresting anaphase movement (onion root tips)
3. Study of cell permeability using mammalian RBCs.

Suggested Readings :

1. Genetics; Winchester, A. M.; Oxford and IBH Publishing Co.
2. Cell and Molecular Biology; De Robertis and De Robertis; Saunders College.
3. Genetics; Strickberger W. M.; Prentice Hall of India.
4. Cell Biology; Powar, C.B; Himalayan Publishing House.
5. Principles of Genetics; Gardener, E. J.; Wiley eastern, New Delhi.
6. A Textbook of Genetics; Rastogi, V.B.; Ramnath and Kedarnath
7. Molecular Biology of the gene; Watson, J.D; Benjamin/ Cummings.
8. Biochemistry; Voet & Voet; John Wiley & Sons.
9. Cytology and Genetics. Dyansagar, C.R. Tata McGraw Hill Publ. Co. New Delhi.
10. Cell Biology : Dyson, R.D. Allen and Bacon, New York.
11. Cell Biology. Rastogi S.C. : Tata McGraw Hill Publ. Co. New Delhi.
12. Cell Biology and Genetics. Kohli, S. jain, S. and Ramesh Book Depot. Jaipur.
13. Cytology : Verma, P.S. and Agrawal V.K : S.Chand and Co. New Delhi.
14. Genetics. Verma, P.S. and Agrawal V.K. S.Chand and Co., New Delhi.
15. Cell Biology and Genetics; Kohli, K.S; Ramesh Book Depot
16. Genetics; Winchester, A.M; Oxford and IBH Publishing Co.
17. Cell and Molecular Biology; De Robertis and De Robertis; Saunders College.
18. Genetics; Strickberger; Macmillan, Prentice Hall of India.
19. Cell Biology; Powar, C.B; Himalayan publishing House.
20. Principles of Genetics; Gardener, E,J; Wiley eastern, New Delhi.
21. A Textbook of Genetics; Rastogi, V.B.; Ramnath & Kedarnath.
22. Cell and Molecular Biology; Gerald Karp; John Wiley and Sons, inc

23. Molecular Biology of the cell; Bruce Alberts, Julian Lewis, James D.Watson; Garland Publishings
24. Textbook of Zoology; Shivapuri, Jacob, D. and Vyas, D.K.; Ramesh Book Depot.
25. Zoology: Storer, T.I. and Using, K.L.: Tata McGraw Hill Publishing Co., New Delhi.
26. D. Reinhold, New York (Indian reprinting : Affiliated East West Press, New Delhi.)
27. Student Text Book of Zoology. Vol.I.II and III. Sedgwick.A.
28. Text book of Zoology. Parker, T.J., Haswell. W.A.Macmillan Co., London.
29. Gilbert, S. T. (2000). Developmental biology, 6th ed. *Sinauer, Sunderland*.
30. Hoar, W. S. (1983). General and comparative physiology. *Prentice Hall*.
31. Prosser, C. L. Comparative animal physiology.
32. Saunders, J. W. Developmental biology: Patterns/Principles/Problems. MacMillan Publ.
33. Wilson, J. A. Principles of animal physiology. Collins MacMillan Publ.
34. Sandhu. T. B. of Embryology
35. Armugam. T. B. of Embryology
36. Pattern. Early Embryology of Chick
37. Verma & Agrawal. Chordate Embryology
38. Tomar. Chordate Embryology
39. Asha Sharma, Chetan K. Sharma, Development Biology, R.B.D. Publishing House, Jaipur
40. K.V. Shastri, Vinita Sukhla, 2014, Development Biology, Rastogi Publication, Meerut, Delhi
41. S.K. Sharma, 2015, Micro Biology & Bio-technology, College Book Center, Jaipur

Foundation Course in Computers

Course Code	Course Title	Course Category	Credit	C.I.A. (Continuous Internal Assessment)	Theory+ Practical	Total
BJVB2015 E	BASICS OF COMPUTER	skill	4	30	50+20	100

Semester-II

Objective:

This paper is intended to be the first basic course for the students of Information Technology. The main objectives of this course are;

1. It will expose the students to the fundamentals of the IT
2. Students will be having the introductory knowledge of the MS-Windows
3. Practically students will be able to use MS-PowerPoint and MS-Word.
4. It will expose the students to concept of Internet and Cybersecurity

Unit I

Word Processing: Introduction, Word Processing Basics, Menu Bar, Using The Icons Below Menu Bar, Opening and closing Documents, Opening Documents, Save and Save as, Page Setup, Print Preview, Document Creation, Editing Text, Text Selection, Cut, Copy and Paste, Spell check, Thesaurus, Formatting the Text, Font and Size selection, Alignment of Text, Paragraph Indenting, Bullets and Numbering, Changing case, Table Manipulation, Draw Table, Changing cell width and height, Alignment of Text in cell, Delete / Insertion of row and column, Border and Shading

Unit II

Presentations, Introduction, Basics, Using PowerPoint, Opening A PowerPoint Presentation, Saving A Presentation, Creation of Presentation, Creating a Presentation Using a Template, Creating a Blank Presentation, Editing Text, Preparation of Slides: Inserting Word Table or an Excel Worksheet, Adding Clip Art Pictures, Inserting Other Objects, Resizing and Scaling an object, Presentation of Slides: Viewing, Choosing a set up for Presentation, Slide Show, Running a Slide Show, Transition and Slide Timing, Automating Slide Show

Unit III

Using Spread Sheets, Introduction, Opening of Spread Sheet, Addressing of Cells, Printing of Spread Sheet, Saving Workbooks, Manipulation of Cells, Entering Text, Numbers and Dates, Creating Text, Number and Date Series, Editing Worksheet Data, Inserting and Deleting Rows, Column, Changing Cell Height and Width, Formulas and Function, Using Formula, Function

Unit IV

Introduction to Internet & Cyber Security : Basics of Computer Networks, LAN, WAN, Internet, Applications of Internet, Connecting to the Internet, World Wide Web (WWW), Web Browsing Software, Search Engines, Downloading Web Pages, Understanding URL, Surfing the web, Basics of E-mail, Email Addressing, Cyber Security: Layers of security, Vulnerability & Threats, Harmful acts, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Introduction to Indian Cyber Law.

Outcome:

- Students will apply the knowledge of IT practically in their day to day life.
- Students will be able to work on computers comfortably.
- Students will be able to create well formatted documents and attractive presentations.
- Students will be able to create spreadsheets
- Students will be well versed with concept of Internet & Cyber Security

Reference Books/Website

1. http://www.tutorialspoint.com/computer_fundamentals/index.htm
2. <http://www.gcflearnfree.org/office>
3. Rapidex computer course by Pustak Mahal Editorial BBOArd, Unicorn Books, 2015
4. Fundamentals of computers (English) 1st Edition by Reema Thareja, Oxford University Press, 2019

Practical

- General use of Windows Operating System
- Creating document in MS-Word like Advertisement, Letter, Tables, Mail Merge etc
- Creating presentations in power point.
- Creation of Simple Worksheet like Mark sheet, Pay slip using MS-Excel
- General use of internet

Semester - II

Course Code	Course Title	Course Category	Credit	C.I.A. (Continouns Internal Assesment)	Theory	Total
BJVB202 ID	जैन संस्कृति एवं जीवन मूल्य (अनिवार्य पत्र)	Interdisciplinary	4	30	70	100

उद्देश्य—

1. जैन संस्कृति एवं भगवान महावीर का परिचय देना
2. जैन सिद्धान्तों का परिचय देना।
3. जीवन मूल्यों का प्रायोगिक प्रशिक्षण देना।

इकाई—1 : जैन संस्कृति एवं इतिहास

1. जैन धर्म और उसकी प्राचीनता
2. भगवान महावीर : जीवन दर्शन
3. जैन धर्म के प्रमुख सम्प्रदाय
4. जैन संस्कृति की विशेषताएँ
5. शाकाहार

इकाई—2 : जैनदर्शन के सिद्धांत

1. आत्मवाद
2. कर्मवाद
3. लोकवाद
4. नौ तत्त्व

इकाई—3 : जीवन विज्ञान

1. जीवन विज्ञान : एक परिचय
2. जीवन विज्ञान के सात अंग
3. जीवन विज्ञान में निर्धारित सोलह मूल्य
4. मूल्य विकास की प्रक्रिया : अनुप्रेक्षा

इकाई —4 : जीवन मूल्य

1. अनेकांत और उसके व्यवहारिक प्रयोग

2. अहिंसा का स्वरूप और जीवनशैली में अहिंसा
3. अणुव्रत आंदोलन और आचार संहिता
4. प्रेक्षाध्यान और उसके अंग

उपलब्धियाँ—

1. जैन संस्कृति से परिचित होंगे।
2. जैन साहित्य और सिद्धान्तों से परिचित होंगे।
3. जैन जीवन शैली से मूल्यों का विकास होगा।

प्रायोगिक—

- आसन—ताड़ासन, त्रिकोणासन, शशाकासन, पवनमुक्तासन, भुजंगासन
- प्राणायाम—अनुलोम—विलोम
- मुद्रा—ज्ञानमुद्रा, वायुमुद्रा
- ध्वनि— महाप्राण ध्वनि
- ध्यान—कायोत्सर्ग (संक्षिप्त), अर्न्तयात्रा, दीर्घश्वासप्रेक्षा, ज्योतिकेन्द्र प्रेक्षा,
- अनुप्रेक्षा—सहिष्णुता

पाठ्य पुस्तक / संदर्भ ग्रन्थ:

- जैन संस्कृति एवं जीवनमूल्य, भाग 1, 2, 3, आचार्य समणी ऋजुप्रज्ञा, जैन विश्वभारती संस्थान, लाडनूँ
- जैन दर्शन मनन एवं मीमांसा, आचार्य महाप्रज्ञ, आदर्श साहित्य संघ, चुरू

Semester-III

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 301	Chemistry-I	Any Three CC	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

Chemistry-Paper-I : inorganic chemistry

Objectives:

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

Unit I : Acids and Bases

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

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

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

Unit III : Non-aqueous solvents

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

Unit IV : Separation methods and Analysis Process

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

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

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

Chemistry-Paper-II :Organic chemistry

Objectives:

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

Unit I: Alcohols

Classification and nomenclature. Monohydric alcohols- Methods of formation by reduction of aldehyde, ketones, carboxylic acids and esters. Hydrogen bonding, acidic nature, reaction of alcohols. Dihydric alcohols- methods of formation, chemical reactions of vicinal glycols, oxidation cleavage $[\text{Pb}(\text{OAc})_4$ and HIO_4] and pinacol- pinacolone rearrangement. Trihydric alcohols- methods of formation, chemical reactions of glycerol.

Unit II : Phenol

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

Unit III : Aldehyde and ketones

Nomenclature and structure of the carbonyl group. Synthesis of aldehyde and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehyde and ketones using 1, 3 dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, perkin and Knoevenagel condensations, condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction, use of acetals as protecting group, oxidation of aldehyde and ketones, Cannizzaro reaction, Bayer Villiger oxidation of ketones, MPV, Clemmensen's reduction, Wolf Kishner reduction, LiAlH_4 and NaBH_4 reduction, Halogenation of enolizable ketones.

Unit IV : Ethers and epoxides & Organic synthesis via Enolates

Nomenclature of ethers and methods of their formation, physical properties, chemical reactions- cleavage and auto oxidation, Ziesel 's method. Synthesis of epoxides. Acid and base- catalyzed ring opening of epoxides, orientation of epoxide ring opening; reactions of Grignard and organolithium reagents with epoxides. Acidity of α hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethylacetoacetate; The Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1,3- dithianes, alkylation and acylation of enamines.

Learning outcomes: After completion the course student would be able to:

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

Chemistry-Paper-III : Physical chemistry

Objectives:

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

Unit I: Thermodynamics-I & First law of thermodynamics

Definition of thermodynamics terms: systems, surroundings etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamics process. Concept of heat and work.

Statement, definition of internal energy and enthalpy. Heat capacity. Heat capacities at constant volume and pressure and their relationship. Joule law-Joule Thomson co-efficient and inversion temperature. Calculation of w, q, dU & dH for the expansion of ideal gases under isothermal and adiabatic condition for reversible process.

Unit II: Thermochemistry

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

Unit III: Electrochemistry I

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

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

Unit IV: Chemical equilibrium

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

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

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

Practicals

Inorganic Chemistry

Preparation of standard solutions

Dilution 0.1M to 0.001M solutions

Gravimetric analysis:(Any One)

- i) Analysis of Cu as $CuSCN$,
- ii) Analysis of Ni as Ni (dimethylglyoxime) and
- iii) Analysis of Zn as $Zn_3(PO_4)_2$

Organic Chemistry

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

Suggested Reading:

1. कार्बनिक रसायन, सुरेश आमेटा, एच.के. पाण्डे, एच.एस. शर्मा, हिमांशु पब्लिकेशन्स, उदयपुर
2. अकार्बनिक रसायन, ओझा, भोजक, कोठारी, चतुर्वेदी, रमेश बुक डिपो, जयपुर
3. प्रायोगिक रसायन, भार्गव, लवानिया, ओझा, रमेश बुक डिपो, जयपुर
4. भौतिक रसायन, शर्मा, भार्गव, गुप्ता, रमेश बुक डिपो, जयपुर

5. कार्बनिक रसायन, विजयश्री मनोज छंगाणी, अल्का पब्लिकेशन, अजमेर
6. अकार्बनिक रसायन, विजयश्री कोठारी छंगाणी, अल्का पब्लिकेशन, अजमेर
7. प्रायोगिक रसायन, छंगाणी, विजयश्री, खण्डेलवाल, अल्का पब्लिकेशन, अजमेर
8. अकार्बनिक रसायन, सुरेश आमेटा, उमा शर्मा, पी.के. शर्मा, मुकेश मेहता, हिमांशु पब्लिकेशन्स, उदयपुर
9. अकार्बनिक रसायन, जी.के. रस्तोगी, यशपाल सिंह, कॉलेज बुक हाऊस, जयपुर
10. प्रायोगिक रसायन, वी.के. गोयल, आर.एस. पीतलिया, कॉलेज बुक हाऊस, जयपुर

Semester-III

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 302	Physics-I	CE*	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Practical				25 Practical	

Physics-Paper-I: Statistical And Thermodynamical Physics-I

Objectives:

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

UNIT I General Thermo-dynamical Interaction:

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

UNIT II Carnot's Engine and Maxwell Relation:

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

UNIT III Production of Low Temperature:

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

UNIT IV Application of Low Temperature:

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

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

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

Suggested Reading :

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, उष्मा गतिकी एवं सांख्यिकीय भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015-16

Physics-Paper-II:Optics –I

Objective

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

UNIT-I Geometrical Optics:

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

UNIT-II Lenses:

Refraction through a thick and thin lenses and its Focal length, Focal length of two thin lenses separated by a distance, Cardinal points of a co-axial lens system, properties of cardinal points; construction of image using cardinal points.

UNIT-III Interference:

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

Unit-IV Polarization:

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

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

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

Suggested Reading :

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, प्रकाशिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015–16

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

Objectives:

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

UNIT-I Circuit Analysis:

Network-some important definitions, loop and nodal equation based on DC and AC circuits (Kirchhoff's Laws), Four terminal network parameters; Current volt conventions, Open circuit, short circuit and hybrid

parameters of any four terminals network. Input, Output and mutual impedance for an active four terminal network.

UNIT – II Network Theorems:

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

UNIT – III Semiconductors:

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

UNIT – IV Rectifiers and Voltage Regulation:

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

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

- ❖ Applies the Kirchhoff's law (first and second) and circuit analysis.
- ❖ Calculate the network theorem (superposition, Thevenin, reciprocity, compensation, maximum power transfer and miller theorems).
- ❖ Discuss the concept of the semiconductor, type of semiconductor, Zener diode and Hall effect.
- ❖ Identify the concept of rectifiers, voltage regulation, various type of filter.
- ❖ Calculation of ripple factor, efficiency and regulation

Suggested Reading :

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, इलेक्ट्रॉनिक्स एवं ठोस प्रावस्था युक्तियां, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015–16

Physics Practical: III

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

Suggested Reading :

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

Semester-III

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 303	Mathematics-I	CE*	4	15	20	100
	Mathematics-II				20	
	Mathematics-III				20	
	Mathematics Practical				25 Practical	

Mathematics-Paper-I :Real Analysis

Objectives:

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

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

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

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

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

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

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

Suggested Reading :

1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, रियल एनालिसिस, आर. बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
2. जी.सी. गौखरु सैनी, रियल एनालिसिस, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics-Paper-II : Differential Equations I

Objectives

- ❖ To give information about Degree & Order of a Differential Equation.
- ❖ To aware Linear Equation & Exact Differential Equation.
- ❖ To develop concept of the 1st Order but Higher Degree Differential Equation Solve for x,y & p.
- ❖ To develop knowledge about the Homogeneous Linear Differential Equations.

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

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

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

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

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

- ❖ Calculate Degree & Order of a Differential Equation.
- ❖ Differentiate between Linear Equation & Exact Differential Equation.
- ❖ Calculate the 1st Order but Higher Degree Differential Equation Solve for x, y & p .
- ❖ Discuss on the Homogeneous Linear Differential Equations.
- ❖ Discuss on the linear differential equation constant coefficients.

Suggested Reading :

1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, अवकलन समीकरण, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
2. जी.सी. गौखरु सैनी, अवकलन समीकरण, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics-Paper-III: Numerical Analysis

Objectives:

- ❖ To aware Relation b/w Differences and Derivatives .
- ❖ To Understand the Divided Differences by Newton's .
- ❖ To give knowledge about the Stirling's and Bessel's Interpolation Formulae.
- ❖ To develop concept of Numerical Integration .

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

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

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

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

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

- ❖ Calculate Relation b/w Differences and Derivatives .
- ❖ Discuss on the Divided Differences by Newton's .
- ❖ Applies the Stirling's and Bessel's Interpolation Formulae.
- ❖ Identify the concept of Numerical Integration.
- ❖ Applies the trapezoidal rule.

Suggested Reading :

1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, संख्यात्मक विश्लेषण, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
2. जी.सी. गौखरु सैनी, संख्यात्मक विश्लेषण, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Semester-III

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 304	Botany-I	CE*	4	15	20	100
	Botany-II				20	
	Botany-III				20	
	Botany Practical				25 Practical	

Botany-Paper-I :Molecular Biology

Objectives:

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

UNIT I: Genetic Material

- Biological, Chemical and physical Nature of Heredity material.
- Structure of DNA, WATSON & Crick model of DNA, Nuclosome model.
- Structure and types of RNAs (mRNA, tRNA and rRNA)

UNIT –II DNA Replication

- Concept, Types and process of DNA Replication.
- Meselson experiment of semiconservative replication of DNA
- Okazaki fragments, DNA Polymerases, DNA protein interaction.
- Preliminary account of DNA damage and repair.

UNIT-III Transcription and Translation

- Transcription in Eukaryotes, role of promoters, RNA Polymerases, Pre RNA synthetases, pre RNA Processing, capping, splicing and polyadenylation.
- Translation in Eukaryotes, Genetic code (Initiation, Elongation and Termination.)

UNIT-IV Regulation of Gene Expression

- Regulation in Gene expression in prokaryotes and Eukaryotes,
- Negative and Positive control.
- Attenuation and Antitermination.
- Reverse Transcription and its application.

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

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

Suggested Readings:

1. Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. 2009. The World of the Cell. 7th Edition. Pearson Benjamin Cummings Publishing, San Francisco.
2. Brown, T. A. 2010. Gene cloning and DNA analysis: An Introduction. Blackwell Publication, USA.
3. Buchanan, B., Gruissem, W. and Jones, R. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists., USA.
4. Chrispeel, M.J. and Sadava, D.E. 1994. Plants, Genes and Agriculture. Jones and Barlett Publishers, USA.

5. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press and Sunderland, Washington, D.C. Sinauer Associates, MA.
6. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology 8th edition. Lippincott Williams and Wilkins, Philadelphia.
7. Glick, B.R. and Pasternak, J.J. 2003. Molecular Biotechnology: Principles and Applications of recombinant DNA. ASM Press, Washington.
8. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley and Sons. Inc. New jersey, USA.
9. Mascarenhas, A.F. 1988. Hand book of Plant tissue culture. Publication and information. Div., ICAR, New Delhi.
10. Purohit, S.S. and Mathur, S.K. 1996. Biotechnology Fundamental and Application. Agro Botanical Publisher, Bikaner.
11. Razdan, M.K., 1993. An introduction to Plant tissue culture. Publication and Information Div., ICAR, New Delhi.
12. Rana, S.V.S. 2012. Biotechnology theory and practice. (Third Ed.) Rastogi Publication, Meerut.
13. Rastogi, V.B. 2008. Fundamentals of Molecular Biology. Ane Books, Meerut, India.
14. Smith, R. H. 2000. Plant Tissue Culture: Techniques and Experiments. 2nd edition, Academic Press, USA.
15. Upadhyaya, A. and Upadhyaya, K. 2005. Basic Molecular Biology. Himalaya Publishers. New Delhi.

Botany-Paper-II : Biotechnology

Objectives:

- ❖ To know the whole concept of Biotechnology
- ❖ To distinguish between morphogenesis and micro propagation
- ❖ To aware about the mechanism of plant tissue culture.
- ❖ To learn about the isolation, culture and somatic cell hybridization
- ❖ To acquire knowledge about recombinant DNA technology and PCR technique.
- ❖ To understand the introduction, process of transgenic plants.

UNIT I: Biotechnology and Plant tissue culture

Biotechnology: Functional definition. Basic aspects of Plant tissue culture, Basal medium, Media preparation and aseptic culture technique. Concept of cellular totipotency, Differentiation and morphogenesis and Micropropagation.

UNIT II: Protoplast, Anther and Embryo culture

Protoplast isolation, culture and Somatic cell hybridization, Anther culture , Embryo culture and their Applications, Applications of Plant tissue culture,

UNIT III: Recombinant DNA technology

Techniques used in rDNA technology. Restriction enzymes. Vectors for gene transfer. Plasmids and Cosmids. Genomic and c-DNA library, Polymerase Chain Reaction (PCR), Applications of PCR technique, DNA Finger Printing.

UNIT IV: , Transgenic plants

Introduction , Process of production of transgenic plants, types of transgenic plants , Application of transgenic plants and Biotechnology

Learning Outcomes: After completion of the course student would be able to:

- ❖ Comprehend the concept of Biotechnology
- ❖ Distinguish between morphogenesis and micro propagation
- ❖ Describe the role of plant tissue culture.

- ❖ Explain the isolation, culture and somatic cell hybridization
- ❖ Acquire knowledge about recombinant DNA technology and PCR technique.
- ❖ Interpret the transgenic plants.

Suggested Readings:

1. Becker, W.M., Kleinsmith, L.J., Hardin, J. and Berton, G. P. 2009. The World of the Cell. 7th Edition. Pearson Benjamin Cummings Publishing, San Francisco.
2. Brown, T. A. 2010. Gene cloning and DNA analysis: An Introduction. Blackwell Publication, USA.
3. Buchanan, B., Gruissem, W. and Jones, R. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists., USA.
4. Chrispeel, M.J. and Sadava, D.E. 1994. Plants, Genes and Agriculture. Jones and Barlett Publishers, USA.
5. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press and Sunderland, Washington, D.C. Sinauer Associates, MA.
6. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology 8th edition. Lippincott Williams and Wilkins, Philadelphia.
7. Glick, B.R. and Pasternak, J.J. 2003. Molecular Biotechnology: Principles and Applications of recombinant DNA. ASM Press, Washington.
8. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley and Sons. Inc. New jersey, USA.
9. Mascarenhas, A.F. 1988. Hand book of Plant tissue culture. Publication and information. Div., ICAR, New Delhi.
10. Purohit, S.S. and Mathur, S.K. 1996. Biotechnology Fundamental and Application. Agro Botanical Publisher, Bikaner. Razdan, M.K., 1993. An introduction to Plant tissue culture. Publication and Information Div., ICAR, New Delhi.
11. Rana, S.V.S. 2012. Biotechnology theory and practice. (Third Ed.) Rastogi Publication, Meerut.
12. Rastogi, V.B. 2008. Fundamentals of Molecular Biology. Ane Books, Meerut, India.
13. Smith, R. H. 2000. Plant Tissue Culture: Techniques and Experiments. 2nd edition, Academic Press, USA.
14. Upadhyaya, A. and Upadhyaya, K. 2005. Basic Molecular Biology. Himalaya Publishers. New Delhi.

Botany-Paper-III : Plant Physiology I

.Objectives:

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

UNIT I: Water

Structure and properties of water, osmosis, water potential and its components, absorption of water, root pressure, pathway of water movement; concepts of symplast and apoplast. Ascent of sap, mechanism of stomatal movements, factor affecting transpiration, its theories, mechanism and significance, antitranspirants and guttation.

UNIT II: Mineral Nutrition

Transport of ions across cell, mechanism of active and passive transport, translocation of, macro and micro nutrients; role of essential nutrients in plant metabolism and their deficiency symptoms. Outline of Nitrogen and phosphorus cycle. Transamination and deamination.

UNIT III: Photosynthesis

Photosynthesis, discovery and structure of pigments (chlorophyll and accessory pigment), light harvesting units, law of limiting factors. Light reaction- photophosphorylation- (cyclic and non cyclic), dark Reaction- Calvin and Benson cycle, Hatch and Slack pathway, Crassulacean acid metabolism and photorespiration.

UNIT IV: Respiration

Respiration: Aerobic and anaerobic, glycolysis, tricarboxylic acid cycle, oxidative phosphorylation, and factors affecting oxidative processes, pentose phosphate pathway, fermentation.

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

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

Suggested Readings:

1. Hopkins, W.G. and Huner, P. A. 2008. Introduction to Plant Physiology. John Wiley and Sons, USA.
2. Jain, V.K. 2013. Fundamental of Plant Physiology. S. Chand and Company Ltd., New Delhi.
3. Malik, C. P. and Srivastava A.K. 1982. Text book of Plant Physiology. Kalyani publication, New Delhi.
4. Mukherjee S., Ghosh A. K. 2006. Plant Physiology. New Central Book Agency, Calcutta.
5. Parashar, A. N. and Bhatia, K. N. 1985. Plant Physiology. Trueman Book Company, New Delhi.
6. Sinha, R. K. 2007. Modern Plant Physiology. 2nd Edition Tata McGraw, New Delhi.
7. Taiz, L. and Zeiger, E. 2006. Plant Physiology. 4th Edition, Sinauer Associates Inc. Publishers, Massachusetts, USA.
8. Verma, S. K. and Verma, M. 2000. A Text book of Plant Physiology, Biochemistry and Biotechnology. S. Chand and co. Ltd., New Delhi.
9. Verma, V. 2007. Text Book of Plant Physiology. ANE Books, India.

