जैन विश्वभारती संस्थान,लाडनूँ

(मान्य विश्वविद्यालय)

आचार्य कालू कन्या महाविद्यालय

पाठ्यक्रम

बी.एससी. स्नातक विज्ञान वर्ग

सी.बी.सी. सिस्टम

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Acharya Kalu Kanya Mahavidhyalaya, Jain Vishva Bharati Institute, Ladnun
Distribution of Papers, Marks and Credit
Semester-I

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Practical	Total
BSC 101	For Science Students Any Three of the following Course to offer Chemistry-I	**Any Three** **CC**	4	15	20	25	100
	Chemistry-II				20		
	Chemistry-III				20		
BSC 102	Physics-I	**CE***			20		100
	Physics-II				20		
	Physics-III		4	15	20	25	
BSC 103	Mathematics-I	**CE***			20		100
	Mathematics-II		4	15	20	25	
	Mathematics-III				20		
BSC 104	Botany-I	**CE***			20		100
	Botany-II				20		
	Botany-III		4	15	20	25	
BSC 105	Zoology-I	**CE***	4	15	20	25	100
	Zoology-II				20		
	Zoology-III				20		
JVB 101	General English	**Core Foundation(CF)**	4	30	70	-	100
JVB 102	अहिंसा एवं शांति (अहिंसा एवं अणुव्रत)	**Core Elective (CE)**	4	30	70		100
		Total	20	105	300	95	500

* Either BSC 102 & 103 Or BSC 104 & 105

Semester-II

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Practical	Total
BSC 201	For Science Students Any Three of the following Course to offer Chemistry-I	**Any Three** **CC**	4	15	20	25	100
	Chemistry-II				20		
	Chemistry-III				20		
BSC 202	**Physics-I**	CE*	4	15	20	25	100
	Physics-II				20		
	Physics-III				20		
BSC 203	Mathematics-I	CE*	4	15	20	25	100
	Mathematics-II				20		
	Mathematics-III				20		
BSC 204	Botany-I	CE*	4	15	20	25	100
	Botany-II				20		
	Botany-III				20		
BSC 205	Zoology-I	CE*	4	15	20	25	100
	Zoology-II				20		
	Zoology-III				20		
JVB201	जैन संस्कृति एवं जीवन मूल्य (अनिवार्य पत्र)	Core Foundation(CF)	4	30	70		100
JVB202	अहिंसा एवं शांति (मानवाधिकार एवं कर्त्तव्य)	Core Elective (CE)	4	30	70		100
		Total	20	105	280	115	500

 * Either BSC 202 & 203 Or BSC 204 &205

Semester-III

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Practical	Total
BSC 301	For Science Students Any Three of the following Course to offer Chemistry-I	**Any Three** **CC**	4	15	20	25	100
	Chemistry-II				20		
	Chemistry-III				20		
BSC 302	Physics-I	**CE***			20		100
	Physics-II				20		
	Physics-III		4	15	20	25	
BSC 303	Mathematics-I	**CE***			20		100
	Mathematics-II		4	15	20	25	
	Mathematics-III				20		
BSC 304	Botany-I	**CE***			20		100
	Botany-II				20		
	Botany-III		4	15	20	25	
BSC 305	Zoology-I	**CE***	4	15	20	25	100
	Zoology-II				20		
	Zoology-III				20		
JVB301	हिन्दी (अनिवार्य पत्र)	**Core Foundation(CF)**	4	30	70	-	100
JVB 302	Indian Culture	**Core Elective**	4	30	70		100
		Total	20	105	320	75	500

* Either BSC 302 &303 Or BSC 304 &305

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Practical	Total
BSC 401	For Science Students Any Three of the following Course to offer Chemistry-I	**Any Three** **CC**	4	15	20	25	100
	Chemistry-II				20		
	Chemistry-III				20		
BSC 402	**Physics-I**	CE*	4	15	20	25	100
	Physics-II				20		
	Physics-III				20		
BSC 403	Mathematics-I	CE*	4	15	20	25	100
	Mathematics-II				20		
	Mathematics-III				20		
BSC 404	Botany-I	CE*	4	15	20	25	100
	Botany-II				20		
	Botany-III				20		
BSC 405	Zoology-I	CE*	4	15	20	25	100
	Zoology-II				20		
	Zoology-III				20		
JVB 401	पर्यावरण (अनिवार्य पत्र)	Core Foundation(CF)	4	30	50	20	100
JVB 402	Modern Indian Thinkers and Social Reforms	Core Elective	4	30	70		100
		Total	20	105	300	95	500

* Either BSC 402 &403 Or BSC 404 & 405

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Practical	Total
BSC 501	For Science Students Any Three of the following Course to offer Chemistry-I	**Any Three** **CC**	4	15	20	25	100
	Chemistry-II				20		
	Chemistry-III				20		
BSC 502	**Physics-I**	CE*	4	15	20	25	100
	Physics-II				20		
	Physics-III				20		
BSC 503	Mathematics-I	CE*	4	15	20	25	100
	Mathematics-II				20		
	Mathematics-III				20		
BSC 504	Botany-I	CE*	4	15	20	25	100
	Botany-II				20		
	Botany-III				20		
BSC 505	Zoology-I	CE*	4	15	20	25	100
	Zoology-II				20		
	Zoology-III				20		
JVB 501	**Basics of Computer (Compulsory Paper)**	Core Foundation(CF)	4	30	50	20	100
JVB 502	**Psychology (General Psychology-I)**	Core Elective(CE)	4	30	50	20	100
		Total	20	105	280	115	500

* Either BSC 502 & 503 Or BSC 504 & 505

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Practical	Total
BSC 601	For Science Students Any Three of the following Course to offer Chemistry-I	Any Three CC	4	15	20	25	100
	Chemistry-II				20		
	Chemistry-III				20		
BSC 602	Physics-I	CE*	4	15	20	25	100
	Physics-II				20		
	Physics-III				20		
BSC 603	Mathematics-I	CE*	4	15	20	25	100
	Mathematics-II				20		
	Mathematics-III				20		
BSC 604	Botany-I	CE*			20		100
	Botany-II				20		
	Botany-III		4	15	20	25	
BSC 605	Zoology-I	CE*	4	15	20	25	100
	Zoology-II				20		
	Zoology-III				20		
JVB 601	Vyaktitava Vikas & Yoga	Core Foundation	4	30	70		100
JVB 602	Psychology (General Psychology-II)	Core Elective(CE)	4	30	50	20	100
		Total	20	105	280	115	500

* Either BSC 602 &603 Or BSC 604 & 605

Distribution of Papers, Marks and Credit
Semester-I

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

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 differet 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 :Periodicityofp-blockelements & Chemistry ofnoblegases

Comparativestudyofp-blockelements:grouptrends,electronicconfiguration,atomicand

ionicradii,ionizationenergy,electronaffinity,electronegativity,oxidationstates, inertpaireffect.

Introductionofnoblegases,Chemical propertiesofthenoble gases,compoundsofnoblegases,chemistryof xenon,structureand bonding of xenoncompounds.

Unit 3 :ChemicalBondingPartI

Introductionofchemicalbonding,propertiesofcovalentbond,valence bond theory and its limitations,directionalcharacteristics ofcovalentbond,hybridization, energeticsofhybridisation andshapesofdifferent

moleculesandions,Valenceshellelectronpairrepulsion(VSEPR)theorytoSnCl$_2$,H$_3$O$^+$,NH$_3$, H$_2$O,TeCl$_4$,ClF$_3$, ICl$_2^-$

Unit 4 : ChemicalBondingPartII

Linearcombinationofatomicorbitals,typesofmolecular orbitals,MOtheory for homonuclear molecules andions(H$_2$+toNe$_2$),molecular orbitaltheoryfor heteronuclear molecules (CO,NO)multicentre bonding inelectron deficientmolecules, bondstrength andbondenergy,dipolemoment,percentage ioniccharacterfrom dipolemomentandelectronegativitydifference.

Learning Outcomes: After complition the course student would 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 ofchemical 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 alkyns.

Unit-I :Mechanismoforganicreaction

Homolytic andheterolytic bondbreaking,Typesofreagents,electrofilesandnucleofiles.Typesoforganic reactions,energyconsiderations,reactiveintermediates-Carbocations,carbanions,free radicals,carbenes,arynesandnitrenes withexamples.Assigningformalchargesonintermediatesandotherionicspecies.Methodofdetermination ofreaction mechanism(productanalysis,intermediates,isotopeeffect,kineticandstereochemicalstudies)

Unit-II : Alkanes& Cycloalkanes

IUPACnomenclatureofbranchedandunbranchedalkanes.Thealkylgroup. Isomerisminalkanessources, methodsofformation(withspecialreferenceofWurtzreaction,Kolbereaction,CoreyHousereactionanddecarboxy lation ofcarboxylicacids.)Physicalpropertiesandchemicalreactionsofalkanes,Mechanism offreeradicalhalogenationsof alkanes,orientation,reactivityandselectivity.
Nomenclature,methodofformation,chemicalreactions,Baeyerstraintheoryanditslimitations.Ringstrain insmallrings(cyclopropaneandcyclobutane),theoryof strainlessrings.

Unit-III :Alkenes & Cycloalkenes

Nomenclatureofalkenes,methodsofformation,mechanismsofdehydrationofalcoholsanddehydrohalogenation ofalkylhalides,regioselectivity inalcoholdehydrations.TheSaytzeffrule,Hofmannelimination.Physicalpropertiesand relativestabilitiesofalkenes.Chemicalreactionsofalkenes— mechanisminvolvedinhydrogenations,Markownikoffsrule, hydroboration–oxidation,oxymercuration-reduction.Epoxidation,ozonolysis,hydration,hydroxylationandoxidationwith KMnO4,polymerization ofalkenes.Subsititutionattheallylicandvinylicpositionofalkenes.Industrialapplicationsof ethyleneandpropene. Methodofformation,conformationandchemicalreactionsofcycloalkenes.

Unit-IV Dienes &Alkynes

Nomenclature andclassification ofdienes,isolated,conjugatedandcumulateddienes,Structureofallenesand butadiene,methodsofformation,polymerization,chemicalreactions,1,2and1,4-additions,Diels-Alderreaction. Nomenclature, structure andbonding inalkynes,methodsofformation.Chemicalreactionsofalkynes,acidityof alkynes.Mechanismofelectrofilicandnucleofilicadditionreactions,Hydroboration-oxidation,metal– ammoniareduction, oxidationandpolymerisation.

Learning Outcomes: After complition the course student would 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 reacitivity and theories.
- ❖ Apply the mechanism of chemical reaction for explaning chemical bonding, nomenclature of various compounds.

