B.Sc.(PCM): Syllabus Revision in 2016-17.

S. No	Course Code	Session 2015-16	Session 2016-17	Remark Syllabus Change/ new course
	BSC101	English	English	
		Unit I: Grammar and Usage	Unit I: Grammar and Usage	
		1. I ense.	1. Tense.	
		2. Modals.	2. Modals.	
		3. Active & Passive voice.	3. Active & Passive voice.	
		4. Direct & Indirect Speech.	4. Direct & Indirect Speech.	
		Unit II Elements of Communication	Unit II Elements of Communication	
		1. Communication: Meaning,	1. Communication: Meaning, Importance	
		Importance and Process	and Process	
		2. Verbal and Non- Verbal	2. Verbal and Non- Verbal Communication	
		Communication	3. Barriers to Communication.	
		3. Barriers to Communication.	4. Qualities of good Communication	
		4. Qualities of good	Unit III: Comprehension(Poetry)	
		Communication	1. Stopping by Woods on a Snowy Evening:	
		Unit III: Comprehension(Poetry)	Robert Frost	
		1. Stopping by Woods on a Snowy	2.Song of Youth by Dr.A.P.J.Abdul Kalam	
		Evening: Robert Frost	3.Where the Mind is Without Fear :	
		2. Song of Youth by Dr.A.P.J.Abdul	Rabindra Nath Tagore	
		Kalam	4. Abou Ben Adhem by Leigh Hunt	
		3. Where the Mind is Without Fear :	Unit: IV: Comprehension (Prose)	
		Rabindra Nath Tagore	1.An Astrologer's Day: R.K.Narayan	
		4. Abou Ben Adhem by Leigh Hunt	2.The Gift of Magi : O.Henry	
		Unit: IV: Comprehension (Prose)	3.Of Studies: Francis Bacon	
		1. An Astrologer's Day: R.K.Narayan	4.On the Rule of the Road: A.G. Gardiner	
		2. The Gift of Magi : O.Henry	Unit V: Composition	
		3. Of Studies: Francis Bacon	1. Letter Writing: Formal and Informal	
		4. On the Rule of the Road: A.G.	2. C.V. Writing.	
		Gardiner	3. E-Mails	
		Unit V: Composition	4. Paragraph Writing	
		1. Letter Writing: Formal and Informal		
		2. C.V. Writing.		
		3. E-Mails		
		4. Paragraph Writing		
	BSC102	Mechanics Unit 1:	Unit 1:	
		Vectors: Vector algebra. Scalar and vector	Vectors: Vector algebra. Scalar and vector	
		products. Derivatives of a vector with	products. Derivatives of a vector with	

respect to	a	parameter.	Orunnary	respect	10	a	parameter.	Orumary
Differential	Ec	quations:1st	order	Different	ial	E	Equations:1st	order
homogeneous	diffe	erential equa	tions. 2 nd	homogen	eous	diff	erential equa	tions. 2 nd
order homog	eneous	differential	equations	order ho	moge	eneou	s differential	equations
with constant	coeffi	cients.		with cons	tant c	coeffi	cients.	

Ordinary ragnant

Unit 2:

roomoot

Laws of Motion: Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum.

noromotor

Unit 3:

Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only). Satellite circular orbit in and applications.Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS). Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped Oscillations.

Unit 4:

Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants – Work done in stretching and work done in twisting a wire -Twisting couple on a cylinder -Determination of Rigidity modulus by static torsion – Torsional pendulum-

Unit 2:

Laws of Motion: Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets. Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum.

noromotor

Ordinary

Unit 3:

Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only). Satellite in circular orbit and applications.Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS). Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped Oscillations.

Unit 4:

Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants – Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion – Torsional pendulum -Determination of

	Determination of Rigidity modulus and	Rigidity modulus and moment of inertia - q,	
	moment of inertia - q, η and \Box by Searles	η and \Box by Searles method.	
	method.	Unit 5:	
	Unit 5:	Special Theory of Relativity: Constancy of	
	Special Theory of Relativity: Constancy of	speed of light. Postulates of Special Theory	
	speed of light. Postulates of Special	of Relativity. Length contraction. Time	
	Theory of Relativity. Length contraction.	dilation. Relativistic addition of velocities.	
	Time dilation. Relativistic addition of		
	velocities.		
 BSC103			
DSC105	Atomic Structure, Bonding, General Organic Chemistry & Aliphatic		
	hydrocarbons		
	UNIT-I	UNIT-I	
	Atomic Structure:	Atomic Structure:	
	Review of: Bohr's theory and its	Review of: Bohr's theory and its	
	limitations, dual behaviour of matter and	limitations, dual behaviour of matter	
	radiation, de Broglie's relation, Heisenberg	and radiation, de Broglie's relation,	
	Uncertainty principle. Hydrogen atom	Heisenberg Uncertainty principle.	
	spectra. Need of a new approach to Atomic	Hydrogen atom spectra. Need of a new	
	structure.	approach to Atomic structure.	
	Quantum Mechanics:	Quantum Mechanics:	
	What is Quantum mechanics? Time	What is Quantum mechanics? Time	
	independent Schrodinger equation and	independent Schrodinger equation and	
	meaning of various terms in it.	meaning of various terms in it.	
	Significance of ψ and ψ 2, Schrödinger	Significance of ψ and ψ 2, Schrödinger	
	equation for hydrogen atom. Radial and	equation for hydrogen atom. Radial and	
	angular parts of the hydogenic	angular parts of the hydogenic wave	
	wavefunctions (atomic orbitals) and their	functions (atomic orbitals) and their	
	variations for $1s$, $2s$, $2p$, $3s$, $3p$ and $3d$	variations for 1s, 2s, 2p, 3s, 3p and 3d	
	orbitals (Only graphical representation).	orbitals (Only graphical representation).	
	Radial and angular nodes and their	Radial and angular nodes and their	
	significance. Radial distribution functions	significance. Radial distribution	
<u> </u>			

and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers *ml* and *ms*. Shapes of *s*, p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (ms). Rules for filling electrons in various orbitals, Electronic configurations of the Stability of half-filled atoms. and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

UNIT-II

Chemical Bonding and Molecular Structure:

Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Covalent bonding: VB Approach: Shapes

functions and the concept of the most probable distance with special reference 2s atomic orbitals. to 1sand Significance of quantum numbers, orbital angular momentum and quantum numbers *ml* and *ms*. Shapes of *s*, *p* and atomic orbitals, nodal planes. d Discovery of spin, spin quantum number (s) and magnetic spin quantum number (ms). Rules for filling electrons orbitals. Electronic in various configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

UNIT-II

Chemical Bonding and Molecular Structure:

Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage

of some inorganic molecules and ions on

the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures in various inorganic and organic compounds.

UNIT-III

MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of *s*-*p* mixing) and heteronuclear diatomic molecules such as CO, NO and NO⁺. Comparison of VB and MO approaches.

Section B: Organic Chemistry-1 Stereochemistry:

Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; *cis - trans*

ionic character.

Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures in various inorganic and organic compounds.

UNIT-III

MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for *s*-*s*, *s*-*p* and *p*-*p* combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of *s*-*p* mixing) and heteronuclear diatomic molecules such as CO, NO and NO⁺. Comparison of VB and MO approaches.

Section B: Organic Chemistry-1 Stereochemistry:

Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

Fundamentals of Organic Chemistry:

UNIT-IV

Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect. Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.

UNIT-V

Aliphatic Hydrocarbons:

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Alkanes: (Upto 5 Carbons).

Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. *Reactions:* Free radical Substitution: Halogenation.

Alkenes: (Upto 5 Carbons)

Preparation: Elimination reactions:

Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; *cis - trans* nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

UNIT-IV

Fundamentals of Organic Chemistry: Physical Effects. Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.Structure, reactivity of organic shape and molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.

UNIT-V

Aliphatic Hydrocarbons:

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Alkanes: (Upto 5 Carbons).

	Dehydration of alkenes and	Preparation: Catalytic hydrogenation,	
	dehydrohalogenation of alkyl halides	Wurtz reaction, Kolbe's synthesis, from	
	(Saytzeff's rule); cis alkenes (Partial	Grignard reagent. Reactions: Free	
	catalytic hydrogenation) and trans alkenes	radical Substitution: Halogenation.	
	(Birch reduction).	Alkenes: (Upto 5 Carbons)	
	Reactions: cisaddition (alk. KMnO4) and	Preparation: Elimination reactions:	
	trans-addition (bromine), Addition of HX	Dehydration of alkenes and	
	(Markownikoff's and anti-Markownikoff's	dehydrohalogenation of alkyl halides	
	addition), Hydration, Ozonolysis,	(Saytzeff's rule); cis alkenes (Partial	
	oxymecuration-demercuration,	catalytic hydrogenation) and trans	
	Hydroboration-oxidation.	alkenes (Birch reduction).	
	Alkynes: (Upto 5 Carbons)	Reactions: cisaddition (alk. KMnO4)	
	Preparation: Acetylene from CaC2 and	and trans-addition (bromine), Addition	
	conversion into higher alkynes; by	of HX (Markownikoff's and anti-	
	dehalogenation of tetra halides and	Markownikoff's addition), Hydration,	
	dehydrohalogenation of vicinal-dihalides.	Ozonolysis, oxymecuration-	
	Reactions: formation of metal acetylides,	demercuration, Hydroboration-	
	addition of bromine and alkaline KMnO4,	oxidation.	
	ozonolysis and oxidation with hot alk.	Alkynes: (Upto 5 Carbons)	
	KMnO4.	Preparation: Acetylene from CaC2 and	
		conversion into higher alkynes; by	
		dehalogenation of tetra halides and	
		dehydrohalogenation of vicinal-	
		dihalides.	
		<i>Reactions:</i> formation of metal acetylides, addition of bromine and alkaline KMnO4, ozonolysis and oxidation with hot alk. KMnO4.	
BSC104	Differential Calculus Unit- I		
	Limit and Continuity (ϵ and δ definition),	Unit- I	
	Types of discontinuities, Differentiability	Types of discontinuities Differentiability of	
	of	functions. Successive differentiation	
	functions, Successive differentiation,	Leibnitz's theorem,	
	Leibnitz's theorem,		

	Unit- II	Unit- II	
	Tangents and normals, Curvature,	Tangents and normals, Curvature,	
	Asymptotes, Singular points,	Asymptotes, Singular points,	
	Unit- III	Unit- III	
	Tracing of curves. Parametric	Tracing of curves. Parametric representation	
	representation of curves and tracing of	of curves and tracing of parametric curves,	
	parametric curves, Polar	Polar	
	coordinates and tracing of curves in polar	coordinates and tracing of curves in polar	
	coordinates.	coordinates.	
	Unit- IV	Unit- IV	
	Rolle's theorem, Mean Value theorems,	Rolle's theorem, Mean Value theorems,	
	Taylor's theorem with Lagrange's and	Taylor's theorem with Lagrange's and	
	Cauchy's forms of remainder, Taylor's	Cauchy's forms of remainder, Taylor's	
	series, Maclaurin's series of sin x, cos x,	series, Maclaurin's series of sin x, cos x, ex,	
	ex,	log(l+x), (l+x)m,	
	$\log(1+x), (1+x)m,$	Unit- V	
	Unit- V	Partial differentiation, Euler's theorem on	
	Partial differentiation, Euler's theorem on	homogeneous functions. Maxima and	
	homogeneous functions. Maxima and	Minima with several variables,	
	Minima with several variables,	Indeterminate forms.	
	Indeterminate forms.		
BSC105	Mechanics Lab		
	1. Measurements of length (or diameter)	1. Measurements of length (or	
	using vernier caliper, screw gauge and	diameter) using vernier caliper, screw	
	travelling microscope.	gauge and	
	2. To determine the Height of a Building	travelling microscope.	
	using a Sextant.	2. To determine the Height of a	
	3. To determine the Moment of Inertia of a	Building using a Sextant.	
	Flywheel.	3. To determine the Moment of Inertia	
	4. To determine the Young's Modulus of a	of a Flywheel.	
	Wire by Optical Lever Method.	4. To determine the Young's Modulus	
	5. To determine the Modulus of Rigidity of	of a Wire by Optical Lever Method.	
	a Wire by Maxwell's needle.	5. To determine the Modulus of	
	6. To determine the Elastic Constants of a	Rigidity of a Wire by Maxwell's	
	Wire by Searle's method.	needle.	
	7. To determine g by Bar Pendulum.	6. To determine the Elastic Constants of	
	8. To determine g by Kater's Pendulum.	a Wire by Searle's method.	
	9. To determine g and velocity for a freely	7. To determine g by Bar Pendulum.	
	6 , ,		