BOTANY PRACTICAL III

1. To determine the water potential of given plant material.
2. Demonstration of phenomenon of osmosis using potato osmometer.
3. Demonstration of phenomenon of plasmolysis.
4. To study the permeability of plasma membrane using different concentration of organic solvents.
5. To study the effect of temperature on permeability of plasma membrane.
6. To demonstrate root pressure.
7. Study of effect of temperature on rate of transpiration.
8. Study of transpiration rate in dorsiventral and isobilateral leaves by use of potometer.
9. Study of the mechanism of stomatal opening and closing.
10. Rate of photosynthesis under varying HCO_3 concentration in an aquatic plant using bicarbonate (Wilmott and Bubbler).
11. Demonstration of O_2 evolution during photosynthesis by inverted funnel method.
12. To study that light is necessary for photosynthesis by using ganong screen.
13. To demonstrate of anaerobic and aerobic respiration.
14. To study that CO_2 , light and chlorophyll is essential for photosynthesis (Moll's half experiment).
15. Study C3 and C4 plant with the kranz anatomy.
16. To study the R.Q. by Ganong's respirometer.

Semester-III

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 305	Zoology-I	CE*	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25 Practical	

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

Objectives:

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

Unit I: Protochordates

- 1.1 **Protochordata:** General characters and classification up to order Type Study:
- 1.2 **Herdmania** : Morphology, digestive system, Nervous System and sense organs, Excretory System, Reproductive system, Ascidian tadpole larva
- 1.3 **Amphioxus:** Structure, digestive system, respiratory system, circulatory system, senseOrgans, excretory system

Unit – II Agnatha and Pisces

- 2.1 **Agatha:** GeneralFeatures of Agnatha and classification up to classesType study: General Features of Petromyzon, Ammocete Larva
- 2.2 **Pisces:**Classification of Pisces upto classes; Difference between Chondrichthyes and Osteichthyes Type Study: General Morphology and anatomy of Scoliodon

Unit-III Tetrapoda

- 3.1 Amphibia: Classification and characters with suitable examples, adaptations for amphibious life
- 3.2 Reptilia: Classification and characters with suitable examples,
- 3.3 Aves: General classification and characters with important examples;
- 3.4 Mammalia-I: Classification and characters with suitable examples

Unit – IV Miscellaneous

- 4.1 Protochordates: General features and phylogeny of Urochordates &cephalochordates; Retrogressive metamorphosis
- 4.2 Pisces: Fins (structure and origin); Types of scales; Migration; Parental Care

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

- ❖ Discuss and study the classification of Protochordata, Ascidia & Amphioxus
- ❖ Understand the classification of Agnatha & Gnathostomata, Characters of Petromyzon, Ammocoe larva, .
- ❖ Learn about the classification of Pisces, and basics of pisciculture, Scales, Fins, migration in fishes.
- ❖ Understand the classification of Amphibia, Reptilia, and the General Topics like Adaptive radiation in Amphibian, Neoteny, Parental care in Amphibians,
- ❖ Understand the classification of Aves, Mammals and the General Topics like perching mechanism, flight adaptation, migration and feathers in birds and adaptation, hair and dentition in Mammals

Zoology-Paper-II: Microbiology & Parasitology

Objectives:

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

Unit –I: Microbiology

- 1.1 The scope of Microbiology: Characterization, Classification and identification of Microorganisms.
- 1.2 History and landmark events in Microbiology: Working of A.V. Leeuwenhock, Louis Pasteur, Robert Koch, Germ Theory of diseases.
- 1.3 World of Microbes: General Morphology of Protozoa, fungi – Molds and Yeasts

Unit-II: Bacteria

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

Unit-III: Other Microbes

- 3.1 Virus: Structure, Classification; Life Cycle- Lytic and Lysogeny; A Bacteriophage
- 3.2 Hepatitis: Structure and types of causative agent, Precaution, Prevention and Control
- 3.3 HIV and AIDS: Epidemiology, prevention, control and treatment

Unit-IV: Parasitology

- 4.1 Parasitic Protozoans: life cycle, pathogenesis and disease caused by Entamoebae; Plasmodium, Trypanosoma, Leishmania
- 4.2 Epidemiology of infectious diseases with reference of Human:
 - Bacterial [Tuberculosis, Leprosy, Meningitis]
 - Fungal[any one]diseases

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

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

Zoology-Paper-III: Physiology- I

Objectives:

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

- ❖ To understand the functions of Biomolecules in body Secretion.
- ❖ To explain the process of digestion.

Unit I Respiration

- 1.1 Mechanism and regulation of Respiration
- 1.2 Transport of oxygen and carbon dioxide, Respiratory Pigments
- 1.3 Respiratory quotient, Respiratory volumes and capacities
- 1.4 Respiratory Disorders and effect of smoking

Unit II Circulation

- 2.1 Body Fluid: Composition and functions of blood; Lymph composition & function; Blood Pressure, Regulation of Blood Pressure
- 2.2 Blood clotting – Intrinsic and extrinsic factors, Blood groups and Rh factor
- 2.3 Physiology of cardiac muscles, structure & function of heart; Human Cardiac Cycle; Cardiac Rhythm; Origin of Heart Beat; Regulation of Heart Beat
- 2.4 Elementary idea of Haemostasis, ECG, factors contributing to heart problems; Angioplasty; Angiography

Unit III Nutrition and Digestion

- 3.1 Balanced diet
- 3.2 Digestion and absorption of carbohydrates, proteins and fats
- 3.3 Hormonal regulation of gastrointestinal function
- 3.4 Vitamins- Fat soluble and water soluble vitamins; Sources, deficiency and diseases

Unit IV Excretion

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

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

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

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

Paper-I: Study of Chordates:

A. Study of Specimen.

- a) **Protochordata:** Herdmania, Ciona, Salpa, Doliolum, Amphioxus
- b) **Lower Chordates:** Petromyzon, Myxine/Bdellostoma, Ammocete larva,
- c) **Pisces:** Sphyrna, Trygon (Sting ray), Pristis (Saw Fish), Raja (Skate), Torpedo, Chimaera (Rat Fish), Acipenser, Amia, Lepidosteus, Notopterus, Labeo, Clarius, Anguilla (eel), Exocoetis, Hippocampus, Echinostoma Sucker Fish), Protopterus,
- d) **Amphibia:** Ichthyophis, Cryptobranchus, Ambystoma (Tiger Salamander), Axolotl Larva, Salamandra, Proteus, Siren, Alytes, Pipa, Hyla, Rhacophorus (Flying Frog)

B. Study of Slides.

- a) Tadpole larva of Herdmania, Herdmania Spicules, T.S. of Amphioxus (Through Oral hood, Pharyngeal, Intestinal and Caudal regions)
- b) V.S. of Skin of Scoliodon, Amphibia
- C. Mounting.
 - a) Herdmania Spicules, Placiod Scale
- D. Dissection: [Through demonstration by chart/ CAL/ Video]
 - a) **Major:** Afferent branchial vessels; Efferent branchial vessels; Cranial nerves of Scoliodon.
 - b) **Minor:** Internal Ear; Eye Muscles; Ampulla of Lorenzini

Paper-II : Microbiology and Parasitology

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

Paper: III Physiology:

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

Suggested Readings:

Chordates:

1. Colbert's evolution of the vertebrates; Colbert, E.H; John Wiley & Sons
2. Text book of Chordate Zoology vol. II ; Sandhu, G.S. and Sandhu, G.S; Campus Books.
3. Modern text book of Zoology-Vertebrates; Kotpal, Rastogi Publication.
4. Vertebrate Zoology; Rastogi, V.B.; Ramnath & Kedarnath.
5. Young, O.Z.: The Life of Vertebrates, Oxford University Press, Oxford.
6. Young, J.Z.: The life of vertebrates. Oxford University Press London 1962 (Low Priced Text Reprint English Language Book Society London, 1962).
7. Barrington, E.J.W.: The Biology Hemichordata & Protochordata Oliver & Boyd, London, 1965
8. Young J. Z : The life of mammals Oxford University Press London 1963
9. R.L Kotpal, 2015, Chordata, Rastogi Publishing, Meerut, Delhi

Parasitology:

1. Burton J Bogitsh Human Parasitology 3rd edition Elsevier.
2. Roberts, L. S. and J. Janovy, Jr. 2004. Foundations of Parasitology. 7th Edition. McGraw Hill, Boston.
3. Smith. Animal Parasitology 1996. Cambridge University Press.
4. Marr et al. Molecular Medical Parasitology 2003, Elsevier.
5. Lawrence R. Ash and Thomas C. Orihel. Atlas of Human Parasitology. American Society for clinical pathology press 5th edition, 2007.
6. Janet Amundson Romich. Understanding Zoonotic Diseases. 2007

7. Paul Schmid-Hempel. The Integrated Study of Infections, Immunology, Ecology, and Genetics (Oxford Biology), 2011
8. H.S Singh & P. Rastogi, 2016, Parasitology, Himalaya Publishing House, pvt. Ltd. Delhi

Microbiology

1. Mani, A., Selvaraj, A.M., Narayanan, L.M. & Arumugam, N. 1996 : Microbiology – saras publications – Nagercoil-India.
2. Sharma, P.D. 1998: Microbiology – Rastogi Publ. Meerut, India
3. Subba Rao, N.S., 1999: Soil Microbiology, Oxford IBH Co. New Delhi, India.
4. Sullia, S.B. & Santharam, S. 2004-General Microbiology, Oxford IBH, India.
5. Meenakumari, S. Microbial Physiology, MJP-Publ.-Chennai, India.
6. Purushotam Kaushik, 2005: Microbiology – S.Chand & Co. New Delhi, India
7. Vijaya Ramesh, 2005: Environmental Microbiology, MJP.Publ., Chennai, India
8. Vijaya Ramesh, 2007: Food Microbiology, MJP.Publ. Chennai, India.
9. Rajan, S. 2007: Medical Microbiology – MJP.Publ. Chennai, India.
10. Purohit, S.S. 2007: Microbiology - Agrobios Publ. India
11. Trivedi, P.C. 2008: Applied Microbiology - Agrobios Publ. India
12. Prescott, 2009: Industrial Microbiology - Agrobios Publ. India
13. Parihar, L. 2008: Advances in Applied Microbiology - Agrobios Publ. India
14. Agarwal, A.K. 2008: Industrial Microbiology, Agrobios Publ. India.
15. Bohra, A. 2006: Food Microbiology, Agrobios Publ. India
16. Bhastiya & Jain, 2015, Immunology, microbiology, & Biotechnology, Himalaya Publishing House pvt. Ltd. Delhi

Physiology:

1. Ganong: Review of Medical Physiology (22nd ed. 2005, Lange Medical)
2. Guyton and Hall: A text book of Medical Physiology (11th ed. 2006, Saunders).
3. Keele & Neil: Samson Wright's Applied Physiology (13th ed. 1989, Oxford)
4. Hall of India Pvt. Ltd., New Delhi - 110 001.
5. Wood, D.W., 1983. Principles of Animal Physiology 3rd Ed.,
6. Prosser, C.L. Brown 1985. Comparative Animal Physiology, Satish Book Enterprise, Agra - 282 003.
7. Wilson, J. A. Principles of animal physiology. Collins MacMillan Publ.
8. Chordate zoology and animal physiology. S. Chand and Co
9. K.V. Shastri, 2015, Animal Physiology and Biotechnology, Rastogi Publication, Meerut, Delhi

Course Code	Course Title	Group	Course Category	Credit	Viva	CIA	Total
BJVB301AE	Effective Communication and Soft Skills in English		Skills	2	35	15	50

Course Description:

This course is designed to enhance the communication and soft skills of undergraduate students in English. The course focuses on developing effective verbal and non-verbal communication skills, teamwork, leadership, and problem-solving abilities. Students will learn to express themselves confidently and clearly in various social, academic, and professional contexts.

Course Objectives:

1. Develop effective communication skills in English, including verbal and non-verbal communication.
2. Enhance teamwork, leadership, and problem-solving abilities.
3. Build confidence in expressing oneself in various social, academic, and professional contexts.
4. Improve active listening, critical thinking, and conflict resolution skills.
5. Develop a positive attitude and emotional intelligence.

- **Introduction to Effective Communication**

- Overview of communication skills
- Verbal and non-verbal communication
- Importance of effective communication in personal and professional life

- **Building Confidence in Communication**

- Understanding personality traits and communication styles
- Developing assertiveness and confidence in communication
- Practicing effective communication in everyday situations

- **Teamwork and Leadership**

- Understanding team dynamics and roles
- Developing leadership skills and qualities
- Practicing teamwork and leadership in group activities

- **Problem-Solving and Conflict Resolution**

- Understanding problem-solving strategies and techniques
- Developing critical thinking and analytical skills
- Practicing conflict resolution and negotiation skills

- **Emotional Intelligence and Positive Attitude**

- Understanding emotional intelligence and its importance
- Developing self-awareness and self-regulation skills
- Practicing positive attitude and emotional intelligence in daily life

- **Final Project Presentations**

- Students will work on a final project that demonstrates their understanding of effective communication and soft skills.
- Students will present their projects in class and receive feedback from peers and instructor.

Assessment:

- Class participation and attendance: 20%
- Group discussions and activities: 20%
- Quizzes and tests: 20%
- Final project: 30%
- Reflective journal: 10%

Required Textbook:

- "The Art of Public Speaking" by Dale Carnegie
- "Effective Communication" by Murugan

Recommended Resources:

- Online articles and videos on effective communication and soft skills
- TED Talks on communication, leadership, and emotional intelligence

Prerequisites: None

Target Audience: Undergraduate students of all disciplines.

Course Duration: 10 weeks

Contact Hours: 2 hours per week

Course Code	Course Title	Course Category	Credit	C.I.A. (Continouns Internal Assesment)	Theory + Practical	Total
BJVB302ID	अहिंसा एवं अणुव्रत	Core Elective (CE)	4	30	70	100

सेमेस्टर – III

उद्देश्य—

1. अणुव्रत के विशेष संदर्भ में अहिंसा तत्त्व को समझाना।

इकाई—1 : अणुव्रत का दार्शनिक आधार

- अणुव्रत दर्शन
- व्रत अणु क्यों ?
- अणुव्रत का स्वरूप
- गुण व्रत, शिक्षा व्रत
- व्रतों की भाषा और भावना
- अणुव्रत का दार्शनिक आधार 'संयम'
- अणुव्रत रचनात्मक या निषेधात्मक

इकाई—2 : अणुव्रत का प्रायोगिक स्वरूप : अणुव्रत आन्दोलन

- अणुव्रत आन्दोलन का उद्भव एवं विकास
- अणुव्रत आन्दोलन क्यों ?
- अणुव्रत आन्दोलन का मूल आधार
- अणुव्रत आन्दोलन का असाम्प्रदायिक स्वरूप
- अणुव्रत आन्दोलन : व्यवस्था सुधार या वृत्ति सुधार
- अणुव्रत प्रवर्तक आचार्य श्री तुलसी का व्यक्तित्व एवं कर्तृत्व

इकाई—3 : अणुव्रत आन्दोलन के अहिंसक कार्यक्रम

- अहिंसा का अर्थ और स्वरूप
- अहिंसा सार्वभौम
- अहिंसा समवाय
- अहिंसा यात्रा
- अहिंसक समाज संरचना की संभावना
- आचार्य तुलसी के अहिंसक प्रयोग

इकाई—4 : अणुव्रत आन्दोलन का सामाजिक/राजनीतिक स्वरूप

- सामाजिक कुरुद्वियों पर प्रहार

- बाल विवाह की निवृत्ति के प्रयास
- विधवा को गरिमामयी स्थान
- मृत्यु भोज पर प्रतिबन्ध के प्रयास
- छूआछूत का अंत
- विद्यार्थी और नशामुक्ति
- अहिंसक समाज व्यवस्था
- राष्ट्रीय एकता की समस्या और समाधान की दिशा
- अणुव्रत चुनाव शुद्धि अभियान
- अणुव्रत संसदीय मंच
- मतदाता और प्रत्याशी की आचार संहिता

उपलब्धियाँ—

1. अणुव्रत आंदोलन को जानकर संयम की दिशा में आगे बढ़ेंगे।

पाठ्य पुस्तक / संदर्भ ग्रन्थ

1. अणुव्रत दर्शन— आचार्य महाप्रज्ञ, जैन विश्वभारती संस्थान, लाडनूं
2. अहिंसा और अणुव्रत— सिद्धान्त और प्रयोग— मुनि सुखलाल एवं आनन्दप्रकाश त्रिपाठी
3. गांधी पश्चात् शांति आंदोलन— प्रो. अनिल धर, जैन विश्वभारती संस्थान, लाडनूं
4. आचार्य तुलसी एवं अणुव्रत आन्दोलन — डॉ. आनन्द प्रकाश त्रिपाठी, यूनवर्सिटी बुक हाउस, जयपुर

Semester-IV

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 401	Chemistry-I	Any Three CC	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

Chemistry-Paper -I: Inorganic chemistry

Objectives:

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

Unit I : Chromatography

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

Unit II : Oxidation and Reduction

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

Unit III : Polymer chemistry of Silicones & Phosphazenes

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

Preparation, properties, substitution reaction and structure of Phosphazenes

Unit IV : Bioinorganic chemistry

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

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

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

Chemistry-Paper -II : Organic chemistry

Objectives:

- ❖ To develop knowledge about classification & nomenclature of carboxylic acid and dicarboxylic acid.

- ❖ To aware about the chemical reactions, mechanism and properties of polymers, halonitroarenes and amines.
- ❖ To develop concept of various laws related to synthesis and catalyzing process.
- ❖ To acquaint the various reactions on the basis of their mechanism.

Unit I : Carboxylic acids & Dicarboxylic acids

Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength, preparation of carboxylic acids, reactions of carboxylic acids – Hell Volhard Zelinisky reaction, synthesis of acid chlorides, esters and amides, reduction of carboxylic acids, mechanism of decarboxylation. Method of formation and chemical reaction of haloacids, hydroxyl acids, malic tartaric and citric acids. Methods of formation and chemical reactions of α , β - unsaturated monocarboxylic acids. methods of formation and effect of heat and dehydrating agents (succinic, glutaric and adipic acids).

Unit II : Carboxylic acids derivatives & Synthetic polymers

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

Addition or chain growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol-formaldehyde resin, urea-formaldehyde resin, epoxy resins and polyurethanes. Natural and synthetic rubbers.

Unit III : Alkyl nitrates, Nitroarenes & Halonitroarenes

Preparation of nitroalkanes and nitroarenes. chemical reactions of nitro alkanes, mechanism of nucleophilic substitution in nitro arenes and their reduction in acidic, neutral and alkaline medium, picric acid. Reactivity, structure and nomenclature of amines, physical properties, stereochemistry of amines. Separation of mixture of primary, secondary and tertiary amines, structural features effecting basicity of amines.

Unit IV Amines

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

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

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

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

Chemistry-Paper -III:Physical Chemistry

Objectives:

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

- ❖ To give information about carnt theorem, mixing of gases, overvoltage and referectivity.

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

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

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

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

Unit II : Electrochemistry II

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

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

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

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

Unit III : pH & Corrosion

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

Unit IV : Physical properties and molecular structure

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

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

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

Practicals

Organic Chemistry

TLC/ Paper chromatography

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

Synthesis of organic compounds (Any Four)

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

Phase Equilibrium :

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

Transition Temperature:

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

Thermochemistry :

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

Viva-Voce and Record

Suggested Reading:

1. कार्बनिक रसायन, सुरेश आमेटा, एच.के. पाण्डे, एच.एस. शर्मा, हिमांशु पब्लिकेशन्स, उदयपुर
2. अकार्बनिक रसायन, ओझा, भोजक, कोठारी, चतुर्वेदी, रमेश बुक डिपो, जयपुर
3. प्रायोगिक रसायन, भार्गव, लवानिया, ओझा, रमेश बुक डिपो, जयपुर
4. भौतिक रसायन, शर्मा, भार्गव, गुप्ता, रमेश बुक डिपो, जयपुर
5. कार्बनिक रसायन, विजयश्री मनोज छंगाणी, अल्का पब्लिकेशन, अजमेर
6. अकार्बनिक रसायन, विजयश्री कोठारी छंगाणी, अल्का पब्लिकेशन, अजमेर
7. प्रायोगिक रसायन, छंगाणी, विजयश्री, खण्डेलवाल, अल्का पब्लिकेशन, अजमेर
8. भौतिक रसायन, वी.के. गोयल, आर.एस. पीतलिया, कॉलेज बुक हाउस, जयपुर

Semester-IV

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 402	Physics-I	CE*	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Prcatical				25 Practical	

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

Objectives:

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

UNIT I Kinetic Theory of Gases:

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

UNIT II Transport Phenomenon of Gases:

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

UNIT III Classical Statistics:

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

UNIT IV Quantum Statistics:

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

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

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

Suggested Reading :

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना,, उष्मा गतिकी एवं सांख्यिकीय भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015-16

Physics-Paper -II: Optics –II

Objectives:

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

UNIT-I Fraunhofer Diffraction:

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

UNIT-II Fresnel class of Diffraction & Resolving Power:

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

Unit-III Optical Activity and Holography:

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

Unit-IV Lasers:

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

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

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

Suggested Reading :

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, प्रकाशिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015–16

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

Objectives:

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

UNIT-I Transistor:

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

UNIT-II Amplifiers with Feedback:

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

UNIT-III Operational Amplifier & Oscillators:

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

UNIT-IV Field Effect Transistor and Digital Circuits:

Field Effect Transistor (FET) and its characteristic biasing JFET, ac operation of JFET and MOSFET. Binary, Hexadecimal and Octal number systems. Binary arithmetic. Logic fundamentals AND, OR, NOT, NOR, NAND, XOR gates, Boolean theorems, transistor as a switch, logic gates: circuit realization of logic functions. Analog to digital and digital to analog analysis. DDL, RTL, TTL circuits.

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

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

Suggested Reading :

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, इलेक्ट्रॉनिकी एवं ठोस प्रावस्था युक्तियां, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015–16

Physics Practical: IV

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

Suggested Reading :

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

Semester-IV

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 403	Mathematics-I	CE*	4	15	20	100
	Mathematics-II				20	
	Mathematics-III				20	
	Mathematics Practical				25 Practical	

Mathematics-Paper-I: Real analysis and metric space

Objectives:

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

Unit 1 . Sequence and series of functions —

Pointwise and Uniform convergence, Cauchy's criterion, Weierstrass M-test, Abel's test, Dirichlet's test for uniform convergence of series of functions, Uniform convergence and Continuity of series of functions,

Unit 2; Term by term differentiation and integration. Metric space —

Definition and examples, Open and Closed sets, Interior and Closure of a set, Limit point of a set.

Unit 3:

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

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

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

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

Suggested Reading:

1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड़. जांगीड़, जितेन्द्र सैनी रियल एनालिसिस एण्ड मैट्रिक स्पेस, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
2. जी.सी. गौखरू सैनी, रियल एनालिसिस एण्ड मैट्रिक स्पेस, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics-Paper-II: Differential Equations II

Objectives:

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

Unit 1 ; Exact linear differential equations, of nth order. Existence and uniqueness theorem.

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

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

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

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

- ❖ Calculate the exact linear differential equations of nth order.
- ❖ Classify the linear differential equations of second order.
- ❖ Discuss the partial differential equations of first order.
- ❖ Identify the homogeneous and non-homogeneous linear partial differential equation.

Suggested Reading :

1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड, जितेन्द्र सैनी रियल एनालिसिस एण्ड मैट्रिक स्पेस, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
2. जी.सी. गौखरू सैनी, रियल एनालिसिस एण्ड मैट्रिक स्पेस, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics- Paper-III: Optimization Theory vector calculus

Objectives:

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

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

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

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

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

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

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

Suggested Reading :

1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड, जितेन्द्र सैनी रियल एनालिसिस एण्ड मैट्रिक स्पेस, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
2. जी.सी. गौखरू सैनी, रियल एनालिसिस एण्ड मैट्रिक स्पेस, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Semester-IV

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 404	Botany-I	CE*	4	15	20	100
	Botany-II				20	
	Botany-III				20	
	Botany Practical				25 Practical	

Botany-Paper-I : Pteridophytes

Objectives:

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

UNIT I:

Pteridophytes: General account of Pteridophytes, origin, classification (G.M. Smith), evolution of stele, development of sporangia (eusporangiate and leptosporangiate) and life cycle patterns of homosporous and heterosporous pteridophytes.

UNIT –II:

Heterospory and seed habit, Apospory and Apogamy. General characteristics of Psilotophyta: Morphology, anatomy and reproduction of *Psilotum*

UNIT-III:

General characteristic of Lycophyta and Sphenophyta: Morphology, anatomy and reproduction of *Seleginella* and *Equisetum*

UNIT-IV:

General characteristics of Filicophyta: Morphology, anatomy and reproduction of *Pteridium* and *Marsilea*. Economic importance of Pteridophytes.

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

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

Suggested Readings:

1. Bierhorst, D.W. 1971. Morphology of Vascular Plants. MacMillan Co., N.Y. and Collier-MacMillan Ltd., London.
2. Parihar, N.S. 1996. The Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.
3. Singh, V., Pandey, P. C. and Jain, D. K. .2013. A text book of Botany. IV edition, Rastogi publication, Meerut.
4. Sharma, O. P. 1990. Textbook of Pteridophyta, MacMillan India Ltd., Delhi.
5. Vashishta, P.C. 1997. Botany for Degree Students- Pteridophyta. S. Chand and Company, New Delhi.

6. Wilson, N. S. and Rothewall, G. W. 1993. Paleobotany and Evolution of Plants. (2nd Edition), Cambridge University Press, U. K.

Botany- Paper-II:Gymnosperms And Paleobotany

Objectives:

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

UNIT I:

Gymnosperm: General characteristics, distribution, classification (K. R. Sporne, 1965) and economic importance. Brief account of Progymnosperm, affinities of Gymnosperms with Pteridophytes and Angiosperms.

UNIT: II

General characteristics of Cycadales, Coniferales: Morphology, anatomy, reproduction and life cycle with special reference to the genera *Cycas* and *Pinus*.

UNIT: III

General characteristics of Ephedrales: Morphology, anatomy, reproduction and life cycle of *Ephedra*. Palaeobotany: Geological time scale, fossil types and their formation, technique of study of fossils.

UNIT IV:

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

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

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

Suggested Readings:

1. Bhatnagar, S. P. and Moitra, A. 1997. Gymnosperms. New Age International (P) Ltd., Publisher, New Delhi.
2. Clark, D. L. 1976. Fossils, Palaeobotany and Evolution. W.M.C. Brown Company, New York.
3. Meyen, S. V. 1978. Fundamentals of Palaeobotany. Chapman and Hall, London.
4. Sharma, O. P. 1997. Gymnosperms. Pragati Prakashan, Meerut, India.
5. Sporne, K. R. 2002. The Morphology of Gymnosperms. B. I. Pub. Pvt. Ltd. Mumbai, Kolkata, Delhi.
6. Thomas, B. A. and Spice, R. A. 1986. The Evolution and Palaeobotany of land Plants. Publ. Crom. Helm London and Sydney.
7. Vasishta P.C. 1980. Gymnosperms. S. Chand and Co. Ltd., New Delhi.

Botany- Paper-III:Plant Physiology Ii And Biochemistry

Objectives:

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

UNIT I:

Seed dormancy and germination, phases of growth and development; plant movement and biological clock and their regulatory factor. Growth hormones: Structure, biosynthesis, and physiological role of auxins, gibberellins.