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 :GaseousStates1
Gaseous lawsandtheirderivations,postulate ofkinetictheoryofgasesanditsderivation,deviationfrom idealbehavior,(withrespecttopressureandvolume),VanderWaalsequationofstate

Unit-III : GaseousStates2
Criticalphenomenon:PVisothermofrealgases,continuity ofstate,theisothermsofVanderWaals equation,relationshipbetweencriticalconstantandVander-Waalsconstant,

thelawofcorrespondingstates,reduced equationofstate.

Rootmeansquare,averageandmostprobablevelocity.QualitativediscussionoftheMaxwell`sdistribution ofmolecular velocities,collisionnumber,meanfreepathandcollisiondiameter.Liquificationofgases.

Unit-IV :Liquidstate
Intermolecularforces,structureofliquids(aqualitativedescription).Structuraldifferencesbetweensolid,

liquidandgases. Liquidcrystals:differencebetweenliquidcrystal,solidandliquid.

Classification,structureandapplication ofliquidcrystal

Learning Outcomes: After complition 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

QualitativeAnalysis:Semimicroanalysis;separationandidentificationofthreecationsandthreeanions inthegiven inorganic mixture, specific testsforsome typical combination of acid radicals.

Physical chemistry

Viscosity, SurfaceTension

1. Todeterminethepercentagecompositionofagivenmixture(non-interactingsystems)by viscositymethod.
2. To determinethe relativeviscosityofgiven unknown organic liquid byviscometer.
3. To determinethe relativesurfacetension ofgivenunknown organic liquid bystalagmometer.
4. To determinethepercentagecomposition ofagivenbinarymixturebysurfacetension method.

Viva-VoceandRecord

Suggested Reading:

1. कार्बनिक रसायन, सुरेश आमेटा, एच.के. पाण्डे, एच.एस. शर्मा, पींकी 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

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

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 betweendifferent frames of reference involving translation. Galilean transformation and invariance of Newton's law. Noninertialframes, fictitous or pseudo forces, Transformation of displacement, velocity and acceleration betweenrotating 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, Timedilation 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 motionunder conservation forces. Discussion of potential energy curves and motion of a particle. Conservation of angularmomentum about an arbitrary point, Precessional motion of spinning top, Spin precession in constant magneticfield.

UNIT-IV Rigid Body Dynamics:

Equation of motion of a rotating body, inertial coefficients, case of J not parallel to w, kinetic energy of rotation andidea of principle axis. Calculation of moment of inertia of a disc, spherical shell, hollow and solid spheres andcylindrical 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 Lecures 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

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 ofenergy and linear momentum, Collision of two particles in one and two dimensions (elastic and inelastic), Analysisof collision in centre of mass frame. Slowing down of neutrons in moderator. System with varying mass. Angularmomentum 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 undern 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.

Learning Outcomes: After complition 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.

Suggested Readings :
1. Berkeley Physics Course Vol. 1, Mechanics (Mc Graw-Hill)
2. The Feynman Lecures 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-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 indifferential form, Gauss law from inverse square law, physical meaning of divergence of a vector, The Laplacianoperator. Possion'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 differenceand potential function. Potential energy of a system. Application: energy required to build a uniformly chargedsphere. Classical radius of the electron, potential and field due to a short dipole, torque and force on a dipole in a Zexternal field.

UNIT -III The Field of Moving Charge:

Magnetic force, Measurement of charge in motion, Invariance of charge. Electric field measured in different framesof reference, Field of a point charge moving with constant velocity, Force on a moving charge, Interaction between amoving 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. Poissions equation for vector potential. Field of any currentcarrying wire and deduction of Bio-Savart law.

Learning Outcomes: After complition 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 powertransfer theorem.
2. To study the variation of charge and current in a RC Circuits with different time constant (using a DCsource).
3. To study the behaviour of an RC Circuits with varying resistance and capacitance using AC mains as aPower 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 reverseresistances.
7. To study the magnetic field along the axis of a current carrying circular coil. Plot the necessary graph andhence find the radius of the circular coil.
8. To determine the specific resistance of a materials and determine difference between two small resistanceusing 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

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

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 Z, Congruences, Chinese Remainder Theorem, Euler's function, primitive roots.

Unit 4: Logic and Propositional Calculus, Propositions, Simple and compound, Basic Logial _,--eperations, Truth tables, Tautolo ies and contradictions Propositional Functions. quantifiers.

Learning Outcomes: After complition 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 complition 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, 1. 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 complition 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 Dimenssions, Pothishala Pvt. Ltd., Allahabad, 1992.
2. P.K. Jain and Khalil Ahmed, A Text Book of Analytical geometry of Three Dimenssions, 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	Practical	Total
BSC 104	Botany-I				20	25	100
	Botany-II	CE*	4	15	20		
	Botany-III				20		

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 Janner), 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 Archaebacteria 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 complition 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.
- Presscott, 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, Volvox, Chara.*
Xanthophyceae: General characteristics, *Vaucheria*: Thallus organization, cell structure, reproduction and life cycle.

UNIT III: Phaeophycae and Rhodophyceae:
Phaeophycee: 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 complition 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.
2. Ghemawat, M. S., Kapoor, J. N. and Narayan, H. S. 1976. A Text book of Algae. Ramesh Book Depot., Jaipur.
3. Gilbart, M. S. 1985. Cryptpogamic Botany. Vol. I and II second edition. Tata McGra Hill Publishing Co. Ltd., New Delhi.
4. Kumar, H. D. 1998. Introductory Phycology. Affiliated East-West Press Ltd., New York.
5. Lee, R.E. 2008. Phycology. Fourth Edition, Cambridge University Press, USA.
6. Sambamurthy, A.V.S.S. 2006. A Textbook of Algae. I. K. International Pvt. Ltd., New Delhi.

7. Singh.V., Pandey, P. C. and Jain, D. K. 2001. A Text book of Botany. Rastogi Publication, Meerut.
8. Thakur, A. and Bassi, S., 2007. Diversity of microbes and Cryptogams. S. Chand and Co., New Delhi.
9. Van den Hoek, C., Mann, D.J. and Jahns, H.M. 1995. Algae: An introduction to Phycology. Cambridge Univ. Press., England.
10. 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 (Alexopoulus 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 andMLOs(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* (Downey 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 *Alterneria (early blight of potato disease),* sex degeneration in fungi and economic importance of fungi.

Learning Outcomes: After complition the course student would 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 .
❖ Larn 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, Ectocapus, 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.

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

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 inCoelenterates

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 complition 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 fasciala.
- ❖ Discuss the sycom canal sysem 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: Palemon: -Morphology, Digestive, Excretory, & Reproductive systems.

Unit II:

2.2Mollusca:

General characters and outline classification up to classes with examples.

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

Unit III:

3.1Echinodermata:

General characters and outline classification up to classes with examples.

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

Unit IV:

a. **Hemichordata:**

General characters and outline classification up to classes with examples.

4.2 Salient features of Balanoglossus

Learning Outcomes: After complition 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.
- ❖ Classifiy in salient features of banlanoglessus

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 an 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

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 complition 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 recticulum structure .
❖ Studetns 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, Paramoecium, Paramoecium showing Binary fission, Paramecium Conjugation, Balantidium, Nyctotherus, Vorticella

II. <u>Porifera:</u> Sycon, Leucosolenia, Hyalonema, Euplectella, Spongilla

III. <u>Coelenterata</u> : Obelia Colony & Medusa, Millepora, Physalia, Vellela, Aurelia, Alcyonium, Gorgonia, Pennatula, Metridium, Stone Corals

V. <u>Ascheliminthes</u> : Ascaris, Drancunculus, Ancylostoma, Wuchereria

2. Study of Permanent Slides

I. <u>Porifera:</u> Sponge gemmules, Sponge spicules,V.S. Sycon, T.S. Sycon,

II. <u>Coelenterata:</u> Obelia medusa, Obelia Colony

III. <u>Platyhelminthes:</u> Miracidium, Sporocyst, Redia and Cercaria, Metacercaria larvae of Fasciola, Hexacanth and Onchosphere larvaa of Taenia solium, Scolex ofTaenia, Mature and gravid proglottids ofTaenia solium.

3. External features and Anatomy through audio visual presentation

I. <u>Cockroach:</u> External features, Mouth parts, Digestive, nervous and reproductive system

II. <u>Earthworm:</u> 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, Cysticerca/Locust, Dragonfly, Queen Termite, Cymax, Moth/ Butterfly,

II. Mollusca : Chiton, Dentalium, Cyprea, Pila, Aplysia, Mytilus, Pincteda, 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. Majupuria 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

15. A manual of Practical Zoology Invertebrates – P. S. Verma
16. 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 Genetices, College Book Center, Jaipur
10. K.C. Soni, 2008, Cell Biology and Genetices, College Book Center, Jaipur

Course Code	Course Title	Course Category	Credit	C.I.A. (Continous Internal Assesment)	Theory+Practical	Total
JVB 101	General English	Core Foundation(CF)	4	30	70	100

Objective:

1. Students will be able to recognize and understand the meaning of targeted grammatical structures in written and spoken form.
2. Students will practice the grammar skills involved in writing sentences and short paragraphs.

Unite -I Grammar and Usage :

1. Parts of Speech
2. Basic Sentence Patterns
3. Sentences beginning with 'It' and 'There'
4. Tenses
5. Phrasal Verbs
6. Articles and other Determiners
7. Direct & Indirect Speech
8. Active and Passive Voice
9. Modal Auxiliaries
10. Simple, Complex and Compound sentences.

Unite -II Book : A Cavalcade of Modern English Prose

   Essays :

   (1) Essentials of Education (2) Testament

Unite -III Writing Skills

   (1) Paragraph Writing   (2) Letter & Application Writing

Unite -IV Vocabulary

   (1) Word often confused   (2) Antonyms and Synonyms

Outcome:

1. Students will begin to self-edit their oral and written production.
2. Students will make less grammatical errors.
3. Students will become clear of grammatical terms.
4. Students will get exposure of writing letters, application and paragraph.

Books :

1. A Textbook of General English for Undergraduate students by R.P. Bhatnagar, Rajul Bhargava, Jain Prakashan Mandir, 1024, Shinghiji ki Gali, Chaura Rasta, Jaipur-302 002.
2. English Grammar, Composition and Reference skills by R.P. Bhatnagar & Rajul Bhargava, Board of Secondary Education, Ajmer.
3. Text Book: A Cavalcade of Modern English Prose, R.P. Bhatnagar, Jain Pustak Mandir, Chaura Rasta, Jaipur.
4. R. Quirk et al (ed.) A Grammar of Contemporary English. Longman, London, 1972.
5. English for Indian Learners by R.P. Bhatnagar, University book house, (P), Jaipur.