Technique 10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g 9. To determine g and velocity for a freely failing body using Digital Timing Technique BSC106 Atomic Structure, Boading, General Organic Chemistry & Aliphatic hydrocarbons Lab 9. To determine g and velocity for a freely failing body using Digital Timing Technique BSC106 Atomic Structure, Boading, General Organic Chemistry & Aliphatic hydrocarbons Lab 9. Section A: Inorganic Chemistry - Volumetric Analysis 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 1. Estimation of soalic acid by titrating it with KMnO4. 3. Festimation of oxalic acid by titrating it with KMnO4. 3. Estimation of Fe (II) ions by titrating it with KMnO4. 4. Estimation of Cu (II) ions by titrating it with K2Cr2O7 using internal indicator. 5. Estimation of Cu (II) ions is dometrically using Na2S2O3. Section B: Organic Chemistry 1. Detection of extra elements (N, S, Cl, Br, Dr) in organic compounds (containing upto upto two extra elements) 1. Detection of mixtures by 2. Separation of mixtures by 2. Separation of mixtures by 2. Separation of mixtures by 3. I dentify and separate the components of a given mixture of two amino acids 2. Separation of mixtures of two amino acids		falling body using Digital Timing	8. To determine g by Kater's Pendulum.	
10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g freedy falling body using Digital Timing Technique 10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g 10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g 11. BSC106 Atomic Structure, Bonding, General Organic Chemistry - Volumetric Analysis 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 11. Estimation of sodium carbonate present in a mixture. 1. Estimation of sodium carbonate present in a mixture. 12. Estimation of oxalic acid by titrating it with KMnO4. 3. Estimation of erystallization in Mohr's salt by titrating with KMnO4. 13. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator. 5. Estimation of Cu (II) ions is dometrically using Na2S2O3. Section B: Organic Chemistry 1. Detection of extra elements (N, S, CL, Br, 1) in organic compounds (containing upto two extra elements) 12. Separation of mixtures by Chromatography: Measure the Ry value in each case (combination of two compounds to be given) (a) Identify and separate the components of a given mixture of two amino acids		Technique	9. To determine \mathbf{g} and velocity for a	
ealculate (a) Spring Constant (b) Value of Technique g 10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g BSC106 Atomic Structure. Bonding, General Organic Chemistry & Aliphatic hydrocarbons. Lab Section A: Inorganic Chemistry - Volumetric Analysis Section A: Inorganic Chemistry - Volumetric Analysis 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. I. Estimation of oxalic acid by titrating it with KMnO4. 3. Estimation of oxalic acid by titrating it with KMnO4. Section of reystallization in Mohr's salt by titrating with KMnO4. 4. Estimation of Fe (II) ions by titrating it with K2C(2O7 using internal indicator. S. Estimation of Cu (II) ions is Section B: Organic Chemistry 5. Estimation of estra elements (N, S, Cl, Br, Br, I) in organic compounds (containing upto two extra elements) I. Detection of mixtures by Chromatography: Measure the Ry value in each case (combination of two compounds to be given) (a) Identify and separate the components of a given mixture of two amino acids (a) Identify and separate the components of a given mixture of two amino acids		10. To study the Motion of a Spring and	freely falling body using Digital Timing	
g 10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g BSC106 Atomic Structure, Bonding, General Organic Chemistry & Aliphatic hydrocarbons Tab Section A: Inorganic Chemistry - Volumetric Analysis Section A: Inorganic Chemistry - Volumetric Analysis I. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. I. Estimation of soalic acid by titrating it with KMnO4. S. Estimation of oxalic acid by titrating it with KMnO4. Section for extra construction in Mohr's salt by titrating with KMnO4. A. Estimation of C u (II) ions by titrating it with K2Cr2O7 using internal indicator. S. Estimation of C u (II) ions ing Na2S2O3. Section B: Organic Chemistry I. Detection of extra elements (N, S, CI, Br, Br, 1) in organic compounds (containing upto two extra elements) 2. Separation of mixtures by Chromatography: Measure the Ry value in each case (combination of two compounds to be given) (a) Identify and separate the components of a given mixture of two amino acids		calculate (a) Spring Constant (b) Value of	Technique	
eccleulate (a) Spring Constant (b) Value of g BSC106 Atomic Structure, Bonding, General Degrane Chemistry & Aliphatic hydrocarbons Lab Section A: Inorganic Chemistry - Volumetric Analysis Section A: Inorganic Chemistry - Volumetric Analysis 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. I. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 2. Estimation of oxalic acid by titrating it with KMnO4. Statimation of oxalic acid by titrating with KMnO4. 3. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator. S. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator. 5. Estimation of Cu (II) ions iodometrically using Na2S2O3. Section B: Organic Chemistry 1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements) S. Estimation of mixtures by Chromatography: Measure the R _y value in each case (combination of two compounds to be given) (a) Identify and separate the components of a given mixture of two amino acids Chrow amino acids		g	10. To study the Motion of a Spring and	
org org BSC106 Atomic Structure, Bonding, General Organic Chemistry & Alphatic hydrocarbons Lab Section A: Inorganic Chemistry - Volumetric Analysis I. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. I. Estimation of sodium carbonate present in a mixture. 2. Estimation of oxalic acid by titrating it with KMnO4. Section of extra clements (N, S, Cl, Br, Br, D) in organic Chemistry 3. Estimation of Cu (II) ions Section B: Organic Chemistry 4. Estimation of extra elements (N, S, Cl, Br, Br, D) in organic compounds (containing upto two extra elements) Section of mixtures by 2. Separation of two extra elements (N, S, Cl, Br, Br, D) in organic of two extra elements) I. Detection of two extra elements (N, S, Cl, Br, Br, D) in organic on fwixtures by 2. Separation of two extra elements (N, S, Cl, Br, Br, D) in organic on fwixtures by I. Detection of two extra elements (N, S, Cl, Br, Br, D) in organic on fwixtures by 2. Separation of mixtures by Chromatography: Measure the Ry value in each case (combination of two compounds to be given) (a) Identify and separate the components of a given mixture of two amino acids			calculate (a) Spring Constant (b) Value	
BSC106 Atomic Structure, Bonding, General Organic Chemistry & Aliphatic hydrocarbons Lab Section A: Inorganic Chemistry - Volumetric Analysis 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. Section and present in a mixture. I. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 2. Estimation of oxalic acid by titrating it with KMnO4. Settimation of oxalic acid by titrating it with KMnO4. Settimation of oxalic acid by titrating it with KMnO4. 3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4. Settimation of Fe (11) ions by titrating it with K2Cr2O7 using internal indicator. Settimation of Cu (11) ions iodometrically using Na2S2O3. Section B: Organic Chemistry 1. Detection of extra elements (N, S, Cl, Br, 1) in organic compounds (containing upto two extra elements) Separation of mixtures by 2. Separation of mixtures by 2. Separation of mixtures by 3. Separation of mixtures by 3. Separation of two compounds 3. Use given) Separate the components 3. Identify and separate the components of 3. Identify and separate the components of 3. Identify and separate the components of 3. Identify and separate the components			of g	
Section A: Inorganic Chemistry - Section A: Inorganic Chemistry - Volumetric Analysis 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 1. Estimation of sodium carbonate present in a mixture. 2. Estimation of oxalic acid by titrating it with KMnO4. 3. Estimation of vater of crystallization in Mohr's sall by titrating with KMnO4. 3. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator. 5. Estimation of Cu (II) ions iodometrically using Na2S2O3. Section B: Organic Chemistry 1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements) 1. Detection of mixtures by Chromatography: Measure the R _y value in each case (combination of two compounds to be given) (a) Identify and separate the components of a given mixture of two amino acids (a) Identify and separate the components of a given mixture of two amino acids	BSC106	Atomic Structure, Bonding, General Organic Chemistry & Aliphatic hydrocarbons Lab		
Volumetric AnalysisVolumetric Analysis1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.1. Estimation of sodium carbonate present in a mixture.2. Estimation of oxalic acid by titrating it with KMnO4.2. Estimation of oxalic acid by titrating it with KMnO4.3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.3. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.5. Estimation of Cu (II) iodometrically using Na2S2O3.Section B: Organic Chemistry1. Detection of extra elements (N, S, Cl, I) in organic compounds (containing upto two extra elements)1. Detection of mixtures by 2. Separation of mixtures by2. Separation of mixtures the Ry value in each case (combination of two compounds to be given)2. Separate the components of a given mixture of two amino acids(a) Identify and separate the components of a given mixture of two amino acids(a) Identify and separate the components		Section A: Inorganic Chemistry -	Section A: Inorganic Chemistry -	
1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.2. Estimation of oxalic acid by titrating it with KMnO4.3. Estimation of oxalic acid by titrating it with KMnO4.3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.3. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.5. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.4. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.5. Estimation of Cu (II) ions iodometrically using Na2S2O3.5. Estimation of Cu (II) ions solt by trate elements (N, S, Cl, I. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)1. Detection of extra elements (N, S, Cl, I. Detection of mixtures by Chromatography: Measure the R _f value in each case (combination of two compounds to be given)2. Separation of mixtures by Chromatography: Measure the components of of a given mixture of two amino acids		Volumetric Analysis	Volumetric Analysis	
sodium hydrogen carbonate present in a mixture.sodium hydrogen carbonate present in a mixture.2. Estimation of oxalic acid by titrating it with KMnO4.2. Estimation of oxalic acid by titrating it with KMnO4.3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.3. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.5. Estimation of Cu (II) ions iodometrically using Na2S2O3.4. Estimation of Cu (II) ions software elements (N, S, Cl, I. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)2. Separation of mixtures by Chromatography: Measure the R _y value in each case (combination of two compounds to be given)1. Detection of two amino acids(a) Identify and separate the components of a given mixture of two amino acids(a) Identify and separate the components of a given mixture of two amino acids		1. Estimation of sodium carbonate and	1. Estimation of sodium carbonate and	
mixture.mixture.2. Estimation of oxalic acid by titrating it with KMnO4.2. Estimation of oxalic acid by titrating it with KMnO4.3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.4. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.4. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.5. Estimationof Cu (II) ions iodometrically using Na2S2O3.5. Estimation of Cu (II) ions iodometrically using Na2S2O3.Section B: Organic Chemistry I. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)2. Separationof mixtures by Chromatography: Measure the R _y value in each case (combination of two compounds to be given)2. Separate the components (a) Identify and separate the components of a given mixture of two amino acids3. Identify and separate the components 		sodium hydrogen carbonate present in a	sodium hydrogen carbonate present in a	
2. Estimation of oxalic acid by tirrating it with KMnO4.2. Estimation of oxalic acid by tirrating it with KMnO4.3. Estimation of water of crystallization in Mohr's salt by tirrating with KMnO4.3. Estimation of water of crystallization in Mohr's salt by tirrating with KMnO4.4. Estimation of Fe (II) ions by tirrating it with K2Cr2O7 using internal indicator.Mohr's salt by tirrating with KMnO4.5. Estimation of Cu (II) ions iodometrically using Na2S2O3.Section B: Organic Chemistry1. Detection of extra elements (N, S, Cl, I). Detection of extra elements (N, S, Cl, I) in organic compounds (containing upto two extra elements)1. Detection of mixtures by Chromatography: Measure the R_f value in each case (combination of two compounds to be given)2. Separate the components of a given mixture of two amino acids(a) Identify and separate the components of a given mixture of two amino acids		mixture.	mixture.	
with KMnO4.with KMnO4.3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.4. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.4. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.5. Estimation of Cu (II) ions iodometrically using Na2S2O3.5. Estimation of Cu (II) ions iodometrically using Na2S2O3.Section B: Organic Chemistry1. Detection of extra elements (N, S, Cl, I) in organic compounds (containing upto two extra elements)1. Detection of mixtures by Chromatography: Measure the Ry value in each case (combination of two compounds to be given)2. Separation of mixtures by chromatography: Measure the Ry value in each case (combination of two compounds to be given)(a) Identify and separate the components of a given mixture of two amino acids(a) Identify and separate the components of a given mixture of two amino acids		2. Estimation of oxalic acid by titrating it	2. Estimation of oxalic acid by titrating it	
3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.4. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.4. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.5. Estimation of Cu (II) ions iodometrically using Na2S2O3.5. Estimation of Cu (II) ions iodometrically using Na2S2O3.Section B: Organic Chemistry 1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)2. Separation of mixtures by Chromatography: Measure the R _f value in each case (combination of two compounds to be given)2. Separation of two compounds each case (combination of two compounds to be given)2. Separate the components (a) Identify and separate the components of a given mixture of two amino acids3. Estimation of wo amino acids		with KMnO4.	with KMnO4.	
Mohr's salt by titrating with KMnO4.Mohr's salt by titrating with KMnO4.4. Estimation of Fe (II) ions by titrating it4. Estimation of Fe (II) ions by titrating itwith K2Cr2O7 using internal indicator.with K2Cr2O7 using internal indicator.5. Estimation of Cu (II) ions5. Estimation of Cu (II) ions iodometricallyiodometrically using Na2S2O3.using Na2S2O3.Section B: Organic ChemistrySection B: Organic Chemistry1. Detection of extra elements (N, S, Cl,1. Detection of extra elements (N, S, Cl, Br,Br, I) in organic compounds (containing upto two extra elements)1) in organic compounds (containing upto two extra elements)2. Separation of mixtures by Chromatography: Measure the Rf value in each case (combination of two compounds to be given)Chromatography: Measure the components (a) Identify and separate the components(a) Identify and separate the components of a given mixture of two amino acids(a) Identify and separate the components		3. Estimation of water of crystallization in	3. Estimation of water of crystallization in	
4. Estimation of Fe (II) ions by titrating it4. Estimation of Fe (II) ions by titrating itwith K2Cr2O7 using internal indicator.5. Estimation of Cu (II) ions5. Estimation of Cu (II) ions5. Estimation of Cu (II) ions iodometricallyiodometrically using Na2S2O3.using Na2S2O3.Section B: Organic ChemistrySection B: Organic Chemistry1. Detection of extra elements (N, S, Cl,1. Detection of extra elements (N, S, Cl, Br,Br, I) in organic compounds (containing1) in organic compounds (containing uptoupto two extra elements)2. Separation of mixtures by2. Separation of mixtures by2. Separation of mixtures byChromatography: Measure the Rf value ineach case (combination of two compoundsto be given)(a) Identify and separate the components(a) Identify and separate the componentsa given mixture of two amino acids		Mohr's salt by titrating with KMnO4.	Mohr's salt by titrating with KMnO4.	
with K2Cr2O7 using internal indicator.with K2Cr2O7 using internal indicator.5. Estimation of Cu (II) ions5. Estimation of Cu (II) ions iodometrically using Na2S2O3.Section B: Organic ChemistrySection B: Organic Chemistry1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)2. Separation of mixtures by Chromatography: Measure the R _f value in each case (combination of two compounds to be given)2. Separation of mixtures by chromatography to be given)(a) Identify and separate the components of a given mixture of two amino acids(a) Identify and separate the components of a given mixture of two amino acids		4. Estimation of Fe (II) ions by titrating it	4. Estimation of Fe (II) ions by titrating it	
5. Estimation of Cu (II) ions5. Estimation of Cu (II) ions iodometrically using Na2S2O3.Section B: Organic ChemistrySection B: Organic Chemistry1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)2. Separation of mixtures by Chromatography: Measure the R _f value in each case (combination of two compounds to be given)2. Separate the components to be given)(a) Identify and separate the components of a given mixture of two amino acids(a) given mixture of two amino acids		with K2Cr2O7 using internal indicator.	with K2Cr2O7 using internal indicator.	
iodometrically using Na2S2O3.using Na2S2O3.Section B: Organic ChemistrySection B: Organic Chemistry1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)2. Separation of mixtures by Chromatography: Measure the Rf value in each case (combination of two compounds to be given)2. Separate the components to be given)(a) Identify and separate the components of a given mixture of two amino acids(a) Identify and separate the components of two amino acids		5. Estimation of Cu (II) ions	5. Estimation of Cu (II) ions iodometrically	
Section B: Organic ChemistrySection B: Organic Chemistry1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)2. Separation of mixtures by Chromatography: Measure the Rf value in each case (combination of two compounds to be given)2. Separate the components each case (combination of two compounds to be given)(a) Identify and separate the components of a given mixture of two amino acids(a) Identify and separate the components a given mixture of two amino acids		iodometrically using Na2S2O3.	using Na2S2O3.	
1. Detection of extra elements (N, S, Cl,1. Detection of extra elements (N, S, Cl, Br,Br, I) in organic compounds (containingI) in organic compounds (containing uptoupto two extra elements)two extra elements)2. Separation of mixtures by2. Separation of mixtures byChromatography: Measure the Rf value ineach case (combination of two compoundsto be given)to be given)(a) Identify and separate the components(a) Identify and separate the componentsof a given mixture of two amino acidsa given mixture of two amino acids		Section B: Organic Chemistry	Section B: Organic Chemistry	
Br, I) in organic compounds (containing upto two extra elements)I) in organic compounds (containing upto two extra elements)2. Separation of mixtures by Chromatography: Measure the R _f value in each case (combination of two compounds to be given)Chromatography: Measure the R _f value in to be given)(a) Identify and separate the components of a given mixture of two amino acids(a) Identify and separate the components a given mixture of two amino acids		1. Detection of extra elements (N, S, Cl,	1. Detection of extra elements (N, S, Cl, Br,	
upto two extra elements)two extra elements)2. Separation of mixtures by2. Separation of mixtures byChromatography: Measure the Rf value inChromatography: Measure the Rf value ineach case (combination of two compoundseach case (combination of two compoundsto be given)to be given)(a) Identify and separate the components(a) Identify and separate the components ofof a given mixture of two amino acidsa given mixture of two amino acids		Br, I) in organic compounds (containing	I) in organic compounds (containing upto	
2. Separation of mixtures by Chromatography: Measure the Rf value in each case (combination of two compounds to be given)2. Separation of mixtures by Chromatography: Measure the Rf value in each case (combination of two compounds to be given)(a) Identify and separate the components of a given mixture of two amino acids(a) Identify and separate the components a given mixture of two amino acids		upto two extra elements)	two extra elements)	
Chromatography: Measure the R _f value in Chromatography: Measure the R _f value in each case (combination of two compounds each case (combination of two compounds to be given) to be given) (a) Identify and separate the components (a) Identify and separate the components of a given mixture of two amino acids a given mixture of two amino acids		2. Separation of mixtures by	2. Separation of mixtures by	
each case (combination of two compounds each case (combination of two compounds to be given) to be given) (a) Identify and separate the components (a) Identify and separate the components of of a given mixture of two amino acids a given mixture of two amino acids		Chromatography: Measure the R_f value in	Chromatography: Measure the R_f value in	
to be given) to be given) (a) Identify and separate the components (a) Identify and separate the components of of a given mixture of two amino acids a given mixture of two amino acids		each case (combination of two compounds	each case (combination of two compounds	
(a) Identify and separate the components (a) Identify and separate the components of of a given mixture of two amino acids a given mixture of two amino acids		to be given)	to be given)	
of a given mixture of two amino acids a given mixture of two amino acids		(a) Identify and separate the components	(a) Identify and separate the components of	
		of a given mixture of two amino acids	a given mixture of two amino acids	