UNIT II:

Structure, biosynthesis and physiological role of Cytokinin and Ethylene. Growth inhibitors: ABA, Ethylene. Physiology of Flowering: Photoperiodism, flowering stimulus, florigen concept, vernalization. Discovery, chemical nature and role of phytochrome in photomorphogenesis and senescence.

UNIT III:

Carbohydrates: Introduction, Importance, Nomenclature and Classification of Carbohydrates, Molecular Structure and Function of monosaccharides, oligosaccharides and polysaccharides. Glycosidic linkage and Glycoprotein.

Lipids–Structure and classification of lipids, fatty acids- saturated and unsaturated, Alpha Oxidation, Beta oxidation and Glyoxalate Cycle, oxidation of fatty acids.

UNIT IV:

Proteins- Amino acids as basic units, structure and classification of proteins (primary, secondary, tertiary and quaternary), Physical and Chemical Properties.

Enzymes :Structure, Nomenclature and classification of enzymes, Characteristics of Enzymes, mechanism of action, Multi Enzyme System, Regulation of Enzyme Activity.

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

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

Suggested Readings:

1. Berg, J.M., Tymoczko, J.L., Stryer, L. 2006. Biochemistry. 6th Edition, W.H. Freeman and Company, New York.
2. Buchanan, B., Gruissem, W. and Jones, R. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists, USA.
3. Conn, E.E., Stumpf, P.K. and Bruening, G. 2006. Outlines of Biochemistry. 4th Edition, John Wiley and Sons Inc. New Jersey, USA.
4. Elliot, W.H. and Elliot, D.C. 2009. Biochemistry and Molecular Biology. Oxford Publishers, India.
5. Hopkins, W.G. and Huner, P.A. 2008. Introduction to Plant Physiology. John Wiley and Sons, USA.
6. Mukherjee, S., Ghosh, A.K. 2006. Plant Physiology. New Central Book Agency, Calcutta.
7. Nelson, D.L. and Cox, M.M. 2004. Lehninger Principles of Biochemistry, 4th edition, W.H. Freeman and Company, New York, USA.

8. Ranjit, K. 2008. Research methodology: A step by step guide for beginners. Pearson, India.
9. Sinha R. K., 2007. Modern Plant Physiology. 2nd Edition Tata McGraw, New Delhi.
10. Taiz, L. and Zeiger, E. 2006. Plant Physiology. 4th Edition Sinauer Associates Inc. Publishers, Massachusetts, USA.
11. Voet, D. and Voet, J.G. 2000. Biochemistry, John Wiley, New York.
12. Wilson, K. and Walker, J. 2008. Principles and techniques of Biochemistry and Molecular Biology, Cambridge University Press.

BOTANY PRACTICAL IV

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

Semester-IV

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 405	Zoology-I	CE*	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25 Practical	

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

Objectives:

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

UNIT-I: Comparative Anatomy of Vertebrates-I

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

- 1.1 Integument and its derivatives.
- 1.2 Alimentary canal and accessory digestive glands.
- 1.3 Respiratory organs.

UNIT-II Comparative Anatomy of Vertebrates-II

Comparative anatomy of the organ systems of Scoliodon, Rana,

- 2.1 Heart, aortic arches and their evolution.
- 2.2 Brain and cranial nerves,
- 2.3 Comparative structure and evolution of urinogenital system (pro, meso and metanephric kidney and genital ducts in males and females).

Unit III: Comparative Anatomy of Vertebrates-III

Comparative anatomy of the organ systems of Scoliodon, Rana,

- 3.1 Osteology: Girdles, limb bones, Vertebrae, ribs and sternum; jaw suspension, Structure and types of vertebrae
- 3.2 Sense Organ: Comparative anatomy of eye
- 3.3 Sense Organ: Membranous labyrinth; sound production

Unit IV: Miscellaneous

- 4.1 Reptila: Poisonous and Non Poisonous Snakes of India.
- 4.2 Aves: Flight Adaptation; Flight Muscles; Perching Mechanism
- 4.3 Mammals-I: Dentition; Adaptive radiation

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

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

Zoology-Paper-II: Biochemistry and Endocrinology

Objectives

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

Unit I: Carbohydrates and their metabolism

- 1.1 Biomolecule: Structure, types, function and properties of Carbohydrate
- 1.2 Metabolism: Glycolysis; fermentation; citric acid cycle; gluconeogenesis;
- 1.3 Glycogen metabolism (glycogenesis and glycogenolysis).

Unit II: Lipids and their metabolism

- 2.1 Biomolecule: Structure, types, function and properties of Lipid
- 2.2 Fatty acid; Triglycerides and Steroids
- 2.3 Metabolism: Biosynthesis and β -oxidation of saturated fatty acids, ketogenesis
- 2.4 Lipid Disorders: Ketosis, Lipidosis

Unit III: Proteins and their metabolism

- 3.1 Biomolecule: Amino acids; essential and non-essential amino acids
- 3.2 Biomolecule: Structure, types, function and general properties of Proteins; four levels of structures in proteins
- 3.3 Enzymes: Major classes, Basic mechanism of action, kinetics and factors affecting enzyme activities

Unit IV: Endocrine Glands and Disorders

Structure, biological actions and regulation of following endocrine glands:

- 4.1 Pituitary
- 4.2 Thyroid; Thymus
- 4.3 Adrenal; Pineal; Pancreas
- 4.4 Testes and Ovary

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

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

Zoology-Paper-III: Physiology- II

Objectives:

- ❖ To Understand the Nerve and Muscles.
- ❖ To explain the Sensory Physiology.
- ❖ To Understand the Reproduction.
- ❖ To understand the hormones action.
- ❖ To learn about the human ear mechanism of hearing

Unit –I: Nerve and Muscle Physiology

- 1.1 Nerves: Types of neurons, E.M. structure of neuron; Myelinated and non-myelinated nerve fibres
- 1.2 Muscles: Ultra structure of striated muscle, Physiology of Muscle Contraction; sliding filament theory of muscle contraction; Neuromuscular Junction

Unit II: [Sensory Physiology]

- 2.1 Structure of human eye; image formation and colour vision
- 2.2 Structure of human ear, mechanism of hearing
- 2.3 Elementary idea of EEG, MRI, CT-scan, mental health (epilepsy, neurosis, psychosis)

Unit III [Reproduction]

- 3.1 Oestrous and menstrual cycle
- 3.2 Male and female sex hormones
- 3.3 Causes of infertility in male and female

Unit IV [Hormones]

- 4.1. General mechanism of hormone action: Peptide hormone; Steroid hormone
- 4.2 Neurohypophysial hormones – Oxytocin and Vasopressin
- 4.3 Hormones of the Adenohypophysis; Hypothalamic control of Adenohypophysis; Dwarfism; Acromegaly

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

- ❖ Interprets the Nerve and Muscles.
- ❖ Understand the Sensory Physiology.
- ❖ Understand the Reproduction.
- ❖ Classify the hormones action.
- ❖ Describe the human ear mechanism of hearing

Zoology Practical- IV

Paper-I: Study of Chordates:

A. Study of Specimen.

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

B. Study of Permanent Slides.

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

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

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

D. Dissection:

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

Paper-II: Biochemistry

- 1. Biochemical detection of carbohydrates, proteins and lipids in a given sample
- 2. Calorimetric estimation of glucose / Protein in a given solution

Paper-III: Physiology II

I. Study of Permanent Slides

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

Suggested Readings:

Biochemistry:

1. Stryer, I. (1988). Biochemistry II. Freeman and Co.
2. Plummer, L. (1989). Practical biochemistry. Tata McGraw.
3. Murray, R. K. et al (1995). Harper's biochemistry, 24th ed. Prentice Hall.
4. Lewin, B. (2000). Gene. John Wiley & sons.
5. Strikburger, M. W. (1994). Genetics. Macmillan Publ. Co.
6. Russel, P. J. (1998). Genetics. The Benjamin Cummins Publishing Co.
7. Lehninger (2004). Principles of biochemistry 4th ed.
8. Gilbert, F. (2000). Basic concepts in biochemistry: A student's survival guide. 2nd ed. McGrawHill
9. Price, N. E. & Stevens, L. (1982). Fundamentals of enzymology. OUP
10. K.V. Shastri, 2015, Animal Physiology and Biochemistry, Rastogi Publication, Meerut, Delhi

Physiology:

1. Ganong: Review of Medical Physiology (22nd ed. 2005, Lange Medical)
2. Guyton and Hall: A text book of Medical Physiology (11th ed. 2006, Saunders).
3. Keele & Neil: Samson Wright's Applied Physiology (13th ed. 1989, Oxford)
4. K.V. Shastri : Physiology
5. William S. Hoar, 1976. General and Comparative Physiology, Prentice
6. K.V. Shastri, 2015, Animal Physiology and Biochemistry, Rastogi Publication, Meerut, Delhi

Endocrinology

1. Hadley: Endocrinology (5th ed. 2000, Prentice Hall)
2. Turner and Bagnara: General Endocrinology (6th ed. 1984, Saunders)
3. Norris: Vertebrate Endocrinology, Fourth Edition, 2007, Academic Press

Course Code	Course Title	Group	Course Category	Credit	Viva	CIA	Total
BJVB401SE	Soft/Communication Skills		Skills	2	35	15	50

Course Description:

This course is designed to enhance the communication and soft skills of undergraduate students in English. The course focuses on developing effective verbal and non-verbal communication skills, teamwork, leadership, and problem-solving abilities. Students will learn to express themselves confidently and clearly in various social, academic, and professional contexts.

Course Objectives:

1. Develop effective communication skills in English, including verbal and non-verbal communication.
2. Enhance teamwork, leadership, and problem-solving abilities.
3. Build confidence in expressing oneself in various social, academic, and professional contexts.
4. Improve active listening, critical thinking, and conflict resolution skills.
5. Develop a positive attitude and emotional intelligence.

- **Introduction to Effective Communication**

- Overview of communication skills
- Verbal and non-verbal communication
- Importance of effective communication in personal and professional life

- **Building Confidence in Communication**

- Understanding personality traits and communication styles
- Developing assertiveness and confidence in communication
- Practicing effective communication in everyday situations

- **Teamwork and Leadership**

- Understanding team dynamics and roles
- Developing leadership skills and qualities
- Practicing teamwork and leadership in group activities

- **Problem-Solving and Conflict Resolution**

- Understanding problem-solving strategies and techniques
- Developing critical thinking and analytical skills
- Practicing conflict resolution and negotiation skills

- **Emotional Intelligence and Positive Attitude**

- Understanding emotional intelligence and its importance
- Developing self-awareness and self-regulation skills
- Practicing positive attitude and emotional intelligence in daily life

- **Final Project Presentations**

- Students will work on a final project that demonstrates their understanding of effective communication and soft skills.
- Students will present their projects in class and receive feedback from peers and instructor.

Assessment:

- Class participation and attendance: 20%

- Group discussions and activities: 20%
- Quizzes and tests: 20%
- Final project: 30%
- Reflective journal: 10%

Required Textbook:

- "The Art of Public Speaking" by Dale Carnegie
- "Effective Communication" by Murugan

Recommended Resources:

- Online articles and videos on effective communication and soft skills
- TED Talks on communication, leadership, and emotional intelligence

*Prerequisites: None

*Target Audience: Undergraduate students of all disciplines.

*Course Duration: 10 weeks

*Contact Hours: 2 hours per week

Course Code	Course Title	Croup	Course Category	Credit	Viva	School Teaching Report	Total
BJVB401SE	English Commiuncation Skill	A	AEC	2	35	15	50

SEMESTER-IV

Course Objectives

1. To improve fluency in spoken English and to practice correct pronunciation.
2. To introduce the techniques of presentation skills
3. Help improve speaking skills through participation in activities such as role plays, discussions, and structured talks/ oral presentations

Unit –I : Listening Skills

- Listening to unknown passages – for global understanding, identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Unit –II

1. Purpose, Different roles for participants, Etiquette in a structured GD - Practice GDs

Achievement:

1. Fluency in spoken English will be improved.
2. The learners will learn the techniques of presentation skills.
3. Speaking skills will be improved.

Reference Books:

J.K. Gangal. A Practical Course in Effective English Speaking Skills. 2012. Prentice Hall India Learning Private Limited.

Course Code	Course Title	Course Category	Credit	CIA	Total
BJVB403VA	Preksha Meditation Introduction and Practice	35 (Pract.)	2	15	50

SEMESTER—IV

Objective:

1. To develop a multidimensional personality
2. To develop inner personality.
3. To develop attitudes and qualities to work effectively in different situations.
4. Effective communication skills to express viewpoints and ideas well.

Unit-1: Preksha Meditation

- Preksha Meditation: An Introduction
- Basic sources of Preksha Meditation
- Parts of Preksha Meditation
- Spiritual basis of Preksha Meditation
- Upasampada of Preksha Meditation

Unit-2 Four Stages of Preksha Meditation

- Kayotsarga
- Long Breathing Preksha
- Samavritti breathing Preksha
- Jyoti Kendra Preksha

Achievements:

1. Development of Multidimensional personality.
2. Development of Inner personality.
3. Development of Attitudes and qualities to work effectively in different situations.
4. Learning of effective communication skills to express viewpoints and ideas well.

Reference Book

1. Prekshadhyan, Acharya Mahapragya, Publisher: Jain Vishwabharati, Ladnun-341306
2. Prakshadhyan: Principles and Experiments, Muni Kishanlal, Publisher: Jain Vishwabharati, Ladnun-341306 (Raj.)

Semester-V

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 501	Chemistry-I	Any Three CC	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

Chemistry-Paper-I : Inorganic Chemistry

Objectives:

- ❖ To develop the knowledge about coordination compound, lanthanides and actinides.
- ❖ To aware about the conceptual knowledge of valence bond theory, nomenclature, spectral properties of elements of transition series.
- ❖ To give information about coordination theory, magnetic moments, spectral properties and electronic configuration of various elements of transition series.
- ❖ To develop understanding about correlation between periodicity and general features of various elements.

Unit I: Coordination Compounds

Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, Valence bond theory of transition metal complexes with reference to tetrahedral, octahedral and cubic complexes, back bonding, Limitations of valence bond theory.

Unit II: Chemistry of elements of first transition series

Characteristic properties of d-block elements, properties of the elements of the first transition series, complexes illustrating relative stability of their oxidation states, coordination number and geometry, Types of magnetic behaviour, magnetic and molar susceptibility, determination of magnetic susceptibility, orbital contribution of magnetic moments, spin-only formula, correlation of μ_s and μ_{eff} values, applications of magnetic moment.

Unit III: Chemistry of lanthanide elements

Position in periodic table, occurrence and isolation, Electronic structure, oxidation states and ionic radii, lanthanide contraction and its consequences, complex formation, spectral properties, magnetic properties, Separation of lanthanides Application of lanthanides.

Unit IV: Chemistry of actinides

Occurrence, electronic configuration, General features and chemistry of actinides, oxidation states and stereochemistry, spectral properties, magnetic properties, chemistry of separation of Np, Pu and Am from U, comparison of lanthanide and actinide.

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

- ❖ Differentiate between lanthanides and actinides on the basis of their properties.
- ❖ Measure the correlation of various values, complex formation and spectral properties of elements of transition series.
- ❖ Classify the coordination compounds, magnetic behavior and stereochemistry of lanthanides and actinides.
- ❖ Define the separation process, structural properties and electronic configuration of compounds

Chemistry- Paper-II : Organic Chemistry

Objectives:

- ❖ To develop conceptual knowledge about infrared absorption spectroscopy, nomenclature of organometallic compounds.
- ❖ To acquaint about various laws of spectroscopy and methods of synthesis related to organometallic and heterocyclic compounds.
- ❖ To aware about laws related to IR spectrum, types of transitions and preparation of heterocyclic compounds.
- ❖ To develop understanding about effects of solvents, structural features and basicity of pyridine, piperidine and pyrrole.

Unit I Electromagnetic spectrum: Absorption spectra (UV) & Infrared IR Absorption spectroscopy

Ultraviolet absorption spectroscopy- absorption laws (Beer- Lambert Law) molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of solvents on transitions, effect of conjugation, concept of chromophore and auxochrome. Bathochromic, hypsochromic and hyperchromic and hypochromic shifts, UV spectra of conjugated enes and enones. Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorption of various functional groups and interpretation of IR spectra of simple organic compounds

Unit II : Organometallic compounds

The Grignard reagent-formation, structure and chemical reaction, organozinc compound: formation and chemical reactions. Organolithium compounds-Formation and chemical reactions.

Nomenclature, structural features, methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamide and sulphaguanidine.

Unit III : Heterocyclic compounds- I

Introduction, molecular orbital picture and aromatic characteristic of pyrrole, furane, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reaction in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole

Unit IV : Heterocyclic compounds-II:

Introduction to condensed five and six membered heterocycles. Preparation and reaction of indole, quinoline and isoquinoline with special reference to Fischer indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis, mechanism of electrophilic substitution reaction of indole, quinoline and isoquinoline.

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

- ❖ Classify the various organic compounds on the basis of UV spectra and transition.
- ❖ Describe and discuss about formation, structure and chemical reactions of heterocyclic compounds.
- ❖ Draw and interpret the molecular orbital picture and aromatic characteristics of organometallic and heterocyclic compounds.
- ❖ Define various derivatives and reaction mechanism of synthesis and substitution related to heterocyclic compounds.

Chemistry- Paper-III : Physical Chemistry

Objectives:

- ❖ To aware about degree of freedom, phase equilibria and quantum mechanism.
- ❖ To develop conceptual knowledge about entropy, electrolytes dipole moment etc.

- ❖ To develop analytical view about evaluation of absolute entropy, activity coefficient and magnetic properties of compounds.
- ❖ To give information about Carnot theorem, mixing of gases, overvoltage and referential activity.

Unit I: Phase Equilibrium I

Statement and meaning of the terms-phase, component and degree of freedom, thermodynamic derivation of Gibbs phase rule, phase equilibria of one component system-water, CO₂ and S systems.

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

Solid solutions: Compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl-H₂O), (FeCl₃-H₂O) and CuSO₄-H₂O system. Freezing mixtures, acetone-dry ice.

Unit II : Phase Equilibrium II

Liquid-Liquid mixtures- Ideal liquid mixtures. Raoult's and Henry's law. Nonideal system-azeotropes-HCl-H₂O and ethanol-water systems.

Partially miscible liquids- Phenol-water, trimethylamine-water, nicotine-water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature.

Immiscible liquids, steam distillation. Nernst distribution law-Thermodynamic derivation, applications.

Unit III : Quantum Mechanics I

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

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

Unit IV : Adsorption

Difference between adsorption, absorption and sorption, Chemisorption, adsorbent and adsorbate, reversible and irreversible adsorption, Characteristics of adsorption, adsorption of gases by solids, factors affecting adsorption, types of adsorption, types of adsorption isotherms, Freundlich and Langmuir adsorption isotherms.

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

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

Term paper/ practicals

Inorganic chemistry:

Preparation:

1. Preparation of sodium trioxalato ferrate (III), Na₃[Fe(C₂O₄)₃] (b) preparation of Ni-DMG complex [Ni(DMG)₂]
2. Preparation of copper tetraammine complex [Cu(NH₃)₄]²⁺

3. Preparation of cis- and trans-bisoxalato diaquachromates (III) ion
4. Preparation of sodium tetrathionate

Organic Chemistry

Qualitative analysis: Analysis of an organic mixture containing two solid components using water, NaHCO_3 , and NaOH for separation and preparation of suitable derivatives.

Suggested Reading:

1. A New Concise Inorganic Chemistry; Fifth Edition; J.D. Lee; Blackwell Science, London, 1989.
2. Inorganic Chemistry; Third Edition; D.F. Shriver and P.W. Atkins; Oxford University Press, New York, 1999.
3. Inorganic Chemistry; Third Edition; Gary L. Miessler and Donald A. Tarr; Pearson Education Inc. Singapore, 2005.
4. Organic Chemistry; Seventh Edition; T.W. Graham Solomons & Craig B. Fryhle; John Wiley and Sons, 1998.
5. Organic Chemistry; Sixth Edition; Robert Thornton Morrison & Robert Neilson Boyd; PHI Pvt. Ltd, 2004.
6. Organic Chemistry Vol. I ; Fifth Edition; I.L. Finar; Longman Scientific and Technical, Singapore, 1975.
7. Organic Chemistry: Vol 1, Mukerjee and Singh
8. Organic Chemistry: Vol 2, Mukerjee and Singh
9. Organic Chemistry: Vol 3, Mukerjee and Singh
10. A Text Book of Physical Chemistry; A.S. Negi, S.C. Anand; New Age International (P) Limited, New Delhi, 2002.
11. The Elements of Physical Chemistry; P.W. Atkins; Oxford University Press, 1996.
12. University General Chemistry; C.N.R. Rao; Macmillan India Ltd., New Delhi, 1998.
13. Physical Chemistry: Puri Sharma and Pathania
14. Physical Chemistry: J. Moore
15. कार्बनिक रसायन, सुरेश आमेटा, एच.के. पाण्डे, एच.एस. शर्मा, हिमांशु पब्लिकेशन्स, उदयपुर
16. अकार्बनिक रसायन, ओझा, भोजक, कोठारी, चतुर्वेदी, रमेश बुक डिपो, जयपुर
17. प्रायोगिक रसायन, भार्गव, लवानिया, ओझा, रमेश बुक डिपो, जयपुर
18. भौतिक रसायन, शर्मा, भार्गव, गुप्ता, रमेश बुक डिपो, जयपुर
19. कार्बनिक रसायन, विजयश्री मनोज छंगाणी, अल्का पब्लिकेशन, अजमेर
20. अकार्बनिक रसायन, विजयश्री कोठारी छंगाणी, अल्का पब्लिकेशन, अजमेर
21. प्रायोगिक रसायन, छंगाणी, विजयश्री, खण्डेलवाल, अल्का पब्लिकेशन, अजमेर
22. प्रायोगिक रसायन, वी.के. गोयल, आर.एस. पीतलिया, कॉलेज बुक हाउस, जयपुर
23. कार्बनिक रसायन, वी.के. रस्तोगी, यसपाल सिंह, कॉलेज बुक हाउस, जयपुर

Semester-V

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 502	Physics-I	CE*	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Practical				25 Practical	

Physics-Paper-I :Mathematical Physics and Special Theory of Relativity – I

Objectives:

- ❖ To understand the concept of co-ordinate transformation.
- ❖ To know the concept of tensor analysis and dirac delta function.
- ❖ 3.To understand the Special functions (Legendre, Bessel, hermite and laguerre) .
- ❖ To aware the techniques of variables and its application to boundary value problems

UNIT I Coordinate Transformation:

Orthogonal curvilinear coordinate system, scale factors, expression for gradient, divergence, curl and their application to Cartesian, circular cylindrical and spherical polar coordinate. Coordinate transformation and Jacobian.

UNIT II Tensor analysis & Dirac Delta function:

Transformation of covariant, contravariant and mixed tensor; Addition, multiplication and contraction of tensors; Metric tensor and its use in transformation of tensors. Dirac delta function and its properties.

UNIT III Special functions:

The second order linear differential equation with variable coefficient and singular points, series solution method and its application to the Hermite, Lagendre and Laguerre differential equations:basic properties like orthogonality, recurrence relation, graphical representation and generating function of Hermite, agendre , Leguerre functions (simple applications)

UNIT IV Boundary Value Problems:

Techniques of separation of variables and its application to following boundary value problems

- (i) Laplace equation in three dimensional Cartesian coordinate system- line charge between two earthed parallel plates (ii) Helmholtz equation in circular cylindrical coordinates – cylindrical resonant cavity, (iii) Wave equation in spherical polar coordinates – the vibrations of a circular membrane, (iv) Diffusion equation in two dimensional Cartesian coordinate system – heat conduction in a thin rectangular plate, (v) Laplace equation in spherical coordinate system –electric potential around a spherical surface.

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

- ❖ Discuss the concept of co-ordinate transformation.
- ❖ Classify the concept of tensor analysis and dirac delta function.
- ❖ 3.Differentiate the Special functions (Legendre, Bessel, hermite and laguerre) .
- ❖ Applies the techniques of variables and its application to boundary value problems.
- ❖ 5 Identify the laplace equation in spherical co ordinate system.

Suggested Reading :

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, गणितीय भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015–16

Physics- Paper-II :Quantum Mechanics – I

Objectives:

- ❖ To Understand the Origin and Experimental Evidence of Quantum theory.
- ❖ To aware the Uncertainty Principles and Schrodinger's Wave Mechanics.
- ❖ To develop concept the Postulates and Operators of Quantum Mechanics.
- ❖ To understand the Simple Solutions of Schrodinger Equation.

UNIT I Origin and Experimental Evidence of Quantum Theory:

Development of quantum theory –Historical development and experimental evidence for quantum theory
Electromagnetic Radiation: Black Body Radiation, qualitative discussion of spectral distribution of energy, limitation of classical theory, Planck's radiation law, photoelectric effect, Compton effect, Matter Waves: De Broglie hypothesis, Davison Germer experiment.

UNIT–II Uncertainty Principles and Schrodinger's Wave Mechanics :

Uncertainty principle and its consequences gamma ray microscope, diffraction at a single slit, its application such as (i) Non existence of electron in nucleus, (ii) Ground state energy of H-atom, (iii) Ground state energy of harmonic oscillator (iv) Natural width of spectral lines. Schrodinger's equation :Its need and justification, time dependent and time independent forms, physical significance of the wavefunction and its interpretation, probability current density.

UNIT–III Postulate's and Operators of Quantum Mechanics :

Operators in quantum mechanics, definition of an linear operator. Linear and Hermitian operator, state function. Expectation value of dynamical variable-position, momentum and energy, Fundamental postulates of quantum mechanics, Eigen function and eigen values, Degeneracy. Orthogonality of eigenfunction, Commutation relations, Ehrenfest's theorem and complementarily wave packet, group and phase velocities, Principle of superposition, Gaussian wave packet.

UNIT IV Simple Solutions of Schrodinger equation :

Time independent Schrodinger equation and stationary state solution, Boundary and continuity conditions on the wave function, particle in one dimensional box, eigen function and eigen values , discrete energy levels, extension of results for three dimensional case and degeneracy of levels.

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

- ❖ Discuss the Origin and Experimental Evidence of Quantum theory.
- ❖ Apply the Uncertainty Principles and Schrodinger's Wave Mechanics.
- ❖ Identify the Postulates and Operators of Quantum Mechanics.
- ❖ Calculate the Simple Solutions of Schrodinger Equation
- ❖ Discuss on the discrete energy level.

Suggested Reading:

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, क्वांटम यांत्रिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015–16

Physics- Paper-III:Solid State Physics

Objectives:

- ❖ To know the concept of Crystal Binding and crystal Structure.
- ❖ To understand the Thermal and Electrical Properties of the Solids.
- ❖ To aware the concept of Band Theory of Solids.
- ❖ To develop concept the Magnetic Property of materials.

UNIT-I Crystal Binding and Crystal Structure:

Various types of Bindings: Cohesive energy and compressibility of ionic crystals , Space Lattice and Crystal Structure, Bravis Lattice, Miller Indices and Crystal Structure, Spacing of Planes in Crystal Lattice, Determination of different crystal properties for SC, FCC, BCC, HCP and perovskite structure, X-ray Diffraction and Bragg's Law, Laue equation of X-ray diffraction, Debye Scherer and Laue Camera.