Course Code	Course Title	Course Category	Credit	C.I.A. (Continouns Internal Assesment)	Theory	Total
JVB 102	अहिंसा एवं शांति (अहिंसा एवं अणुव्रत)	Core Elective (CE)	4	30	70	100

उद्देश्य–

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

इकाई–1

अणुव्रत का दार्शनिक आधार

इकाई–2

अणुव्रत का प्रायोगिक स्वरूप : अणुव्रत आन्दोलन

इकाई–3

अणुव्रत आन्दोलन के अहिंसक कार्यक्रम

इकाई–4

अणुव्रत आन्दोलन का सामाजिक/राजनीतिक स्वरूप

उपलब्धियाँ–

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

पाठ्य पुस्तक / संदर्भ ग्रन्थ

1. अणुव्रत दर्शन– आचार्य महाप्रज्ञ
2. अहिंसा और अणुव्रत– सिद्धान्त और प्रयोग– मुनि सुखलाल एवं आनन्दप्रकाश त्रिपाठी
3. गांधी पश्चात् शांति आंदोलन– प्रो. अनिल धर

प्रायोगिक–

1. कायोत्सर्ग, महाप्राण ध्वनि, ज्योति केन्द्र पर श्वेत रंग का ध्यान।
2. आसन– शंशाकासन, योगमुद्रा
3. अनुप्रेक्षा– सहिष्णुता
4. अणुव्रत आचार संहिता

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

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 :IonicSolids

Ionicstructures(ABandAB$_2$ type),packingofions,Radiusratioandcoordinationnumber, calculationoflimiting radiusratiofor tetrahedral, octahedralandcubiccrystalstructure, limitationsof radius ratio rules,Polarizing powerand polarisability ofions,Fajansrule, latticeenergy andborn landeequation,Born Haber cycle andits applications, solvation energyand solubilityofionic solids.

Unit-II :Metallic Bond &Weak interactions

Introductionofmetallicbond,propertiesofmetals,theoriesofMetallicbond-oldelectron free theory,valancebondtheory,limitationsofvalencebondtheory,molecularorbitalorbandtheory,latticedefects in ionicsolids, semiconductors.
Hydrogen bondingand VanderWaalsforces.

Unit-III :s-BlockElements

Comparativestudy,diagonalrelationships,salientfeaturesofhydrides, solvation and complexationtendenciesincludingtheirfunction in biosystems andintroductionto alkyls and aryls.

Unit-IV :Some importantcompoundsofp-block elements

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

Learning Outcomes: After complition the course student would 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 relaed to geometrical structure, reactions and configuration of various compounds.

UnitI : Stereochemistryoforganiccompounds

Conceptof isomerism, typeofisomerism.Optical isomerism;elements of symmetry, molecular chirality-allenes and biphenyl, Enantiomers, stereogenic centre, optical activity, propertiesofenantiomers.Chiralandachiralmoleculeswithtwostereogeniccentres,distereomers Threo,and erythro diastereomers, meso compounds. Resolutionof enantiomers, inversion, retention andracemisation. Relative andabsolute configuration, sequence rule, D&L and R&S systemofnomenclature.

Unit-II :Geometrical,Conformational isomerism&Arenes

Determinationofconfigurationofgeometricisomers,E&Z- systemofnomenclature, geometricisomerismin oximesand in cyclic compounds.

Conformational analysisof ethane and n-butane. Newman projectionandSawhorse formulae. Fischerandflyingwedge formula. Differencebetween configurationand conformation

Nomenclatureofbenzenederivatives.The arylgroup,aromaticnucleusandsidechain.Structureof benzene,molecularformulaandKekulestructure.Stability andcarbon-carbonbondlengthofbenzene,resonance structure,MO picture.

Unit-III :Aromaticity &Aromatic electrofilic substitution

The Huckel's rule, aromaticions.

Generalpattern of the mechanism, role ofsigma and picomplexes. Mechanism ofnitration,halogenations,sulphonation,mercurationandFriedelCraftreactionwithenergyprofile diagrams. Activatinganddeactivatingsubstituents,orientationandortho/pararatio.Sidechainreactionsof benzenederivatives. Birchreduction.

Unit-IV :Alkylandarylhalides &Polyhalogen compounds

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

Chloroform, carbon tetra chloride. Methods of formation of aryl halides, nuclear and side chain reaction. The addition-elimination and the elimination addition mechanism of nucleofilic 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 complition the course student would able to:
- ❖ Explain about elememts 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 prepation and determinants.

Unit I:Solidstate

Definitionofspacelattice,Unitcell.Lawofcrystallography(i)lawofconstancyofinterfacialangles (ii)law of rationalityofindices(iii)lawofsymmetry.Symmetryelementsincrystals. Xraydiffraction bycrystals.Derivationof
Braggsequation,DeterminationofcrystalstructureofNaCl,KClandCsCl(Laue'smethodandpowdermethod)**.**

UnitII :Colloidalstate

Definitionofcolloids,classificationofcolloids.Solidsinliquids(sols):properties- kinetics, opticalandelectrical.Stabilityofcolloids,protectiveaction,HardySchulzelaw. Goldnumber.Liquidsin solids (gels):classification,preparationandproperties,inhibition,generalapplicationofcollides. Liquidinliquid (emulsions): typesofemulsions,preparation,Emulsifiers.

Unit-III :ChemicalKinetics

Chemicalkineticsand itsscope,rateofareaction,factorsinfluencing the rateofareaction, Concentrationdependenceofrates,mathematical characteristicsofsimplechemicalreaction-zeroorder,firstorder,secondorder,pseudoorder,halflifeandmean life.
Determinations of the orderof reaction-differentialmethod, method of integration, method ofhalf-life period and isolation method.Theoriesofchemicalkinetics,Effectoftemperatureontherate reaction,Arrheniusconceptofactivationenergy.Simplecollisiontheory basedonhardspheremodel,transition statetheory(equilibriumhypothesis).Expressionfortherateconstantbasedonequilibrium constantand thermodynamic aspects.

Unit-IV :Solutions,Dilutesolutions &Colligativeproperties

idealandnon idealsolutions,methodsofexpressing concentrationsofsolutions, activityand activitycoefficient. Raoult`slaw,relativelowering ofvapourpressure,molecularweightdetermination. Osmosislawofosmoticpressureanditsmeasurement,determinationofmolecularweightfrom osmoticpressure, Elevationofboiling pointanddepression offreezing point. Thermodynamicderivationofrelationbetween molecularweightandelevationofboiling pointanddepression in freezing point. Experimentalmethodsfor determining variouscolligative properties. Abnormal molarmass degree of dissociation and association of solutes.

Learning Outcomes: After complition the course student would able to:
- ❖ Draw and interpret symmertries and structures of crystalsand colloids.
- ❖ Compare among various forms of crystals, order and trainsition state of compounds.
- ❖ Measure and calculate the mathematical characteristics simple chemical reactions and determinants.

Practical's

Inorganic chemistry:

Quantitative analysis:Volumetric analysis

  (a) Determination ofaceticacid incommertial vinegar usingNaOH.
  (b) Determination of alkalicontent ant acid tablet usingHCl.
  (c) Estimation of calcium content in chalk as calciumoxalatebypermanganometery.
  (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

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

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 indifferential 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 complition 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, simplependulum 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-mechanicalsystem-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 complition 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 dimensionalmono-atomic and diatomic lattice, acoustic and optical modes, dispersion relations. Concept of group and phasevelocities.

UNIT – II Electrical Transmission Line:
Electrical transmission line, propagation velocity, losses, characteristic impedance, standing waves, effect oftermination.

UNIT –III Wave Motion:
Wave motion – Elastic waves in a solid rod. Pressure waves in a gas column. Transverse waves in a string, waves inthree 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 offree space. EM waves in dispersive media (normal case). Spectrum of electromagnetic radiations.

Learning Outcomes: After complition the course student would 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 Determing damping coefficient and Q of the oscillator.
   (b) To study the electromagnetic damping of a compound pendulum and to find the variation of dampingcoeefficient with the assistance of the conducting lamina.
7. To find J by Callender and Barne's Method.
8. To determine Youngs 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 theperiod 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

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

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. गौखरू 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 complition 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. जांगीड. जांगीड़, जितेन्द्र सैनी,, समाकलन गणित, आर. बी.डी. पब्लिशिंग हाउस, जयपुर–दिल्ली, 2015–16
2. जी.सी. गोखरू 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 complition 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 Dimenssions, Pothishala Pvt. Ltd., Allahabad, 1992.
2. P.K. Jain and Khalil Ahmed, A Text Book of Analytical geometry of Three Dimenssions, 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

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

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 Orgenells
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 complition 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, pleotropy, 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 *Paramaecium.*

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 complition the course student would able to:
- ❖ Undersand 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 funeria.
- ❖ 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 andMarchantia.*

UNIT III:

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

UNIT IV:

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

Learning Outcomes: After complition the course student would 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 funeria.
- ❖ 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. Crytogramic 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.*

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

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

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

Learning Outcomes: After complition 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, incomplete 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 ofChromosome 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 complition the course student would 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 in 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 1DNA: 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, Enzymes and factors of transcription;
4.3 Protein Synthesis: Elementary idea of the mechanism of translation

Learning Outcomes: After complition the course student would 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 sysnthesis.
- ❖ 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: Moleculor 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; Benzamin/ 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 repring : 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

Course Code	Course Title	Course Category	Credit	C.I.A. (Continouns Internal Assesment)	Theory	Total
JVB201	जैन संस्कृति एवं जीवन मूल्य (अनिवार्य पत्र)	Core Foundation(CF)	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 विशेषताएं
5. शाकाहार

इकाई–2 : जैन दर्शन के सिद्धांत

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

इकाई–3 : जीवन विज्ञान

1. जीवन विज्ञान : एक परिचय
2. जीवन 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 जीवन शैली 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, शंशाकासन, पवनमुक्तासन, भुंजगासन
प्राणायाम–अनुलोम–विलोम
मुद्रा–ज्ञानमुद्रा, वायुमुद्रा
ध्वनि– महाप्राण ध्वनि
ध्यान–कायोत्सर्ग (संक्षिप्त), अर्न्तयात्रा, दीर्घश्वासप्रेक्षा, ज्योतिकेन्द्र प्रेक्षा,
अनुप्रेक्षा–सहिष्णुता