PSC201 Favirometal Science Unit-1 Ecosystem: concepts and functions Unit-1 Ecosystem: concepts and functions PSC201 Favirometal Science Unit-1 Ecosystem: concepts and functions Unit-1 Ecosystem: concepts and functions Functions Ecosystem: Aboric and Introduction of Ecosystem: Point Ecosystem: Biodiversity: Definition, Type and levels of Biodiversity: Definition of biodiversity: Biodiversity: Conservation of biodiversity: Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India. Unit - 2 Natural Resources Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India. Unit - 2 Natural Resources Definition, Marine pollution, Soil pollution, Classification of soidi waste, Composition and characteristics of soid waste, collection, conveyance and waste, collection, conveyance and disposal methods of soid waste, Reuse, Recycle and Recovery of waste.			(glycine, aspartic acid, glutamic acid,	(glycine, aspartic acid, glutamic acid,	
ehromatography chromatography (b) Identify and separate the sugars present in the given mixture by paper in the given mixture by paper chromatography. BSC201 Environmental Science Unit-1 Ecosystem: concepts and functions Luit-1 Ecosystem: concepts and functions Ecosystem- Definition and Introduction of Ecosystem- Abiotic and Biotic components, types of Ecosystem. Luit-1 Ecosystem: Structure and functions of Ecosystem. Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem. Biodiversity. Definition, Type and levels of Biodiversity. Values, Threats of biodiversity. Conservation of biodiversity. Definition and classification of natural resources, Types and uses of renewable and non renewabble resources in India, potentials of resources in India. Definition, Marine pollution, Noise pollution, Marine pollution, Soil pollution, Thermal pollution, Noise pollution, Classification of solid waste, composition and characteristics of soil waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.			tyrosine or any other amino acid) by paper	tyrosine or any other amino acid) by paper	
 (b) Identify and separate the sugars present in the given mixture by paper chromatography. (b) Identify and separate the sugars present in the given mixture by paper chromatography. BSC201 Environmental Science Unit-1 Ecosystem: concepts and functions Ecosystem. Definition and Introduction of Ecosystem. Abiotic and Biotic components, types of Ecosystem. Structure and functions of Ecosystem. Food chain, Food web, Ecological pyramids, Energy flow in FCosystem. Biodiversity. Values, Threats of biodiversity. Conservation of biodiversity- la-situ and Ex-situ. Unit - 3 Starial Recources Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India. Definition, Marine pollution, Soil pollution, Marine pollution, Classification of solid waste, collection, convegance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste. Waste, Composition and characteristics of solid waste, collection, convegance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste. 			chromatography	chromatography	
in the given mixture by paper in the given mixture by paper in the given mixture by paper chromatography. BSC201 Environmental Science Unit-1 Ecosystem: concepts and functions Ecosystem- Abiotic and Biotic components, types of Ecosystem, Scosystem- Sod chain, Food Structure and functions of Ecosystem, Structure and functions of Ecosystem, Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem, Biodiversity. Definition, Type and levels Biodiversity. Conservation of biodiversity- In-situ and Ex-situ. Unit - 2 Natural Resources Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India. Unit - 3 Environmental Pollution, Marine pollution, Maro			(b) Identify and separate the sugars present	(b) Identify and separate the sugars present	
BSC201 Environmental Science Unit-1 Ecosystem: concepts and Inactions Unit-1 Ecosystem: concepts and functions Ecosystem: Definition and Introduction of Ecosystem: Abiotic and Biotic components, types of Ecosystem; Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem; Biodiversity: Definition, Type and levels of Biodiversity: Definition, Type and levels of Biodiversity: Onservation of biodiversity: In-situ and Ex-situ. Unit-1 Ecosystem: Ecosystem: Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem. Biodiversity: Definition, Type and levels of Biodiversity: Onservation of biodiversity- biodiversity: Onservation of biodiversity- lin-situ and Ex-situ. Biodiversity. Values, Threats of Biodiversity. Values, Threats of Biodiversity Conservation of biodiversity- In-situ and Ex-situ. Unit - 2 Natural Resources of Biodiversity Conservation of biodiversity- lin-situ and Ex-situ. Unit - 2 Natural Resources India. Unit - 2 Natural Resources of Biodiversity Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India. Unit - 3 Environmental Pollution and Control measures pollution, Marine pollution, Soit pollution, Marine pollution, Marine pollution, Marine pollution, Marine pollution, Marine pollution, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.			in the given mixture by paper	in the given mixture by paper	
BSC201 Environmental Science Unit - I Cosystem: Concepts and Unit - I Ecosystem: Concepts and functions Ecosystem: Definition and Introduction of Ecosystem: Abiotic and Biotic Components, types of Ecosystem Structure and functions of Ecosystem. Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem. Biodiversity: Definition, Type and levels Biodiversity: Observation of biodiversity. In-situ and Ex-situ. Biodiversity. Values, Threats of Unit - 2 Natural Resources Biodiversity. Definition and classification of natural resources in India. Unit - 3 Environmental Pollution and Control measures Causes. Effects and Control measures of Air_ pollution. Marine pollution. Soil pollution, Thermal pollution, and Nuclear Disaster management: Floods, cardiques, Unit -4 Solid Waste Management Incoduction of solid Unit -4 Solid Waste Management Incoduction, Classification of solid Unit -4 Solid Waste Management Incoduction, Classification of solid Introduction, Classification of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.			chromatography	chromatography	
BSC201 Environmental Science Unit-1 Ecosystem: concepts and functions Ecosystem: Definition and Introduction of Ecosystem: Abiotic and Biotic components, types of Ecosystems. Structure and functions of Ecosystem. Ecosystem: Abiotic and Biotic components, types of Ecosystem. Structure and functions of Ecosystem. Structure and functions of Ecosystem. Structure and functions of Ecosystem. Biodiversity. Structure and functions of Ecosystem. Biodiversity. Definition, Type and levels of Biodiversity. Definition, Type and levels of Biodiversity. Values, Threats of biodiversity. Conservation of biodiversity: In-situ and Ex-situ. Unit - 2 Natural Resources Biodiversity. Values, Threats of biodiversity. Conservation of biodiversity: In-situ and Ex-situ. Unit - 2 Natural Resources Definition and classification of natural resources, Types and uses of renewable non renewable resources in India, Definition and Control measures of Air pollution, Matrine pollution, Noise causes, Effects and Control measures of Air pollution, Matrine pollution, and Nuclear Diasater management: Floods, earthquake, cyclone and landslides. Unit - 4 Solid Waste Management Introduction, Classification of solid Introduction, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of			en e	en on alography.	
Unit-1 Ecosystem: concepts and functionsUnit-1 Ecosystem: concepts and functionsEcosystem: Definition and Introduction of Ecosystem: Abiotic and Biotic components, types of Ecosystems, Structure and functions of Ecosystem- Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem. Biodiversity. Values, Threats of Biodiversity. Values, Threats of biodiversity Conservation of biodiversity. In-situ and Ex-situ. Unit - 2 Natural Resources Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India, potentials of resources in India.Unit - 2 Natural Resources Definition and classification of natural resources in India, potentials of resources in India, pollution, Marine pollution, Noise pollution, Classification of and Nuclear Hazards. Disaster management: Floods, earthquake exclone and landslides.Unit - 4 Solid Waste Management Introduction, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Resycle and Recovery of waste.Unit-3 Euvironmental Unit-3 Euvironment Sutanable development, urban problems		BSC201	Environmental Science		
Image: InstituteFunctionsEcosystem- Definition and Introduction of Ecosystem- Abiotic and Biotic components, types of Ecosystem- Solical pyramids, Energy flow in Ecosystem- Biodiversity- Definition, Type and levels of Biodiversity- Definition, Type and levels of Biodiversity Values, Threats of biodiversity Conservation of biodiversity- In-situ and Ex-situ.Biodiversity- Composition of biodiversity- In-situ and Ex-situ.Unit -2 Natural Resources Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India.Unit -2 Natural Resources Definition and classification of natural resources in India.Unit -3 Environmental Pollution and Control measures of Air pollution, Matire pollution, and Nuclear Hazards.Unit -4 Solid Waste Management Introduction, Classification of solid waste, Composition and characteristics of solid waste, Collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Unit -4 Solid Waste, Reuse, sustinable development, urban problems			Unit-1 Ecosystem: concepts and	Unit-1 Ecosystem: concepts and functions	
Ecosystem- Definition and Introduction of Ecosystem- Abiotic and Biotic components, types of Ecosystems, Structure and components, types of Ecosystems, Structure and functions of Ecosystem. Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem- Biodiversity- Definition, Type and levels of Biodiversity Conservation of biodiversity- ln-situ and Ex-situ.Ecosystem- Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem. Biodiversity- Definition, Type and levels of Biodiversity Conservation of biodiversity- ln-situ and Ex-situ.Ecosystem. types and levels of Biodiversity Conservation of biodiversity- ln-situ and Ex-situ.Unit -2 Natural Resources and non renewable resources in India, potentials of resources in India.Unit -3 Environmental Pollution and Control measures pollution, Marine pollution, Soil pollution, Thermal pollution, and Nuclear Hazards.Unit -4 Solid Waste Management Introduction, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Recycle and Recovery of waste.Ecosystem. Foloodic and Fuero pollution, Waster, Composition and characteristics of solid waste, Recycle and Recovery of waste.			functions	Ecosystem- Definition and Introduction of	
Ecosystem- components, types of Ecosystems, Structure and functions of Ecosystem, Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem.types of Ecosystem- Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem.Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem.Biodiversity- Definition, Type and levels Biodiversity- Definition, Type and levels of Biodiversity. Values, Threats of biodiversity Conservation of biodiversity- In-situ and Ex-situ.Biodiversity. Values, Threats of biodiversity Conservation of biodiversity- In-situ and Ex-situ.Unit - 2 Natural Resources Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India, potentials of resources in India.Unit - 3 Environmental Pollution and Control measures Causes, Effects and Control measures of. Air pollution, Thermal pollution, and Nuclear Hazards, Disaster management: Hazards, Disaster management: Hazards, Disaster management: Hazards, Disaster collection, Conveyane and disposal methods of solid waste, Reveele and Recovery of waste.Unit -4 Solid Waste Management Introduction, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyane and disposal methods of solid waste, Reveele and Recovery of waste.Unit -4 Solid waste, Reveele and Recovery of waste.			Ecosystem- Definition and Introduction of	Ecosystem- Abiotic and Biotic components,	
Image: components, types of Ecosystem, Structure and functions of Ecosystem.functions of Ecosystem.Structure and functions of Ecosystem.Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem.Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem.Ecosystem.Biodiversity- Definition, Type and levels of Biodiversity. Values, Threats of biodiversity Conservation of biodiversity- ln-situ and Ex-situ.Biodiversity, Values, Threats of biodiversity Conservation of biodiversity- ln-situ and Ex-situ.Unit -2 Natural Resources Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India, potentials of resources in India.Unit -2 Natural Resources Unit -3 Environmental Pollution and Control measures of: Air pollution, Water pollution, Noise pollution, Thermal pollution, and Nuclear Hazards.Unit -4 Solid Waste Management Introduction, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Unit-5 Social Issues and Environment Sustainable development, urban problems			Ecosystem- Abiotic and Biotic	types of Ecosystems, Structure and	
Structure and functions of Ecosystem- Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem. Biodiversity- Definition, Type and levels of Biodiversity, Values, Threats of biodiversity, Values, Threats of biodiversity Conservation of biodiversity- ln-situ and Ex-situ.Biodiversity- Definition, Type and levels Biodiversity, Values, Threats of biodiversity Conservation of biodiversity- ln-situ and Ex-situ.Unit -2 Natural Resources Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India, potentials of resources in India.Unit -2 Natural Resources Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India.Unit -2 Natural Resources Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India.Unit -3 Environmental Pollution and Control measures Causes, Effects and Control measures of Causes, Effects and Control measures of Air pollution, Marine pollution, Noise pollution, Thermal pollution, and Nuclear Hazards.Unit -4 Solid Waste Management Introduction, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.			components, types of Ecosystems,	functions of Ecosystem- Food chain, Food	
Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem. Biodiversity- Definition, Type and levels of Biodiversity- Definition, Type and levels of Biodiversity, Values, Threats of biodiversity, Values, Threats of biodiversity. In-situ and Ex-situ.Biodiversity- In-situ and Ex-situ.Unit -2 Natural Resources Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India. Unit -3 Environmental Pollution and Control measuresUnit -3 Environmental Pollution and Control measures of Air pollution, Marine pollution, Noise pollution, Thermal pollution, and Nuclear Hazards.Unit -4 Solid Waste Management Introduction, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Ecosystem. Biodiversity- Definition, Type and levels of Biodiversity. Values, Threats of biodiversity Conservation of biodiversity In-situ and Ex-situ.Unit -3 Environmental Pollution and Control measures pollution, Marine pollution, Noise pollution, Thermal pollution, and Nuclear Hazards.Unit -4 Solid Waste Management Introduction, Classification of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Unit -5 Social Issues and Environment Sustainable development, urban problems			Structure and functions of Ecosystem-	web, Ecological pyramids, Energy flow in	
Joint - 1Pyramids, Energy flow in Ecosystem. Biodiversity- Definition, Type and levels of Biodiversity, Values, Threats of biodiversity Conservation of biodiversity- In-situ and Ex-situ.Biodiversity Values, Threats of biodiversity Conservation of biodiversity- In-situ and Ex-situ.In-situ and Ex-situ.Unit - 2 Natural Resources Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India, potentials of resources of Causes, Effects and Control measures of Causes, Effects and Control measures of Air pollution, Water pollution, Soil pollution, Thermal pollution, and Nuclear Hazards.Unit - 4 Solid Waste Management Introduction, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Biodiversity- Definition, Type and levels of biodiversity Conservation of biodiversity- In-situ and Ex-situ.Unit - 4 Solid Waste Management disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Biodiversity Conservation of biodiversity- In-situ and Ex-situ.Unit - 5 Social Issues and Environment Sustainable development, urban problemsDefinition and problems			Food chain, Food web, Ecological	Ecosystem.	
Biodiversity- Definition, Type and levels of Biodiversity, Values, Threats of biodiversity Conservation of biodiversity- In-situ and Ex-situ.Biodiversity Conservation of biodiversity- In-situ and Ex-situ.In-situ and Ex-situ.Unit -2 Natural ResourcesIn-situ and Ex-situ.Unit -2 Natural ResourcesDefinition and classification of natural resources, Types and uses of renewable and non renewable resources in India, potentials of resources in India.Unit -2 Natural Resources Unit -2 Natural ResourcesUnit -3 Environmental Pollution and Control measuresControl measures of Causes, Effects and Control measures of Causes, Effects and Control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, and Nuclear Hazards.Control measures of causes, effects and Control measures of Air pollution, Marine pollution, Noise pollution, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Unit -4 Solid Waste, Reuse, Recycle and Recovery of waste.			pyramids, Energy flow in Ecosystem.	Biodiversity- Definition, Type and levels of	
of Biodiversity, Values, Threats of biodiversity Conservation of biodiversity- In-situ and Ex-situ.biodiversity- In-situ and Ex-situ.In-situ and Ex-situ.Unit -2 Natural ResourcesDefinition and classification of natural resources, Types and uses of renewable and non renewable resources in India. potentials of resources in India. potentials of resources in India.Unit -3 Environmental Pollution and Control measuresCauses, Effects and Control measures Causes, Effects and Control measures of: Air pollution, Marine pollution, Soil pollution, Marine pollution, and Nuclear Hazards.Causes, Effects and Control measures Disaster management: Floods, earthquake, cyclone and landslides.Disaster management: Floods, earthquake, cyclone and landslides.Unit -4 Solid Waste Management Introduction, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reeuse, Recycle and Recovery of waste.Unit -5 Social Issues and Environment Sustainable development, urban problems			Biodiversity- Definition, Type and levels	Biodiversity, Values, Threats of	
biodiversity Conservation of biodiversity- In-situ and Ex-situ.In-situ and Ex-situ.In-situ and Ex-situ.Unit -2 Natural ResourcesUnit -2 Natural ResourcesDefinition and classification of natural resources, Types and uses of renewable and non renewable resources in India, potentials of resources in India.Definition and classification of natural resources in India.Unit -3 Environmental Pollution and Control measuresControl measuresCauses, Effects and Control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Soil pollution, Thermal pollution, and Nuclear Hazards.Couses, earthquake, cyclone and landslides.Disaster management: Floods, earthquake, cyclone and landslides.Unit -4 Solid Waste Management usate, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Unit -5 Social Issues and Environment Justianable development, urban problems			of Biodiversity, Values, Threats of	biodiversity Conservation of biodiversity-	
In-situ and Ex-situ.Unit -2 Natural ResourcesUnit -2 Natural ResourcesDefinition and classification of natural resources, Types and uses of renewable and non renewable resources in India.Definition and classification of natural resources, Types and uses of renewable of resources in India.Unit -3 Environmental Pollution and Unit -3 Environmental Pollution, Mater pollution, Water pollution, Soil pollution, Marine pollution, Moise pollution, Thermal pollution, and Nuclear Hazards.Causes, Effects and Control measures of: Air pollution, Marine pollution, Moise pollution, Thermal pollution, and Nuclear Hazards.Disaster management: Floods, earthquake, tyclone and landslides.Unit -4 Solid Waste Management unit -4 Solid Waste ManagementIntroduction, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Unit-5 Social Issues and Environment Sustanable development, urban problems			biodiversity Conservation of biodiversity-	In-situ and Ex-situ.	
Unit -2 Natural ResourcesDefinition and classification of natural resources, Types and uses of renewable and non renewable resources in India, potentials of resources in India.Definition and classification of natural resources in India, unit -3 Environmental Pollution and Control measuresUnit -3 Environmental Pollution and Control measuresUnit -3 Environmental Pollution and Control measuresCauses, Effects and Control measures of; Causes, Effects and Control measures of; Air pollution, Marine pollution, Soil pollution, Thermal pollution, and Nuclear Hazards.Causes thermal pollution, Noise Disaster management; Floods, earthquake, evclone and landslides.Disaster management: Floods, earthquake, ryclone and landslides.Unit -4 Solid Waste Management usst, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Unit-5 Social Issues and Environment sustainable development, urban problems			In-situ and Ex-situ.	Unit -2 Natural <u>Resources</u>	
Definition and classification of natural resources, Types and uses of renewable and non renewable resources in India, potentials of resources in India, potentials of resources in India, potentials of resources in India, potentials of resources in India, Unit- 3 Environmental Pollution and Control measuresUnit- 3 Environmental Pollution and Control measuresCauses, Effects and Control measures of: Causes, Effects and Control measures of: Causes, Effects and Control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, and Nuclear Hazards, Disaster management: Floods, earthquake, eyclone and landslides.Unit -4 Solid Waste Management uset, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Unit-5 Social Issues and Environment Sustainable development, urban problems			Unit -2 Natural <u>Resources</u>	Definition and classification of natural	
Image: Section of the sources of the sources of the sources in India, potentialsnon renewable resources in India, potentialsand non renewable resources in India,unit - 3 Environmental Pollution andUnit - 3 Environmental Pollution andUnit - 3 Environmental Pollution andControl measuresCauses, Effects and Control measures of:Causes, Effects and Control measures of:Air pollution, Water pollution, Soilpollution, Marine pollution, Noisepollution, Marine pollution, Noisepollution, Marine pollution, NoiseThermal pollution, and Nuclear Hazards.pollution, Thermal pollution, and NuclearDisaster management: Floods, carthquake,cyclone and landslides.Unit - 4 Solid Waste ManagementIntroduction, Classification of solidsolid waste, composition and characteristics ofsolid waste, collection, conveyance anddisposal methods of solid waste, Reuse,Recycle and Recovery of waste.Recycle and Recovery of waste.Sustainable development, urban problems			Definition and classification of natural	resources, Types and uses of renewable and	
Image: Instantand non renewable resources in India.Unit- 3 Environmental Pollution andImage: InstantUnit- 3 Environmental Pollution andControl measuresImage: InstantUnit- 3 Environmental Pollution andControl measuresImage: InstantControl measuresCauses. Effects and Control measures of:Image: InstantCauses, Effects and Control measures of:Air pollution, Water pollution, SoilImage: InstantPollution, Marine pollution, NoisePollution, Marine pollution, Marine pollution, and NuclearImage: InstantDisaster management: Floods, earthquake,Pollution, Classification of solidImage: InstantIntroduction, Classification of solidWaste, Composition and characteristics ofImage: InstantIntroduction, Classification of solidSolid waste, collection, conveyance andImage: InstantIntroduction, Classification of solidSolid waste, collection, conveyance andImage: InstantSolid waste, Composition and characteristics ofSolid waste, collection, conveyance andImage: InstantIntroduction, Classification of solidSolid waste, collection, conveyance andImage: InstantIntroduction, Classification of solidSolid waste, collection, conveyance andImage: InstantIntroduction, conveyance andRecycle and Recovery of waste.Image: InstantIntroduction, conveyance andSustainable development, urban problems			resources, Types and uses of renewable	non renewable resources in India, potentials	
Image: bit is			and non renewable resources in India,	of resources in India.	
Unit-3 Environmental Pollution and Control measuresControl measuresControl measuresCauses, Effects and Control measures of: Causes, Effects and Control measures of: Air pollution, Water pollution, Water pollution, Water pollution, Marine pollution, and Nuclear Hazards. pollution, Thermal pollution, and NuclearDisaster management: Floods, earthquake, cyclone and landslides.Hazards.Disaster management: Floods, earthquake, eyclone and landslides.Unit -4 Solid Waste ManagementIntroduction, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Unit-5 Social Issues and Environment Sustainable development, urban problems			potentials of resources in India.	Unit- 3 Environmental Pollution and	
Control measuresCauses, Effects and Control measures of:Causes, Effects and Control measures of:Causes, Effects and Control measures of:Air pollution, Water pollution, SoilAir pollution, Water pollution, Soilpollution, Marine pollution, Noise pollution,pollution, Marine pollution, Noisepollution, Marine pollution, and Nuclear Hazards.pollution, Thermal pollution, and NuclearDisaster management: Floods, earthquake,Hazards.Curit -4 Solid Waste Managementcyclone and landslides.Introduction, Classification of solidIntroduction, Classification of solidwaste, Composition and characteristics ofsolid waste, collection, conveyance anddisposal methods of solid waste, Reuse,disposal methods of solid waste, Reuse,Recycle and Recovery of waste.Guise and Recovery of waste.Sustainable development, urban problems			Unit- 3 Environmental Pollution and	Control measures	
Causes, Effects and Control measures of: Air pollution, Water pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Marine pollution, Noise pollution, Thermal pollution, and Nuclear Hazards.Air pollution, Marine pollution, Noise pollution, and Nuclear Disaster management: Floods, earthquake, evclone and landslides.Disaster management: Floods, earthquake, evclone and landslides.Disaster management: Floods, earthquake, cyclone and landslides.Unit -4 Solid Waste Management solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Unit-5 Social Issues and Environment Sustainable development, urban problems			<u>Control measures</u>	Causes, Effects and Control measures of:	
Air pollution, Water pollution, Soilpollution, Marine pollution, Noise pollution,pollution, Marine pollution, NoiseThermal pollution, and Nuclear Hazards.pollution, Thermal pollution, and NuclearDisaster management: Floods, earthquake,Hazards.Cyclone and landslides.Disaster management: Floods, earthquake.Unit -4 Solid Waste Managementcyclone and landslides.Introduction, Classification of solidUnit -4 Solid Waste Managementsolid waste, composition and characteristics ofIntroduction, Classification of solidsolid waste, collection, conveyance andwaste, Composition and characteristics ofsolid waste, collection, conveyance andsolid waste, collection, conveyance andRecycle and Recovery of waste.Unit-5 Social Issues and EnvironmentSustainable development, urban problems			Causes, Effects and Control measures of:	Air pollution, Water pollution, Soil	
pollution, Marine pollution, NoiseThermal pollution, and Nuclear Hazards.pollution, Thermal pollution, and NuclearDisaster management: Floods, earthquake,Hazards.cyclone and landslides.Disaster management: Floods, earthquake,cyclone and landslides.cyclone and landslides.Unit -4 Solid Waste ManagementIntroduction, Classification of solidwaste, Composition and characteristics ofsolid waste, Composition and characteristics ofsolid waste, collection, conveyance anddisposal methods of solid waste, Reuse,Recycle and Recovery of waste.Kecycle and Recovery of waste.Sustainable development, urban problems	1		Air pollution, Water pollution, Soil	pollution, Marine pollution, Noise pollution,	
pollution, Thermal pollution, and NuclearDisaster management: Floods, earthquake,Hazards.cyclone and landslides.Disaster management: Floods, earthquake,Unit -4 Solid Waste Managementcyclone and landslides.Introduction, Classification of solidUnit -4 Solid Waste Managementwaste, Composition and characteristics ofIntroduction, Classification of solidsolid waste, collection, conveyance andwaste, Composition and characteristics ofdisposal methods of solid waste, Reuse,solid waste, collection, conveyance andRecycle and Recovery of waste.disposal methods of solid waste, Reuse,Unit-5 Social Issues and EnvironmentRecycle and Recovery of waste.Sustainable development, urban problems			pollution, Marine pollution, Noise	Thermal pollution, and Nuclear Hazards.	
Hazards.Cyclone and landslides.Disaster management: Floods, earthquake, cyclone and landslides.Unit -4 Solid Waste Managementcyclone and landslides.Introduction, Classification of solidUnit -4 Solid Waste Managementwaste, Composition and characteristics ofIntroduction, Classification of solidsolid waste, collection, conveyance andwaste, Composition and characteristics ofsolid waste, collection, conveyance andsolid waste, collection, conveyance andRecycle and Recovery of waste.disposal methods of solid waste, Reuse,Unit-5 Social Issues and EnvironmentRecycle and Recovery of waste.Sustainable development, urban problems			pollution, Thermal pollution, and Nuclear	Disaster management: Floods, earthquake,	
Disaster management: Floods, earthquake, cyclone and landslides.Unit -4 Solid Waste ManagementUnit -4 Solid Waste ManagementIntroduction, Classification of solidUnit -4 Solid Waste Managementwaste, Composition and characteristics ofIntroduction, Classification of solidsolid waste, collection, conveyance andwaste, Composition and characteristics ofsolid waste, collection, conveyance andsolid waste, collection, conveyance andRecycle and Recovery of waste.disposal methods of solid waste, Reuse,Unit-5 Social Issues and EnvironmentRecycle and Recovery of waste.Sustainable development, urban problems			Hazards.	cyclone and landslides.	
cyclone and landslides.Introduction, Classification of solidUnit -4 Solid Waste Managementwaste, Composition and characteristics ofIntroduction, Classification of solidsolid waste, collection, conveyance andwaste, Composition and characteristics ofdisposal methods of solid waste, Reuse,solid waste, collection, conveyance andRecycle and Recovery of waste.disposal methods of solid waste, Reuse,Unit-5 Social Issues and EnvironmentRecycle and Recovery of waste.Sustainable development, urban problems			Disaster management: Floods, earthquake,	Unit -4 Solid Waste Management	
Unit -4 Solid Waste Managementwaste, Composition and characteristics ofIntroduction, Classification of solidsolid waste, collection, conveyance andwaste, Composition and characteristics ofdisposal methods of solid waste, Reuse,solid waste, collection, conveyance andRecycle and Recovery of waste.disposal methods of solid waste, Reuse,Unit-5 Social Issues and EnvironmentRecycle and Recovery of waste.Sustainable development, urban problems			cyclone and landslides.	Introduction, Classification of solid	
Introduction, Classification of solidsolid waste, collection, conveyance andwaste, Composition and characteristics ofdisposal methods of solid waste, Reuse,solid waste, collection, conveyance andRecycle and Recovery of waste.disposal methods of solid waste, Reuse,Unit-5 Social Issues and EnvironmentRecycle and Recovery of waste.Sustainable development, urban problems			Unit -4 Solid Waste Management	waste, Composition and characteristics of	
waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Recycle and Recovery of waste, Reuse, Unit-5 Social Issues and Environment Sustainable development, urban problems			Introduction, Classification of solid	solid waste, collection, conveyance and	
solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.Recycle and Recovery of waste.Recycle and Recovery of waste.Sustainable development, urban problems	1		waste, Composition and characteristics of	disposal methods of solid waste, Reuse,	
disposal methods of solid waste, Reuse,Unit-5 Social Issues and EnvironmentRecycle and Recovery of waste.Sustainable development, urban problems	1		solid waste, collection, conveyance and	Recycle and Recovery of waste.	
Recycle and Recovery of waste. Sustainable development, urban problems	1		disposal methods of solid waste, Reuse,	Unit-5 Social Issues and Environment	
	1		Recycle and Recovery of waste.	Sustainable development, urban problems	