UNIT-II Thermal and Electrical Properties of the Solids:

Concepts of Thermal Energy and Phonons, Internal Energy and Specific Heat, the Various Theories of Lattice Specific Heat of Solids: The Einstein Model, Debye Model, Electronic Contribution of the internal Energy hence to the Specific Heat of Metals, Thermal Conductivity of the lattice. Electrical Conductivity: Drude-Lorentz Theory of Electrical Conductivity, Boltzmann Transport Equation, Sommerfield Theory of Electrical Conductivity, Mathiessen's Rule, Thermal Conductivity and Wildemann-Franz's Law, The Hall Effect.

UNIT-III Band Theory of Solids:

Formation of Bands, Periodic Potential of a Solid, Wave Function in a Periodic Lattice and Bloch Theorem, Density of states , Kronig Penny Model, Velocity of the Bloch electrons and Dynamical Effective Mass, Momentum, Crystal Momentum and Physical Origin of the Effective Mass, Negative Effective Mass and concept of Holes, The distinction between metals, insulators, and semiconductors.

UNIT-IV Magnetic Properties:

Classification of Magnetic Materials, Origin of Atomic Magnetism, Dynamics of Classical Dipole In Magnetic Field, Magnetic Susceptibility, phenomenon of Diamagnetic, Para magnetic susceptibility of Ionic Crystal, Ferromagnetism, Temperature Dependence of Saturation of Spontaneous Magnetization, The Paramagnetic Region, the Nature of Ferromagnetism, Nature and Origin of Weiss Molecular Field, Heisenberg's Exchange Interaction, (Quantum Theory of Ferromagnetism), Relation between Exchange

Integral and Weiss Constant, Ferromagnetism Domains, Magnetostriction

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

- ❖ Identify the concept of Crystal Binding and crystal Structure.
- ❖ Study the Thermal and Electrical Properties of the Solids.
- ❖ Classify the concept of Band Theory of Solids.
- ❖ Discuss the Magnetic Property of materials.
- ❖ Identify relation between exchange integral and Weiss constant.

Suggested Reading :

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, ठोस अवस्था भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015-16

Physics Practical: V

1. Study of a RC transmission line at 50 Hz
2. Study of a RC transmission line
 - at fixed frequency
 - at variable frequency
3. Study of resonance in a LCR circuit 9 (Using air core inductance and damping by metal plate)
 - At fixed frequency by varying C, and

- by varying frequency
4. Study of characteristics of junction diode and zener diode
 5. Study of
 - Recovery time of junction diode and point contact diode
 - Recovery time as function of frequency of operation and switching current
 6. To design zener regulated power supply and study the regulation with various loads.
 7. To study the characteristics of a field effect transistor (FET) and design/study amplifier of finite gain
 8. To study the frequency response of a transistor amplifier and obtain the input and output impedance of the amplifier.
 9. To Design and study of an R-C phase shift oscillator and measure output impedance (frequency response with change of component of R and C).
 10. To study a voltage multiplier circuit to generate high voltage D.C. from A.C.
 11. Using discrete components, study OR, AND, NOT logic gates, compare with TTL integrated circuits (I.C.'s).
 12. Application of operational amplifier (OP-AMP) as : Minimum two of the following exercises-
 - (a) Buffer (for accurate voltage measurement)
 - (b) Inverting amplifier
 - (c) Non inverting amplifier
 - (d) Summing amplifier.

Suggested Reading :

1. प्रो. प्रभा दशोरा, तृतीय वर्ष प्रायोगिकी भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, नई दिल्ली, 2015

Semester-V

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 503	Mathematics-I	CE*	4	15	20	100
	Mathematics-II				20	
	Mathematics-III				20	
	Mathematics Practical				25 Practical	

Mathematics-Paper-I:Algebra - I

Objectives:

- ❖ To Understand the definition and Simple Properties of Group & Subgroup.
- ❖ To aware the Cayley's Theorem and Fundamental Theorem of Isomorphism.
- ❖ To know the Definition of Ring and Subrings.
- ❖ 4 To gain knowledge of morphism of ring.

Unit 1: Definition and simple properties of Groups and Subgroups. Permutation group, Cyclic group. Cosets,

Unit 2 ; Lagrange's theorem on the order of subgroups of a finite order group.

Unit 3: Morphism of groups, Cayley's theorem. Normal, subgroups and Quotient groups. Fundamental theorems of Isomorphism.

Unit 4: Definition and simple properties of Rings and Subrings. Morphism of rings. Embedding of a ring

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

- ❖ Discuss on definition and Simple Properties of Group & Subgroup.
- ❖ Apply the Lagrange's Theorem on the Order of Subgroups.
- ❖ Calculate the Cayley's Theorem and Fundamental Theorem of Isomorphism.
- ❖ Discuss the definition of Ring and Subrings.
- ❖ Differentiate group, subgroup and quotient group.

Suggested Reading :

1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, बीजगणित, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
2. जी.सी. गोखरू सैनी, बीजगणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics- Paper-II:Complex Analysis -I

Objectives:

- ❖ To Understand the Complex Plane, Connected & Compact Set.
- ❖ To Aware the Complex Valued function.
- ❖ To know the Complex Integral.
- ❖ To study Taylor's theorem and Laurent's theorem .

Unit 1: Complex plane. Connected and Compact sets. Curves and Regions in complex plane. Jordan curve Theorem (statement only). Extended complex plane. Stereographic projection.

Unit 2 ; Complex valued function — Limits, Continuity and Differentiability. Analytic functions, Cauchy-Riemann equations (Cartesian and polar form). Harmonic functions, construction of an analytic function.

Unit 3 : Complex integration, Complex line integrals, Cauchy integral theorem, Indefinite integral, Fundamental theorem of integral calculus for complex functions. Cauchy integral formula, Analyticity of the derivative of an analytic function, Morera's theorem, Poisson integral formula, Liouville' theorem.

Unit 4 : Taylor's theorem. Laurent's theorem. Maximum modulus theorem

Learning Outcomes After completion the course student would able to:

- ❖ Discuss the Complex Plane, Connected & Compact Set.
- ❖ Identify the Complex Valued function.
- ❖ Classify the Complex Integral.
- ❖ Solve the Taylor's Theorem and Maximum Modulus Theorem.
- ❖ Discuss on the fundamental theorem of integral calculus for complex functions.

Suggested Reading :

1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, बीजगणित, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
2. जी.सी. गौखरु सैनी, बीजगणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics- Paper-III:Dynamics

Objectives:

- ❖ To Understand the Velocity and Acceleration.
- ❖ To Study the Motion along Horizontal & Vertical Elastic String.
- ❖ To aware the Motion in Resisting medium.
- ❖ To know about simple harmonic motion and Hooke's Law.

Unit 1: Velocity and acceleration — along radial and transverse directions, along tangential and normal directions.

Unit 2 : S.H.M., Hooke's law, motion along horizontal and vertical elastic strings.

Unit 3: Motion in resisting medium - Resistance varies as velocity and square of velocity.

Unit 4: Work and Energy. Motion on a smooth curve in a vertical plane. Motion on the inside and outside of a smooth vertical circle.

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

- ❖ Discuss the Velocity and Acceleration.

- ❖ Classify the Motion along Horizontal & Vertical Elastic String.
- ❖ Identify the Motion in Resisting medium.
- ❖ Calculate Work and Energy.
- ❖ Calculate the motion on the inside and outside of a smooth vertical circle.

Suggested Reading :

1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, बीजगणित, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
2. जी.सी. गौखरु सैनी, बीजगणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Semester-V

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 504	Botany-I	CE*	4	15	20	100
	Botany-II				20	
	Botany-III				20	
	Botany Practical				25 Practical	

Botany-Paper-I: Morphology Of Angiosperms

Objectives:

- ❖ To understand the basic plan of flowering plants.
- ❖ To get knowledge about the morphology of root system and shoot system.
- ❖ To learn the origin, development and types of leaves
- ❖ To study the detailed structure of flower.
- ❖ To aware students with the concept and significance of seed.

UNIT 1: Plant habit

The basic plan of flowering plants, modular types of growth, diversity of plant form in annuals, biennials and perennials, evolution of tree habit in gymnosperm, monocotyledons and dicotyledons, trees largest and longest lived plants.

UNIT II Morphology of Root System

Root: Structure of root, types and structural modification for storage, physiological and mechanical, interaction of root with other microorganisms.

Stem: Structure, types and modification (storage and mechanical), branching pattern, monopodial and sympodial growth, canopy architecture.

UNIT III: II Morphology of Leaves

Leaves: Origin, development, types, phyllotaxy, venation, lamina parts, shapes, size and modifications, leaf surface features and appendages, leaf surface area, stomata and trichome structure.

UNIT IV: II Morphology of Flower and Seed

Flower: Flower as a modified shoot, detailed structure of flower, types of inflorescence and specialized inflorescence, **fruit** Structure, types and classification,

Seed: detail structure of seed and seed coat (monocot and dicot), significance of seed, suspended animation, dispersal strategies.

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

- ❖ Understand the basic plan of flowering plants.
- ❖ Carry out the comparative morphology of root system and shoot system.
- ❖ Discuss the origin, development, types of leaves
- ❖ Get knowledge about the detailed structure of flower
- ❖ Interpret the concept of seed with its significance.

Suggested Readings:

1. Eames, A. J. 1981. Morphology of Angiosperms .McGraw Hill, New York.
2. Gifford, E.M. and Foster, A.S. 1989. Morphology and Evolution of Vascular Plants. W.H. Freeman, New York.
3. Sporne, K.R. 1974. Morphology of Angiosperms. Hutchinson University Press, London.
4. Singh, V.P., Pandey, P.C. and Jain, D.K. 2011. A Text book of Botany- Angiosperms. Rastogi Publication, Merrut.

5. Trivedi, P.C., Sharma, N. and Dhankad, R. S. 2009. Plant Morphology and Anatomy. Ramesh Book Depot. Jaipur.

Botany- Paper-II :Anatomy Of Flowering Plants

Objectives:

- ❖ To understand the structure and classification of tissues
- ❖ To distinguish simple and complex tissues.
- ❖ To know about the definition, classification, types and function of meristem.
- ❖ To study the anatomy of stem, root and leaf.
- ❖ To analyze different types of wood with secondary growth

UNIT I: Classification and structure of tissues

Simple tissue: Structure occurrence and function (parenchyma, collenchyma, sclerenchyma), Complex tissues: Structure, origin and function (xylem and phloem), tissue systems, Secretory tissues: Glands, glandular hairs, nectaries, hydathodes, schizogenous and lysigenous ducts, resin ducts, mucilage ducts and laticifers. Vascular bundle: Types (conjoint, collateral, bi-collateral, open closed, radial, concentric: amphicribal and amphivasal).

UNIT II: Meristem

Meristem definition, classification, types and function, Shoot apical meristem theories: Apical cell theory, histogen theory, tunica-corpus theory, continuing meristematic residue, cytohistological zonation. Root apical meristem theories: Apical cell theories, histogen theory, korper-kappe theory, quiescent cell theory,

UNIT III: Analogy of Stem, Root and Leaf

Stem: Primary structure in dicotyledonous and monocotyledonous, primary anomalous structures. Root: Primary structure in dicotyledonous and monocotyledonous, development of lateral roots and adventitious root. Leaf- Internal structure of dorsiventral, isobilateral and centric leaves.

UNIT IV: Secondary growth

Secondary growth in dicot and monocot stem. Secondary structures: Wood structure, types and formation of wood, annual rings, tyloses, dendrochronology, periderm, bark and lenticels. Anomalous secondary growth in dicot stem, in monocot stem in dicot roots.

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

- ❖ Understand the structure and classification of tissues
- ❖ Distinguish simple and complex tissues.
- ❖ Explain the definition, classification, types and function of meristem.
- ❖ Discuss the anatomy of stem, root and leaf.
- ❖ Analyze different types of woods with secondary growth.

Suggested Readings:

1. Cuttler, E.G. 1971. Plant Anatomy. Part III Organs, Edward Arnold Ltd., London.
2. Cuttler, E.G. 1969. Plant Anatomy. Part I Cells and Tissue. Edward Arnold Ltd., London.
3. Eames, A.J. and MacDaniels, L.H. 1987. An Introduction to Plant Anatomy. Tata MacGraw-Hill Publishing Company Ltd., New Delhi.
4. Esau, k. 1985. Plant Anatomy. 2nd Edition Wiley Eastern, New Delhi.
5. Fahn, A. 1997. Plant Anatomy. Aditya Books (P) Ltd., New Delhi.
6. Fahn, A. 2000. Plant Anatomy. Permagon Press.

- Gifford, E.M. And Foster, A.S. 1989. Morphology and Evolution of Vascular Plants. W.H. Freeman, New York.
- Pandey, S.N. and Chadha, A. 2014. A text book of Botany- Plant anatomy and Economic Botany. Vikas publishing house Pvt. Ltd, New Delhi.
- Vashishta, P.C. 1974. Plant Anatomy. Pradeep Publication, Jalandhar.
- Singh, V.P., Pandey, P.C. and Jain, D.K. 2011. A Text book of Botany- plant Morphology and anatomy. Rastogi Publication, Merrut.
- Trivedi, P.C., Sharma, N. and Dhankad, R. S. 2009. Plant Morphology and Anatomy. Ramesh Book Depot. Jaipur.

Botany- Paper-III :Anatomy Of Flowering Plants Plant Systematics

Objectives:

- ❖ To understand the scope and importance of plant systematics .
- ❖ To study the different taxonomical tools.
- ❖ To get knowledge about the principle and rules of botanical nomenclature.
- ❖ To aware students with different families with Bentham and hooker classification.
- ❖ To learn about the botanical gardens and herbariums.

UNIT I:

Scope and importance of taxonomy, history and classification of angiosperm (Linneaus, Bentham and Hooker and Engler and Prantl), concept of species, genus and family. Taxonomic tools: Herbarium, E-Flora, botanical garden, monograph, library index, journals, key and icons.

UNIT II:

Principle and rules of botanical nomenclature: Ranks, names, type method, principle of priority and its limitations, Rules of Validity, Rules of Effectivity, Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, paraphyly and polyphyly

UNIT III:

Taxonomic studies of the following families (Bentham and Hooker), Dicots: Ranunculaceae, Brassicaceae, Malvaceae, Rubiaceae, Fabaceae, Apiaceae, Asteraceae, Apocynaceae and Asclepidaceae.

UNIT IV:

Taxonomic studies of the following families (Bentham and Hooker): Solanaceae, Convolvulaceae, Acanthaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Liliaceae, Orchidaceae and Poaceae.

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

- ❖ Understand the scope and importance of angiosperms.
- ❖ Enhance knowledge about the taxonomical tools.
- ❖ Discuss the principle and rules of botanical nomenclature.
- ❖ Compare different families with Bentham and hooker classification
- ❖ Learn about the botanical gardens and herbariums.

Suggested Readings:

- Naik, V.N.2011. Taxonomy of Angiosperms. TATA McGraw Hill, New Delhi.
- Pandey, S.N. and Misra, S.P. 2008. Taxonomy of Angiosperms. Ane Books India, New Delhi.
- Saxena, N.B. and Saxena, S. 2011. Plant Taxonomy. Pragati Prakashan, New Delhi.
- Sharma, B.D. 1984. Flora of India vol. I. Botanical Survey of India, Calcutta.
- Sharma, O.P. 1996. Plant Taxonomy. TATA McGraw Hill, New Delhi
- Simpson, M.C. 2006. Plant Systematics. Elsevier, Amsterdam.
- Singh, G. 2001. Plant systematics. Oxford and IBH, New Delhi.
- Sivarajan, V.V. 1991. Introduction to Principles of Plant Taxonomy. Oxford and IBH, New Delhi.

BOTANY PRACTICAL V

1. Study of different modifications of root, stem, leaf by using specimens.
2. Study of different epidermal appendages (trichome etc.) by making slides.
3. Study of floral apex.
4. Survey and study of dispersal mechanism of seeds.
5. Microscopic studies on types and anatomy of stomata (monocotyledons and dicotyledons).
6. Study of apical and lateral meristem using plant material and slides
7. Anatomical study of root, stem and leaf (dicotyledons and monocotyledons) by making double stained temporary and permanent slides.
8. Anatomical studies of anomalous secondary structure in stem by making temporary and permanent slides.
9. Anatomical study of dicot and monocot seed (Cicer, Maize and cotton)
10. Study of vegetative and floral characters of species of the families studied in theory.
11. Identification of selected taxa up to genus using taxonomic keys.
12. Herbarium technique.
13. Familiarity with local flora and preparation of herbarium sheet.

Semester-V

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 505	Zoology-I	CE*	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25 Practical	

Zoology-Paper-I: Ethology**Objectives:**

- ❖ To understand Concepts of Ethology- Motivation, Fixed Action Patterns (FAP), Sign Stimulus; Innate Releasing Mechanism (IRM); Action Specific Energy (ASE); Learning; Imprinting.
- ❖ To understand Methods of Studying Behaviour: Studies in Laboratory- Neurotransmitter, physiological and Neurochemical techniques. Brief account on Pheromones,
- ❖ To explain the Social organization.
- ❖ To learn about the Biological Rhythms
- ❖ To explain the control of behavior neural control hormonal control

Unit I: Concept of Ethology

- 1.1 Introduction and history of Ethology
- 1.2 Concepts and patterns of behaviour: FAP, Sign Stimulus, Innate Releasing Mechanism, Action Specific Energy, Concept of motivation
- 1.3 Learned behaviour and types of learning

Unit II: Study of Behaviour

- 2.1. Methods of studying Brain Behaviour: Neurotransmitter, Physiological and Neurochemical Technique
- 2.2 Genetic basis of behaviour
- 2.3 Control of behaviour: Neural control, Hormonal control
- 2.4 Elementary idea of role of Pheromones

Unit III: Social Organisation

- 3.1 Elements of Social Behaviour
- 3.2 Living in groups: Characteristics and advantages with respect to Honey bee, Deer, monkey
- 3.3 Migration in Birds; Causes of migration and Navigation

Unit IV Biological Rhythms

- 4.1 Faunal diversity in India and World; Endangered Mammals and Birds of India
- 4.2 Wild life Conservation with reference to India & Rajasthan
- 4.3 National Parks, Sanctuaries and Biosphere Reserves of India

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

- ❖ Concepts of Ethology- Motivation, Fixed Action Patterns (FAP), Sign Stimulus; Innate Releasing Mechanism (IRM); Action Specific Energy (ASE); Learning; Imprinting.
- ❖ Methods of Studying Behaviour : Studies in Laboratory- Neurotransmitter, physiological and Neurochemical techniques. Brief account on Pheromones,
- ❖ Understand the Social organization.
- ❖ Interprets the Biological Rhythms
- ❖ Discuss the control of behavior neural control hormonal control

Zoology-Paper-II :Biotechniques, Instrumentation and Bioinformatics

Objectives:

- ❖ To learn about the term Electrophoresis, Radioactivity.
- ❖ To understand the working principle of Centrifuge, Incubator, pH meter.
- ❖ To understand the cell culture techniques and separation techniques in biology.
- ❖ To Understand the Principle, parts, and its application of Microscopic techniques. Understand the working principle of UV-Vis principle, Colorimeter.
- ❖ To aware the recognize the importance of various databases

Unit –I: Biotechniques

- 1.1 Concepts of sterilization: Filtration, autoclaving, dry heat sterilization, wet sterilization and radiation
- 1.2 Separation of biomolecules: Centrifugation (Sedimentation, density gradient);Chromatography (Elementary idea of Paper – ascending and Circular, thin layer, gel filtration and ion exchange-Principles and applications)
- 1.3 Electrophoresis: Agarose Gel Electrophoresis, SDS-PAGE

Unit-II: Micro Technique

- 2.1 Fixation, dehydration, clearing, embedding & section cutting
- 2.2 Difficulties encountered during section cutting (causes and remedies)
- 2.3 Double staining with Haematoxylin and Eosin
- 2.4 Histochemical staining techniques for carbohydrates (Periodic acid schiff), proteins (Mercury-bromophenol blue) and lipids (Sudan black-B)

Unit-III: Instrumentation

- 3.1 Microscope: Principle of Microscopy and types
- 3.2 Principles of colorimeter
- 3.3 Principles of spectrophotometers

Unit-IV: Bioinformatics

- 4.1 Bioinformatics: Definition, Scope, Basic concepts in bioinformatics, importance and role of bioinformatics in life sciences
- 4.2 Bioinformatics databases- introduction, types of databases
- 4.3 Nucleotide sequence databases, Elementary idea of protein databases
- 4.4 BLASTA, FASTA, PHYLOGENY TREE Analysis

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

- ❖ Discuss the term Electrophoresis, Radioactivity.
- ❖ Understand the working principle of Centrifuge, Incubator, pH meter.
- ❖ Understand the cell culture techniques and separation techniques in biology.
- ❖ Understand the Principle, parts, and its application of Microscopic techniques. Understand the working principle of UV-Vis principle, Colorimeter.
- ❖ Recognize the importance of various databases

Zoology-Paper-III:Immunology & Biotechnology**Objectives:**

- ❖ To understand Distinguish Innate immunity and Acquired Immunity
- ❖ To understand the importance of Immune system
- ❖ To understand Study and understand the DNA Recombinant technology
- ❖ To Understand the Scope and Significance of Biotechnology
- ❖ To learn about mechanism of Antigen & Antibody reaction

Unit –I: (Basics of Immunology)

- 1.1 Characteristics of Immune System; Types of immunity: Active, passive, innate and acquired immunity
- 1.2 Types of antibodies and their structure and function.
- 1.3 Mechanism of Antigen Antibody reactions: Precipitation, agglutination, Neutralisation, Opsonization, Complement

Unit –II: (Cells and Organs in Immunity)

- 2.1 Immune Cells & Organs: B and T Lymphocytes, Plasma Cell, Null Cell, Primary and Secondary Lymphoid Organs; tonsils, adenoids, thymus, bone marrow, bursa fabricus, macrophages
- 2.2 Mechanism: Humoral and Cell- Mediated Immunity.
- 2.3 Complement System, Interferons, Vaccines

Unit –III: (Biotechnology)

- 3.1 History, Scope and application of recombinant DNA technology; Genetic Engineering
- 3.2 Basic concepts in recombinant DNA technology, cDNA Library; DNA manipulation enzymes (Nucleases, Ligases, Polymerases)
- 3.3 Vectors for Gene Transfer (Plasmids and Phages)

Unit –IV: (Applications of Biotechnology)

- 4.1 Monoclonal antibodies and their production and applications
- 4.2 Protoplast Fusion and their Application
- 4.3 Environmental Biotechnology: Metal recovery; Petroleum recovery; Pest Control; Waste Water Treatment

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

- ❖ Distinguish innate immunity and Acquired Immunity.
- ❖ Understand the importance of Immune system.
- ❖ Study and understand the DNA Recombinant technology.
- ❖ Understand the Scope and Significance of Biotechnology.
- ❖ Discuss the mechanism of Antigen & Antibody reaction

Zoology Practical**Paper-I: Ethology**

1. Locomotory behaviour of (Tribolium):
 - Effects of light intensity and light quality on the rate of locomotion
2. Study of individual and social behavioural patterns of a troop of monkey through visual aids
3. Antenal Grooming in Cockroach

Paper-II: Biotechniques, Instrumentation & Bioinformatics

1. Separation of amino acids by paper chromatography and TLC
2. Separation of proteins by electrophoresis technique
3. Double staining method
4. Demonstration of carbohydrates, proteins and lipids by histochemical methods
5. Introduction to basic laboratory instruments and equipments- Autoclave, Centrifuge, pH meter, Micropipettes, Digital balance, Homogenizer, Electrophoresis apparatus; Molar and normal solutions calculations
6. Use of internet for survey of literature using protein and nucleotide databases (NCBI)
7. Use of softwares like Microsoft offices, BLASTA, FASTA

Paper-III: Immunology & Biotechnology

1. Antigen – Antibody interaction by double diffusion method (Ouchterlony)
2. Study of histological slides of organs of immune system – Thymus, Lymph nodes and Spleen
3. Isolation of DNA/ Plasmid (Genomic DNA from any available source) by phenol extraction method.

Suggested Reading:

Biotechnology

1. Elements of Biotechnology – Gupta
2. T. B. of Biotechnology – Dubey
3. Modern Concept of Biotechnology – Kumar H. D
4. Advances in Biotechnology – Jogdand
5. T. B. of Biotechnology – Chatwal
6. Bhatiya and Jain, 2015, Immunology, Microbiology and Biotechnology, Himalaya Publishing House Pvt. Ltd. Delhi

Biotechnique and Microtechnique

1. Animal Tissue Technique – Humason
2. Histological Technique – Devaenport
3. Microtechnique – Jiwaji&Patki
4. Microtechnique – Wankhede
5. Biophysical Chemistry – Upadhyay, Upadhyay and Nath
6. Techniques in Life Sciences – D. B. Tembhare

Bioinformatics

1. Mount W. 2004. Bioinformatics and Sequence Genome Analysis 2nd Edition CBS Pub. New Delhi.
2. Bergman, N. H. Comparative Genomics. Humana Press Inc. Part of Springer Science+BusinessMedia, 2007.
3. Baxevanis, A. D. Ouellate, B. F. F. 2009. Bioinformatics: A Practical Guide to the
4. Analysis of Genes and Proteins. John-Wiley and Sons Publications, New York.
5. Campbell A. M. and Heyer, L. J. 2007. Discovering Genomics, Proteomics and Bioinformatics, 2nd Edition. Benjamin Cummings.
6. Des Higgins and Willie Taylor 2000. Bioinformatics: Sequence, Structure and Databanks. Oxford University Press.
7. Rashidi H. H. and Buehler 2002. Bioinformatics Basics: Applications in Biological Science and Medicine, CRC Press, London.
8. Gibas Cynthia and Jambeck P. 2001. Developing Bioinformatics Computer Skills:
9. Shroff Publishers and Distributors Pvt. Ltd. (O'Reilly), Mumbai.
10. Bhatiya and Jain, 2015, Immunology, Microbiology and Biotechnology, Himalaya Publishing House Pvt. Ltd. Delhi

Course Code	Course Title	Group	Course Category	Credit	C.I.A. (Continuums Internal Assessment)	Project Formation	Project Presentation	Total
BJVB502MJ	Project : Formation and Presentation-Innovation	A	Core Course	4	30	50	20	100

SEMESTER-V

Objective:-

Students will have basic understanding of:-

- What is the project its characteristics and type.
- Planning and Executing a Project.
- Project Report Writing.
- Presenting the Project.

Unit I -Introduction

- What is a Project?
- Characteristics of Project
- Types of Project
- Key Terms-Project Scope, Project Stakeholder, Project Deliverables, Project Milestone, Project Dependencies
- Project Management

Unit II- Planning and Executing a Project

- Project Plan & its Need
- Steps For An Effective Project Planning& Execution
- Creating a Project

Unit III -Report Writing

- What is a Project Report?
- Importance of Project Report
- Types of Project Report
- Steps for Creating Project Report
- Project Report Writing

Unit IV- Presenting the Project

- Importance of Properly Presented Project
- Steps for Presentation
- Presenting the Project

Outcomes:-

After completing the course students will be able to draft, plan, execute, present a project and will submit it in form of report.