पाठ्य पुस्तक/ संदर्भ ग्रन्थः

• जैन संस्कृति एवं जीवन मूल्य, भाग 1, 2, 3, डॉ. सहआचार्य समणी ऋजुप्रज्ञा, जैन विश्व भारती संस्थान, लाडनूं

Course Code	Course Title	Course Category	Credit	C.I.A. (Continouns Internal Assesment)	Theory	Total
JVB202	अहिंसा एवं शांति (मानवाधिकार एवं कर्त्तव्य)	Core Elective (CE)	4	30	70	100

उद्देश्य–

1. मानवाधिकार एवं कर्त्तव्य की जानकारी देना।

इकाई–1

मानवाधिकार : अर्थ एवं परिभाषा, ऐतिहासिक विकास

इकाई–2

मानवाधिकार– मानव अधिकारों का स्वरूप, मानवीय गरिमा का आदर एवं विश्व नागरिकता, जीवन के प्रति सम्मान

इकाई–3

भारतीय दृष्टिकोण में मानवाधिकार

इकाई–4

अधिकार एवं कर्त्तव्य, मानवाधिकार का अर्न्राष्ट्रीय घोषणा पत्र

उपलब्धियाँ–

1. मानवाधिकारों एंव कर्त्तव्यों के प्रति जागरूकता बढेगी।

पाठ्य पुस्तक / संदर्भ ग्रन्थः

1. अहिंसा प्रशिक्षण एवं विश्व शांति– प्रो. बच्छराज दूगड़
2. मानवाधिकार, शांति एवं गांधी दर्शन– डॉ. अनिल धर एवं पूजा शर्मा

Practical

   i. Case study of : Violation of Rights of woman and child.

   ii. Study of legel efficiancy in the violation cases.

   iii. Preparation of Histograph of the human rights Scenerio in Rajasthan/India.

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

Chemistry-Paper-I :inorganic chemistry

Objectives:
- ❖ To develop the conceptual knowledge of acid and bases.
- ❖ To aware about the classification of acids, non aquous solvents and separation methods.
- ❖ To give information about various characteristics & laws realed 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. NH_3 and liq. SO_2

Unit IV : Seperation 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 complition 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

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 [$Pb(OAc)_4$ 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 substitions, 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 Knovenagel 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.

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

Chemistry-Paper-III :Physical chemistry

Learning outcomes: After complition the course student would able to:
- ❖ Calssify the various organic compounds on the basis of mechanism and structure.
- ❖ Apply the knowledge of processing derivatives for synsthesize various products.
- ❖ Describe and discuss about technical terminology related to alcohols, ketones & ethers ec.
- ❖ Explain different methods of formation according to chemical reactions.

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 Thomsan 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 : Themochemistry

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 Ka of acids, determination of solubility product of a sparingly soluble salt, condutometric 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 Clausious- Clapeyron equation, application

Learning Outcomes: After complition 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

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

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 interation; Gibb'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 relationsand 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 Discussionof Superconductivity.

Learning Outcomes: After complition 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 सांख्यकीय 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 adistance, Cardinal points of a co-axial lens system, properties of cardinal points; construction of image usingcardinal 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 wavelengthand refractive index by Newton ring. Michelson Interferometer, Measurement of wavelength and refractive index byMichelson Interferometer.

Unit-IV Polarization:

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

Learning Outcomes: After complition 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 ofany four terminals network. Input, Output and mutual impendence 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 ofcharge 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: shuntinductors, shunt capacitor, L sections and π sections filters. Voltage regulation and voltage stabilization by Zenerdiode, Voltage multiplier circuits.

Learning Outcomes: After complition the course student would 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, इलेक्ट्रोनिकी 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 refractiveindex 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 & Desorme'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 polarimer.
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

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

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, SuBSCquences.
- ❖ 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 complition the course student would able to:
- ❖ Applies the Real Numbers as Complete Ordered Field, Closed & opened Sets.
- ❖ Calculate the Cauchy's Sequences, SuBSCquences.
- ❖ 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. गौखरू 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 complition 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. गौखरू 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, Trapazoidal rule. Simpson's one-/ third, Simpson's three-eighth and Gauss's quadrature formulae.

Learning Outcomes: After complition 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. गौखरू सैनी, संख्यात्मक विश्लेषण, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

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

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, Nuclcosome model.
- Structure and types of RNAs (mRNA, tRNA adr RNA)

UNIT –II DNA Replication
- Concept, Types and process of DNA Replication.
- Staht 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 synthests, pre RNA Processing, copping, 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 complition 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 Upadhayaya, 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 complition the course student would 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 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.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 Upadhayaya, K. 2005. Basic Molecular Biology. Himalaya Publishers. New Delhi.

Botany-Paper-III :Plant Physiology I

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.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

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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, it's 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 complition the course student would 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 C_{O2}, light and chlorophyll is essential for photosynthesis (Moll's half experiment).
15. Study C3 andC4 plant with the kranz anatomy.
16. To study the R.Q. by Ganong's respirometer.

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

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

Objectsives:
- ❖ 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 class 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:**Classfication of Pisces upto class; 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 complition the course student would able to:
- ❖ Discuss and study the classification of Protochordata, Ascidia & Amphioxus

- ❖ Understand the classification of Agnatha & Gnathostomata, Characters of Petromyzon, Ammocoet 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

Objectsives:
- ❖ To understand the classification Microorganisms.
- ❖ To Understand and study the Bactria.
- ❖ 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. Leeuvenhock, 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 complition the course student would able to:
- ❖ Applies the classification Microorganisms.
- ❖ Understand and study the Bactria.
- ❖ Explain the Parasite Protozoans.
- ❖ Classify the Virus,Hepatitis and HIV.
- ❖ Interprets the plasmodium, trypanosome, leishmania.

<div align="center">**Zoology-Paper-III: Physiology- I**</div>

Objectsives:
- ❖ 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; Rennin- Angiostensin System, Micturition, Regulation of Body Fluids & Acid Base balance

Learning Outcomes: After complition 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.
- ❖ Interprets 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), Acipensor, Amia, Lepidosteus, Notopterus, Labeo, Clarius, Anguilla (eel), Exocoetus, Hippocampus, Echenesis Sucker Fish), Protopterus,

        d) **Amphibia:** Icthyophis, Cryptobranchus, Ambyostoma (Tiger Salamander), Axolotl Larva, Salamandra, Proteus, Siren, Alytes, Pipa, Hyla, Rhacophorous (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 ofScoliodon.

    b)   **Minor:** Internal Ear; Eye Muscles; Ampulla of Lorrenzini

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 Socieety 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 Pubishing 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, Merrut, Delhi

Course Code	Course Title	Course Category	Credit	C.I.A. (Continouns Internal Assesment)	Theory	Total
JVB 301	हिन्दी (अनिवार्य पत्र)	Core Foundution(CF)	4	30	70	100

उद्देश्य–

1. हिन्दी व्याकरण– संज्ञा, सर्वनाम, कारक, पर्यायवाची, विलोमशब्द, समुच्चारित भिन्नार्थक शब्द, मुहावरें, लोकोक्तियाँ आदि का सामान्य ज्ञान करवाना।
2. देवनागरी लिपि का परिचय देना।
3. व्यावहारिक पत्रों की जानकारी देना।

इकाई–I

व्याकरण–संज्ञा, सर्वनाम, कारक, पर्यायवाची, विलोमशब्द, समुच्चारित भिन्नार्थक शब्द, मुहावरें, लोकोक्तियाँ,

इकाई–II

देवनागरी लिपि की विशेषताएँ, सरकारी पत्र, अर्द्धसरकारी पत्र

इकाई–III

काव्य संचय – निम्नलिखित कवियों की चयनित कवितायें :
मैथिलीशरण गुप्त– मातृभूमि, आगे बढ़ो ! ऊँचे चढ़ो !,
जयशंकर प्रसाद– भारत महिमा, प्रयाण–गीत
सुमित्रानंदन पंत– भारत माता, द्रुत झरों
निराला– वह तोड़ती पत्थर
रामधारी सिंह दिनकर– जनतंत्र का जन्म
सच्चिदानन्द हीरानन्द वात्स्यायन 'अज्ञेय'– हिरोशिमा
सुधीन्द्र– कोकिल, राजस्थान–वन्दना
गिरिजा कुमार माथुर – पन्द्रह अगस्त

इकाई–IV

गद्य संग्रह   –   निम्नलिखित लेखकों की चयनित रचनायें
प्रेमचन्द– आत्माराम (कहानी)
डॉ. रामचरण महेन्द्र– राष्ट्र मंदिर का सुवासित पुष्प : केसरीसिंह बारहठ (जीवनी)
महादेवी वर्मा– बहिन सुभद्रा (रेखाचित्र)
जैनेन्द्र कुमार– साधना के कवि (संस्मरण)
हरिकृष्ण प्रेमी– राखी (एकांकी)
हरिशंकर परसाई– मूल्यों का उलटफेर (व्यंग्य)
जवाहरलाल नेहरु– इतिहास से शिक्षा (पत्र साहित्य)
विद्यानिवास मिश्र– हल्दी–दूब और दधि, अच्छत (ललित निबन्ध)
अगरचन्द नाहटा– राजस्थान की सांस्कृतिक धरोहर (सांस्कृतिक निबन्ध)

उपलब्धियाँ–

1. विद्यार्थियों का व्याकरण के ज्ञान में वृद्धि होगी।
2. विद्यार्थी कार्यालय पत्र लिखने में समर्थ हो सकेंगे।
3. विद्यार्थी देवनागरी लिपि के महत्त्व, उसकी विशेषता आदि से अपने ज्ञान में वृद्धि करेंगे।

पाठ्यपुस्तक/संदर्भ ग्रंथ–

1. काव्य संचय, सम्पादक– डॉ. शम्भूनाथ पाण्डेय, अनुराग प्रकाशन, अजमेर
2. गद्य संग्रह, सम्पादक– डॉ. विजय कुलश्रेष्ठ, अलका पब्लिकेशन, अजमेर
3. हिन्दी व्यावहारिक व्याकरण एवं रचना, डॉ. राघव प्रकाश, पिंकसिटी पब्लिकेशन, जयपुर

Course Code	Course Title	Course Category	Credit	C.I.A. (Continouns Internal Assesment)	Theory	Total
JVB 302	**Indian Culture**	Core Elective(CE)	4	30	70	100

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
पुरूषार्थ 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

भारतीय संस्कृति के मूल तत्व, सुखबीर सिंह, बिजेन्द्र कुमार, साहित्य भण्डार पब्लिकेशन, मैरठ

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

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 aquous 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 differencial migration, Adsorption phenomenon, nature of the adsorbent, solvent systems, Rf 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 silicons, 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^+, Ca^{+2} and Mg^{+2}, nitrogen fixation.