	Unit-5 Social Issues and Environment	related to energy, Water conservation, Rain	
	Sustainable development, urban problems	water harvesting water shed management,	
	related to energy, Water conservation,	Resettlement and rehabilitation Public	
	Rain water harvesting water shed	awareness and Environmental Education.	
	management, Resettlement and	Environment Protection Act- 1986, Air	
	rehabilitation Public awareness and	(Prevention and Control of Pollution) Act,	
	Environmental Education. Environment	Water (Prevention and control of Pollution)	
	Protection Act- 1986. Air (Prevention and	Act. Wildlife Protection Act. Forest	
	Control of Pollution) Act. Water	conservation Act.	
	(Prevention and control of Pollution) Act		
	Wildlife Protection Act Forest		
	conservation Act		
BSC202	Electricity, Magnetism and EMT		
	Unit 1:	Unit 1:	
	Vector Analysis: Review of vector algebra	Vector Analysis: Review of vector algebra	
	(Scalar and Vector product), gradient,	(Scalar and Vector product), gradient,	
	divergence, Curl and their significance,	divergence, Curl and their significance,	
	Vector Integration, Line, surface and	Vector Integration, Line, surface and	
	volume integrals of Vector fields, Gauss-	volume integrals of Vector fields, Gauss-	
	divergence theorem and Stoke's theorem of	divergence theorem and Stoke's theorem of	
	vectors (statement only).	vectors (statement only).	
	Unit 2:	Unit 2:	
	Electrostatics: Electrostatic Field, electric	Electrostatics: Electrostatic Field, electric	
	flux, Gauss's theorem of electrostatics.	flux, Gauss's theorem of electrostatics.	
	Applications of Gauss theorem- Electric	Applications of Gauss theorem- Electric	
	field due to point charge, infinite line of	field due to point charge, infinite line of	
	charge, uniformly charged spherical shell	charge, uniformly charged spherical shell	
	and solid sphere, plane charged sheet,	and solid sphere, plane charged sheet,	
	charged conductor. Electric potential as	charged conductor. Electric potential as line	
	line integral of electric field, potential due	integral of electric field, potential due to a	
	to a point charge, electric dipole,	point charge, electric dipole, uniformly	
	uniformly charged spherical shell and solid	charged spherical shell and solid sphere.	
	sphere. Calculation of electric field from	Calculation of electric field from potential.	
	potential. Capacitance of an isolated	Capacitance of an isolated spherical	
	spherical conductor. Parallel plate,	conductor. Parallel plate, spherical and	
	spherical and cylindrical condenser.	cylindrical condenser. Energy per unit	
	Energy per unit volume in electrostatic	volume in electrostatic field. Dielectric	
	field. Dielectric medium. Polarisation.	medium. Polarisation. Displacement vector	
	Displacement vector. Gauss's theorem in	Gauss's theorem in dielectrics. Parallel plate	
	dielectrics. Parallel plate capacitor	canacitor completely filled with dielectric	
	plate cupacitor	suprotion completery miles with dielectric.	