References books:-

1. The Presentation Book - How to Created, Shape it and Delivered it, Emmaleddden, Pearson Business : 2nd Edition 19 Jan., 2017.

Course Code	Course Title	Group	Course Category	Credit	Proposal Formulation	Feild Work	Viva-Voce	Total
BJVB503SI	INTERNSHIP			4	25	50	25	100

SEMESTER-V

1. For Internship student will select School, Govt. Hospital, Panchayat Center, Village or any Social Institutions where they will learn, teaching skills, cleaning skills, leadership skills, Programme Planning and Execution skills etc.
2. Student will make a proposal under guidance of her teacher at first stage of Internship (25 Marks).
3. As per the proposal they will execute their task at different institutions (50 Marks).
4. Internship duration will be of 30 days (two hours daily).
5. After the completion of internship student will submit the certificate from concerned institution to AKKM office.
6. Viva voce will be conducted for students (25 Marks).
7. There is no theory examination.
8. This internship paper contains 4 credits (1 credit for proposal formulation, 2 credits for feild work and 1 credit for viva-voce.

Semester-VI

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 601	Chemistry-I	Any Three CC	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

Chemistry-Paper-I: Inorganic chemistry

Objectives:

- ❖ To develop understanding about metal ligand bonding, metal complexes and organometallic.
- ❖ To aware about the conceptual knowledge of spectral properties and kinetic aspects of metal complexes.
- ❖ To develop conceptual knowledge about selection rules, trans effect and substitution reactions.
- ❖ To give information about spectrochemical series, kinetic stability and bonding application of alkyls and aryls.

Unit I : Metal– ligand bonding in transition metal complexes

An elementary idea of crystal-field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal– field parameters, colour of transition metal ions, limitations of crystal field theory.

Unit II : Spectral properties of transition metal complexes

Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states and Spectroscopic terms (L-S Coupling), spectrochemical series, Orgel– energy level diagram for d^1 and d^9 states, the electronic spectrum of $[Ti(H_2O)_6]^{+3}$ complex ion.

Unit III : Thermodynamic and kinetic aspects of metal complexes

Thermodynamic and kinetic stability, thermodynamic stability and factors affecting the stability, substitution reactions of square planar complexes, types of substitution reactions and trans effect.

Unit IV : Organometallic chemistry

Definition, nomenclature and classification of organometallic compounds, preparation, properties, bonding and application of alkyls and aryls 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.

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

- ❖ Classify the organometallic compounds and metal complexes on the basis of transition, stability and bonding structures.
- ❖ Measure the correlation among structural & kinetic properties of metal complexes.
- ❖ Apply the knowledge of bonding, spectral properties and structures to define basic properties of compounds.
- ❖ Draw and interpret the energy level diagram and spectroscopic series for various states

Chemistry-Paper-II: Organic Chemistry

Objectives:

- ❖ To develop conceptual knowledge about nuclear magnetic resonance, industrial uses and structures of compounds.
- ❖ To aware about classification, nomenclature and properties of carbohydrates, amino acids, fats and detergents.
- ❖ To develop understanding about synthesis, group analysis and industrial uses of fat, oil and detergents.

Unit I : Nuclear magnetic resonance (NMR) spectroscopy

Proton magnetic resonance ^1H -NMR spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constant, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

Unit II : Carbohydrates :

Classification and nomenclature, monosaccharides, mechanism of osazone formation, inter conversion of glucose and fructose, chain lengthening and chain shortening of aldose. Configuration of monosaccharide. erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glucosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D(+)-glucose. Mechanism of mutarotation. Structure of ribose and deoxy ribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

Unit III : Amino acids, peptides, proteins and nucleic acid

Classification, structure and stereochemistry of amino acids. Acid base behaviour of isoelectric point and electrophoresis. Preparation and reaction of α amino acid. Structure and nomenclature of peptides and proteins. Classification of proteins, peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid phase peptide synthesis. Structure of peptides and proteins, level of protein structure. Protein denaturation / renaturation. introduction. Constituents of nucleic acid: ribo and ribonucleosides, nucleotides. The double helical structure of DNA/RNA

Unit IV : Fats, oils and detergents

Natural fats edible and industrial oils of vegetable resin common fatty acids, glycerides, hydrogenation of unsaturated oils. saponification value, iodine value, acid value, soaps, synthetic detergents, alky and aryl sulphonates.

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

- ❖ Classify the various compounds on the basis of structure, stereochemistry and formation process.
- ❖ Describe and discuss about formation, structure and chemical reactions of carbohydrates, peptides and nucleic acids.
- ❖ Apply the knowledge of industrial uses of fats, oils and detergents to produce some useful products.

Chemistry-Paper-III: Physical chemistry**Objectives:**

- ❖ To aware about conceptual knowledge of photochemistry, spectroscopy and mechanics.
- ❖ To develop understanding about qualitative and quantitative description of fluorescence, selection rules and isotopes.
- ❖ To develop analytical view about laws of photochemistry, degree of freedom and energy levels.
- ❖ To give information about transfer process, Raman spectrum and atomic orbitals.

Unit I: Photochemistry:

Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus-Draper 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) quantum yield, photosensitized reaction-energy transfer process (simple examples)

Unit II: Spectroscopy I

Introduction: Electromagnetic radiation of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degree of freedom.

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

Electronic spectrum: Concept of potential energy curves for bonding and anti-bonding molecular orbitals, qualitative description of selection rules and Frank-Condon principle.

Unit III: Spectroscopy II

Vibrational spectrum: Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant, qualitative relation of force constants and bond energy, effect of anharmonicity and isotopes on the spectrum, idea of vibrational frequencies of different functional groups.

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

Unit IV: Quantum Mechanics II:

Molecular orbital theory: Basic ideas criteria for forming M.O. from A.O. construction of M.O. by LCAO- H_2^+ ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ , σ^* and π , π^* orbitals and their characteristics. Hybrid orbitals sp , sp^2 , sp^3 , calculation of coefficients of atomic orbitals used in these hybrid orbitals.

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

- ❖ To measure the calculation of energy levels, coefficients and spectral intensity of compounds.
- ❖ To plot and interpret the bond energy, force constant, potential energy curves of compounds.
- ❖ To describe various properties of compounds on the basis of energy, potential and dipole moment etc.
- ❖ To analyze the various structures of compounds on the basis of quantum mechanics.

Term paper / Practicals

Inorganic chemistry

Calorimetry

- a) Jobs
- b) Mole ratio method
Adulteration – food stuffs
Effluent analysis water analysis.

Physical Chemistry

Electrochemistry

- (a) To determine the strength of the given acid conductometrically using standard alkali solution
- (b) To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically
- (c) To study the saponification of ethyl acetate conductometrically

(d) To determine the ionization constant of a weak acid conductometrically

(e) To titrate potentiometrically the given ferrous ammonium sulphate solution using $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ as titrant and calculate the redox potential of $\text{Fe}^{++}/\text{Fe}^{+++}$ system on the hydrogen scale.

Molecular weight determination:

1. Determination of molecular weight of a non volatile solute by Rast method/Beckmann freezing point method.
2. Determination of the apparent degree of dissociation of an electrolyte (e.g. NaCl) in an aqueous solution at different concentrations by ebullioscopy.

Colorimetry:

To verify Beer-Lambert law $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ and determine the concentration of the given solution of the substance.

Viva-Voce & Record

Suggested Reading:

1. A New Concise Inorganic Chemistry; Fifth Edition; J.D. Lee; Blackwell Science, London, 1989.
2. Inorganic Chemistry; Third Edition; D.F. Shriver and P.W. Atkins; Oxford University Press, New York, 1999.
3. Inorganic Chemistry; Third Edition; Gary L. Miessler and Donald A. Tarr; Pearson Education Inc. Singapore, 2005.
4. Organic Chemistry; Seventh Edition; T.W. Graham Solomons & Craig B. Fryhle; John Wiley and Sons, 1998.
5. Organic Chemistry; Sixth Edition; Robert Thornton Morrison & Robert Neilson Boyd; PHI Pvt. Ltd, 2004.
6. Organic Chemistry Vol. I ; Fifth Edition; I.L. Finar; Longman Scientific and Technical, Singapore, 1975.
7. Organic Chemistry: Vol 1, Mukerjee and Singh
8. Organic Chemistry: Vol 2, Mukerjee and Singh
9. Organic Chemistry: Vol 3, Mukerjee and Singh
10. A Text Book of Physical Chemistry; A.S. Negi, S.C. Anand; New Age International (P) Limited, New Delhi, 2002.
11. The Elements of Physical Chemistry; P.W. Atkins; Oxford University Press, 1996.
12. University General Chemistry; C.N.R. Rao; Macmillan India Ltd., New Delhi, 1998.
13. Physical Chemistry: Puri Sharma and Pathania
14. Physical Chemistry: J. Moore
15. कार्बनिक रसायन, सुरेश अमेटा, एच.के. पाण्डे, एच.एस. शर्मा, हिमांशु पब्लिकेशन्स, उदयपुर
16. अकार्बनिक रसायन, ओझा, भोजक, कोठारी, चतुर्वेदी, रमेश बुक डिपो, जयपुर
17. प्रायोगिक रसायन, भार्गव, लवानिया, ओझा, रमेश बुक डिपो, जयपुर
18. भौतिक रसायन, शर्मा, भार्गव, गुप्ता, रमेश बुक डिपो, जयपुर
19. कार्बनिक रसायन, विजयश्री मनोज छंगाणी, अल्का पब्लिकेशन, अजमेर
20. अकार्बनिक रसायन, विजयश्री कोठारी छंगाणी, अल्का पब्लिकेशन, अजमेर
21. प्रायोगिक रसायन, छंगाणी, विजयश्री, खण्डेलवाल, अल्का पब्लिकेशन, अजमेर

Semester-VI

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 602	Physics-I	CE*	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Practical				25 Practical	

Physics- Paper-I: Mathematical Physics and Special Theory of Relativity – II

Objectives:

- ❖ To Understand the Lorentz Transformation.
- ❖ To know the concepts of Four Vector Formulation, longitudinal and Transverse Doppler's Effect.
- ❖ To aware the Transformation between Laboratory and Centre of mass.
- ❖ To develop concept about the Transformation Electric and Magnetic Field.

UNIT – I Lorentz Transformation:

Lorentz transformation and rotation in space-time, time like and space like vector, world line, macro-causality.

UNIT – II Four vector Formulation:

Four vector formulation, energy momentum four vector, relativistic equation of motion, invariance of rest mass, orthogonality of four force and four velocity, Lorentz force as an example of four force, transformation of four frequency vector, longitudinal and transverse Doppler's effect.

UNIT – III Transformation between Lab and CM:

Transformation between laboratory and center of mass system. Four momentum conservation, kinematics of decay products of unstable particles and reaction thresholds: Pair production, inelastic collision of two particles, Compton effect.

UNIT – IV Transformation electric and Magnetic field:

Transformation electric and Magnetic fields between two inertial frames.

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

- ❖ Discuss the Lorentz Transformation.
- ❖ Classify the concepts of Four Vector Formulation, Longitudinal and Transverse Doppler's Effect.
- ❖ Identify the Transformation between Laboratory and Centre of mass.
- ❖ Calculate the Transformation Electric and Magnetic Field.
- ❖ Differentiate longitudinal and transverse Doppler's effect.

Suggested Reading :

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, गणितीय भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015-16

Physics- Paper-II: Quantum Mechanics – II

Objectives:

- ❖ To Know the Bound State Problem-I
- ❖ To Understand the Bound State Problem-II
- ❖ To aware Application of Quantum Theory.
- ❖ To gain knowledge about molecular spectroscopy.

UNIT I Bound State Problems - I:

Potential step and rectangular potential barrier, calculation of reflection and transmission coefficient, Qualitative discussion of the application to alpha decay (tunnel effect), square well potential problem, calculation of transmission coefficient.

UNIT II Bound State Problems- II:

Particle in one dimensional infinite potential well and finite depth potential well, energy value and eigen functions. Simple harmonic oscillator (one dimensional) eigen function, energy eigenvalues, zero point energy.

UNIT – III Applications of Quantum Theory to Atomic Spectroscopy:

Quantum features of spectra of one electron atoms. Frank–Hertz experiment and discrete energy states. Schrodinger equation for a spherically symmetric potential, Schrodinger equation for a one electron atom in spherically coordinates, separation of variables, Orbital angular momentum and quantization spherical harmonics, energy levels of H–atom, Shapes of $n = 1$ and $n = 2$ wavefunctions, Average value of radius of H–atom, Comparison with Bohr Model and Bohr Correspondence Principle. Stern and Gerlach experiment, spin and magnetic moment. Spin orbit coupling and qualitative explanation of fine structure. Atoms in magnetic field Zeeman splitting.

UNIT – IV Molecular Spectroscopy:

Qualitative features of molecular spectra: Rigid rotator discussion of energy, eigen values and eigen function, rotational energy levels of diatomic molecules, Rotational spectra, vibrational energy levels of diatomic molecules, vibrational spectra, vibrational rotational spectra.

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

- ❖ Discuss on the Bound State Problem-I (Potential Step, Potential Barrier, Square Well Potential) and Tunnel Effect.
- ❖ Classify the Bound State Problem-II (One Dimensional Potential Box, Eigen Value, Eigen Function).
- ❖ Applies Quantum Theory to Atomic Spectroscopy.
- ❖ Identify the Concept of Molecular Spectroscopy.
- ❖ Differentiate vibrational spectra and rotational spectra

Suggested Reading :

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना,, क्वांटम यांत्रिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015–16

Physics- Paper-III: Nuclear Physics**Objectives:**

- ❖ To Understand the Concept of Nuclear Properties like Quadrupole Moment, Nuclear Spin, Nuclear Energy, Mass spectroscopy and Theory of Nuclear Forces.
- ❖ To know the Concept of Nuclear Fission.
- ❖ To Aware the Concept of Elementary Particles.
- ❖ To develop knowledge about the Concept of Detector and Accelerator.

UNIT-I Nuclear Properties:

Rutherford's theory of a particle scattering, Properties of Nuclei: Quadrupole Moment and Nuclear Ellipticity, Quadrupole Moment and Nuclear spin, Parity and Orbital angular momentum, Parity and its

conservation, Nuclear Mass and Mass Spectroscopy, Nuclear Energy, Discovery of neutron and proton-neutron hypothesis, Neutron to proton Ratio (n/z), The nuclear potential, Nuclear mass, Mass Defect and Binding energy, Theory of Nuclear forces.

UNIT-II Nuclear Fission:

The Discovery of Nuclear Fission, The Energy Release in Fission, The Fission products mass distribution of fission products, Charge distribution of fission products, ionic charge of fission products, Fission cross Section and threshold, Neutron emission in fission, The prompt neutron and delayed neutrons, Mechanism for the emission of delayed neutrons. Energy of fission Neutrons, Theory of nuclear fission and Liquid Drop Model, Barrier Penetration-Theory of Spontaneous fission, Nuclear Energy Sources, Nuclear Fission as a source of Energy, The Nuclear Chain Reaction, condition of controlled chain Reaction, Nuclear Reactors.

UNIT-III Elementary particles:

Classification of Elementary Particles, Fundamental Interactions, Unified approach (Basic ideas), The conservation Laws, Quarks (Basic ideas), Charmed and color Quarks. Nuclear Fusion: The sources of stellar Energy.

UNIT-IV Detector and Accelerators:

Particle and Radiation Detectors: Ionization Chamber, Region of Multiplicative Operation, Proportional Counter, Geiger-Muller Counter, Cloud Chamber, BF₃ and Scintillation detector. Ion sources, Cock-Craft-Walton High Voltage Generators, Van De-Graff Generators, Drift Tube Linear Accelerators, Wave Guide Accelerator, Magnetic Focussing In cyclotron, Synchrocyclotron, Betatron, The Electromagnetic Induction Accelerator, Electron Synchrotron, Proton Synchrotron.

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

- ❖ Discuss the Concept of Nuclear Properties like Quadrupole Moment, Nuclear Spin, Nuclear Energy, Mass spectroscopy and Theory of Nuclear Forces.
- ❖ Classify the Concept of Nuclear Fission.
- ❖ Identify the Concept of Elementary Particles.
- ❖ Applies the Concept of Detector and Accelerator.
- ❖ Differentiate drift tube linear accelerator and wave guide accelerator.

Suggested Reading :

1. प्रभा दशोरा, नीलम गुप्ता, उषा परनामी, मीनल बाफना, नाभिकीय भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015-16

Physics Practical: VI

1. Determination of Planck's constant by photo cell (retarding potential method using optical filters, preferably five wave length)
2. Determination of Planck's constant using solar cell.
3. Determination of Stefan's constant (Black body method)
4. Study of the temperature dependence of resistance of a semiconductor (four probe method).
5. Study of Iodine spectrum with the help of grating and spectrometer and ordinary bulb light.
6. Study of characteristics of a GM counter and verification of inverse square law for the same strength of a radioactive source.
7. Study of β -absorption in Al foil using GM counter.
8. To find the magnetic susceptibility of a paramagnetic solution using Qninck's method. Also find the ionic molecular susceptibility of the ion and magnetic moment of the ion in and magnetic moment of the ion in terms of both magnetons.

9. Determination of coefficient of rigidity as a function of temperature using torsional oscillator (resonance method).
10. Study of polarization by reflection from a glass plate with the help of Nicol's prism and photo cell and verification of Brewster law and law of Malus.
11. e/m measurement of magnetic field using ballistic galvanometers and search coil study of variation of magnetic field of an electromagnet with current.
12. Measurement of electric charge by Millikan's oil drop method.

Suggested Reading :

1. प्रो. प्रभा दशोरा, तृतीय वर्ष प्रायोगिकी भौतिकी, आर.बी.डी. पब्लिशिंग हाउस, जयपुर, नई दिल्ली, 2015

Semester-VI

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 603	Mathematics-I	CE*	4	15	20	100
	Mathematics-II				20	
	Mathematics-III				20	
	Mathematics Practical				25 Practical	

Mathematics- Paper-I : Algebra - II

Objectives:

- ❖ To aware the Integral domain and Field.
- ❖ To Understand the Ideals and Quotient Ring.
- ❖ To develop knowledge the Linear Dependence and Linear Independence of Vectors.
- ❖ To know sum of subspaces.

Unit 1 ; Integral domain and field. Characteristics of a Ring and Field.

Unit 2 : Ideals and Quotient Ring. Maximal ideal and Prime ideal. Principal Ideal domain. Field of quotients of an integral domain. Prime fields. Definition, Examples and Simple properties of Vector spaces and Subspaces.

Unit 3 : Linear combination, Linear dependence and Linear independence of vectors. Basis and Dimension.

Unit 4 ; Generation of subspaces. Sum of subspaces. Direct sum and Complement of subspaces. Quotient space and its dimension.

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

- ❖ Discuss about integral domain and Field.
- ❖ Identify the Ideals and Quotient Ring.
- ❖ Classify the Linear Dependence and Linear Independence of Vectors.
- ❖ Applies the Sum of Subspace.
- ❖ Discuss about quotient space

Suggested Reading :

1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. जांगीड़, जितेन्द्र सैनी, बीजगणित, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
2. जी.सी. गौखरु सैनी, बीजगणित जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics- Paper-II : Complex Analysis -II

Objectives:

- ❖ To understand the Power Series.
- ❖ To develop knowledge about the Branch Point.
- ❖ To develop concept about the Conformal Mapping.
- ❖ To give information about cauchy's residue theorem.

Unit 1 ; Power series — Absolute convergence, Able' s theorem, Cauchy-Hadamard theorem, Circle and Radius of convergence, Analyticity of the sum function of a power series.

Unit 2: Singularities of an analytic function, Branch point, Meromorphic and Entire functions, Rouché's theorem, Casorati - Weierstrass theorem.

Unit 3; Residue at a singularity, Cauchy's residue theorem. Argument principle. Rouché's theorem. Fundamental theorem of Algebra.

Unit 4: Conformal mapping. Bilinear transformation and its properties. Elementary mappings: $w(z) = \frac{1}{2}\left(z + \frac{1}{z}\right)$, z^2 , ez , $\sin z$, $\cos z$, and $\log z$.

Evaluation of a real definite integral by contour integration. Analytic continuation. Power series method of analytic continuation.

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

- ❖ Discuss on the Power Series.
- ❖ Identify the Branch Point.
- ❖ Applies Fundamental Theorem of Algebra.
- ❖ Analyze the Conformal Mapping.
- ❖ Discuss on the circle and radius of convergence

Suggested Reading :

1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड़. जांगीड़, जितेन्द्र सैनी, बीजगणित, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
2. जी.सी. गौखरु सैनी, बीजगणित जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Mathematics- Paper-III: Statics

Objectives:

- ❖ To understand the Resultant and Equilibrium Coplanar Force Acting on a Rigid Body.
- ❖ To know the Friction.
- ❖ To aware the Virtual Work.
- ❖ To develop knowledge about the Common Catenary Force in the 3-D.

Unit 1 Resultant and equilibrium coplanar force acting on a rigid body.

Unit 2 Friction

Unit 3 Virtual work,

Unit 4 common catenary force in the three dimensions.

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

- ❖ Discuss on the Resultant and Equilibrium Coplanar Force Acting on a Rigid Body.
- ❖ Classify about the Friction.
- ❖ Calculate the Virtual Work.
- ❖ Identify the Common Catenary Force in the 3-D.
- ❖ Differentiate friction and virtual work.

Suggested Reading :

1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड़. जांगीड़, जितेन्द्र सैनी, बीजगणित, आर.बी.डी. पब्लिशिंग हाउस, जयपुर-दिल्ली, 2015-16
2. जी.सी. गौखरु सैनी, बीजगणित जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Semester-VI

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 604	Botany-I	CE*	4	15	20	100
	Botany-II				20	
	Botany-III				20	
	Botany Practical				25 Practical	

Botany- Paper-I : Reproductive Biology Of Angiosperms

Objectives:

- ❖ To know the detailed structure of flower and male gametophyte.
- ❖ To understand the mechanism of distribution of pollen grains.
- ❖ To learn about the structure of pistil and female gametophyte.
- ❖ To get knowledge about the process of pollination and fertilization
- ❖ To study the development of embryo and endosperm

UNIT I: Structure of Flower and Male Gametophyte

Ontogeny of Flower parts- development and variations, structure of anther, microsporogenesis, microgametogenesis, Teptum Types and Functions, Development of Male Gametophyte, Structure of Pollen Grains.

UNIT II: Structure of Pistil and FemaleGametophyte

Structure and types of ovule, special structures- aril, oburator etc., megasporogenesis, megagametogenesis (monosporic, bisporic and tetrasporic types), structure of typical embryo sac, (Polygonum, Allium and Adoxa type).

UNIT III: Pollination and Fertilization

Pollination types, significance adaptations; compatibility and incompatibility; basic concepts. Pollen tube entry, syngamy and triple fusion, double fertilization, development, type and function of endosperm.

UNIT IV: Development Of Embryo and Endosperm

Six types of Embryogeny; General pattern of development of dicot and monocot embryo suspensor structure and function, embryo-endosperm relationship; nutrition of embryo, apomixis, polyembryony, fruit-development and maturation.

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

- ❖ Explain the detailed structure of flower and male gametophyte.
- ❖ Discuss the mechanism of distribution of pollen grains.
- ❖ Interpret the structure of pistil and female gametophyte.
- ❖ Describe the process of pollination and fertilization
- ❖ Understand the development of embryo and endosperm

Suggested Readings:

1. Bhojwani, S.S. and Bhatnagar, S.P. 2004. The Embryology of Angiosperms. Vikas Publishing House, New Delhi.
2. Davis, C.L. 1965. Systematic Embryology of Angiosperms. John Wiley, New York.
3. Johri, B. D. 1984. Embryology of Angiosperms. Springer Verlag, Berlin.
4. Johri, B. M. 1984. Embryology of Angiosperms. Springer-Verlag, Netherlands.
5. Maheswari, P. 1985. Introduction to Embryology of Angiosperms. Mac Graw Hill House(P) Ltd., New York.
6. Raghavan, V. 2000. Developmental Biology of Flowering plants. Springer, Netherlands.
7. Trivedi, P.C. Sharma, N. and Sharma, J. L. 2003. Structure, Development and reproduction in Flowering Plants. Ramesh Book Depot., Jaipur.

Botany- Paper-II : Economic Botany And Ethnobotany**Objectives:**

- ❖ To know the origin of cultivated plants
- ❖ To acquire knowledge of food plants, vegetables and fruits.
- ❖ To analyze the spices, oil yielding plants and Beverages.
- ❖ To understand medicinal plants, fibers and woods.
- ❖ To get aware about ethical aspects of Ethnobotany

UNIT I: Food Plants, Vegetables and Fruits

Centre of origin of cultivated plants , **Food plants** : rice, wheate , maize, potato, **Vegetables** : General account with a note on radish, garlic, cabbage, spinach, cauliflower, cucumber and pea. **Fruits** : General account with a note on apple, banana, mango, watermelon and orange.

UNIT II: Spices ,Oil yeilding Plants, and Beverages

Spices : General account with an emphasis on those cultivated in Rajasthan(Cumin,Capsicum, Coriender). **Beverages** : Characteristics and uses Beverages(Tea and Coffee) , Oil yielding plants (*Brassica* and *Cocus*).

UNIT III: Medional Plants, Fibers and Woods

Medional Plants : General account with an emphasis on those cultivated in Rajasthan(Senna, Isabgol, SAFed musli)

Fibers : General account with a note on Cotten and Jute. **Woods** : General account of sources of fire wood : timbers and bamboos.

UNIT IV: Ethnobotany

Ethnobotany and its concepts and relevance. Ethanobotanical areas of Rajasthan, ethnic groups in India and ethanobotanical study of any tribal area of Rajasthan. Ethical aspect of ethnobotany.

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

- ❖ Get knowledge about the cultivated plants
- ❖ Interpret different food plants, vegetables and fruits.
- ❖ Eenhance knowledge about spices, oil yielding plants and Beverages.
- ❖ Comprehend about medicinal plants, fibers and woods.
- ❖ Acquire knowledge about ethical aspects of Ethnobotany

Suggested Readings:

1. Gupta, S.K. and Kaushik, M.P. 1973. An Introduction to Economic Botany. K. Nath and Co., Meerut.
2. Hill, A.W. 1952. Economic Botany. McGraw Hill Book Co., New York.

3. Jain, S.K. 1981. Glimpses of Indian Ethnobotany. Oxford and IBH, New Delhi.
4. Jain, S.K. 1987. A Manual on Ethnobotany. Scientific Publisher, Jodhpur.
5. Prakash, G., Sharma, S. K. 1975. Introductory Economic Botany. Jai Prakash Nath and Cossec, Meerut.
6. Sambamurthy, A.V.V.S. and Subrahmanyam, N.S. 1989. A Text Book of Economic Botany. Wiley Eastern Ltd., New Delhi.
7. Sen, S. 1992. Economic botany. New Central Book Agency, Calcutta.
8. Singh, V., Pandey, P.C. and Jain, D.K. 1998-99. Economic Botany. Rastogi Publications, Meerut.
9. Verma, V. 1974. A Text Book of Economic Botany. Emkay Publications, New Delhi.