Learning Outcomes: After complition the course student would able to:
- ❖ Differentiate between oxidation& reduction and structures of silicons .
- ❖ 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.

<div align="center">**Chemistry-Paper -II :Organic chemistry**</div>

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 aquaint the various reactions on the basis of their mechanism.

Unit I : Carboxylic acids & Dicarboxylic acids

Nomennclature, 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 aldehylic and ketonic compounds. Gabriel- Pthalamide 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 complition the course student would able to:
- ❖ Calssify the various organic compounds on the basis of mechanism and structure.
- ❖ Apply the knowledge of processing derivatives for synsthesize 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.

Objectives:
- ❖ To aware about laws of thermodynamics, pH, polarization of molecular structure.
- ❖ To develop conceptual knowledge about entrophy, electrolytes dipole moment etc.
- ❖ To develop analytical view about evaluation of absolute entrophy, activity coefficient and magnetic propertires 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 poteniometric 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 complition 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 entrophy, 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/dialometric method (e.g. $MnCl_2$
$4H_2O/SrCl_2 2H_2O$).

Thermochemistry :

1. To determine the solubility of benzoic acid at different temperature and to determine H 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

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

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, entropyand thermodynamic probability; Monoatomic ideal gas; Barometric equation ; Specific heat capacity of diatomicgas; Heat capacity of solids.

UNIT IV Quantum Statistics:

Black body radiation and failure of classical statistics, Postulates of quantum statistics, indistingushability , wavefunction and exchange degeneracy, a priori-probability; Bose Einstein statistics and its distribution function ;Plankdistribution 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 complition 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 सांख्यकीय 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, anddetermination 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 andplane transmission grating.

Unit-III Optical Activity and Holography:

Optical activity, Specific rotation, biquartz and half shade polarimeters. Basic concepts of holography, constructionof 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. Typesof lasers, construction, working and energy level schemes of He-Ne and Ruby laser. Properties and uses of lasers.

Learning Outcomes: After complition 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 theirequivalent circuits. Analysis of transistor amplifiers using hybrid parameters and its frequency response. Fixed andemitter 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 negativefeedback- stabilization of gain by negative feedback, Effect of feedback on output and input resistance. Reduction ofnonlinear 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 foroscillations, circuit requirement for oscillation, basic oscillator analysis. Colpitt and Hartley oscillators. R-Coscillators, 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 complition the course student would able to:
- ❖ Identify characteristics of transistor (common base configuration, common emmiter 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, इलेक्ट्रोनिकी 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 commoncollector configurations
5. Determination of band gap using a junction diode.
6. Determination of power factor (cos $\square$) 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

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

Mathematics-Paper-I: Real analysis and matric 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 complition 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 matric space.

Suggested Reading :
1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. 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 differnitial 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 complition 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-homogenous linear partial differential equation.

Suggested Reading :
1. बी.एल. चौरसिया, संजीव त्यागी अनिल शर्मा, बी. एल. जांगीड. 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-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 complition 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. 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

Semester-IV

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

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 homosporus and heterosporus 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 complition the course student would 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 characterstics of Ephedrales: Morphology, anatomy, reproduction and life cycle of *Ephedra.* Palaeobotany: Geological time scale, fossil types and their formation, technique ofstudy 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 complition 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 Palaeobotnay 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, gibberllins.

UNIT II:
Structure, biosynthesis and physiological role of Cytokinine and Ethylene. Growth inhibitors: ABSEisic acid.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 , Molicular Structure and Function of monosaccharides, oligosaccharides andpolysaccharides. Glycisidic linkage and Glycoprotein.
Lipids–Structure and classification of lipids, fatty acids- saturated and unsaturated, Alpha Oxidation, Bita 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 complition the course student would 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, malecone 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 femalecone, 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 andC4 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.

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

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 complition 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 LipidDisorders: 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 complition the course student would able to:
- ❖ Interprets the function of Carbohydrates and other metabolism.
- ❖ Explain the function of Lipids and metabolism
- ❖ Interprete the importance of Bio molecules
- ❖ Understand the function of Proteins and metabolism
- ❖ Explain the Types of Endocrine glands

Zoology-Paper-III:Physiology- II

Objectsives:
- ❖ 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; Acromegali

Learning Outcomes: After complition the course student would 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), Ornithorhyncus (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 Medula, 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 4thed.
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 Physilogy 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 Physilogy and Biochemistry, Rastogi Publication, Meerut, Delhi

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

Course Code	Course Title	Course Category	Credit	C.I.A. (Continouns Internal Assesment)	Theory+Practical	Total
JVB 401	पर्यावरण (अनिवार्य पत्र)	Core Foundation(CF)	4	30	50+20=70	100

उद्देश्य—

1. पर्यावरण के बारे में जानकारी देना।
2. पर्यावरण के प्रति जागरूकता बढ़ाना।

इकाईI : पर्यावरण अध्यापन एवं पारिस्थितिक तंत्र

1. पर्यावरण, परिभाषा, क्षेत्र, महत्त्व
2. पर्यावरण अवक्रमण— कारण, प्रभाव, निवारण
3. पारिस्थितिक तंत्र— अवधारणा, संरचना एवं कार्य
4. उत्पादक, उपभोक्ता एवं अपघटक, ऊर्जा का प्रवाह, आहार श्रृंखला
5. वन, चारागाह, मरु एवं जलीय पारिस्थितिकी

इकाईII : प्राकृतिक संसाधन

1. नवीनीकरण तथा अनवीनीकरण संसाधन
2. वन संसाधन, ऊर्जा संसाधन, खाद्य संसाधन
3. जल संसाधन, खनिज संसाधन, भू संसाधन
4. संसाधनों का विकल्प
5. केस स्टडी

इकाईIII : पर्यावरण समस्यायें

1. वायु, जल, मृदा, ध्वनि प्रदूषण
2. अपशिष्ट प्रबंधन—अपशिष्ट प्रकार एवं नियन्त्रण
3. विपदा नियन्त्रण —बाढ़, भूचाल, तूफान, भू–स्खलन एवं आणविक
4. असतत से सतत विकास की ओर
5. मौसम परिवर्तन, वैश्विक तापमान वृद्धि, अम्लीय वर्षा, ओजोन परत क्षीणता

इकाईIV : जैव विभिन्नता तथा उसका संरक्षण

1. जैव विभिन्नता–परिभाषा, अर्थ, जैव विभिन्नता को चुनौतियां
2. जैव विभिन्नता का संरक्षण–जैव विभिन्नता का स्व स्थानीय तथा परस्थानीय संरक्षण
3. पर्यावरण सुरक्षा अधिनियम–वायु, जल, वन्यजीव, वन
4. पर्यावरण एवं मानव स्वास्थ्य हेतु सूचना प्रौद्योगिकी की भूमिका
5. पर्यावरण संरक्षण हेतु सामाजिक आन्दोलनों की भूमिका

उपलब्धियाँ—

1. पर्यावरण के बारे में जानकारी मिलेगी।
2. पर्यावरण के प्रति जागरूकता बढ़ेगी।

प्रायोगिक : पर्यावरण परिसम्पत्ति के प्रलेखन हेतु स्थानीय क्षेत्र का भ्रमण (कोई एक)

• तालाब ⁄ वन ⁄ चारागाह ⁄ पहाड़ी ⁄ पहाड़
• स्थानीय प्रदूषित स्थान का भ्रमणशहरी ⁄ ग्रामीण ⁄औद्योगिक ⁄ कृषि

पाठ्य पुस्तक ⁄ संदर्भ ग्रन्थः

1. पर्यावरण अध्ययन, प्रो. अनिल धर, जैन विश्व भारती संस्थान, लाडनूं

Course Code	Course Title	Course Category	Credit	C.I.A. (Continouns Internal Assesment)	Theory	Total
JVB 402	Modern Indian Thinkers and Social Reforms	Core Elective(CE)	4	30	70	100

Semester- IV

Objectives -

1. To Understandabout basic knowledge about social reforms.

2. To know about introducation and views of Indian Social Thinkers.

Unit - I

Dayanand Sarswati   -   Life introduction plan of social reform Arya Samaj.

Swami Vivekanand   -   Life Introduction, Social Thought, Nationalist Thought.

Unit - II

Bankim Chandra Chatrji   -   Life introduction, Concept of Nationalism

Smt. Annie Besant   -   National Education, Woman Awakening

Unit - III

Gopal Krishan Gokhale   -   Political Idea, Economic Idea, Social Idea

Arvind Ghosh   -   Life Introduction, Concept of Nationalism, Concept of superman

Unit - IV

Mahatma Gandhi   -   Concept of truth, Ahimsha and Satyagraha, Theory of Tristiship

Dr. Bhim Rao Ambedkar   -   Life Introduction Contribution to Reform for Depraced Class.

Acharya Tulsi   -   Life Introduction, Social Reform, Anuvart Movement.

Out comes -

1. Student know about social reforms.

2. Student know about views of various Indian Social Thinkers.

Reference Books-

1. आधुनिक भारतीय राजनीतिक चिन्तन, डॉ. बी.आर. पुरोहित, राजस्थान हिन्दी ग्रंथ अकादमी, जयपुर
2. भारतीय राजनीतिक विचारक, प्रो. मधुकर श्याम चतुर्वेदी, कॉलेज बुक हाउस, जयपुर
3. भारतीय राजनीतिक चिन्तन, प्रो. के.एल. कमल, राजस्थान हिन्दी ग्रंथ अकादमी, जयपुर

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

Chemistry-Paper-I : Inorganic Chemistry

Objectives:
- ❖ To develop the knowledge about coordination compound, lanthanides and actinides.
- ❖ To aware about the conceptual knowledge of valance 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 .

UnitI: CoordinationCompounds
Werner'scoordinationtheoryanditsexperimentalverification,effectiveatomic numberconcept, chelates, nomenclature ofcoordination compounds, isomerismincoordination compounds, Valencebondtheoryoftransitionmetalcomplexeswithreferencetotetrahedral, octahedralandcubiccomplexes, backbonding, Limitationsofvalencebond theory.

UnitII: Chemistryofelementsoffirsttransitionseries
Characteristicpropertiesofdblockelements,properties ofthe 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 ofmagnetic moment.

UnitIII: Chemistryoflanthanide elements
Positioninperiodic table,occurrence and isolation,Electronicstructure, oxidationstatesandionic radii, lanthanidecontraction and itsconsequences,complexformation,spectral properties, magnetic properties, Separation of lanthanidesApplication oflanthanides.