completely filled with dielectric.

Unit 3:

Magnetism: Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector

potential. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, induction, permeability, magnetic magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials.

Unit 4:

Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law.

self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.

Unit 5:

Maxwell's equations Electromagnetic wave p Equation of continuity of current, Displacement Maxwell's equations, Poynt energy density in electromag electromagnetic wave propagat vacuum and isotropic dielectr transverse nature of EN polarization.

BSC203 Chemical energetic, Equilibria Functional Group Organic Cher **UNIT-I**

Unit 3:

Magnetism: Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector

potential. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials.

Unit 4:

Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law,

self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.

Unit 5:

Unit 5:	Maxwell`s equations and
Maxwell's equations and	Electromagnetic wave propagation:
Electromagnetic wave propagation:	Equation of continuity
Equation of continuity	of current, Displacement current, Maxwell's
of current, Displacement current,	equations, Poynting vector, energy density
Maxwell's equations, Poynting vector,	in electromagnetic field, electromagnetic
energy density in electromagnetic field,	wave propagation through vacuum and
electromagnetic wave propagation through	isotropic dielectric medium, transverse
vacuum and isotropic dielectric medium,	nature of EM waves, polarization.
transverse nature of EM waves,	
polarization.	
Chemical energetic, Equilibria & Functional Group Organic Chemistry-I	
UNIT-I	UNIT-I
Chemical Energetics:	Chemical Energetics:
Review of thermodynamics and the Laws	Review of thermodynamics and the Laws of
of Thermodynamics. Important principles	Thermodynamics. Important principles and

and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation. Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.

Chemical Equilibrium:

Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between ΔG and ΔG o, Le Chatelier's principle. Relationships between *Kp*, *Kc* and *Kx* for reactions involving ideal gases.

UNIT-II

Ionic Equilibria:

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle. definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral differential and enthalpies solution and dilution. of Calculation of bond bond energy. dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature -Kirchhoff's equation. Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.

Chemical Equilibrium:

Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between ΔG and ΔG o, Le Chatelier's principle. Relationships between *Kp*, *Kc* and *Kx* for reactions involving ideal gases.

UNIT-II

Ionic Equilibria:

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

Section B: Organic Chemistry-2

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

UNIT-III

Aromatic hydrocarbons:

Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid.

Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

Alkyl and Aryl Halides:

Alkyl Halides: (Upto 5 Carbons) Types of Nucleophilic Substitution (SN₁, SN₂ and SN_i) reactions.

Preparation: from alkenes *and* alcohols. *Reactions:* hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination v/s substitution.

Aryl Halides:

Preparation: (Chloro, bromo and iodobenzene case): from phenol, Sandmeyer & Gattermann reactions. Reactions (Chlorobenzene): Aromatic

nucleophilic substitution (replacement by -

Section B: Organic Chemistry-2

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

UNIT-III

Aromatic hydrocarbons:

Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid.

Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

Alkyl and Aryl Halides:

Alkyl Halides: (Upto 5 Carbons)

Types of Nucleophilic Substitution $(SN_1, SN_2 \text{ and } SN_i)$ reactions.

Preparation: from alkenes *and* alcohols.

Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination v/s substitution.

Aryl Halides:

Preparation: (Chloro, bromo and iodobenzene case): from phenol, Sandmeyer & Gattermann reactions.

Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by – OH group) and effect of nitro substituent.