Botany- Paper-III : ECOLOGY

Objectives:

- ❖ To acquire knowledge of community, ecosystem and phytogeography
- ❖ To know about structure, components, food chains, hub, energy flows.
- ❖ To understand about vegetation and environmental pollution
- ❖ To get aware about environmental management
- ❖ To learn about different protocols.

UNIT I: Ecological factors and Population ecology

Environment and plant: Ecological factors; Atmosphere (four distinct zone), light (photosynthetically active radiation, zonation in water bodies, photoperiodism, heliophytes and sciophytes), temperature (Raunkier's classification of plant: megatherm, mesotherm, microtherm, heikistotherm, thermoperiodicity and vernalisation), soil (development, soil profile, properties). Ecological adaptations of hydrophytes, xerophytes, epiphytes and halophytes. Population ecology: growth curve, ecotypes, ecads. Population interaction among organisms (neutralism, amensalism, allelopathy), competition, predation, parasitism and mutualism.

UNIT II: Community, Ecosystem and phytogeography

Community characteristics, frequency, density, cover, life forms, biological spectrum, ecological succession. Ecosystem: Structure, components, food chain, food web, energy flow, trophic levels and ecological pyramids, primary and secondary productivity, biogeochemical cycle of carbon and phosphorus.

UNIT III: vegetation and Environmental pollution

Biogeographic regions of India, vegetation types of India; forest grassland with special reference to Rajasthan. Environmental pollution- air, water and soil, WWF, chipko movement, green house effect, ozone depletion loss of biodiversity and extinction of species, red data book.

UNIT IV: Environmental management

Concept and principles of environmental management, principle of optimized use and sustainable development, threats to sustainable development, National Environmental Policy, management of forest and degraded lands, concepts and principles of environmental management, efforts to control these effects (Vienna Convention, Montreal Protocol, Earth summit, Kyoto Protocol, World Summit on sustainable development, 2002 Carbon trade); IPCC.

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

- ❖ Acquire complete knowledge of community, ecosystem and phytogeography
- ❖ Explain the structure, components, food chains and energy flows.
- ❖ Understand about vegetation and environmental pollution

- ❖ Interpret about environmental management
- ❖ Discuss and different protocols.

Suggested Readings:

1. Banerjee, P.K. 2006. Introduction to Biostatistics. S. Chand and Co., New Delhi.
2. Koromondy, E.J. 1996. Concepts of Ecology. 4th Edition Prentice-Hall of India Pvt. Ltd., New Delhi.
3. Misra, K.C. 1988. Manuals of Plant Ecology. (3rd Edition) Oxford and IBH Publishing Co., New Delhi.
4. Odum, E.P. 1983. Basic Ecology. 5th Edition Thomson Business International Waldis Pvt. Ltd., Baricahd.
5. Odum, E.P. 2008. Ecology. Oxford and IBH Publisher.
6. Sharma, P.D. 2010. Ecology and Environment, (8th Edition) Rastogi Publications, Meerut.
7. Singh, J.S., Singh, S.P. and Gupta, S. 2006. Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi.

BOTANY PRACTICAL VI

1. Study different types of placentation, ovules and special structures of ovule through permanent slides, specimens or photographs.
2. Study of female gametophyte through permanent slides/ photographs: types and ultra structure of mature embryo sac.
3. Study of pollen grains: fresh and acetolyzed showing ornamentation and aperture, pseudomonads, pollinia (slides/photographs/ fresh materials).
4. Study of the different stages of anther development.
5. Study of pollen morphology of available plants.
6. Study of monocotyledons and dicotyledons embryo of angiosperms through slides/photographs..
7. Submission of economically important plants and plant products (cereals, pulses, spices, fibers, condiments, fat and oils, tea, coffee, wood, dyes, tobacco).
8. Study following specimens with special reference to :
 - Botany of the economically important part.
 - Processing if any involved.
 - Specimens of cereals, pulses, fibres, spices, beverage (tea, coffee), sugar, oil yielding plants and medicinal plants (mentioned in theory).
9. Microchemical test for starch, sugar, oils, proteins, fat, carbohydrate, lignin using wheat, maize, soyabean. Chana, sweet potato, clove, ground nut, mustard and match sticks.
10. Study of starch grains in potato .
11. Field trip to economically important place.
12. Collection, description and submission of at least 5 plants of ethnobotanical importance.
13. Study of adaptive anatomical and morphological features of Hydrophytes, Epiphytes and Xerophytes using plant material.
14. To study different statistical methods: mean, median and mode, standard error, standard deviation.
15. Regression analysis and application of statistical tests in environmental problems.
16. Determine the dissolved oxygen content in polluted and unpolluted water samples.
17. Field trip to a National Park/Biosphere reserve/Wild life Sanctuary (Student should submit a detailed project report based on the field trip. Evaluation of the project will be based on the detailed report and presentation).
18. Project work on a particular ecosystem/Polluted Site/ Level of Pollution in the City or Town/Land use site.

Semester-VI

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BSE 605	Zoology-I	CE*	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25 Practical	

Zoology-Paper-I: Evolution and Biostatistics

Objectives:

- ❖ To understand the process of evolution.
- ❖ To discuss concept the Lamarkism, Neo-Lamarkism and Darwinism.
- ❖ To classify and draws the Geological time scale.
- ❖ To understand aware the students for Palaentology Fossils and its significance
- ❖ To describe the Biostatistics and Biostatistical Tools.

Unit –I: Evolution

- 1.1 Basics and origin of life: Definition, pre-darwinian theories of evolution; Oparin-Haldane concept of origin of life; Miller- Urey experiment
- 1.2 Micro-evolution: Lamarckism; Darwinism; Neo-Darwinism
- 1.3 Evidences of evolution: Various evidences favouring evolution: Homology, analogy, vestigial organs; palaentological, embryological, biogeographical and biochemical evidences

UNIT II: Evolution II

- 2.1 Macro-evolution: Geological time scale,
- 2.2 Genetic basis of evolution: Hardy-Weinberg law, genetic drift, , Sewall -Wright effect;
- 2.3 Variation, Adaptations and Isolation, Mimicry
- 2.4 Formation of fossils and Important

UNIT III: Biostatistics Concept

- 3.1 Biostatistics: Definition and Scope
- 3.2 Census and sampling methods
- 3.3 Collection and Tabular Presentation of Data: Tabulation of data; Frequency
- 3.4 Distribution Table; Continuous and Discontinuous Series
- 3.5 Graphical Presentation of Data: Bar, Histogram, Line graph, Polygon, Pie Diagrams Ogives

UNIT IV: Biostatistical Tools

- 4.1 Measures of Central tendency: mean, median mode
- 4.2 Measures of Dispersion, Mean deviation & Standard deviation, and Standard error.
- 4.3 Probability

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

- ❖ Understand the process of evolution.
- ❖ Understand the Lamarkism, Darwinism and Neo-Darwinism.
- ❖ Interpret Geological time scale.
- ❖ Explain Palaentology Fossils and its significance
- ❖ Discuss the Biostatistics and Biostatistical Tools

Zoology-Paper-II : Economic Zoology

Objectives:

- ❖ To Understand the Various concepts in Sericulture, Lac culture and Apiculture.
- ❖ To interpret the various concepts in Chemical Control.
- ❖ To Understand aware the students and provides the economical importance of Vermiculture
- ❖ To Understand the Various concepts in Vector borne diseases, Animal husbandry.
- ❖ To classify the economics of aquaculture.

Unit I: Economic Entomology- Insects of economic importance

- 1.1 Sericulture: Types of Silkworm. Life cycle and rearing of *Bombyx mori*, Production of silk , chemical Composition of Silk,
- 1.2 Apiculture –Habits and Habitat, species of Honey Bees, Types of hives, method of Bee-keeping Honey Bee Product.
- 1.3 Lac culture – Lac insect, *Laccifer lacca* - Life cycle, Cultivation of Lac , Lac products and Economic Importance

Unit-II: Economic Entomology

- 2.1 Chemical control of Insecticides: Pyrethroids, Carbamate and HCN (mode of action, merits and demerits)
- 2.2 Biological control of Pests: Biological agents (predators and parasites; merits and demerits)
- 2.3 Animal pest: Life cycle, damage and control of
 - I. House fly – *Musca domestica*
 - II. Stable fly – *Stomoxys calcitrans*

Unit III: Economics of aquaculture

- 3.1 Pisciculture – Steps of Fish culture, Fish Product,
- 3.2 Prawn culture -Culture techniques of fresh water Prawn,
- 3.3 Pearl culture: Habit, Habitat, General characters, mantle & Shell, Formation & culture.

Unit IV: Economic importance of other animals

- 4.1 Vector borne diseases. A brief account of insect vectors affecting the health of man and domestic animals
- 4.2 Animal husbandry: Introduction to common dairy animals; Techniques of dairy management
- 4.3 Vermiculture: Vermitechnology, Bio-Fertilizers

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

- ❖ Discuss the various concepts in Sericulture, Lac culture and Apiculture.
- ❖ Understand the various concepts in Chemical Control.
- ❖ Provide the economical importance of Apiculture
- ❖ Understand the various concepts in Vector borne diseases, and Animal husbandry
- ❖ Explain the Economics of aquaculture

Zoology-Paper-III: Ecology and Environmental Biology

Objectives:

- ❖ To differentiate current environmental issues based on Atmosphere.
- ❖ To understand Gain critical understanding on human influence on environment.
- ❖ To understand Positive attitude towards Biodiversity conservation.
- ❖ To describe the various concepts in Pollution.
- ❖ To know the sources, affect and control measures of water and noise pollution.

Unit I: Atmosphere

- 1.1 Atmosphere: Major zones and its importance, Composition of air
- 1.2 Hydrosphere: Global distribution of water, Physico-chemical characteristics of water
- 1.3 Lithosphere: Soil Layer; formation of soil
- 1.4 Light: As Abiotic factor; Physico- chemical characteristics of Light; Photoperiodism

Unit II: Ecosystem

- 2.1 Ecosystem: Definition, Structure and functions; Types of Ecosystem; Food chain, Food web and ecological pyramids
- 2.2 Ecosystem: Biogeochemical Cycle (O_2 , CO_2 , N, P, S); Energy flow in an ecosystem,
- 2.3 Population Introduction: Population characteristics, Population growth patterns: (exponential/Malthusian and sigmoid growth patterns)
- 2.4 Community Characteristics, Structure and method (Quadrat method Transect method, plotless method:

Unit III: Biodiversity & Conservation

- 3.1 Various Aspects of Biodiversity, Degree of Diversity,
- 3.2 Ex situ and In situ Conservation; Alpha, Beta and Gamma Diversity, Causes of reduction of Biodiversity
- 3.3 Conservation measures of Animals.

Unit IV: Pollution

- 4.1 Sources, effect and control measures of air pollution, Acid rain, green house effect, Ozone depletion and global warming
- 4.2 Sources, effect and control measures of water pollution
- 4.3 Sources effect and control measures of noise pollution

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

- ❖ Describe the current environmental issues based on ecological principles.
- ❖ Gain critical understanding on human influence on environment.
- ❖ Aware about the positive attitude towards Biodiversity conservation.
- ❖ Understand the various concepts in Pollution.
- ❖ Explain the sources, affect and control measures of water and noise pollution.

Semester VI
Zoology Practical

Paper-I: Evolution and Biostatistics

1. Construction of frequency table, histograms, Polygons, Pie Charts
2. Exercise on Mean, Mode, Median, Std. Deviation, Std. error, Probability

Paper-II: Economic Zoology

1. Study of the following prepared slides/specimens: Honey Bee, Silk Worm, Termite, Earthworm types (any two) -(Drawida modesta, Pheretima posthuma ; Fish parasites, Larvivorous fishes (Guppy, Gambusia)
2. Economic importance of commonly occurring insect pests and preparation of life cycle of these pests.
3. Study of Beneficial insects and their life stages.

Paper-III: Ecology & Environmental Biology

1. Determination of population density in a terrestrial community or hypothetical community by quadrat method.
2. Study of life table and fecundity table, plotting of the three types of survivorship curves from the hypothetical data.
3. Estimation of pH, chlorides and water vapour quantity in soil
4. Estimation of Dissolved oxygen, Salinity, pH, free CO_2 in water samples
5. Plankton study in Fresh water

6. Study of natural ecosystem and field report; Visit to a National park and Sanctuary (candidates are required to submit the report of the visit)

Suggested readings:

Evolution

1. Gupta, P.K., A Text Book of Cytology, Genetics and Evolution, Rastogi Publication, Meerut
2. Ridley, M. (2004) Evolution. III Editio. Blackwell Publishing
3. Stricberger, M.W. Evolution. Jones& Bartlett, USA 1996
4. Hall and Hallgrimsson: Strickberger's Evolution (2008, Jones and Bartlett)
5. Moody: Introduction to Evolution (1978, Kalyani).
6. Rastogi: Organic Evolution (2007, Kedarnath & Ramnath
7. Kohli, Ranga, Lori, Bhatia, Animal Diversity and Evolution, RBD Publishing House, Jaipur.

Statistics:

1. Probability and Statistics for Engineers and Scientists by Walpole, Myers, Myers and Ye, 7th Edition, Pearson Education.
2. Mathematical Statistics by Freund, Prentice Hall, India
3. Introduction to Statistical Quality Control by Montgomery, John Wiley and Sons.
4. Principles of Biostatistics by M. Pagano and K. Gauvreau: Thompson learning (2nd edition)
5. Biostatistics: A Foundation for Analysis in the Health Sciences by W. W. Daniel: John Wiley and Sons Inc (7th edition); Indian Reprint 2006.
6. Biostatistics by Satguru Prasad: Emkay Publication
7. G.S. Shukhla, Upadhyay, Reena Mathur, S.G. Prasad, 2011, Economic Animal Science, Biostatics and Animal Behaviour, Rastogi Publication, Meerut, Delhi

Economic Zoology:

1. Shukla and Upadhyaya : Economic Zoology (Rastogi Publishers, 1999-2000)
2. Shrivastava: Test book of Applied Entomology, Vol. I &II (Kalyani Publishers, 1991)
3. Mani: Insects, NBT, India, 2006.
4. Jabde: Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lac culture, Agricultural Pests and their Control, 2005 Publisher Vedams eBooks (P) Ltd. New Delhi
5. G.S. Shukhla, Upadhyay, 2015, Economic Animal Science, Rastogi Publication, Meerut, Delhi

Ecology & Environmental Biology

1. Odum, E. P. (1996). Ecology: A bridge between science and society. *Sinauer Associates Inc.*
2. Chapman, J. L. And Reiss, M. J. (1992). Ecology, principles and applications. *Cambridge University Press.*
3. Verma, P. S. & Agarwal, V. K. (1983). Environmental biology (principles of ecology). *S.Chand & Co.*
4. Singh, J. H. *et al* (2006). Ecology, environment and resource conservation. *Anamaya Publ.N. Delhi*
5. Kendeigh, S. C. Animal ecology. *Prentice Hall*
6. Kormondy, E. T. Concept of ecology. *Prentice Hal*
7. *Dhirendra, Devershi, Ecology and Environmental Biology, College Book House. Pvt. Ltd., Jaipur*

Course Code	Course Title	Group	Course Category	Credit	C.I.A. (Continuums Internal Assessment)	Theory	Total
BJVB601MJ	System of Indian Philosophy		Core Course	4	30	70	100

SEMESTER-VI

उद्देश्य :

भारतीय दर्शन के अध्ययन के उद्देश्य इस प्रकार हैं—

1. भारतीय दर्शन की परम्पराओं को समझना।
2. भारतीय दर्शन की वैदिक और श्रमण परम्परा का ज्ञान करना।
3. श्रमण परम्परा के जैन और बौद्ध दर्शन के प्रमुख सिद्धान्तों का अध्ययन करना।
4. वैदिक परम्परा में सांख्य-योग, न्याय-वैशेषिक और मीमांसा-वेदान्त के प्रमुख सिद्धान्तों का अध्ययन करना।

इकाई—1

- आस्तिक —नास्तिक दर्शन : एक परिचय
- भारतीय दर्शन की विशेषताएं
- चार्वाक दर्शन का प्रमाण विचार
- चार्वाक दर्शन की तत्व मीमांसा

इकाई—2

- अनेकांतवाद एवं स्यादवाद
- षड्द्रव्य विचार
- चार आर्य सत्य
- प्रतीत्यसमुत्पाद

इकाई—3

- सांख्य का द्वैतवाद
- अष्टांग योग की अवधारणा
- न्याय का प्रमाण विचार और ईश्वर विचार
- वैशेषिक का पदार्थ विचार और परमाणुवाद

इकाई—4

- मीमांसा का धर्म विचार
- आचार्य शंकर एवं रामानुज के अनुसार माया, ब्रह्म एवं मोक्ष विचार

उपलब्धियां :

भारतीय दर्शन के अध्ययन की उपलब्धियां इस प्रकार हैं—

1. भारतीय दर्शन की परम्पराओं को समझें।
2. भारतीय दर्शन की वैदिक और श्रमण परम्परा का ज्ञान हुआ।
3. श्रमण परम्परा के जैन और बौद्ध दर्शन के प्रमुख सिद्धान्तों का अध्ययन किया।
4. वैदिक परम्परा में सांख्य-योग, न्याय-वैशेषिक और मीमांसा-वेदान्त के प्रमुख सिद्धान्तों का अध्ययन किया।

संदर्भ पुस्तके—

1. भारतीय दर्शन— प्रोफेसर आनंद प्रकाश त्रिपाठी, यूनिवर्सिटी बुक हाउस जयपुर राजस्थान
2. भारतीय दर्शन, दत्ता एवं चटर्जी संगम प्रकाशन, इलाहाबाद
3. भारतीय दर्शन — डॉ बट्टीनाथ सिंह महादेव प्रकाशन, वाराणसी

Course Code	Course Title	Course Category	Credit	C.I.A. (Continouns Internal Assesment)	Theory	Total
BJVB602MJ	Indian Culture	(CE)	4	30	70	100

SEMESTER-VI

उद्देश्य :

1. प्राचीन भारतीय संस्कृति की जानकारी प्रदान करना।
2. प्राचीन गौरवशाली विश्वविद्यालयों के बारे में जानकारी प्रदान करना।
3. प्राचीन महाकाव्यों और भारतीय जीवन मूल्यों के बारे में जानकारी प्रदान करना।

इकाई – 1

- भारतीय संस्कृति** — परिभाषा, पृष्ठभूमि एवं विशेषताएं,
वर्णाश्रम व्यवस्था — परिभाषा एवं महत्व
पुरुषार्थ एवं ऋण — अर्थ, प्रकार एवं महत्व
प्राचीन सामाजिक संगठन — पारिवारिक जीवन

इकाई – 2

- प्राचीन भारत में नारी की स्थिति
प्राचीन भारत की न्याय व्यवस्था
शिक्षा एवं शिक्षण संस्थाएं,
धर्म — शैव, वैष्णव, जैन, बौद्ध
सम्प्रदाय — विट्ठल, नाथ

इकाई – 3

- भारतीय कला एवं अवशेष — भारतीय वास्तुकला, मूर्तिकला एवं चित्रकला
महाकाव्य युगीन संस्कृति — रामायण एवं महाभारत
भारतीय अभिलेख एवं सिक्के
कालिदास एवं तुलसीदास — जीवन परिचय एवं सांस्कृतिक व साहित्यिक योगदान

इकाई – 4

- भारतीय पर्व एवं त्यौहार — हिन्दू, मुस्लिम, सिक्ख एवं इसाई पर्व
रविन्द्रनाथ टैगोर — सामाजिक एवं सांस्कृतिक महत्व
भारतीय संस्कृति का विदेशों में प्रचार-प्रसार
भारतीय संस्कृति का मानव-कल्याण में योगदान

उपलब्धियां

1. विद्यार्थी प्राचीन भारतीय संस्कृति की जानकारी प्राप्त कर सकेंगे।
2. विद्यार्थी प्राचीन गौरवशाली विश्वविद्यालयों के बारे में ज्ञान प्राप्त कर सकेंगे।
3. विद्यार्थी प्राचीन महाकाव्यों और भारतीय जीवन मूल्यों के बारे में जानकारी प्राप्त कर सकेंगे।

Reference Books :

1. भारतीय संस्कृति, रूपनारायण त्रिपाठी, रामदेव साहू, श्याम पब्लिकेशन, जयपुर
2. भारतीय संस्कृति के 21 अध्याय, एस.एल. नागौरी, युनिवर्सिटी बुक हाउस, जयपुर
3. भारतीय संस्कृति का विकास, सत्यकेतु विद्यालंकार, श्री सरस्वती सदन, नई दिल्ली
4. भारतीय संस्कृति के मूल तत्व, सुखबीर सिंह, बिजेन्द्र कुमार, साहित्य भण्डार पब्लिकेशन, मैरठ

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC 701	Chemistry-I	CE	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

SEMESTER-VII

PAPER 1 :- ANALYTICAL CHEMISTRY

Unit 1

Fundamentals of Chemical Analysis:

Classification of analytical method, significance, Sensitivity and Selectivity of Analytical methods, Sampling, Accuracy & precision, Errors: types of errors, error distribution curve, Calibration curve .

Unit 2

Spectroscopic Techniques-I

Basic principles of the spectrophotometry, basic instrumentation: single beam and double beam spectrophotometer.

Flame Photometry & Atomic Absorption Spectroscopy (AAS): Principle, General layout of instrument and applications.

Unit 3

Spectroscopic Techniques-II

Inductively Coupled Plasma Spectroscopy (ICPS): ICP -MS, OES, Theory, instrumentation and applications.

Unit 4

Fluorescence Spectroscopy: Principle, Fluorescence, Phosphorescence -basic Instrumentation and their applications. Chemiluminescence.

Nephelometry and Turbidometry: Principle, instrumentation and applications.

Suggested Readings:

1. Vogel's Textbook of Quantitative Chemical Analysis, G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney, Publ ELBS, Longman, UK
2. Basic Concepts of Analytical Chemistry, S.M. Khopkar, Wiley Eastern.
3. Fundamentals of Analytical Chemistry, D.A. Skoog, D.M. West and F.J. Holler. Pubi WB Saunders.
4. Analytical Chemistry, G.D. Christian, John Willy & Sons.

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC 702	Physics-I	CE	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Practical				25 Practical	

Advanced Quantum Mechanics:

Linear Vector and Representation Theory:

Linear vector space, Dirac notations of Bra - Ket notation, Matrix representation of Observables and states, Determination of eigenvalues and eigenstate for observables using matrix representations, Coordinate and momentum representations.

Theory of Angular Momentum:

Symmetry, invariance and conservation laws, relation between rotation and angular momentum, commutation rules, Matrix representations.

Scattering Theory:

Differential and total Scattering cross-sections laws, partial wave analysis and application to simple cases, Born approximation validity and simple applications.

Approximation Methods:

Time-independent Perturbation theory (non-degenerate and degenerate), Zeeman effect (Normal), Stark effect, Variational method and applications to helium atom and simple cases; WKB approximation.

Reference Books:

1. Quantum Mechanics: Nouredine Zettili
2. Modern Quantum Mechanics: J.J. Sakurai.
3. Introduction to Quantum Mechanics : C.J. Joachain and B.H. Bransden.
4. Introduction of Quantum Mechanics: D.J. Griffiths.
5. Principles of Quantum Mechanics: P.A.M.Dirac.

(B.Sc.)
Semester - VII
Distribution of Papers, Marks and Credit

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC 703	Tensor Analysis		4	15	60	100
					25 Practical	

Mathematics - Tensor Analysis

Learning Objectives:

- ❖ Discuss about the Kronecker delta, Invariant, Covariant and Contravariant Tensors.
- ❖ To aware about the Metric Tensor, Angle between of two Vectors, Principal directions for a Symmetric Covariant Tensor of Second Order.
- ❖ Understand the Christoffel Symbols, Ricci's Theorem, Divergence of Vector and Tensor Field, Gradient and Laplacian of a Scalar Function.
- ❖ To discuss about the Geodesics, Euler's Equations, Geodesics and Riemannian Co-ordinates, Parallelism of a Vector of Variable Magnitude along a Curve, Fundamental.

Unit 1: Tensor Algebra – Space of N-dimensions, Dummy Index, Kronecker delta, Invariant, Covariant and Contravariant Tensors, Product of two Tensors, Second and Higher Order Tensors, Symmetric and Skew-Symmetric Tensors, Conjugate Tensors.

Unit 2: Metric Tensors – Euclidean Space of 3-D, Riemannian Space, Metric Conjugate Tensors, Associate Vector, Associate Tensor, Magnitude of a Vector, Angle between of two Vectors, Principal directions for a Symmetric Covariant Tensor of Second Order, Permutations Symbols and Tensors.

Unit 3: Christoffel Symbols, Properties of Christoffel Symbols, Laws of Transformation of Christoffel Symbols, Covariant differentiations of Second and Higher Order Tensors, Laws of Covariant differentiations Tensor, Ricci's Theorem, Divergence of Vector and Tensor Field, Gradient and Laplacian of a Scalar Function, Tensorial form for Gauss and Stokes Theorem.

Unit 4: Geodesics, Euler's Equations, Differential Equations of Geodesics in a V_N , First Curvature, Null-Geodesics, Geodesics and Riemannian Co-ordinates, Parallelism of a Vector of Variable Magnitude along a Curve, Fundamental Theorem of Riemannian Geometry.

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

- ❖ Understand the Basic Concept and Product of the Tensors.
- ❖ Understand the Concepts of Different Types of Tensors and their Properties.
- ❖ Understand the Basic Concept the Geodesics.

- ❖ Understand the Basic Concept of the Covariant differentiations Tensor, Ricci's Theorem, Divergence of Vector and Tensor Field, Gradient and Laplacian of a Scalar Function.

Suggested Reading:

1. Barry Spain, Tensor Calculus, Radha Publ. House Calcutta, 1988.
2. Weatherbum, Riemannian Geometry and Tensor Calculus, Cambridge University Press, 2008.
3. J.L. Bansal, Tensor Analysis, Jaipur Publishing House, Jaipur, 2014.
4. Heinz Schade and Klaus Neemann, Tensor Analysis, De Gruyter, Germany, 2018.
5. A. J. McConnell, Applications of Tensor Analysis, Dover Publications, 2014.

Semester-VII - Botany

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC 704	Advanced Plant Pathology		4	15	60	100
					25 Practical	

Objectives :

- ❖ To acquire knowledge about plant pathology.
- ❖ To understand symptoms, transmission and protection of Gungal and Bacterial diseases .
- ❖ To learn about Phytoplasma Disease and Plant Galls.
- ❖ To know about Nematology and Nematodes Disease.
- ❖ To apply the knowledge of Advanced Plant Pathology in daily life.

Unit-I : Plant pathology:

History and scope, nature and concept of plant disease, symptoms of plant disease.

Host factor in disease development, host parasite interaction, transmission, inoculum potential, enzymes, effector and toxin in plant disease.