UnitIV: Chemistryofactinides
Occurrence,electronicconfiguration,Generalfeaturesandchemistry ofactinides, oxidationstatesandstereochemistry,spectralproperties,magneticproperties, chemistry ofseparationofNp,Pu and AmfromU, comparison oflanthanideand actinide.

Learning Outcomes: After complition the course student would 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 transistion 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 aquaint about various laws of spectroscopy and methods of synthesis related to organmetallic and heterocyclic compounds.
- ❖ To aware about laws related to IR spectrum, types of tranisitions and preparation of heterocyclic compounds.
- ❖ To develop understanding about effects of solvents, structural features and basicity of pyridine, piperidine and pyrrole.

UnitI Electromagneticspectrum: Absorptionspectra(UV) &InfraredIRabsorptionspectroscopy

Ultravioletabsorptionspectroscopy-   absorption   laws   (Beer-   LambertLaw)molarabsorptivity, presentationandanalysisofUVspectra,typesofelectronictransitions, effectofsolventsontransitions,effectofconjugation,   conceptofchromophoreandauxochrome.Bathochromic, hypsochromic andhyperchromic and hypochromicshifts, UVspectra ofconjugated enes andenones. Molecularvibrations,Hookeslaw,selectionrules,intensity   andposition ofIRbands,measurementofIRspectrum,fingerprint   region,   characteristicabsorptionsofvarious   functional groups andinterpretationofIRspectra ofsimple organic compounds

UnitII :Organometalliccompounds

TheGrignardreagent-formation,structureandchemicalreaction,organozinc   compound: formation   and chemicalreactions.Organolithiumcompounds-Formation and chemical reactions.
Nomenclature,structuralfeatures,methodsofformationandchemicalreactions   of thiols,thioethers, sulphonic acids, sulphonamide and sulpha guanidine.

UnitIII :Heterocyclic compounds- I

Introduction, molecularorbital picture   and aromatic characteristic of pyrrole, furane,thiophene andpyridine.Methodsofsynthesisandchemicalreactionswithparticularemphasisonthe   mechanism ofelectrophilicsubstitution.Mechanism   ofnucleophilicsubstitution   reaction   inpyridinederivatives. Comparisionofbasicityofpyridine, piperidine and pyrrole

UnitIV : Heterocycliccompounds-II:

Introductiontocondensedfiveandsixmemberedhetrocycles.Preparationand   reactionofindole,quinolineand isoquinolinewithspecialreference   tofischer   indolesynthesis,skraupsynthesis   andBischler-Napieralskisynthesis,mechanismofelectrophilicsubstitution reactionofindole,quinolineandiso quinoline.

Learning Outcomes: After complition the course student would able to:
- ❖ Calssify 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 orbit picture and aromatic characteristics of organometallic and heterocyclic compounds.
- ❖ Define various devivatives 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 entrophy, electrolytes dipole moment etc.
- ❖ To develop analytical view about evaluation of absolute entropy, activity coefficient and magnetic propertires of compounds.
- ❖ To give information about carnt theorem, mixing of gases, overvoltage and referectivity.

UnitI: PhaseEquilibriumI

Statementandmeaning of the terms-phase,componentand degree of freedom, thermodynamicderivationofGibbsphaserule,phaseequilibriaofonecomponentsystem-water,CO_2 andS systems.

Phaseequilibriaoftwocomponentsystem:Solid-liquidequilibria,simpleeutecticBi-Cd,Pb-Ag systems, desilverisationoflead.

Solidsolutions**:**Compoundformationwithcongruentmelting point(Mg-Zn)andincongruentmeltingpoint, (NaCl-H_2O),(FeCl$_3$-H_2O) and CuSO$_4$-H_2O) system. Freezingmixtures,acetone-dryice.

UnitII :PhaseEquilibriumII

Liquid–Liquidmixtures- Idealliquidmixtures.Raoult`s andHenry`slaw.Nonideal system-azeotropes-HCl–$H_2O$and ethanol-watersystems.

Partially miscible liquids- Phenol-water, trimethylamine-water, nicotine-water systems. Lower andupper consulate temperature. Effectof impurityon consulattemperature.

Immiscible liquids,steamdistillation. Nernstdistribution law-Thermodynamic derivation,applications.

UnitIII :QuantumMechanicsI

Black-bodyradiation,Planck`sradiationlaw,photoelectriceffect,heatcapacityof solids, Behr`s modelofhydrogenatom(noderivation)andits defects. ComptonEffect.De Brogliehypothesis, Heisenberg`suncertainty principle,Sinusoidalwaveequation,Hamiltonianoperator,Schrodingerwaveequation anditsimportance,physicalinterpretationofthewavefunction,postulatesofquantummechanics,particleina one dimensionalbox.

SchrodingerwaveequationforH-atom,separationintothreeequations(withoutderivation),quantumnumbers and their importance, hydrogen like wave functions, radialwave functions,angularwave functions.

UnitIV :Adsorption

Differencebetween adsorption,absorptionandsorption, Chemisorption,adsorbentandadsorbate, reversible and irreversible adsorption, Characteristics of adsorption ,adsorption of gases by solids, factors affecting adsorption,typesofadsorption, typesofadsorptionisotherms,FreundlichandLangmuiradsorption isotherms.

Learning Outcomes: After complition 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 entrophy, 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 ofsodiumtrioxalato ferrate (III), $Na_3[Fe(C_2O_4)_3]$ (b)preparation ofNi-DMG complex[$Ni(DMG)_2$]
2. Preparation ofcopper tetraammine complex [$Cu(NH_3)$]SO_4
3. Preparation ofcis-and trans-bisoxalato diaquachromates (III) ion
4. Preparation ofsodiumtetrathionate

Organic Chemistry

Qualitative analysis: Analysis ofan organic mixture containingtwo solid componentsusingwater,$NaHCO_3$,and NaOHforseparationand preparation ofsuitable 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 हाऊस, जयपुर
23. कार्बनिक रसायन, वी.के. रस्तोगी, यसपाल सिंह, कॉलेज बुक हाऊस, जयपुर

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

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 andcontraction 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, seriessolution 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, Lagendre , Leguerre functions (simple applications)

UNIT IV Boundary Value Problems:

Techniques of separation of variables and its application to following boundary value problems
(i) Laplance equation in three dimensional Cartesian coordinate system- line charge beween twoearthed parallel plates (ii) Helmholtz equation in circular cylindrical coordinates – cylindricalresonant cavity, (iii) Wave equation in spherical polar coordinates – the vibrations of a circularmembrane, (iv) Diffusion equation in two dimensional Cartesian coordinate system – leatconduction in a thin rectangular plate, (v) Laplace equation in spherical coordinate system –electric potential around a spherical surface.

Learning Outcomes: After complition 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 quantumtheory Electromagnetic Radiation: Black Body Radiation, qualitative discussion of spectral distribution ofenergy, limitation of classical theory, Planck's radiation law, photoelectric effect, Compton effect, MatterWaves: 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, itsapplication 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 Hermition operator, state function. Expectation value of dynamical variable-position, momentum and energy, Fundamentalpostulates of quantum mechanics, Eigen function and eigen values, Degeneracy. Orthogonality of eigenfunction, Commutation relations, Ehrenfest's theorem and complementarily wave packet, group and phasevelocities, 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 complition 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 descrete 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

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 andCrystal Structure, Bravis Lattice, Miller Indices and Crystal Structure, Spacing of Planes in CrystalLattice, Determination of different crystal properties for SC, FCC, BCC,HCP and perovaskite structure,X-ray Diffraction and Bragg's Law, Laue equation of X-ray diffraction, Debye Scherer and LaueCamera.

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 theinternal Energy hence to the Specific Heat of Metals, Thermal Conductivity of the lattice. ElectricalConductivity: Drude-Lorentz Theory of Electrical Conductivity, Boltzmann Transport Equation,Sommerfield Theory of Electrical Conductivity, Mathiessen's Rule, Thermal Conductivity andWildemann-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 BlochTheorem, Density of states , Kronig Penny Model, Velocity of the Bloch electrons and DynamicalEffective Mass, Momentum, Crystal Momentum and Physical Origin of the Effective Mass, NegativeEffective 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 InMagnetic 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 complition 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. 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 charecteristics 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 impendence of the amplifier.
9. To Design and study of an R-C phase shift oscillator and measure output impendence (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

Course Code	Course Title	CourseCategory	Credit	C.I.A.	Theory	Practical	Total
BSC 503	Mathematics-I		4	15	20	25	100
	Mathematics-II	CE*			20		
	Mathematics-III				20		

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 complition 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. गौखरू सैनी, बीजगणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

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 complition 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. गौखरू 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 complition 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. गौखरू सैनी, बीजगणित, जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Practical	Total
BSC 504	Botany-I				20		
	Botany-II	CE*	4	15	20	25	100
	Botany-III				20		

Botany-Paper-I:Morphology Of Angiosperms

Objectives:
- ❖ To understand the basic plan of flouring 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 formin 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 complition the course student would able to:
- ❖ Understand the basic plan of flouring 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, Secretary 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, dendrochronolgy,periderm,bark and lenticels. Anomalous secondary growth in dicot stem, in monocot stem in dicot roots.

Learning Outcomes: After complition 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 Anatom*y*. 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.

7. Gifford, E.M. And Foster, A.S. 1989. Morphology and Evolution of Vascular Plants. W.H. Freeman, New York.

8. Pandey, S.N. and Chadha, A. 2014. A text book of Botany- Plant anatomy and Economic Botany. Vikas publishing house Pvt. Ltd, New Delhi.

9. Vashishta, P.C. 1974. Plant Anatomy. Pradeep Publication, Jalandhar.

10. Singh, V.P., Pandey, P.C. and Jain, D.K. 2011. A Text book of Botany- plant Morphology and anatomy. Rastogi Publication, Merrut.

11. 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 complition 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:
1. Naik, V.N.2011. Taxonomy of Angiosperms. TATA McGraw Hill, New Delhi.
2. Pandey, S.N. and Misra, S.P. 2008. Taxonomy of Angiosperms. Ane Books India, New Delhi.
3. Saxena, N.B. and Saxena, S. 2011. Plant Taxonomy. Pragati Prakashan, New Delhi.
4. Sharma, B.D. 1984. Flora of India vol. I. Botanical Survey of India, Calcutta.
5. Sharma, O.P. 1996. Plant Taxonomy. TATA McGraw Hill, New Delhi
6. Simpson, M.C. 2006. Plant Systematics. Elsevier, Amsterdam.
7. Singh, G. 2001. Plant systematics. Oxford and IBH, New Delhi.
8. 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 andpermanent 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.