	OH group) and effect of nitro substituent.	Benzyne Mechanism: KNH ₂ /NH ₃ (or
	Benzyne Mechanism: KNH ₂ /NH ₃ (or	NaNH ₂ /NH ₃). Reactivity and Relative
	NaNH ₂ /NH ₃). Reactivity and Relative	strength of C-Halogen bond in alkyl, allyl,
	strength of C-Halogen bond in alkyl, allyl,	benzyl, vinyl and aryl halides.
	benzyl, vinyl and aryl halides.	UNIT-IV
	UNIT-IV	Alcohols, Phenols and Ethers (Upto 5
	Alcohols, Phenols and Ethers (Upto 5	Carbons)
	Carbons)	Alcohols:
	Alcohols:	Preparation: Preparation of 10, 20 and 30
	Preparation: Preparation of 10, 20 and 30	alcohols: using Grignard reagent, Ester
	alcohols: using Grignard reagent, Ester	hydrolysis, Reduction of aldehydes,
	hydrolysis, Reduction of aldehydes,	ketones, carboxylic acid and esters.
	ketones, carboxylic acid and esters.	Reactions: With sodium, HX (Lucas test),
	Reactions: With sodium, HX (Lucas test),	esterification, oxidation (with PCC, alk.
	esterification, oxidation (with PCC, alk.	KMnO4, acidic dichromate, conc. HNO3).
	KMnO4, acidic dichromate, conc. HNO3).	Oppeneauer oxidation Diols: (Upto 6
	Oppeneauer oxidation Diols: (Upto 6	Carbons) oxidation of diols. Pinacol-
	Carbons) oxidation of diols. Pinacol-	Pinacolone rearrangement.
	Pinacolone rearrangement.	Phenols: (Phenol case)
	Phenols: (Phenol case)	Preparation: Cumene hydroperoxide
	Preparation: Cumene hydroperoxide	method, from diazonium salts.
	method, from diazonium salts.	Reactions: Electrophilic substitution:
	Reactions: Electrophilic substitution:	Nitration, halogenation and sulphonation.
	Nitration, halogenation and sulphonation.	Reimer-Tiemann Reaction, Gattermann-
	Reimer-Tiemann Reaction, Gattermann-	Koch Reaction, Houben-Hoesch
	Koch Reaction, Houben-Hoesch	Condensation, Schotten – Baumann
	Condensation, Schotten – Baumann	Reaction.
	Reaction.	Ethers (aliphatic and aromatic): Cleavage
	Ethers (aliphatic and aromatic):	of ethers with HI.
	Cleavage of ethers with HI.	UNIT-V
	UNIT-V	Aldehydes and ketones (aliphatic and

	Aldehydes and ketones (aliphatic and	aromatic): (Formaldehye, acetaldehyde,	
	aromatic): (Formaldehye, acetaldehyde,	acetone and benzaldehyde)	
	acetone and benzaldehyde)	Preparation: from acid chlorides and from	
	Preparation: from acid chlorides and from	nitriles.	
	nitriles.	Reactions - Reaction with HCN, ROH,	
	Reactions - Reaction with HCN, ROH,	NaHSO ₃ , NH ₂ -G derivatives. Iodoform test.	
	NaHSO ₃ , NH ₂ -G derivatives. Iodoform	Aldol Condensation, Cannizzaro's reaction,	
	test. Aldol Condensation, Cannizzaro's	Wittig reaction, Benzoin condensation.	
	reaction, Wittig reaction, Benzoin	Clemensen reduction and Wolff Kishner	
	condensation. Clemensen reduction and	reduction. Meerwein-Pondorff Verley	
	Wolff Kishner reduction. Meerwein-	reduction.	
	Pondorff Verley reduction.		
BS	C204 Differential Equations Unit- I	Unit- I	
	First order exact differential equations.	First order exact differential equations.	
	Integrating factors, rules to find an	Integrating factors, rules to find an	
	integrating factor. First order higher degree	integrating factor. First order higher degree	
	equations solvable for x, y, p.	equations solvable for x, y, p.	
	Unit- II	Unit- II	
	Methods for solving, higher-order	Methods for solving higher-order	
	differential equations. Basic theory of	differential equations Basic theory of linear	
	linear differential equations. Wronskian.	differential equations Wronskian and its	
	and its properties. Solving a differential	properties Solving a differential equation	
	equation by reducing its order.	by reducing its order.	
	Unit- III	Unit- III	
	Linear homogenous equations with	Linear homogenous equations with constant	
	constant coefficients, Linear non-	coefficients, Linear non-homogenous	
	nomogenous equations, The method of	equations, The method of variation of	
	Fular equation of parameters, The Cauchy-	parameters, The Cauchy-Euler equation,	
	Euler equation, Simultaneous differential	Simultaneous differential equations, Total	
	equations, 1 otal differential equations.	amerential equations.	
	Unit- IV	Unit- IV	
	Order and degree of partial differential	Order and degree of partial differential	
	equations, Concept of linear and non-linear	equations, Concept of linear and non-linear	

	partial differential equations, Formation of	partial differential equations, Formation of	
	first order partial differential equations,	first order partial differential equations,	
	Linear partial differential equation of first	Linear partial differential equation of first	
	order, Lagrange's method, Charpit's	order, Lagrange's method, Charpit's	
	method.	method.	
	Unit- V	Unit- V	
	Classification of second order partial	Classification of second order partial	
	differential equations into elliptic,	differential equations into elliptic, parabolic	
	parabolic and hyperbolic through	and hyperbolic through illustrations only.	
	illustrations only.		
BSC205	Electricity, Magnetism and EMT Lab		
	Unit- I		
	First order exact differential equations.	First order exact differential equations.	
	integrating factors, rules to find an	Integrating factors, rules to find an	
	integrating factor. First order nigher degree	integrating factor. First order higher degree	
	equations solvable for x, y, p.	equations solvable for x, y, p.	
	Unit- II	Unit II	
	Methods for solving higher-order	Methods for solving higher order	
	differential equations Basic theory of	differential equations. Pasia theory of linear	
	linear differential equations. Wronskian	differential equations. Wronskian and its	
	and its properties Solving a differential	properties Solving a differential equation	
	equation by reducing its order	by reducing its order	
	equation by readoing its order.	by reducing its order.	
	Unit- III	Unit- III	
	Linear homogenous equations with	Linear homogenous equations with constant	
	constant coefficients, Linear non-	coefficients, Linear non-homogenous	
	homogenous equations, The method of	equations, The method of variation of	
	variation of parameters, The Cauchy-	parameters, The Cauchy-Euler equation.	
	Euler equation, Simultaneous differential	Simultaneous differential equations, Total	
	equations, Total differential equations.	differential equations.	
		-	
	Unit- IV	Unit- IV	
	Order and degree of partial differential	Order and degree of partial differential	
	equations, Concept of linear and non-linear	equations, Concept of linear and non-linear	
	partial differential equations, Formation of	partial differential equations, Formation of	
	first order partial differential equations,	first order partial differential equations,	
	Linear partial differential equation of first	Linear partial differential equation of first	
	order, Lagrange's method, Charpit's	order Lagrange's method Charpit's	

		method.	method.	
		Unit- V	Unit- V	
		Classification of second order partial	Classification of second order partial	
		differential equations into elliptic,	differential equations into elliptic, parabolic	
		parabolic and hyperbolic through	and hyperbolic through illustrations only.	
		illustrations only.		
	BSC206	Chemical energetic, Equilibria & Functional Group Organic Chemistry-I	Section A: Physical Chemistry	
		Section A: Physical Chemistry	Thermochemistry	
		Thermochemistry	1. Determination of heat capacity of	
		1. Determination of heat capacity of	calorimeter for different volumes.	
		calorimeter for different volumes.	2. Determination of enthalpy of	
		2. Determination of enthalpy of	neutralization of hydrochloric acid with	
		neutralization of hydrochloric acid with	sodium hydroxide.	
		sodium hydroxide.	3. Determination of enthalpy of ionization	
		3. Determination of enthalpy of ionization	of acetic acid.	
		of acetic acid.	4. Determination of integral enthalpy of	
		4. Determination of integral enthalpy of	solution of salts (KNO ₃ , NH ₄ Cl).	
		solution of salts (KNO ₃ , NH ₄ Cl).	5. Determination of enthalpy of hydration of	
		5. Determination of enthalpy of hydration	copper sulphate.	
		of copper sulphate.	6. Study of the solubility of benzoic acid in	
		6. Study of the solubility of benzoic acid in	water and determination of ΔH .	
		water and determination of ΔH .	Ionic equilibria	
		Ionic equilibria	pH measurements	
		pH measurements	a) Measurement of pH of different solutions	
		a) Measurement of pH of different	like aerated drinks, fruit juices, shampoos	
		solutions like aerated drinks, fruit juices,	and soaps (use dilute solutions of soaps and	
		shampoos and soaps (use dilute solutions	shampoos to prevent damage to the glass	
		of soaps and shampoos to prevent damage	electrode) using pH-meter.	
		to the glass electrode) using pH-meter.	b) Preparation of buffer solutions:	
		b) Preparation of buffer solutions:	(i) Sodium acetate-acetic acid	
L	1			1

	(i) Sodium acetate-acetic acid	(ii) Ammonium chloride-ammonium	
	(ii) Ammonium chloride-ammonium	hydroxide	
	hydroxide	Measurement of the pH of buffer solutions	
	Measurement of the pH of buffer solutions	and comparison of the values with	
	and comparison of the values with	theoretical values.	
	theoretical values.	Section B: Organic Chemistry	
	Section B: Organic Chemistry	1. Purification of organic compounds by	
	1. Purification of organic compounds by	crystallization (from water and alcohol) and	
	crystallization (from water and alcohol)	distillation.	
	and distillation.	2. Criteria of Purity: Determination of	
	2. Criteria of Purity: Determination of	melting and boiling points.	
	melting and boiling points.	3. Preparations: Mechanism of various	
	3. Preparations: Mechanism of various	reactions involved to be discussed.	
	reactions involved to be discussed.	Recrystallisation, determination of melting	
	Recrystallisation, determination of melting	point and calculation of quantitative yields	
	point and calculation of quantitative yields	to be done.	
	to be done.	(a) Bromination of Phenol/Aniline	
	(a) Bromination of Phenol/Aniline	(b) Benzoylation of amines/phenols	
	(b) Benzoylation of amines/phenols	(c) Oxime and 2,4-dinitrophenylhydrazone	
	(c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone	of aldenyde/ketone	
BSC301	Thermal Physics and Statistical Mechanics		
	Laws of	Unit 1:	
	Thermodynamics:Thermodynamic	Laws of Thermodynamics:Thermodynamic	
	Description of system: Zeroth Law of	Description of system: Zeroth Law of	
	thermodynamics and temperature. First	thermodynamics and temperature. First law	
	law and internal energy, conversion of heat	and internal energy, conversion of heat into	
	into work, Various Thermodynamical	work, Various Thermodynamical Processes,	
	Processes, Applications of First Law:	Applications of First Law: General Relation	
	General Relation between CP & CV, Work	between CP & CV, Work Done during	
	Done during Isothermal and Adiabatic	Isothermal and Adiabatic Processes,	
	Processes, Compressibility & Expansion	Compressibility & Expansion Coefficient,	
	Coefficient, Reversible & irreversible	Reversible & irreversible processes, Second	
	processes, Second law & Entropy,	law & Entropy, Carnot's cycle & theorem,	
	Carnot's cycle & theorem, Entropy	Entropy changes in reversible & irreversible	

changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.

Unit II:

Thermodynamic Potentials: Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations & applications - Joule-Thompson Effect, Clausius- Clapeyron Equation, Expression for (CP – CV), CP/CV, TdS equations.

Unit III:

Kinetic Theory of Gases: Derivation of Maxwell's law of distribution of velocities and

its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases.

Unit IV:

Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh- Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law.

Unit V:

Statistical Mechanics: Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell-Boltzmann law - distribution of velocity -Quantum statistics - Fermi-Dirac distribution law - electron gas - Boseprocesses, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.

Unit II:

Thermodynamic Potentials: Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations & applications - Joule-Thompson Effect, Clausius- Clapeyron Equation, Expression for (CP – CV), CP/CV, TdS equations.

Unit III:

Kinetic Theory of Gases: Derivation of Maxwell's law of distribution of velocities and

its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases.

Unit IV:

Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh- Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law.

Unit V:

Statistical Mechanics: Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell-Boltzmann law - distribution of velocity -Quantum statistics - Fermi-Dirac distribution law - electron gas - Bose-Einstein distribution law - photon gas -

	Einstein distribution law - photon gas -	comparison of three statistics.	
	comparison of three statistics.		
BSC302	Solutions, Phase equilibria, Conductance, Electrochemistry & Functional Group Organic Chemistry-II		
	Section A: Physical Chemistry-2	Section A: Physical Chemistry-2	
	UNIT-I	UNIT-I	
	Solutions:	Solutions:	
	Thermodynamics of ideal solutions: Ideal	Thermodynamics of ideal solutions: Ideal	
	solutions and Raoult's law, deviations	solutions and Raoult's law, deviations from	
	from Raoult's law – non-ideal solutions.	Raoult's law - non-ideal solutions. Vapour	
	Vapour pressure-composition and	pressure-composition and	
	temperaturecomposition curves of ideal	temperaturecomposition curves of ideal and	
	and non-ideal solutions. Distillation of	non-ideal solutions. Distillation of	
	solutions. Lever rule. Azeotropes. Partial	solutions. Lever rule. Azeotropes. Partial	
	miscibility of liquids: Critical solution	miscibility of liquids: Critical solution	
	temperature; effect of impurity on partial	temperature; effect of impurity on partial	
	miscibility of liquids. Immiscibility of	miscibility of liquids. Immiscibility of	
	liquids- Principle of steam distillation.	liquids- Principle of steam distillation.	
	Nernst distribution law and its	Nernst distribution law and its applications,	
	applications, solvent extraction.	solvent extraction.	
	Phase Equilibrium:	Phase Equilibrium:	
	Phases, components and degrees of	Phases, components and degrees of freedom	
	freedom of a system, criteria of phase	of a system, criteria of phase equilibrium.	
	equilibrium. Gibbs Phase Rule and its	Gibbs Phase Rule and its thermodynamic	
	thermodynamic derivation. Derivation of	derivation. Derivation of Clausius –	
	Clausius – Clapeyron equation and its	Clapeyron equation and its importance in	
	importance in phase equilibria. Phase	phase equilibria. Phase diagrams of one-	
	diagrams of one-component systems	component systems (water and sulphur) and	
	(water and sulphur) and two component	two component systems involving eutectics,	
	systems involving eutectics, congruent and	congruent and incongruent melting points	

incongruent melting points (lead-silver,

FeCl₃-H₂O and Na-K only).