Protective and defense mechanism (morphological, biochemical) in plants

Unit-II : Symptomlogy, Identification and control of following plant diseases

Fungal disease:- white rust & early blight, Paddy blast, Leaf rot and foot rot of pan (*Piper beetle*), Red rot of sugarcane, Flax rust.

Bacterial disease: Brown rot of potato, Blight of rice, Crown Gall disease of stone fruits, Angular leaf spot of cotton.

Unit-III : Phytoplasma Disease and Plant Galls

Phytoplasma Disease: Little leaf of brinjal, Sesame Phyllody.

Plant Galls: Classification, developmental anatomy, host parasite interaction and physiology of insect induced plant galls of Rajasthan- *Pongamia*, *Cordia*, *Prosopis* and *Salvadora*, Economic significance of galls.

Unit-IV : Nematology and Nematodes Disease

Nematology: General account of nematodal diseases, symptoms, Methods used in Nematology. Control of plant parasitic nematodes. Inter relationship between nematodes and other plant pathogens.

Nematodes Disease: Molya disease of wheat and barley, Soyabean Cyst nematode.

Suggested laboratories exercises:

- Histopathology of nematode infected roots Study of following disease:

- Red rot of sugarcane Paddy blast
- Flax rust
- Crown gall disease of stone fruits Angular leaf spot of cotton
- Little leaf of brinjal Sesame Phyllody
- Galls of Pongamia, *Cordia*, *Prosopis*, *Salvadora* Molya disease of wheat and barley
- Soyabean cyst nematodes

Learning Outcomes : After completion of the course student would able to-

- ❖ Acquire knowledge about plant pathology.
- ❖ Understand symptoms, transmission and protection of Gungal and Bacterial diseases .
- ❖ Describe Phytoplasma Disease and Plant Galls.
- ❖ Explain Nematology and Nematodes Disease.
- ❖ Interpret of Advanced Plant Pathology in daily life.

Suggested Reading:

1. Agrios, G.N. 2005. Plant pathology, 5th edition Academic Press, New York, USA
2. Alexopoulos, C.J.C.W. Mims and M. Blackwell. 1996 Introductory Mycology, 4th edition, John Wiley and sons, Inc., New York, USA
3. Khan, J.A. and Dijkstra. 2002. Plant virus as molecular pathogens. The Haworth Press Inc. USA
4. Mehrotra, R.S. and A. Agrawal. 2003 Plant Pathology. 2nd Edition TATA Mc Graw Hill. Pub. Company Ltd. New Delhi
5. Singh, R.S. 1982 Plant Pathogens: The Fungi. Oxford and IBH Publishing Company, New Delhi, India
6. Singh, R.S. 1982 Plant Pathogens: The Prokaryotes. Oxford and IBH Publishing Company, New Delhi, India
7. Trigliano, R.N., M.T. Windham and A.S. Windham. 2008. Plant pathology: Concept and Laboratory Exercise. 2nd edition CRC Press.
8. Vidhyasekram, P. 2004. Concise Encyclopedia of plant Pathology. Food product press and Haworth Press Inc. Binghamton, Ne.

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC 705	Zoology-I	CE	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25 Practical	

SEM- VII

BASICS OF TOXICOLOGY

Objectives: Learning Outcomes of the course “(“Basics of Toxicology)”: On completion of the course, students are able to:

1. Understand about the Historical overview & scope of toxicology Chemical Interaction
2. Understand about Absorption & Distribution of toxicology
3. Understand the Biotransformation of Xenobiotics.
4. Understand about the Hepatotoxicity Nephrotoxicity Pulmonary toxicity and Nervous system

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

1. Understand general Historical overview & scope of toxicology, Classification of Toxic agents Spectrum of Undesired effects, Chemical Interaction.
2. Discuss the. Absorption & Distribution of Toxicology, Metabolism of Toxicants.
3. Understand Oxidation, Reduction, Hydrolysis and Enzyme Reaction.
4. Discuss the Hepatotoxicity, Nephrotoxicity Pulmonary toxicity and Nervous system.

UNIT-I Introduction to Toxicology

1. Historical overview & scope of toxicology
2. Classification of Toxic agents
3. Spectrum of Undesired effects
4. Chemical Interaction

UNIT-I Mechanism of Toxicology

1. Absorption & Distribution
2. Metabolism of Toxicants
3. Reaction Metabolites
4. Elimination

UNIT III Biotransformation of Xenobiotics

1. Oxidation – Cytochrome P-450- Dependent Monooxygenase system, Flavin containing Monooxygenase, Nonmicrosomal Reaction, Cooxidation during Prostaglandin Biosynthesis.
2. Reduction
3. Hydrolysis
4. Enzyme Reaction- Glucuronidation, Sulfation, Methylation, Acetylation, Amino acid conjugation, Glutathione conjugation & Phosphorylation

UNIT IV Target organ Toxicity

1. Hepatotoxicity : Susceptibility of the Liver , Types of Liver injury, Biochemical mechanism, Example of Hepatotoxicants.
2. Nephrotoxicity: Susceptibility of Kidney, Renal physiology & function Example of Nephrotoxicants.
3. Pulmonary toxicity: Susceptibility of the Lung, Types of toxic response, Example of Lung toxicants.
4. Nervous system : Nervous system structure & function , Vulnerability of Nervous System , Neurotoxicity, Example of Neurotoxicants.

Practicals

- Estimation of Non-Respirable Dust in Air by using Dust Sampler
- Estimation of Respirable Dust in Air by using Dust Sampler
- Microbial analysis in Water
- Analysis of Adulteration in food samples
- Bacteriological analysis of drinking water by MPN method
- Microbial analysis in soil
- Visit to In situ or Ex situ Conservation Centre/ Social Service Organization/ Environmental Education Centre
- Visit to Local Polluted Site -Observations and Remedial Measures

SUGGESTED READING:

1. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
2. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
3. Casserett and Doull's Toxicology: The basic source of Poisons. (VI Edition)
4. Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press.
5. Study Material (Handbooks) of Sikkim Manipal University for Science Health and Technology for the Degree of Post Graduation in Ecology and Environment
6. Smith, Keith (1996) Environmental Hazards- Assessing risk and reducing disaster, 2nd Edition, London & New York.
7. Wisnr B., Adams, J. (Ed.) (2002) WHO Environmental Health in Emergencies and Disaster- A practical guide, World Health Organisations.
8. Conner, David (1994) Managing the environment with rapid Industrialisation- Lessons from the East Asian Experience, OECD, Paris.
9. Khanna, Gopesh Nath (1990) Environment Problems and the United Nations, Ashish Publishing House, New Delhi.
10. Sharma P.D., Environmental Biology and Toxicology, Meerut: Rastogi Publications
11. Study Material (Handbooks) of Sikkim Manipal University for Science Health and Technology for the Degree of Post Graduation in Ecology and Environment
12. Sharma, B.K. Environmental Chemistry. Meerut publication
13. Pandey, Shukla, Trivedi, Fundamentals of Toxicology. New Central book agencies.

Course Code	Course Title	Group	Course Category	Credit	C.I.A. (Continuous Internal Assessment)	Theory Practicle	Total
BJVB 701MJ	Research Methodology	A	Core Course	4	30	50+20	100

सेमस्टर—सप्तम शोध प्रविधि

समय : 3 घण्टे

पूर्णांक : 100 (30 + 70)

नोट:— प्रश्न पत्र का निर्माण हिन्दी एवं अंग्रेजी भाषा में किया जाएगा। जिसका विद्यार्थी हिन्दी/अंग्रेजी/संस्कृत में उत्तर दे सकेंगे। इस प्रश्न पत्र में सम्पूर्ण पाठ्यक्रम को तीन खण्डों में विभाजित किया गया है। प्रत्येक खण्ड के निर्देश सावधानी पूर्वक पढ़ें। खण्ड “ब” के किसी एक प्रश्न का उत्तर संस्कृत में देना अनिवार्य है। इसका विस्तृत विवरण इस प्रकार है—

खण्ड अ

इस खण्ड में प्रत्येक इकाई से 02 लघु प्रश्न लेते हुए कुल 10 प्रश्न होंगे। प्रत्येक लघु प्रश्न का उत्तर लगभग 20 शब्दों में हो।

कुल अंक— 10

खण्ड ब

इस खण्ड में प्रत्येक इकाई से कम से कम एक प्रश्न लेते हुए कुल 07 प्रश्न होंगे। जिनमें से कुल 5 प्रश्नों के उत्तर दिये जाने हैं। इस खण्ड के किसी एक प्रश्न का उत्तर संस्कृत में देना अनिवार्य है। प्रत्येक प्रश्न का उत्तर लगभग 250 शब्दों में हो।

कुल अंक— 30

खण्ड स

इस खण्ड के प्रश्न संख्या 9 एवं 10 आन्तरिक विकल्पसहित होंगे। जिनके प्रत्येक प्रश्न का उत्तर लगभग 500 शब्दों में हो।

कुल अंक 30

इस प्रश्न पत्र का समस्त पाठ्यक्रम निम्न प्रकार से पाँच इकाईयों में विभाजित होगा —

इकाई—1:

शोध : स्वरूप—परिचय, (Introduction : Research),

वर्णनात्मक शोध (Descriptive Research),

शोध के प्रकार (Types of Research),

ऐतिहासिक, तुलनात्मक, भाषात्मक, सामाजिक, प्रविधिपरक एवं कार्यपरक शोध (Historical, Comperative, Linguistic, Social, Methodological and Action Research),

इकाई—2:

शोध—समस्या का चयन (Selection of Research Problem),

परिकल्पना (Hypothesis),

शोध—क्षेत्र (Area of Research),

शोध रूपरेखा (Synopsis)

इकाई—3:

शोधविधियां (Methods of Research), वैज्ञानिक विधि (Scientific Method)
निरीक्षणात्मक विधि (Observation Method), साक्षात्कार विधि (Interview Method)
प्रश्नपरक विधि (Questionnaire Method)

इकाई—4:

वैयक्तिक व एकल अध्ययन (Case Study), प्रतिदर्श—प्रतिचयन (Sampling),
सामग्री या आंकड़ों का संग्रहण व निरीक्षण (Collection & Analysis of Data etc.),

इकाई—5 :

पादटिप्पण (Foot Notes), डाइक्रिटिकल मार्क (Diacritical Marks),
उपसंहार (Conclusion), सन्दर्भ ग्रन्थ सूची (Bibliography), परिशिष्ट निर्माण (Appendix),

सहायक ग्रन्थ

- 1- Methods in Social Research, William Goode, Paul K. Hatt, McGraw Hill Book Company, 1974.
2. अनुसंधान विधियां (व्यवहारक विज्ञानों में), डॉ. एच.के. कपिल, एच.पी. भार्गव बुक हाउस, आगरा, 2015
3. अनुसंधान विधियां, डॉ. डी.एन. श्रीवास्तव, साहित्य प्रकाशन, आगरा, 2010
- 4- Research Methodology, Gopal Lal Jain, Mangal Deep Publication, Jaipur, 2003.
- 5- Scientific Social Surveys and Research, Pauline V. Young, Prentice Hall of India Private Limited, New Delhi, 1939.

Semester – VII Minor (Interdisciplinary)

[Choose any one] (702-709)

Course Code – BJVB 702 Value Education and Spirituality

Marks 100

[70 Written Exam & 30 CIA]

Credit-4

Objectives

- To understand the need of value oriented education.
- To understand the process of contemplation for value development.
- To understand the non-violence and culture of peace.
- To understand the cardinal principles of Jainism.

Unit-I Value Education

- Challenges of Modern Education system and need of value education.
- Values-meaning, definitions, different views and classifications of values.
- Social duties, Responsibilities and Human Rights.

Unit- II Socio Ethical Life Style:

- Social Ethics and Jain Concepts.
- PanchMahavrat- Ahimsa, Satya, Acharya, Bmrahmcharya&Aparigrah.
- Tri Ratna- SamyakDarshan, Gyana&Charitra.
- Anekantvada

Unit-III Development of Social Harmony.

- Peace and Its Relevance in social harmony.
- Social Harmony through Conflict Management.
- Training in Non-violence.

Unit-IV Enhancement of Values in behavior-

- Development of Moral Values: Contemplation of honesty, self-discipline and Non-violence
- Contemplation of mental balance, will power and patience for development of mental values.
- Development of Emotional & Spiritual Values.

SUGGESTED READING

- Structure of Values, Mukharjee RK (1955).....
- Devatma' Value Education: 4 supplements to present education. Arora K. NCET, New Delhi 1999.
- Helping students ascend the steps of value education. A. Dutta. (2004)
- Values and Ethics in School Education, Luther, M. (2001) New Delhi Mc Grow Hill.
- Value Development in Higher Education, Mukhopadhyaya M. (Eds.) 2004)
- Human Values and Education-Rahul, S.P. (1986) Sterling New Delhi.
- Education in Human Values. Saraf (1999) Vikash Publication, New Delhi.
- Value Education: Theory and Practice, Dr. N.L. Gupta, Krishna Brothers, Ajmer, 1986.
- अमूर्तचिन्तन-आचार्यमहाप्रज्ञ, जैनविश्वभारतीप्रकाशन, लाडनू 2001
- गांधीदर्शन शांतिमानवाधिकार, प्रो. अनिल धर, जैनविश्वभारतीसंस्थान, लाडनू।
- विश्वशांति एवंअहिंसाप्रशिक्षण, डॉ. बच्छराजदूगड़, जैनविश्वभारतीसंस्थान, लाडनू 2001
- जैन धर्ममेंअहिंसा, वशिष्ठनारायण सिंहा, वाराणसी।
- जैनदर्शनमननऔरमीमांसा-आचार्यमहाप्रज्ञ, आदर्शसाहित्य संघ, चूरु।
- अहिंसादर्शन, डॉ. अनेकान्तकुमारजैन, श्रीलालबहादुरशास्त्री सं. विद्यापीठ, नईदिल्ली।

Semester – VII Minor (Interdisciplinary)

Course Code – BJVB 702 Preksha Meditation and Self Management

Marks 100

[70 Written Exam & 30 CIA]

Credit-4

Paper V

Objectives

1. To understand historical development of Preksha Meditation.
2. To understand the components, spiritual-scientific basis, objectives and benefits of Preksha Meditation.
3. To introduce the practicals & process of Preksha Meditation.

Unit-I Preksha Meditation - I

Preksha Meditation: nature, *upsampada*, main, supportive and specific components.

Kayotsarga (Relaxation with self awareness): objectives, spiritual and scientific basis and benefits.

Internal Trip (*Antaryatra*): objectives, spiritual and scientific basis and benefits.

Unit-II Preksha Meditation – II

Perception of Breathing: objectives, spiritual and scientific basis, types and benefits.

Perception of Body: objectives, spiritual and scientific basis and benefits.

Unit-III Preksha Meditation - III

Perception of Psychic Centres: objectives, spiritual and scientific basis and benefits.

Psychic Colour Mediation (*LeshyaDhyana*): objectives, spiritual and scientific basis and benefits.

Contemplation (*Anupreksha*): objectives, spiritual and scientific basis and benefits.

Unit-IV Self Management through Preksha Meditation

Personality development and Preksha Meditation.

Health management and Preksha Meditation.

Stress Management and Preksha Meditation.

Memory and Preksha Meditation.

Time management and Preksha Meditation.

Emotional management and Preksha Meditation.

SUGGESTED READING

1. प्रेक्षापुष्प—आचार्यमहाप्रज्ञ, जैनविश्वभारतीप्रकाशन, लाडनूँ, 2003।
2. अपनादर्पणअपनाबिम्ब— युवाचार्यमहाप्रज्ञ, जैनविश्वभारतीप्रकाशन, 1991।
3. प्रेक्षाध्यान : सिद्धातऔरप्रयोग—आचार्यमहाप्रज्ञ, जैनविश्वभारतीप्रकाशन, लाडनूँ।
4. प्रेक्षाध्यान : व्यक्तिवविकास—मुनि धर्मेश, जैनविश्वभारतीप्रकाशन, लाडनूँ।
5. जीवन विज्ञान की रूपरेखा—मुनि धर्मेश, जैनविश्वभारतीप्रकाशन, लाडनूँ, 1996।
6. जीवन विज्ञान, प्रेक्षाध्यान एवं योग—संपा. समणी डॉ. मल्लीप्रज्ञा, जैनविश्वभारतीविश्वविद्यालय, 2009।
7. Mirror of the Self – AcharyaMahaprajna, Jain VishvaBharatiPrakashan, Ladnun (Rajasthan), 1995.
8. PrekshaDhyana – Theory & Practice, AcharyaMahaprajna, Jain VishvaBharatiPrakashan, Ladnun (Rajasthan), 1994.

Semester – VII Minor (Interdisciplinary)

Course Code – BJVBI 702 Informational Technology and Computer Application

Paper V

The main objectives of this course are;

- It will expose the students to the fundamentals of the IT.
- Students will be having the introductory knowledge of the MS-Windows
- Practically students will be able to use MS-PowerPoint, MS-Word, MS-Excel and create their own blog.

Course Contents (Term End Theory Exam):**Unit I: Introduction to Computers and Windows**

- Application of Computers
- Block Diagram of Computer
- Input and Output devices
- Types of software
- Introduction to Operating system: Windows
- Functions of operating system
- How you can Fast your Computer or Maintenance of computer

Unit II: Concept of MS Word and MS Excel and its application

- MS Word Window Layout
- Creating and Formatting Documents
- Editing Documents
- Working with Tables.
- Mail Merge, Macro Recording, Thesaurus, Printing Document (How to Use Page-Setup Before Printing)
- Introduction to Excel and its Applications
- Concept of workbook and worksheet
- Layout of Worksheets
- Use of basic formula and functions
- Sorting, Filtering and charts
- Report Generation (Pivot Table)
- Security or Protecting Worksheets

Unit III: Introduction & Application of MS-PowerPoint

- PowerPoint Slide Creation
- Slide Layout
- Views
- Adding content to slide- Text, Graphics, Sound, Video
- Applying Slide Transition
- Custom Animation
- Slide Show
- Working With Image or ClipArt (how you edit clipart image)

Unit IV: Internet

- Introduction to internet
- ISP (Internet Services Providers)
- About Modem, Type of Internet Connection
- Web browser – its functions
- Concept of search engine, What is surfing

- Social Networking site/How to pay online bill/How to book tickets online/How to use Paytm
- Website and its types
- Searching, downloading and uploading
- Basic concepts of sending and receiving E-mail
- Blog uses and creation of blog
- How to Create Simple web page (or Personal web page)

Course Contents (Practical) :

- Creating document in MS-Word like Advertisement, Letter, Tables, Charts etc.
- Creation of Simple Worksheet like Mark sheet, Pay slip using MS-Excel.
- Creation of Power Point Presentation on various themes.

Outcome:

- Students will apply the knowledge of IT practically in their day-to-day life.
- Students will be able to create well-formatted documents, attractive presentations and calculation part through excel.
- Students will be able to create their own blog.

SUGGESTED READING/Website

1. http://www.tutorialspoint.com/computer_fundamentals/index.htm
2. <http://www.gcflearnfree.org/office>
3. Fundamentals of computers (English) Ist Edition by ReemaThareja, Oxford University Press, 2014
4. Introduction to Computer by Peter Norton, Tata McGraw hill
5. Introduction to Computer by Gary B Shelly

Semester – VII Minor (Interdisciplinary)
Course Code – BJVB 702 The Use of English

Marks 100

[70 Written Exam & 30 CIA]

Credit-4

Paper V

Course Description: The Use of English is a course designed to familiarize the students with basic tenants of English language comprising both grammar and composition.

Unit I: Basic Sentence Patterns and Transformation.

Unit II: Time, Tense and Concord.

Unit III: Voice, Narration and Modal Auxiliaries.

Unit IV: Writing Skills. (Letter, Application, Précis, Report and Essay Writing.)

SUGGESTED READING

- Green, David. *Contemporary English Grammar Structure and Composition*. Laxmi Publications; Second edition (2015)
- Hornby, A.S. *A guide to Patterns and Uses*. Oxford University Press, New Delhi.
- Swan, Michael. *Practical English Grammar*. Oxford University Press, New Delhi.
- Harit, S.K. *Communication Skills and English Grammar*. Associated Book Company, Jodhpur.
- Krishnaswamy, N. *Modern English: A Book of Grammar, Usage and Composition*. Laxmi Publications.

Semester – VII Minor (Interdisciplinary)
Course Code – BJVB 702 Non-violence and Peace

Marks 100

[70 Written Exam & 30 CIA]

Credit-4

Paper V

- Unit- I Violence: Concept, types, impact**
Non-violence- Philosophical and Historical Interpretation,
Applied aspect, Training in Non-violence
- Unit-II Conflict – Cause, Forms, Impact**
Conflict Resolution-Diplomatic, Gandhian and
Anekantik Techniques.
- Unit-III Human Nature Relationship**
Environmental Problems.
Ethical Aspects.
- Unit – IV World Peace**
Threat to Global Peace
Initiative For Peace Making

SUGGESTED READING

- विश्वशांति एवंअहिंसाप्रशिक्षण—प्रो. बच्छराजदूगड़,
- गांधीदर्शन, शांति एवंमानवाधिकार, डॉ. अनिलधर, जैनविश्वभारतीसंस्थान, लाडनूँ
- पर्यावरण अध्ययन, डॉ. सतिन्द्र सिंह
- Anekant the Third Eye, AcharyaMahapragya.
- Towards a Nonviolent Future, S.L. Gandhi(Ed.), Anuvibha, Jaipur, 2015
- Peace Studies, The Discipline and Dimensions AshuPasricha, 2003

प्राकृत
एम.ए. सेमेस्टर—द्वितीय
(FOUNDATION PAPER)

Paper V

BJVB 702 -Introduction to Prakrit

[70 Written Exam & 30 CIA]

क्रेडिट—4

पूर्णांक : 100 (70लिखितपरीक्षा + 30CIA)

इकाई—प्रथम : उत्तराययन सूत्र — अध्ययन 1 (गाथा 1—20)

इकाई—द्वितीय : उत्तराययन सूत्र — अध्ययन 1 (गाथा 25—48)

इकाई—तृतीय : प्राकृतभाषाकासामान्य परिचय

प्राकृत की उत्पत्ति एवंविकास, प्रमुख प्राकृतों की सामान्य विशेषताएँ (मागधी, अर्द्धमागधी, शौरसेनी, महाराष्ट्री एवं अपभ्रंश)

इकाई—चतुर्थ : प्राकृतसाहित्य काइतिहास

श्वेताम्बर एवंदिगम्बरआगमसाहित्य, प्राकृतकाव्य (महाकाव्य, खण्डकाव्य, ऐतिहासिक काव्य) कथा एवंचरितसाहित्य, प्राकृत गद्य एवंचम्पूसाहित्य, प्राकृतसट्टक एवंप्राकृतव्याकरणसाहित्य ।

संदर्भग्रंथ :

1. उत्तरज्झयणाणि—हिन्दीअनुवाद एवंव्याख्या साहित, संपादकआचार्यश्रीमहाप्रज्ञ, जैनविश्वभारती, लाडनूं
2. प्राकृतभाषा एवंसाहित्य काआलोचनात्मकइतिहास, नेमिचन्द्र शास्त्री, ताराप्रकाशन, वाराणसी
3. प्राकृतसाहित्य काइतिहास, डॉ. जगदीशचन्द्रजैन, चौखम्बाप्रकाशन, वाराणसी
- 4- Introduction to Prakrit, A.C. Woolner
- 5- History of Prakrit Literature, HardevBahar

Semester – I Core Foundation Paper
Course Code – BJVB 702 Introductions to Jainism
[70 Written Exam & 30 CIA]

Marks 100

Credit-4

Unit I: Jain History

2. Antiquity of Jainism (*Riabha and Mahavira*)
3. Jain religious Schools, Orders, and Sects
4. Jain Festival
5. Jain Literature

Unit II: Jain Metaphysics

6. Concept of Reality
7. Cosmology: Jain Perspective
8. The Nine Truths of Classical Jainism
9. Salvation and way of it

Unit III: Jain Principal

10. Anekantvada
11. Syadvada
12. Karmavada

Unit IV: Jain Ethics & Yoga

13. Jain Life Style : Based on Ahimsa on Aparigraha
14. Jain view of Environment
15. Jain Yoga

SUGGESTED READING

- AcharyaMahaprajna, *Jain DarshanMananAurMimansa*, AdarshSahityaSangh, Churu, 1977, (p. 1-84)
- Shastri, Kailashchandra, *Jain Dharm*, BharatvarshiyaDigamber Jain Sangh, Mathura, UP, 1985. (Chap. – 1, 4, 5, 6 and the part of Chap. 7 – p. 337 – 365)
- Jain, Jyoti Prasad, **Religion and Culture of the Jains**, BharatiyaGyanpeeth, 1999 (Chap. – 1 to 3 and 7 to 9)
- Bhaskar, Bhagchand Jain, *Jain Dharma kaMaulikItihas* SamyakgyanPracharakMandal, Jaipur. Vol 1 & 2.
- ShastriNemichandra, *TirthankaraMahaveer aura UnkiAcharyaParampara*, Vol.-I., PrachyaShramanaBharati, Mujaffar Nagar, U.P.
- SamaniRijuPrajna, *Jain ItihasaurSanskriti*, Jain VishvaBharati Institute, Ladnun
- SamaniRijuPrajna, *Jain Tattvamimansa aura AcharaMimansa*, Jain VishvaBharati Institute, Ladnun.