Course Code	Course Title	CourseCategory	Credit	C.I.A.	Theory	Practical	Total
BSC 505	Zoology-I		4	15	20	25	100
	Zoology-II	CE*			20		
	Zoology-III				20		

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 Behabiour
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 complition 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 complition 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 complition the course student would 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

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 Editon 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. ShroffPublishersand 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	Course Category	Credit	C.I.A. (Continouns Internal Assesment)	Theory+ Practical	Total
JVB501	Basics of Computer (Compulsory Paper)	Core Foundation(CF)	4	30	50+20=70	100

Objective :

To enable students to be aware of using MS Word, MS PowerPoint, Excel and Internet. Students will be able to do daily work using these tools and able to surf internet, download and send emails easily.

Unit I :MS Word

1. An overview of the basics of word processing.
2. How to use spell check, grammar check, and the thesaurus
3. Gain proficiency in editing
4. Formatting a document
5. How to use the undo and redo commands
6. Moving and copying text within a document
7. Typography, paragraph formatting and column formatting
8. How to enhance a document, wizards and templates, and tables

Unit II :MS Excel

1. Creating an excel worksheet
2. Saving an excel worksheet
3. Opening an existing workbook
4. Using formula and functions
5. Printing a worksheet
6. Creating a simple expense worksheet.

Unit III :

1. **MS PowerPoint presentation**
2. Saving a PowerPoint presentation,
3. Working with an existing PowerPoint presentation,

Unit IV :Internet

1. Basics of Internet
2. Site Surfing
3. Search Engines
4. Email Accounts - Receiving Mails, Composing Mails, Spam, Calendar
5. Download
6. Creating blogs
7. Online conversion

Outcome :

  1. Students will be able to apply word, excel and powerpoint in their daily work.

2. Students will be able to make use of internet for their study purpose and will be able to create blog to exhibit their talent.

Practical :   **MM : 20**

1. Create a banner using document, marksheet using worksheet and Presentation on any topic
2. Create an email account, blog and download files

1. Only practical (No theory)

2. External :

        Assignment/Project :   50 Marks

        Viva : 20 Marks

        CIA :   30 Marks (Attendance - 10, Test - 5,

                         Presentation - 5, Assignment - 10)

Suggested Reference Material :

a. Text Books :

1. Special Edition Using Microsorft Office 2007 By Ed Bott

2. Absolute Beginner's Guide to Computer Basics by Mechael Millar

3. Discovering the Internet : Complete, 4th edn. Complete by Gary B. Shelly, Jennifer T. Campbell

b. Recommended Website :

1. http://office.microsoft.com/en-us/training/

2. http://www.gcflearnfree.org/office2007

Course Code	Course Title	CourseCategory	Credit	C.I.A. (Continouns Internal Assesment)	Theory+ Practical	Total
JVB502	Psychology (General Psychology-I)	Core Elective(CE)	4	30	50+20=70	100

Objectives:
1. To understand the concepts of basic Psychological process.
2. To understand the application of psychological concepts in daily routine problems.

Unit-I: Introduction of Psychology
(i) Meaning and Definition of Psychology
(ii) Goals of Psychology
(iii) Fields of Psychology
(iv) Methods of Psychology

Unit-II: Development of Human Behaviour
(i) Meaning of Heredity an Environment
(ii) Interaction of Heredity and Environment
(iii) Biological Determinants
(iv) Environmental Determinants

Unit-III: Perception
(i) Nature and Definition of Perception
(ii) Major Approaches of perception
(iii) Factors Influencing Perception: Personal & Social
(iv) Illusion and Differences between Illusion and Hallucination

Unit-IV: Learning
(i) Meaning and Nature of Learning
(ii) Role of Motivation in Learning
(iii) Classical and Instrumental Conditioning
(iv) Transfer of Learning

Outcome -
1. Students will be aware of various Psychological approach and environment which will lead to the development of human behaviour.

Practical
(i) Measurement of Illusion
(ii)Measurement of Transfer of Learning
(iii) Measurement of level or Depression
(iv) Measurement of the capacity of Verbal Learning
(v) Assessment of Personality

Books:-
1. Baron, R.A. Psychology: The essential sciences, New York; Allyn & Bacon.
2. Limbardo, P.G. & Weber, A.L.: Psychology, New York, Harper Collins College Publisher.
3. Lefton, L.A., Psychology, Boston; Allyn & Baron.
4. Morgan and King: Introduction to Psychology.
5. Singh, A.K.: Uchatar Samanya Manovigyan.
6. Azimurrahman: Samanya Manovigyan.
7. Suleman : Samanya Manovigyan.
8. Lal Bachan Tripathi : Uchatar Manovigyan.

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Practical	Total
BSC 601	Chemistry-I		4	15	20	25	100
	Chemistry-II	Any Three CC			20		
	Chemistry-III				20		

Chemistry-Paper-I :Inorganic chemistry

Objectives:
- ❖ To develop understanding about metl 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 slection rules, trans effect and substitution reactions .
- ❖ To give information about spectrochemical series, kinetic stability and bonding application of alkyls and aryls .

UnitI : Metal– ligandbondingin transition metalcomplexes

Anelementary ideaofcrystal-field theory,crystalfield splitting in octahedral,tetrahedralandsquareplanarcomplexes, factorsaffecting thecrystal– fieldparameters, colouroftransition metalions, limitationsofcrystalfield theory.

UnitII : Spectralpropertiesoftransitionmetalcomplexes

Typesofelectronictransitions,selection rulesfor d-d transitions, spectroscopic ground statesandSpectoscopic terms(L-SCoupling), spectrochemicalseries, orgel- energyleveldiagramfor d^1 and d^9 states,theelectronicspectrumof$[Ti(H_2O)_6]^{+3}$ complex ion.

UnitIII :Thermodynamic and kinetic aspects of metal complexes

Thermodynamic and kinetic stability, thermodynamicstabilityandfactorsaffectingthestability,substitutionreactionsofsquareplanarcomplexes, typesofsubstitutionreactions andtranseffect.

UnitIV :Organometallic chemistry

Definition, nomenclature and classification of organometallic compounds, preparation,properties,bonding nadapplicationsofalkylsandarylsofLi,Al, Hg,SnandTi,abriefaccountof metal– ethyleniccomplexesandhomogenoushydrogenation,mononuclearcarbonylsandthenatureofbonding in metal carbonyls.

Learning Outcomes: After complition the course student would 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 insdustrial uses of fat, oil and detergents.

UnitI :Nuclear magneticresonance(NMR)spectroscopy

Protonmagneticresonance ^{1}H-NMR spectroscopy,nuclear shieldinganddeshielding, chemicalshiftandmolecularstructure,spinspinsplittingandcouplingconstant, areas ofsignals, interpretation ofPMRspectraofsimpleorganic moleculessuchasethylbromide, ethanol, acetaldehyde,1,1,2tribromoethane, ethylacetate, tolueneandacetophenone.Problemspertaining to thestructure elucidation ofsimple organic compounds usingUV, IRand PMR spectroscopictechniques.

UnitII :Carbohydrates :

Classification andnomenclature, monosaccharides, mechanismof osazone formation, inter conversionofglucoseandfructose,chainlengthing andchainshortening ofaldose. Configurationof monosaccharide. erythroandthreodiastereomers.Conversionofglucoseintomannose.Formationofglucosides, ethersandesters.Determinationofringsizeofmonosaccharides.CyclicstructureofD(+)-glucose.Mechanism ofmutarotation.Structureofriboseanddeoxy ribose.Anintroduction todisaccharides(maltose,sucrose and lactose)and polysaccharides (starch and cellulose) withoutinvolvingstructure determination.

UnitIII :Aminoacids,peptides,proteinsandnucleicacid

Classification,structure and stereochemistry ofaminoacids. Acidbase behaviourof isoelectric pointand electrophoresis. Preparation and reactionofα aminoacid. Structure and nomenclature ofpeptidesand proteins.Classification ofproteins,peptide structure determination, end group analysis, selectivehydrolysis of peptides. Classicalpeptidessynthesis, solidphasepeptide synthesis. Structreof peptidesandproteins,levelsofproteinstructure.Proteindenaturation /renaturation.
introduction. Constituents ofnucleic acidriboandribonucieosides,nucleotides.The double helicalstructure ofDNA/RNA

UnitIV :Fats, oils and detergents

Natural fats edible and industrial oils of vegetable resin common fatty acids, glycerides,hydrogenation ofunsaturatedoils. saponificationvalue, iodinevalue,acidvalue,soaps,synthetic detergents,alkyland arylsulphonates.

Learning Outcomes: After complition the course student would able to:
- ❖ Calssify 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.

UnitI: Photochemistry:

Interactionofradiationwith matter,differencebetween thermalandphotochemicalprocesses. Lawsofphotochemistry:Grothus-Drapper law, Stark-Einstien law, Jablonskidiagramdepicting various processes occurring intheexcitedstate.,qualitativedescription offluorescence,phosphorescence,non radiative process(internalconversion, intersystemcrossing)quantumyield,photosensitizedreaction-energytransferprocess (simple examples)

UnitII: Spectroscopy I

Introduction:Electromagnetic radiation of the spectrum, basic features of different spectrometers, statementofthe Born Oppenheimerapproximation, degree offreedom.

Rotationalspectrum:Diatomicmolecules,Energy levelsofrigidrotator,(semiclassicalprinciples)selectionrules, spectralintensity,distributionusingpopulationdistribution(MaxwellBoltzmanndistribution), determinationof bond length, qualitative description ofnonrigidrotator, isotopeeffect.

Electronicspectrum: Concept of potential energycurves for bondingand anti bonding molecular orbital's, qualitative description ofselection rulesand Frank–Condon principle.

UnitIII: Spectroscopy II

Vibrational spectrum: Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules,purevibrationalspectrum,intensity.,determinationofforceconstant,qualitativerelationsof force constantsandbondenergy,effectofanharmonicmotionand isotopeson thespectrum,ideaofvibrational frequencies ofdifferent functionalgroups.

Ramanspectrum**:** Conceptofpolarizability,purerotationalandpurevibrationalRamanspectraofdiatomic molecules,selection rules.

UnitIV: QuantumMechanicsII:

Molecularorbitaltheory:BasicideascriteriaforformingM.O.fromA.O.construction   ofM.O.`sbyLCAO-H_2^+ ion,calculationofenergylevelsfromwavefunctions,physicalpictureofbondingand antibonding wavefunctions, conceptof σ, σ*andπ, π*orbitals and theircharacteristics.Hybridorbitals sp, sp^2, sp^3,calculationofcoefficients ofatomic orbitalsused in thesehybrid orbitals.

Learning Outcomes: After complition the course student would 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 describes 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.