UNIT-II

Conductance:

Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions. Transference number and its experimental determination using Hittorf and Moving boundary methods. Ionic mobility. Applications of conductance measurements: determination of degree of ionization of weak electrolyte, solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acid-base).

Electrochemistry:

Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell. Nernst equation and its importance. Types of electrodes. Standard electrode potential. Electrochemical series. Thermodynamics of a reversible cell, calculation of thermodynamic properties: ΔG , ΔH and ΔS from EMF data. Calculation of equilibrium constant from EMF data. Concentration cells with transference and without transference. Liquid junction potential and salt bridge. pН determination using hydrogen

(lead-silver, FeCl₃-H₂O and Na-K only).

UNIT-II

Conductance:

Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of Transference number ions. and its experimental determination using Hittorf and Moving boundary methods. Ionic mobility. Applications of conductance measurements: determination of degree of ionization of weak electrolyte, solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acid-base).

Electrochemistry:

Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell. Nernst equation and its importance. Types of electrodes. Standard electrode potential. Electrochemical series. Thermodynamics of a reversible cell, calculation of thermodynamic properties: ΔG , ΔH and ΔS from EMF data. Calculation of equilibrium constant from EMF data. Concentration cells with transference and without transference. Liquid junction potential and salt bridge. pH determination using hydrogen electrode and

	electrode and quinhydrone electrode.	quinhydrone electrode. Potentiometric
	Potentiometric titrations -qualitative	titrations -qualitative treatment (acid-base
	treatment (acid-base and oxidation-	and oxidation-reduction only).
	reduction only).	Section B: Organic Chemistry-3
	Section B: Organic Chemistry-3	Functional group approach for the following
	Functional group approach for the	reactions (preparations & reactions) to
	following reactions (preparations &	be studied in context to their structure.
	reactions) to	UNIT-III
	be studied in context to their structure.	Carboxylic acids and their derivatives
	UNIT-III	Carboxylic acids (aliphatic and aromatic)
	Carboxylic acids and their derivatives	Preparation: Acidic and Alkaline
	Carboxylic acids (aliphatic and aromatic)	hydrolysis of esters.
	Preparation: Acidic and Alkaline	Reactions: Hell – Vohlard - Zelinsky
	hydrolysis of esters.	Reaction.
	Reactions: Hell – Vohlard - Zelinsky	Carboxylic acid derivatives (aliphatic):
	Reaction.	(Upto 5 carbons)
	Carboxylic acid derivatives (aliphatic):	Preparation: Acid chlorides, Anhydrides,
	(Upto 5 carbons)	Esters and Amides from acids and their
	Preparation: Acid chlorides, Anhydrides,	interconversion.
	Esters and Amides from acids and their	Reactions: Comparative study of
	interconversion.	nucleophilicity of acyl derivatives.
	Reactions: Comparative study of	Reformatsky Reaction, Perkin
	nucleophilicity of acyl derivatives.	condensation.
	Reformatsky Reaction, Perkin	UNIT-IV
	condensation.	Amines and Diazonium Salts
	UNIT-IV	Amines (Aliphatic and Aromatic): (Upto 5
	Amines and Diazonium Salts	carbons)
	Amines (Aliphatic and Aromatic): (Upto 5	Preparation: from alkyl halides, Gabriel's
	carbons)	Phthalimide synthesis, Hofmann
	Preparation: from alkyl halides, Gabriel's	Bromamide reaction.
	Phthalimide synthesis, Hofmann	Reactions: Hofmann vs. Saytzeff
_		

Bromamide reaction.	elimination, Carbylamine test, Hinsberg
Reactions: Hofmann vs. Saytzeff	test, with HNO ₂ , Schotten – Baumann
elimination, Carbylamine test, Hinsberg	Reaction. Electrophilic substitution (case
test, with HNO ₂ , Schotten – Baumann	aniline): nitration, bromination,
Reaction. Electrophilic substitution (case	sulphonation.
aniline): nitration, bromination,	Diazonium salts: Preparation: from
sulphonation.	aromatic amines. Reactions: conversion to

Diazonium salts:

Preparation: from aromatic amines. Reactions: conversion to benzene, phenol, dves.

UNIT-V

Amino Acids, Peptides and Proteins:

Preparation of Amino Acids: Strecker synthesis using Gabriel's phthalimide synthesis. Zwitterion, Isoelectric point and Electrophoresis.

Reactions of Amino acids: ester of -COOH group, acetylation of -NH₂ group, complexation with Cu2+ ions, ninhydrin test.

Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins. Determination of Primary structure of Peptides degradation by Edmann degradation (N-terminal) and C-terminal (thiohydantoin and with carboxypeptidase enzyme). Synthesis of simple peptides (upto dipeptides) by N-protection (tbutyloxycarbonyl and phthaloyl) & Cactivating groups and Merrifield solidbenzene, phenol, dyes.

UNIT-V

Amino Acids, Peptides and Proteins:

Preparation of Amino Acids: Strecker synthesis using Gabriel's phthalimide synthesis. Zwitterion, Isoelectric point and Electrophoresis.

Reactions of Amino acids: ester of -COOH group, acetylation of –NH₂ group, complexation with Cu2+ ions, ninhydrin test.Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins. Determination of Primary structure of Peptides by degradation Edmann degradation (N-terminal) and C-terminal (thiohydantoin and with carboxypeptidase enzyme). Synthesis of simple peptides (upto dipeptides) N-protection by (tbutyloxycarbonyl and phthaloyl) & Cactivating groups and Merrifield solid-phase synthesis.

Carbohydrates: Classification, and General Properties, Glucose and Fructose (open chain cyclic and structure),

	nhago armthogia	Determination of configuration of	
	phase synthesis.	Determination of configuration of	
	Carbohydrates: Classification, and	monosaccharides, absolute configuration of	
	General Properties, Glucose and Fructose	Glucose and Fructose, Mutarotation,	
	(open chain and cyclic structure),	ascending and descending in	
	Determination of configuration of	monosaccharides. Structure of disacharrides	
	monosaccharides, absolute configuration	(sucrose, cellobiose, maltose, lactose) and	
	of Glucose and Fructose, Mutarotation,	polysacharrides (starch and cellulose)	
	ascending and descending in	excluding their structure elucidation.	
	monosaccharides. Structure of		
	disacharrides (sucrose, cellobiose, maltose,		
	lactose) and polysacharrides (starch and		
	cellulose) excluding their structure		
	elucidation.		
DECOM			
BSC303	Real Analysis Unit- I	Unit- I	
	Finite and infinite sets, examples of	Finite and infinite sets, examples of	
	countable and uncountable sets. Real line,	countable and uncountable sets. Real line,	
	bounded sets, suprema and infima,	bounded sets, suprema and infima,	
	completeness property of R, Archimedean	completeness property of R, Archimedean	
	property of R, intervals. Concept of cluster	property of R, intervals. Concept of cluster	
	points and statement of Bolzano-	points and statement of Bolzano-	
	Weierstrass theorem.	Weierstrass theorem	
	Unit- II	Unit- II	
	Real Sequence Bounded sequence	Real Sequence Bounded sequence Cauchy	
	Cauchy convergence criterion for	convergence criterion for sequences	
	sequences Cauchy's theorem on limits	Cauchy's theorem on limits order	
	order preservation and squeeze theorem	preservation and squeeze theorem	
	monotone sequences and their	monotone sequences and their convergence	
	convergence (monotone convergence	(monotone convergence theorem without	
	theorem without proof)	proof)	
	Unit- III	Unit- III	
	Integration. The Riemann Integral and its	Integration The Riemann Integral and its	
	properties. Integrability of continuous and	properties Integrability of continuous and	
	monotonic functions Functions of	monotonic functions. Functions of bounded	
	hounded variation their relation with	variation their relation with monotonic	
	monotonic functions, and integrability	functions and integrability The	
	integracinty.	integrations, and integrationally. The	

	The fundamental theorem of calculus.	fundamental theorem of calculus. Mean	
	Mean value theorems of integral calculus.	value theorems of integral calculus.	
	Convergence of improper integrals.	Convergence of improper integrals. Infinite	
	Infinite series. Cauchy convergence	series. Cauchy convergence criterion for	
	criterion for series, positive term series,	series, positive term series, geometric	
	geometric series,	series,	
	Unit- IV	Unit- IV	
	comparison test, convergence of p-series,	comparison test, convergence of p-series,	
	Root test, Ratio test, alternating series,	Root test, Ratio test, alternating series,	
	Leibnitz's test (Tests of Convergence	Leibnitz's test (Tests of Convergence	
	without proof). Definition and examples of	without proof). Definition and examples of	
	absolute and conditional convergence.	absolute and conditional convergence.	
	Unit- V	Unit- V	
	Sequences and series of functions,	Sequences and series of functions,	
	Pointwise and uniform convergence. Mn-	Pointwise and uniform convergence. Mn-	
	test, M test,	test, M test,	
	Statements of the results about uniform	Statements of the results about uniform	
	convergence and integrability and	convergence and integrability and	
	differentiability of functions, Power series	differentiability of functions, Power series	
	and radius of convergence.	and radius of convergence.	
BSC304	SEC-1 (Choose any one)		
BSC304	SEC-1 (Choose any one)		
BSC304	SEC-1 (Choose any one)		
BSC304 BSC304	SEC-1 (Choose any one) Analytical Geometry		Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I	Unit I	Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I Analytical geometry of three dimensions.	Unit I Analytical geometry of three dimensions.	Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I Analytical geometry of three dimensions. Direction cosines.	Unit I Analytical geometry of three dimensions. Direction cosines.	Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I Analytical geometry of three dimensions. Direction cosines. Unit II	Unit I Analytical geometry of three dimensions. Direction cosines. Unit II	Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane.	Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane.	Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III	Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III	Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder.	Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder.	Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV	Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV	Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV Techniques for sketching parabola, ellipse	Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV Techniques for sketching parabola, ellipse	Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV Techniques for sketching parabola, ellipse and hyperbola.	Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV Techniques for sketching parabola, ellipse and hyperbola. Reflection properties of	Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV Techniques for sketching parabola, ellipse and hyperbola. Unit V	Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV Techniques for sketching parabola, ellipse and hyperbola. Reflection properties of parabola, ellipse and hyperbola.	Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV Techniques for sketching parabola, ellipse and hyperbola. Unit V Classification of quadratic equations	Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV Techniques for sketching parabola, ellipse and hyperbola. Reflection properties of parabola, ellipse and hyperbola. Unit V	Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV Techniques for sketching parabola, ellipse and hyperbola. Unit V Classification of quadratic equations representing lines, parabola, ellipse and	Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV Techniques for sketching parabola, ellipse and hyperbola. Reflection properties of parabola, ellipse and hyperbola. Unit V Classification of quadratic equations	Syllabus Change
BSC304 BSC304 A	SEC-1 (Choose any one) Analytical Geometry Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV Techniques for sketching parabola, ellipse and hyperbola. Unit V Classification of quadratic equations representing lines, parabola, ellipse and hyperbola. Spheres, Cylindrical surfaces.	Unit I Analytical geometry of three dimensions. Direction cosines. Unit II Straight line. Plane. Unit III Sphere. Cone. Cylinder. Unit IV Techniques for sketching parabola, ellipse and hyperbola. Reflection properties of parabola, ellipse and hyperbola. Unit V Classification of quadratic equations representing lines, parabola, ellipse and	Syllabus Change

		hyperbola. Spheres, Cylindrical surfaces.	
		Illustrations of graphing standard quadric	
		surfaces like cone, ellipsoid.	
BSC304 B	Integral Calculus	Init I	Syllabus Change
D	Integration by Partial fractions integration	Integration by Partial fractions integration	
	of rational and irrational functions	of rational and irrational functions	
	Properties of definite integrals	Properties of definite integrals	
	Unit II		
	Reduction formulae for integrals of	Paduction formulae for integrals of rational	
	rational trigonometric	trigonometric exponential and logarithmic	
		functions and of their combinations	
	Areas and lengths of surves in the plane		
	Areas and lengths of curves in the plane,	Onit in	
	Unit IV	Areas and lengths of curves in the plane,	
	volumes and surfaces of solids of		
		volumes and surfaces of solids of	
	Unit V	revolution.	
	Double and Triple integrals.		
		Double and Triple integrals.	
 BSC304	Physics workshop skills		Syllabus Change
C	Unit 1: Introduction: Measuring units.	Unit 1: Introduction: Measuring units.	-,
	conversion to SI and CGS. Familiarization	conversion to SI and CGS. Familiarization	
	with meter scale, Vernier calliper, Screw	with meter scale, Vernier calliper, Screw	
	gauge and their utility. Measure the	gauge and their utility. Measure the	
	dimension of a solid block, volume of	dimension of a solid block, volume of	
	cylindrical beaker/glass, diameter of a thin	cylindrical beaker/glass, diameter of a thin	
	wire, thickness of metal sheet, etc.	wire, thickness of metal sheet, etc. Use of	
	Unit 2: Mechanical Skill: Concept of	Sextant to measure height of buildings,	
	workshop practice. Overview of	mountains, etc.	
	manufacturing methods: casting, foundry,	Unit 2: Mechanical Skill: Concept of	
	machining, forming and welding. Types of	workshop practice. Overview of	
	welding joints and welding defects.	manufacturing methods: casting, foundry,	
	Common materials used for manufacturing	machining, forming and welding. Types of	
	like steel, copper, iron, metal sheets,	welding joints and welding defects.	
	composites and alloy, wood. Concept of	Common materials used for manufacturing	
	machine processing.	like steel, copper, iron, metal sheets,	
	Unit 3: Cutting tools, lubricating oils.	composites and alloy, wood. Concept of	
	Cutting of a metal sheet using blade.	machine processing, introduction to	
	Smoothening of cutting edge of sheet	common machine tools like lathe, shaper,	