Multidisciplinary Course Introduction to Sanskrit

(संस्कृत का परिचय)

इकाई-१

- संस्कृतवर्णमालापरिचय
 - १. स्वरवर्ण
 - २. व्यञ्जनवर्ण
- शब्दरूप(संज्ञात्मक)

शब्द	अकारान्त	आकारान्त	इकारान्त	ईकारान्त	उकारान्त	ऋकारान्त
पुलिङ्ग	राम, बालक	-	कवि, हरि, पति	-	गुरु	पितृ, दातृ
स्त्रीलिङ्ग	-	लता	मति	नदी	धेनु	मातृ
नपुंसकलिङ्ग	फल	-	वारि	-	वस्तु	-

- शब्दरूप(हलन्त\व्यञ्जनान्त)

पुलिङ्ग	राजन्, आत्मन्, महत्, गच्छत्, ब्रह्मन्, विद्वस्
स्त्रीलिङ्ग	वाच्, सरित्, दिश्, परिषद्
नपुंसकलिङ्ग	जगत्, नामन्, मनस्, पयस्, कर्मन्

- सर्वनाम- अस्मद्, युष्मद्, तद्, यद्, एतद्, अदस्, भवत्, किम्, सर्व (तीनों लिङ्गों में)।
- धातुरूप
 - १. परस्मैपदीधातु- पठ्, भू, लिख्, अस्, गम्, खाद्, वद्, हस्, कृ, पा, दा, नी, ज्ञा।
 - २. आत्मनेपदीधातु- लभ्, सेव्, भाष्, वन्द्, मुद्, क्षम्, रम्, कम्प्।

इकाई-२

- सन्धि
 - १. स्वरसन्धि
 - २. व्यञ्जनसन्धि
 - ३. विसर्गसन्धि
- समास
 - १. अव्ययीभावसमास
 - २. तत्पुरुषसमास
 - ३. कर्मधारायसमास
 - ४. द्विगुसमास
 - ५. बहुव्रीहिसमास

६. द्वन्द्वसमास

इकाई-३

- कारक
१.कर्ता, २.कर्म, ३.करण, ४.सम्प्रदान, ५.अपादान, ६.सम्बन्ध, ७. अधिकरण
- वाच्य
१.कर्तृवाच्य, २. कर्मवाच्य, ३. भाववाच्य
- प्रत्यय
१. कृदन्त- क्त, क्तवत्, क्त्वा, ल्यप्, तुमुन्, क्तिन्, ल्युट्, तव्य/तव्यत्, अनीयर्।
२. तद्धित- मतुप्, वतुप्, अण्, घञ्, इन्, ठक्, तल्, ष्यञ्।
३. स्त्रीप्रत्यय- टाप्, डीप्, डीष्।
- अव्यय
१.स्थानवाची- अत्र, तत्र, यत्र, सर्वत्र, अन्यत्र, कुत्र, यतः, ततः।
२.समयवाची- यदा, तदा, कदा, सर्वदा, अद्य, ह्यः, श्वः, परश्वः।
३.समुच्चयवाची- च, अपि, एव
४. दिशावाची- अभितः, परितः, पुरतः, वामतः, दक्षिणतः।
५. निषेधवाची- मास्तु, अलम्, न।
६.सादृश्यवाची- इव, नु, वा, चित्।
- उपसर्ग- आ, उत्, अनु, प्र, प्रति, अव, उप, सम, अप।
- विशेष्य-विशेषणसम्बन्ध
- संस्कृत अनुवाद(हिन्दी से संस्कृत में)

इकाई-४ (संस्कृतसाहित्य का आलोचनात्मक इतिहास)

- संस्कृतसाहित्य का उद्भव और विकास
- संस्कृत साहित्य के विभिन्न विधाओं का अध्ययन
 - १. गद्यकाव्य
 - २. पद्यकाव्य
 - ३. चम्पूकाव्य
 - ४. नाटक
- संस्कृत साहित्य के प्रमुख रचनाकारों का परिचय
 - १. कालिदास
 - २. भारवी
 - ३. श्रीहर्ष
 - ४. भवभूति
 - ५. भास
 - ६. शूद्रक
 - ७. बाणभट्ट

सहायक ग्रन्थसूची :

१. रचनानुवादकौमुदी, कपिलदेव द्विवेदी, विश्वविद्यालय प्रकाशन, वाराणसी, २०२४.
२. बृहत् अनुवाद-चन्द्रिका, चक्रधर नौटीयाल “हंस” शास्त्री, मोतीलाल बनारसीदास, वाराणसी, १९६२.
३. सुगम संस्कृत व्याकरण, राकेश शास्त्री-प्रतिमा शास्त्री, पंचशील प्रकाशन, जयपुर, १९९७.
४. व्याकरणसौरमम्, कमल कमलाकान्त मिश्र, एन.सी.ई.आर.टी., नई दिल्ली, २००२.
५. संस्कृत साहित्य का इतिहास, उमाशङ्कर शर्मा(ऋषि), चौखम्बा भारती अकादमी, वाराणसी, २०१७.
६. संस्कृत साहित्य का समीक्षात्मक इतिहास, डा. कपिलदेव द्विवेदी, उत्तरप्रदेश संस्कृत अकादमी, लखनऊ, १९९३.

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC 801	Chemistry-I	CE	4	15	20	100
	Chemistry-II				20	
	Chemistry-III				20	
	Chemistry Practical				25 Practical	

PAPER 2 :- GROUP THEORY & CHEMICAL BONDING

Unit 1

Stereochemistry and bonding in main group compounds

VSEPR, Walsh Diagrams of tri and tetra atomic molecules, Bent's rule and energetics of hybridization, some simple reactions of covalently bonded molecules: atomic inversion and Berry pseudorotation.

Unit 2

Metal Ligand Bonding

Limitations of Crystal field theory, molecular orbital theory: octahedral, tetrahedral and square planar complexes, π -bonding and molecular orbital theory, explanation of position of the ligands in Spectrochemical series using MOT and Comparison with CFT.

Unit 3

Molecular Symmetry and Symmetry Groups:

Symmetry elements and operations, proper axis of symmetry & rotation, symmetry planes & reflection, center of symmetry & inversion, improper axis of symmetry & improper rotation and identity.

Definition and Theorems of Group Theory: Defining properties of Group, subgroup and classes; group multiplication tables.

Molecular Point Groups: Identification of molecular point groups, molecules of low, high & special symmetry, molecules containing multiple higher order axes, Schonflies symbols, systematic assignment of point groups. Descent in symmetry with substitution.

Unit 4

Matrix Methods in Symmetry

Introduction to matrices, types of matrices, equal matrices, matrix mathematics, block factorization of large matrices, transformation matrices.

Representations of groups by matrices (representation for the C_n , C_{nv} , C_{nh} , D_{nh} etc. groups to be worked out explicitly). Reducible and irreducible representations, Character of a representation. Great Orthogonality Theorem (without Proof) and its Importance. Construction of character tables.

Suggested Readings:

1. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.
2. Inorganic Chemistry, J.E. Huheey, Pearson.

3. Inorganic Chemistry, Shriver and Atkins, Oxford University Press
4. Modern Inorganic Chemistry, William L. Jolly, Tata McGraw Hill
5. Concepts and Models of Inorganic Chemistry, Bodie E. Douglas and Darl H. McDaniel, Oxford
6. Inorganic Chemistry, GeryWulfsberg, Viva
7. Chemistry of the Elements, N.N.Green Wood and A. Earnshow, Elsevier.
8. Inorganic Chemistry, James E house, Elsevier.
9. Chemical Applications of Group Theory. F.A. Cotton
10. Molecular Symmetry and Group Theory, Robert L Carter, John Wiley & Sons
11. Symmetry and Spectroscopy of Molecules, K Veera Reddy, New Age
12. Advanced Inorganic Chemistry, Asim K Das

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC 802	Physics-I	CE	4	15	20	100
	Physics-II				20	
	Physics-III				20	
	Physics Practical				25 Practical	

Atomic Molecular and Laser Physics:

Atomic Physics:

Dipole selection rules (examples with derivation), Natural and Doppler Broadening, Spin-orbit coupling, Hyperfine structure of lines, Anomalous Zeeman effect, Paschen-Back and Stark Effects, Application of Resonance Spectroscopy: ESR.

Rotational and vibrational Spectra:

Rotational spectra of diatomic molecule as a rigid and non rigid rotator. Vibrational spectra of a diatomic molecule as an anharmonic oscillator. A brief discussion of formation and derivation of molecular states. Vibrational structure of electronic transition : progression, sequence.

Electronic Spectra:

The Franck Condon principle. Dissociation energy. A brief discussion of Intensity alternation and missing lines in rotational spectra. Raman effect and vibrational and rotational Raman spectra of diatomic molecules.

Lasers:

Requisites for producing laser light, Longitudinal and transverse cavity modes, Mode selection, Q-switching and Mode locking Beam Characteristics in Plane and Confocal cavity resonators.

Reference Books:

1. Atomic and Molecular spectra, Laser: Rajkumar
2. Physics of Atoms and Molecules: B.H. Bransden and C.J. Joachain
3. Lasers - Theory and Applications: K. Thyagrajan and A.K. Ghatak.
4. Introduction to Atomic Spectra: H.E. White.

(B.Sc.)
Semester - VIII
Distribution of Papers, Marks and Credit

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC 803	FLUID DYNAMICS		4	15	60	100
					25 Practical	

Mathematics - FLUID DYNAMICS

Learning Objectives: This course enables the student to learn:

- ❖ The concepts of fluid, its properties and behavior under various conditions of internal and external flows.
- ❖ The fundamentals of Fluid Dynamics, which is used in the applications of Aerodynamics, Hydraulics, Marine Engineering, Gas dynamics etc.
- ❖ To imbibe basic laws and equations used for analysis of static and dynamic fluids

Unit I

Velocity, Stream Lines and Path Lines, Stream Tubes and Filaments, Fluid Body, Density, Pressure, Differentiation following the Fluid, Equation of continuity, Boundary conditions, Kinematical and physical, Rate of change of linear momentum, Equation of motion of an in viscid fluid. Euler's momentum Theorem, Conservative forces, Bernoulli's theorem in steady motion energy equation for in viscid fluid, circulation, Kelvin's theorem, vortex motion, Helmholtz equation.

Unit II

Two-Dimensional Motion, Two Dimensional Functions, Complex Potential, basic singularities, source, sink, Vortex, doublet, Circle theorem, Flow past a circular cylinder with circulation, Blasius Theorem, Lift force, (Magnus effect).

Unit III

Viscous flows, Navier-Stokes equations, Vorticity and circulation in a viscous fluid, Steady flow through an arbitrary cylinder under pressure, Steady Couette flow between cylinders in relative motion, Steady flow between parallel planes.

Unit IV

Boundary Layer concept, Boundary Layer equations, Displacement thickness, Momentum thickness, Kinetic energy thickness, integral equation of boundary layer, flow parallel to semi-infinite flat plate, Blasius equation and its solution in series.

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

- ❖ Classify and exploit fluids based on the physical properties of a fluid.
- ❖ Compute correctly the kinematical properties of a fluid element.
- ❖ Apply correctly the conservation principles of mass, linear momentum, and energy

to fluid flow systems.

- ❖ Understand both flow physics and mathematical properties of governing Navier-Stokes equations and define proper boundary conditions for solution.
- ❖ Provide the student with the basic mathematical background and tools to model fluid motion.
- ❖ Calculate the flow of an ideal fluid in a variety of situations.
- ❖ Develop a physical understanding of the important aspects that govern fluid flows that can be observed in a variety of situations in everyday life.

ReferenceBooks:

1. Milne Thomson. L.M., (1968). Theoretical Hydrodynamics, Fifth edition, Dover Publications INC, New York.
2. Curle.N., and Davies H.J., (1971), Modern Fluid Dynamics Volume-I, D Van Nostrand Company Ltd., London.
3. Yuan, S.W, (1976). Foundations of Fluid Mechanics, Prentice- Hall, India.
4. Shanthi Swarup, (2003), Fluid dynamics, Krishna Prakasan media Pvt Ltd, Meerut.
5. J.L. Bansal, Viscous Fluid Dynamics, Jaipur Publishing Houses, Jaipur.

Semester VIII- Botany

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC 804	Plant Resource Utilization	CE	4	15	60	100
					25 Practical	

Objectives :

- ❖ To acquire knowledge about utilization of plant resources .
- ❖ To understand different aspects of Biodiversity and Green revolution .
- ❖ To learn about Origin, botany, cultivation and utilization of desert plant resources .
- ❖ To know about different Principles and Strategies for Consevation.
- ❖ To apply the knowledge about utilization of plant resources in daily life.

Unit-I Biodiversity and Green revolution

Plant Biodiversity: Concept, status in India, utilization and concerns. Sustainable development: Basic Concepts. Origin of agriculture.

World centers of primary diversity of domesticated plants: The Indo-Burmese centre, plant introductions and secondary centers.

Green revolution: Benefits and adverse consequences. Plants used as avenue trees for shade, pollution control and aesthetics.

Unit-II : Desert Plant Resources

Origin, botany, cultivation and utilization of: (i) Food, forage and fodder crops, (ii) ornamental plants, plants used in sericulture, as petro crops, in narcotics, as mastigatories, fumitories and fiber crops, (iii) medicinal and aromatic plants (iv) vegetables, fruits, spices condiments and oil yielding crops (v) Important fire-wood and timber- yielding plants and non-wood forest products (NWFPs) such as bamboos and rattans. Raw materials for paper making, gums, tannins, dyes and resins.

Unit-III : Principles and Strategies for Consevation

Principles of conservation: Extinctions, environmental status of plants based on International Union for Conservation of Nature (IUCN).

Strategies for conservation– *in situ* conservation: International efforts and Indian initiatives, protected areas in India- sanctuaries, national parks, biosphere reserves, wetlands, mangroves and coral reefs, conservation of wild biodiversity.

Strategies for conservation – *ex situ* conservation: Principles and practices, botanical gardens. Field gene banks, Seedbanks, *in vitro* repositories and cryobanks.

Unit-IV : Institutes for Consevation

General account of the activities of Botanical Survey of India (BSI), National Bureau of plant Genetic Resources (NBPGR), Indian Council of Agriculture Research (ICAR), AYUSH (Ministry of Ayurveda, Yoga and Naturipathy, Unani,Siddha and Homeopathy), Indian Spice Board, Council

of Scientific and Industrial Research (CSIR) and Department of Biotechnology (DBT) for conservation and non formal conservation efforts.

Suggested Laboratory Exercises

The practical course is divided into three units (1) Laboratory work, (2) Field survey and (3) Scientific visits

Laboratory Work

Food crops : Wheat, rice, maize, chickpea (Bengal gram), Potato, Sweet

Potato, Sugarcane: Morphology, anatomy, Biochemical tests for stored food materials

Forage fodder crops: Study of any five important crops of the locally available (for example fodder, sorghum, Bajra, khejari Ardu, Zizyphus)

Plant fiber: Cotton, Jute, hemp, sunn hemp, Cannabis, Kapok: Morphology anatomy, microscopic study of whole fibre using appropriate staining procedure.

Medicinal and aromatic Plants: Depending on the geographical location; Papaver somniferum, Catharanthus roseus, Adhatoda cylanica, Allium sativum, Rauwolfia serpentine, Withania somnifera, Phyllanthus amarus, P. fratermus, Andrographis paniculata, Aloe Berbadadens, Mentha arvensis, Rosa spp. Pogostemon cablin, Origamom vulgare,, Vetiveria zizinioides.

Study of live or herbarium specimens or other visual materials to become familiar with these resources.

Vegetable oils: Mustard, groundnut, Soyabean, coconut, sunflower, castor.

Morphology, microscopic structure of the oil yielding tissues. test for oil and iodine number.

Gum, resins, tannins, dyes : perform simple test for gums and resins. prepare a water extract of vegetable tannins (Acacia, terminalia, tea, cassia spp.) and dyes (Turmeric, Indigo, Butea, lawsonia) and perform test to understand their chemical nature.

Field survey-

1. Prepare a short list of 10 most important sources of fire wood and timber in your locality. Give their local names, scientific names and families to which they belong. Mention their properties.
2. A survey of a part of the town or city should be carried out by the entire class to make the student aware about the vegetation characteristics of particular area in city or town.

Scientific visits

The students should be taken to one of the following:

1. A Protected area (Biosphere reserve, National park and Sanctuary)
2. A Wetland
3. Mangroove

Learning Outcomes : After completion of the course student would be able to-

- ❖ Acquire knowledge about utilization of plant resources.
- ❖ Understand different aspects of Biodiversity and Green revolution.
- ❖ Describe Origin, botany, cultivation and utilization of desert plant resources.
- ❖ Explain different Principles and Strategies for Conservation.
- ❖ Interpret about utilization of plant resources in daily life.

Suggested Readings

1. Anonymous 1997. National Gene Bank: Indian Heritage on Plant Genetic Resources (Booklet). National Bureau of Plant Genetic Resources, New Delhi.
2. Arora, R.K. and Nayar, E.R. 1984. Wild Relatives of Crop Plants in India. NBPGR Science Monograph No. 7.
3. Baker, H.G. 1978. Plants and Civilization (3rd edn.) C.A. Wadsworth, Belmont. 41.
4. Bole, P.V. and Vaghani, Y. 1986. Field Guide to Common Indian Trees. Oxford University Press, Mumbai.
5. Chandel, K.P.S., Shukla, G. and Sharma, N. 1996. Biodiversity in Medicinal and Aromatic plants in India :Conservation and Utilization. National Bureau of Plant Genetic Resources, New Delhi.
6. Conway, G. 1999. The Doubly Green Revolution : Food for All in the 21st Century. Penguin Books.
7. Council of Scientific and Industrial Research 1986. The Useful Plants of India. Publications and Information Directorate, CSIR, New Delhi.
8. Gadgil, M. and Guha, R. 1996. Ecology and Equity : Use and Abuse of Nature in Contemporary India. Penguin, New Delhi.
9. Kocchar, S.L. 1998. Economic Botany of the Tropics, 2nd edition. Macmillan India Ltd., Delhi.
10. Kothari, A. 1997. Understanding Biodiversity : Life Sustainability and Equity. Orient Longman.
11. Kohli, R., Arya, K.S., Singh, P.H. and Dhillon, H.S. 1994. Tree Directory of Chandigarh, Lovdale Educational, New Delhi.
12. Paroda, R.S. and Arora, R.K. (1991). Plant Genetic Resources Conservation and Management. IPGRI (Publication) South Asia Office, C/o NBPGR. Pusa Campus, New Delhi.
13. Pimentel, D. and Hall, C.W. (Eds.) 1989. Food and Natural Resources, Academic Press, London, New York.
14. Plant Wealth of India 1997. Special Issue of Proceedings Indian National Science Academy B-63.
15. Plucknett, D.L., Smith, N.J.H., William, J.T. and Murti Annishetty, N. 1987. Gene Banks and Worlds Food. Princeton University Press, Princeton, New Jersey, USA.
16. Rodgers, N.A. and Panwar, H.S. 1988. Planning a Wildlife Protected Area Network in India. Vol. I. The Report. Wildlife Institute of India, Dehradun.
17. Sahni, K.C. 2000. The Book of Indian Trees. 2nd edition. Oxford University Press, Mumbai.

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Total
BBSC 805	Zoology-I	CE	4	15	20	100
	Zoology-II				20	
	Zoology-III				20	
	Zoology Practical				25 Practical	

SEM- VIII

CELLULAR MECHANICS

Objectives: Learning Outcomes of the course “(Cellular mechanics)”: On completion of the course, students are able to:

1. Understand about the Programmed Cell Death the Events of Apoptosis
Central Regulators of Apoptosis: The & l-2 Family.
2. Understand about Types of Cancer Causes of Cancer
3. Understand the General wear and tear and genetic instability. Free radicals, oxidative damage and antioxidants
4. Understand about the Stem Cells Cloning

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

1. Understand the Programmed Cell Death the Events of Apoptosis
2. Central Regulators of Apoptosis: The & l-2 Family
3. Discuss the Absorption & Distribution of Toxicology, Metabolism of Toxicants.
4. Understand Oxidation, Reduction, Hydrolysis and Enzyme Reaction.
5. Discuss the Hepatotoxicity, Nephrotoxicity Pulmonary toxicity and Nervous system.

UNIT I--Cell Death and Cell Renewal

1. Programmed Cell Death
- 2.the Events of Apoptosis
- 3.Caspases: The Executioners of Apoptosis
4. Central Regulators of Apoptosis: The & l-2 Family

UNIT II-- Cancer

1. Types of Cancer
2. the Development of Cancer
- 3.Causes of Cancer
- 4.Properties of Cancer Cells

UNIT III---Aging: The biology of senescence

1. Maximum life span and life expectancy.
2. Causes of aging.
 - (a) General wear and tear and genetic instability
 - (b) Free radicals, oxidative damage and antioxidants
 - (c) Telomerase and aging

UNIT IV--Stem Cells and the Maintenance of Adult Tissues

- 1.Stem Cells
- 2.Medical Applications of Adult Stem\

3. Cloning
4. Somatic Cell Nuclear Transfer

Practical:

1. Radioresponse of tumors
1. 2. Chemoprevention of chemical carcinogenesis
3. Morphological, histopathological, and biochemical studies of various cancerous tissues.
4. Study of Pre-cancerous and cancerous lesions of oral cancer, Breast cancer, Cervix cancer, prostate cancer etc.
5. Visits to the Radiotherapy Department, S.M.S. Medical College, Jaipur: Rajasthan

References:

1. Cell and Molecular Biology; De Robertis and De Robertis; Saunders College
2. Cell Biology; Powar, C.B.; Himalaya Publications.
3. Molecular Biology of the gene; Watson J.D; Benjamin/ Cummings
4. Molecular Biology of the Gene. I.D Watson, N.H. Hopkins, J.W. Roberts, J.A. Steiz and AM Weiner The Benjamin/Cummings Pub. Co., Inc., California.
5. Molecular Cell Biology, J. Darnell H. Lodish and D. Baltimore Scientific American Books, Inc., USA.
6. Molecular Biology of the cell. B. Alberts, D.D. Bray, J. Lewis, M. Rafif, K. Roberts and J.D. Watson. Garland Publishing inc., New York.
7. Gene IV, Benjamin Lewin. Oxford University Press, UK.
8. Molecular Biology and Biotechnology. A comprehensive desk reference, R.A. Meyers (Ed.), VCH Publishers, Inc., New York.
9. Molecular Cloning: A Laboratory Manual, J. Sambrook, E.F. Fritsch and T. Maniatis, Cold Spring Harbor Laboratory Press, New York.
10. Introduction to Practical Molecular Biology, P.D. Dabre, John Wiley & Sons Ltd. New York.
11. Molecular Biology Lab Fax, T.A. Brown (Ed.), Bios Scientific Publishers Ltd., Oxford

SEMESTER- VIII (Minor)
(ANY ONE)

Course Code	Course Title	Course Category	Credit	Departmental Presentation	CIA	Theory	Total
BJVB 801	Review of Literature	Research	4	50	15	35	100

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

- ❖ Decipher the concept, source and types of literature.
- ❖ Development of research writing skills.
- ❖ Understand the concept of seminar and workshop.
- ❖ Development of understanding method of reviewing literature.

Theory (2 Credits)

UNIT-I Review of Literature

- a) Meaning, Nature of Literature Review
- b) Significance of Literature Review
- c) Principles of Literature Review
- d) Identification of Research gaps through Literature Review

UNIT II Sources of Literature

Sources of Literature:

- a) Primary
- b) Secondary
- c) Tertiary

Practical (2 Credits)

Collection of Review of Literature on concerned subject (minimum 15 including books, journals, digital sources and encyclopedias)

Work Cited :

- Ferguson, G.A. (1971), Statistical Analysis in Psychology and Education, Kogakusna, Tokyo : McGraw-Hill.
- Garrett, H.E. (1971), Statistical in Psychology and Education, New Delhi: Paragon International Publisher.
- Guilford, J.P. &Fruchter, B. (1981), Fundamental Statistical in Psychology and Education, New York: McGraw-Hill.
- Mangal, S.K. (2008), Statistical in Psychology and Education, New Delhi: Prentice Hall of India Private Limited.
- McCall, R. (1993), Fundamental Statistics for the Behavioural Science. New York: Harcourt Brace.
- Ravid, Ruth. (2000), Practical Statistics for Education. New York: University Press of America
- Seigel, S. & Castel Ian N.J. (1988), Non-parametric statistics for the Behavioural Science. Singapore: Graw-Hill Book Co.

Formulation of Research Proposal

Course Code	Course Title	Course Category	Credit	Prop osal For mula tion	CIA+ Theory	Total
BJVB 801	Formulation of Research Proposal	CC	4	50	15+35=50	100

Learning Outcomes: After completion of this course students will able to:

- ❖ Develop the research design
- ❖ Understand various research steps
- ❖ Explain the various research methods and techniques

UNIT-1: Research Design Quantitative-I

- a) Selection of research problem
- b) Review of related literature
- c) Objectives of research
- d) Formation of hypothesis

UNIT-2: Research Design Quantitative-II

- a) Procedure of Data collection, classification and tabulation
- b) Variables
- c) References - Footnote, Bibliography

Work Cited:

- Anderson, R.I., and T.A. Banerot (1952), Statistical Theory of Research, New York, McGraw Hill Book Company.
- Ferguson, G.A. (1971), Statistical Analysis in Psychology and Education, Kogakusna, Tokyo : McGraw-Hill.
- Garrett, H.E. (1966), Statistical in Psychology and Education, VokelsFeffers and Simons Ltd., Bombay
- Garrett, H.E. (1971), Statistical in Psychology and Education, New Delhi: Paragon International Publisher.
- Guilford, J.P. &Fruchter, B. (1981), Fundamental Statistical in Psychology and Education, New York: McGraw-Hill.
- Kerlinger, Fredan N. (1964), Foundations of Behavioral Research, Holt Rinherth and Winston, New Yourk
- Mangal, S.K. (2008), Statistical in Psychology and Education, New Delhi: Prentice Hall of India Private Limited.
- McCall, R. (1993), Fundamental Statistics for the Behavioural Science. New York: Harcourt Brace.
- Ravid, Ruth. (2000), Practical Statistics for Education. New York: University Press of America
- Seigel, S. & Castel Ian N.J. (1988), Non-parametric statistics for the Behavioural Science. Singapore: Graw-Hill Book Co.
- Sharma, R.A. (1993), Fundamental of Educational Research, International Publishing House, Meerut,
- गुप्ता एस.पी. (2011), अनुसंधानसंदर्शिका, सम्प्रत्यय, कार्यविधि एवंप्रविधि, शारदापुस्तकभवन, इलाहाबाद ।
- यादव, राकेशचन्द (2009), राजर्षिपुरुषोत्तमदासदण्डन के शैक्षिकविचार, प्रथमसंस्करण, उत्तरप्रदेशराजर्षिदण्डनमुक्तविश्वविद्यालय, इलाहाबाद ।
- कौल, लौकेश, (2009), शैक्षिकअनुसंधान की कार्यप्रणाली, तृतीय पुर्नमुद्रण, विकासपब्लिशिंगहाउसप्रा. लि., नईदिल्ली ।

गुप्ता एस.पी. एवंअलकागुप्ता (2008), व्यवहारपरकविज्ञानोंमेंसांख्यिकी विधियां, चतुर्थसंस्करण, शारदापुस्तकभवन, इलाहाबाद ।

पाण्डेय, के.पी. (2008), शैक्षिकअनुसंधान, तृतीय संस्करण, विश्वविद्यालय प्रकाशन, वाराणसी ।

राय, पासरनाथ (2007), अनुसंधानपरिचय, द्वादशमसंस्करण, लक्ष्मी नारायण अग्रवाल, आगरा ।

गैरिट, हेनरीई. (1989), शिक्षाऔरमनोविज्ञानमेंसांख्यिकीय, ग्यारहवांहिन्दीसंस्करण, कल्याणीपब्लिशर्स, लुधियाना ।

सिन्हा, एच. सी. (1979), शैक्षिकअनुसंधान, विकासपब्लिशिंगहाउसप्रा. लि., नईदिल्ली ।

Course Code	Course Title	Group	Course Category	Credit	Mark			Total
JVB802	Paper Publication/Presentation of Paper At National Level seminar/conferences	A	Core Course	4	50+50			100

SEMESTER-VIII (Major)

In this paper there is no theory examination. In this paper following action should be taken.

- 1- Two research articles should be published in two different ISSN based research magazine. (2 Credits)
- 2- Participation and presentation of two paper in national level seminars/conferences. (2 Credits)

Course Code	Course Title	Group	Course Category	Credit	Mark			Total
JVB802	Research Project/Dissertation	A	Core Course	8	200			200

SEMESTER-VIII

In this paper there is no theory examination. This paper contains following evaluation methodology-

1- Preparation of Dissertation - 4 Credit Marks-100

2- Dissertation Presentation and Viva-Voce - 4 Credit Marks-100