PhysicalChemistry
Electrochemistry
(a) To determine the strength of the given acidconductometricallyusingstandard alkalisolution
(b)To determine the solubilityand solubilityproductofasparinglysoluble electrolyte conductometrically
(c) Tostudythe saponificationofethylacetateacetate conductometrically
(d)To determine the ionizationconstantofa weakacid conductrometrically
(e)   TotitratepotentiometricallythegivenferrousammoniumsulphatesolutionusingKMnO4/ $K_2Cr_2O_7$

astitrantand calculatetheredox potentialofFe^{++}/Fe^{+++}systemon the hydrogen scale.
Molecularweight determination:
1. Determination ofmolecularweightofa non volatilesolute byRastmethod/Beckmann freezingpoint method.
2. Determinationoftheapparentdegreeofdissociationofanelectrolyte(e.g.NaCl)inaqueoussolutionat differentconcentrations byebullioscopy.

Colorimetry:
ToverifyBeer-LambertlawKMnO4/$K_2Cr_2O_7$ anddeterminetheconcentrationofthegivensolutionofthe 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 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

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Practical	Total
BSC 602	Physics-I	CE*			20		100
	Physics-II		4	15	20	25	
	Physics-III				20		

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, ongitudinal 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 anexample of four force, transformation of four frequency vector, longitudinal and transverseDoppler's effect.

UNIT – III Transformation between Lab and CM:
Transformation between laboratory and center of mass system. Four momentum conservation,kinemations 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 complition 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.
- ❖ o gain knowledge about molecular spectroscopy.

UNIT I Bound State Problems - I:
Potential step and rectangular potential barrier, calculation of reflection and transmissioncoefficient, Qualitative discussion of the application to alpha decay (tunnel effect), square wellpotential problem, calculation of transmission coefficient.

UNIT II Bound State Problems- II:
Particle in one dimensional infinite potential well and finite depth potential well, energy valueand 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 energystates. Schrodinger equation for a spherically symmetric potential, Schrodinger equation for aone electron atom in spherically coordinates, separation of variables, Orbital angular momentumand 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 BohrCorrespondence Principle. Stern and Gerlach experiment, spin and magnetic moment. Spin orbitcoupling and qualitative explanation of fine structure. Atoms in magnetic field Zeeman spliting.

UNIT – IV Molecular Spectroscopy:
Qualitative features of molecular spectra: Rigid rotator discussion of energy, eigen values andeigen function, rotational energy levels of diatomic molecules, Rotational spectra, vibrationalenergy levels of diatomic molecules, vibrational spectra, vibrational rotational spectra.

Learning Outcomes: After complition 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

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 andNuclear Ellipticity, Quadrupole Moment and Nuclear spin, Parity and Orbital angularmomentum, Parity and its conservation, Nuclear Mass and Mass Spectroscopy, Nuclear Energy,Discovery of neutron and proton-neutron hypothesis, Neutron to proton Ration (n/z), The nuclearpotential, 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 massdistribution of fission products, Charge distribution of fission products, ionic charge of fissionproducts, Fission cross Section and threshold, Neutron emission in fission, The prompt neutronand delayed neutrons, Mechanism for the emission of delayed neutrons. Energy of fissionNeutrons, Theory of nuclear fission and Liquid Drop Model, Barrier Penetration-Theory ofSpontaneous fission, Nuclear Energy Sources, Nuclear Fission as a source of Energy, TheNuclear 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: Thesources 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-Walten High Voltage Generators, Van De-Graff Generators, Drift TubeLinear Accelerators, Wave Guide Accelerator, Magnetic Focussing In cyclotron,Synchrocyclotron, Betatron, The Electromagnetic Induction Accelerator, Electron Synchrotron,Proton Synchrotron.

Learning Outcomes: After complition 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 tem perature using torsional oscillator (resonance method).
10. Study of polarization by reflection from a glass plate with the help of Nichol'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 change 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

Course Code	Course Title	CourseCategory	Credit	C.I.A.	Theory	Practical	Total
BSC 603	Mathematics-I		4	15	20	25	100
	Mathematics-II	CE*			20		
	Mathematics-III				20		

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 complition 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. गौखरू 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, Rouche's theorem, Casorati - Weierstrass theorem.

Unit 3; Residue at a singularity, Cauchy's residue theorem. Argument principle. Rouche's eorem. Fundamental theorem of Algebra.

Unit 4: Conformal mapping. Bilinear transformation and its properties. Elementary mappings: w (z) $=\frac{1}{2}\left(z + \frac{1}{z}\right)$, z2 ,ez,sinz, cosz, and logz.
 Evaluation of a real definite integral by contour integration. Analytic continuation. Power series method of analytic continuation.

Learning Outcomes: After complition the course student would 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. जांगीड. जांगीड़, जितेन्द्र सैनी, बीजगणित, आर.बी.डी. पब्लिशिंग हाउस, जयपुर–दिल्ली, 2015–16
2. जी.सी. गौखरू सैनी, बीजगणित जयपुर पब्लिशिंग हाउस, जयपुर, 2015

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 commom catenary force in the three dimensions.

Learning Outcomes: After complition the course student would 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. जांगीड. जांगीड़, जितेन्द्र सैनी, बीजगणित, आर.बी.डी. पब्लिशिंग हाउस, जयपुर–दिल्ली, 2015–16
2. जी.सी. गौखरू सैनी, बीजगणित जयपुर पब्लिशिंग हाउस, जयपुर, 2015

Course Code	Course Title	Course Category	Credit	C.I.A.	Theory	Practical	Total
BSC 604	Botany-I				20		100
	Botany-II	CE*	4	15	20	25	
	Botany-III				20		

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, microsporogensis, 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, megagametogensis (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 complition 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 Cosec, Meerut.
6. Sambamurthy, A.V.V.S. and Subrahmanyan, 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, alleliopathy), competition, predation, parasitism and mutulism.

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 complition the course student would 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	Practical	Total
BSC 605	Zoology-I		4	15	20		100
	Zoology-II	**CE***			20	25	
	Zoology-III				20		

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-Haldaneconcept 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 complition the course student would able to:
- ❖ Understand the process of evolution.
- ❖ Understand the Lamarkism, Darwinism and Neo-Darwinism.

- ❖ Interprete Geological time scale.
- ❖ Explain Palaentology Fossils and its significance
- ❖ Discuss the Biostatistics and Biostatistical Tools

<h1 align="center">Zoology-Paper-II : Economic Zoology</h1>

Objectives:
- ❖ To Understand the Various concepts in Sericulture, Lac culture and Apiculture.
- ❖ To interprets 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 Hony Bees, Types of cates, 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, Carbomate 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 nebulo
  - 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, mentle & 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 Animalhusbandry: Introduction to common dairy animals; Techniques of dairy management
- 4.3 Vermiculture: Vermitechnology, Bio-Fertilizers

Learning Outcomes: After complition the course student would able to:
- ❖ Discuss the various concepts in Sericulture, Lac culture and 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 Economical 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 (Quadrt method Transeet method, plotless method:

Unit III: Biodiversity & Conservation
3.1 Various Aspects of Biodversity, Degree of Deversity,
3.2 Ex situ and In situ Conservation; Alpha, Beta and Gama 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 complition 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.

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 quadrate 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 Montgomerry, John Wiley and Sons.
4. Principles of Biostatistics by M. Pagano and K. Gauvrean: 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 AssociatesInc*.
2. Chapman, J. L. And Reiss, M. J. (1992). Ecology, principles and applications. *CambridgeUniversity Press*.
3. Verma, P. S. & Agarwal, V. K. (1983). Environmental biology (principles of ecology). *S.Chand & Co*.
4. Singh, J. H. e*t 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	Course Category	Credit	C.I.A. (Continouns Internal Assesment)	Theory	Total
JVB601	PERSONLITY DEVELOPMENT & YOGA (व्यक्तित्व विकास और योग) (Compulsory Paper)	Core Foundation(CC)	4	30	70	100

Semester-VI

उद्देश्य :

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

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

इकाई I

व्यक्तित्व का अर्थ एवं परिभाषा, व्यक्तित्व के निर्धारक तत्त्व, व्यक्तित्व के प्रकार।

इकाई II

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

इकाई III

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

इकाई IV

व्यक्तित्व विकास प्रक्रिया एवं योग — अध्यात्म योग का स्वरूप, अध्यात्म विकास की भूमिकाएं, अध्यात्म योग के सूत्र, आहार–संयम, उपवास

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, लाडनूं–341306 (राज.)

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

Course Code	Course Title	Course Category	Credit	C.I.A. (Continouns Internal Assesment)	Theory+Practical	Total
JVB602	Psychology (General Psychology-II)	Core Elective(CE)	4	30	50+20=70	100

Objectives:
- To enable students to develop an understanding of general principles of Psychology.
- To understand the concepts of Psychology and This course will familiarize students with the basic psychological processes and the studies relating to the factors which influence them.
- To understand how psychological can be hundred in terms of various psychological principle.

Unit-I: Memory
(i) Meaning and Definition of Memory
(ii) Types of Memory
(iii) Meaning and Nature of Forgetting
(iv) Measures of Improving Memory

Unit-II: Thinking and Problem Solving Behaviour
(i) Definition and Nature of Thinking
(ii) Types of Thinking
(iii) Methods of Solving the Problem
(iv) Steps of Problem Solving Behaviour

Unit-III: Motivation
(i) Meaning and Nature of Motivation
(ii) Motivation Cycle
(iii) Biological and Psychological Motivation
(iv) Intrinsic and Extrinsic Motivation

Unit-IV: Human Ability
(i) Definition and Nature of Intelligence
(ii) Mental Age & IQ
(iii) Types of Intelligence Tests
(iv) Nature of Creativity and Relation of Intelligence and Creativity

Outcome- This course will familiarize students with the basic psychological processes and the studies relating to the factors which influence them.

Books:-
1. Baron, R.A. Psychology: The essential sciences, New York; Allyn & Bacon.
2. Limbardo, P.G. & Weber, A.L.: Psychology, New York, Harper Collins College Publisher.
3. Lefton, L.A., Psychology, Boston; Allyn & Baron.
4. Morgan and King: Introduction to Psychology.
5. Singh, A.K.: Uchatar Samanya Manovigyan.

6. Azimurrahman: Samanya Manovigyan.

7. Suleman : Samanya Manovigyan.

8. Lal Bachan Tripathi : Uchatar Manovigyan.

Practical
(i) Measurement of Intelligence
(ii) Measurement of Achievement Motivation
(iii) Measurement of level or Creativity
(iv) Measurement the level of Forgiveness
(v) Measurement the level of Memory