		using file. Drilling of holes of different	drilling, milling and surface machines.	
		diameter in metal sheet and wooden block.	Unit 3: Cutting tools, lubricating oils.	
		Unit 4: Electrical and Electronic Skill:	Cutting of a metal sheet using blade.	
		Use of Multimeter. Soldering of electrical	Smoothening of cutting edge of sheet using	
		circuits having discrete components (R, L,	file. Drilling of holes of different diameter	
		C, diode) and ICs on PCB.	in metal sheet and wooden block. Use of	
		Unit 5: Introduction to prime movers:	bench vice and tools for fitting. Make	
		Mechanism, gear system, wheel, Fixing of	funnel using metal sheet.	
		gears with motor axel. Lever mechanism.	Unit 4: Electrical and Electronic Skill:	
			Use of Multimeter. Soldering of electrical	
			circuits having discrete components (R, L,	
			C, diode) and ICs on PCB. Operation of	
			oscilloscope. Making regulated power	
			supply. Timer circuit, Electronic switch	
			using transistor and relay.	
			Unit 5: Introduction to prime movers:	
			Mechanism, gear system, wheel, Fixing of	
			gears with motor axel. Lever mechanism,	
			Lifting of heavy weight using lever. braking	
			systems, pulleys, working principle of	
			power generation systems. Demonstration	
			of pulley experiment.	
	BSC304 D	Computational physics skills Unit I: Introduction: Importance of	Unit I: Introduction: Importance of	Syllabus Change
	D	computers in Physics paradigm for	computers in Physics, paradigm for solving	
		solving physics problems for solution.	nhysics problems for solution. Usage of	
		Usage of linux as an Editor Algorithms	linux as an Editor Algorithms and	
		and Flowcharts: Algorithm: Definition.	Flowcharts: Algorithm: Definition	
		properties and development. Flowchart	properties and development Flowchart	
		Concept of flowchart, symbols, guidelines.	Concept of flowchart, symbols guidelines	
		types. Examples: Cartesian to Spherical	types. Examples: Cartesian to Spherical	
		Polar Coordinates. Roots of Ouadratic	Polar Coordinates, Roots of Ouadratic	
		Equation, Sum of two matrices. Sum and	Equation. Sum of two matrices. Sum and	
1		Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin	Equation, Sum of two matrices, Sum and Product of a finite series. calculation of sin	
		Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series.	Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series, algorithm for plotting (1)	
		Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series. Unit II: Scientific Programming: Some	Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a	
		Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series. Unit II: Scientific Programming : Some fundamental Linux Commands (Internal	Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile thrown at an angle with the	
		Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series. Unit II: Scientific Programming : Some fundamental Linux Commands (Internal and External commands). Development of	Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile thrown at an angle with the horizontal.	
		Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series. Unit II: Scientific Programming : Some fundamental Linux Commands (Internal and External commands). Development of FORTRAN, Basic elements of	Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile thrown at an angle with the horizontal. Unit II: Scientific Programming: Some	
		Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series. Unit II: Scientific Programming : Some fundamental Linux Commands (Internal and External commands). Development of FORTRAN, Basic elements of FORTRAN: Character Set, Constants and	Equation, Sum of two matrices, Sum and Product of a finite series, calculation of sin (x) as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile thrown at an angle with the horizontal. Unit II: Scientific Programming : Some fundamental Linux Commands (Internal	

their types, V	ariables and their types,	and External commands). Development of
Keywords, V	ariable Declaration and	FORTRAN, Basic elements of FORTRAN:
concept of ins	struction and program.	Character Set, Constants and their types,
Operators: An	ithmetic, Relational, Logical	Variables and their types, Keywords,
and Assignme	ent Operators. Expressions:	Variable Declaration and concept of
Arithmetic, R	elational, Logical, Character	instruction and program. Operators:
and Assignme	ent Expressions. Fortran	Arithmetic, Relational, Logical and
Statements: I	O Statements	Assignment Operators. Expressions:
(unformatted/	formatted).	Arithmetic, Relational, Logical, Character
Unit III: Co	ntrol Statements: Types of	and Assignment Expressions. Fortran
Logic (Seque	ntial, Selection, Repetition),	Statements: I/O Statements
Branching Sta	atements (Logical IF,	(unformatted/formatted), Executable and
Arithmetic IF	, Block IF, Nested Block IF,	Non-Executable Statements, Layout of
SELECT CA	SE and ELSE IF Ladder	Fortran Program, Format of writing
statements), I	Looping Statements (DO-	Program and concept of coding,
CONTINUE,	DO-ENDDO, DOWHILE,	Initialization and Replacement Logic.
Implied and N	Nested DO Loops), Jumping	Examples from physics problems.
Statements (U	Inconditional GOTO,	Unit III: Control Statements: Types of
Computed G	OTO, Assigned GOTO)	Logic (Sequential, Selection, Repetition),
Subscripted V	Variables (Arrays: Types of	Branching Statements (Logical IF,
Arrays, DIMI	ENSION Statement, Reading	Arithmetic IF, Block IF, Nested Block IF,
and Writing A	Arrays), Functions and	SELECT CASE and ELSE IF Ladder
Subroutines (Arithmetic Statement	statements), Looping Statements (DO-
Function, Fur	nction Subprogram and	CONTINUE, DO-ENDDO, DOWHILE,
Subroutine),	RETURN, CALL,	Implied and Nested DO Loops), Jumping
COMMON a	nd EQUIVALENCE	Statements (Unconditional GOTO,
Statements),	Structure, Disk I/O	Computed GOTO, Assigned GOTO)
Statements, o	pen a file, writing in a file,	Subscripted Variables (Arrays: Types of
reading from	a file. Examples from physics	Arrays, DIMENSION Statement, Reading
problems.		and Writing Arrays), Functions and
Unit IV: Scie	entific word processing:	Subroutines (Arithmetic Statement
Introduction	to LaTeX: TeX/LaTeX	Function, Function Subprogram and
word process	or, preparing a basic LaTeX	Subroutine), RETURN, CALL, COMMON
file, Documer	nt classes, Preparing an input	and EQUIVALENCE Statements),
file for LaTe2	K, Compiling LaTeX File,	Structure, Disk I/O Statements, open a file,
LaTeX tags f	or creating different	writing in a file, reading from a file.
environments	, Defining LaTeX commands	Examples from physics problems.
and environm	ents, Changing the type style,	Programming:
Symbols from	n other languages.	1. Exercises on syntax on usage of
Equation rep	presentation: Formulae and	FORTRAN
equations.		2. Usage of GUI Windows, Linux

Unit V: Visualization: Introduction to graphical analysis and its limitations. Introduction to Gnuplot. importance of visualization of computational and computational data, basic Gnuplot commands: simple plots, plotting data from a file, saving and exporting, multiple data sets per file, physics with Gnuplot (equations, building functions, user defined variables and functions), Understanding data with Gnuplot

commands and working in an editor to write sources codes in FORTRAN. 3. To print out all natural even/ odd numbers between given limits. 4. To find maximum, minimum and range of a given set of numbers. **5.** Calculating Euler number using exp(x) series evaluated at x=1. Unit IV: Scientific word processing: Introduction to LaTeX: TeX/LaTeX word processor, preparing a basic LaTeX file, Document classes, Preparing an input file for LaTeX, Compiling LaTeX File, LaTeX tags for creating different environments, Defining LaTeX commands and environments, Changing the type style, Symbols from other languages. Equation representation: Formulae and equations, Figures and other floating bodies, Lining in columns- Tabbing and tabular environment, Generating table of contents, bibliography and citation, Making an index and glossary, List making environments, Fonts, Picture environment and colors, errors. Unit V: Visualization: Introduction to graphical analysis and its limitations. Introduction to Gnuplot. importance of visualization of computational and computational data, basic Gnuplot commands: simple plots, plotting data from a file, saving and exporting, multiple data sets per file, physics with Gnuplot (equations, building functions, user defined

Commands, familiarity with DOS

variables and functions), Understanding data with Gnuplot

Hands on exercises:

 To compile a frequency distribution and evaluate mean, standard deviation etc.
 To evaluate sum of finite series and the

			area under a curve.	
			3. To find the product of two matrices	
			4. To find a set of prime numbers and	
			Fibonacci series.	
			5. To write program to open a file and	
			generate data for plotting using Gnuplot.	
			6. Plotting trajectory of a projectile	
			projected horizontally.	
			7. Plotting trajectory of a projectile	
			projected making an angle with the	
			horizontally.	
			8. Creating an input Gnuplot file for	
			plotting a data and saving the output for	
			seeing on the screen. Saving it as an eps	
			To find the roots of a guadratic equation	
			10 Motion of a projectile using simulation	
			and plot the output for visualization	
			11. Numerical solution of equation of	
			motion of simple harmonic oscillator	
			and plot the outputs for visualization.	
			12. Motion of particle in a central force	
			field and plot the output for visualization.	
	DECOM			
	BSC304 E	Pharmaceutical Chemistry Unit-I	Unit-I	Syllabus Change
		Drugs & Pharmanauticals, Drug	Durran & Blaumanaticalar Dava	
		Diugs & That macculicais. Diug	Drugs & rharmaceuticais: Drug	
		discovery, design and development; Basic	discovery, design and development; Basic	
		Retrosynthetic approach.	Retrosynthetic approach. Synthesis of the	
		UNIT-II	representative drugs of the following	
		Synthesis of the representative drugs of the	classes: analgesics agents, antipyretic	
1		following classes: antibiotics	classes: analgesics agents, antipyretic agents, anti-inflammatory agents (Aspirin,	
		Synthesis of the representative drugs of thefollowingclasses:antibiotics(Chloramphenicol);antibacterialand	classes: analgesics agents, antipyretic agents, anti-inflammatory agents (Aspirin, paracetamol, lbuprofen).	
		Synthesis of the representative drugs of the following classes: antibiotics (Chloramphenicol); antibacterial and antifungal agents	classes: analgesics agents, antipyretic agents, anti-inflammatory agents (Aspirin, paracetamol, lbuprofen). UNIT-II	
		Synthesis of the representative drugs of the following classes: antibiotics (Chloramphenicol); antibacterial and antifungal agents UNIT-III	classes: analgesics agents, antipyretic agents, anti-inflammatory agents (Aspirin, paracetamol, lbuprofen). UNIT-II Synthesis of the representative drugs of the	
		Synthesis of the representative drugs of the following classes: antibiotics (Chloramphenicol); antibacterial and antifungal agents UNIT-III Synthesis of the representative drugs of the	classes: analgesics agents, antipyretic agents, anti-inflammatory agents (Aspirin, paracetamol, lbuprofen). UNIT-II Synthesis of the representative drugs of the following classes: antibiotics	
		Synthesis of the representative drugs of the following classes: antibiotics (Chloramphenicol); antibacterial and antifungal agents UNIT-III Synthesis of the representative drugs of the	classes:analgesicsagents,antipyreticagents,anti-inflammatoryagents(Aspirin,paracetamol,lbuprofen).UNIT-IIUNIT-IISynthesis of the representative drugs of thefollowingclasses:antibiotics	
		Synthesis of the representative drugs of the following classes: antibiotics (Chloramphenicol); antibacterial and antifungal agents UNIT-III Synthesis of the representative drugs of the following classes: Central Nervous System	classes:analgesicsagents,antipyreticagents,anti-inflammatoryagents(Aspirin,paracetamol,lbuprofen).UNIT-IISynthesis of the representative drugs of thefollowingclasses:antibiotics(Chloramphenicol);antibacterialand	

UNIT-IV Sulphanethoxazol, Sulphacetamide, Fermentation Trimethoprim); antiviral agents (Acyclovir), Aerobic and anaerobic fermentation. UNIT-III	
FermentationTrimethoprim); antiviral agents (Acyclovir),Aerobic and anaerobic fermentation.UNIT-III	
Aerobic and anaerobic fermentation. UNIT-III	
Production of (i) Ethyl alcohol and citric Synthesis of the representative drugs of the	
acid, (ii) Antibiotics; Penicillin, following classes: Central Nervous System	
Cephalosporin, Chloromycetin and agents (Phenobarbital,	
Streptomycin, Diazepam),Cardiovascular (Glyceryl	
UNIT-V trinitrate), antilaprosy (Dapsone), HIV-	
Aerobic and anaerobic fermentation. AIDS related drugs (AZT- Zidovudine).	
Production of Lysine, Glutamic acid, UNIT-IV	
Vitamin B ₂ , Vitamin B12 and Vitamin C. Fermentation	
Aerobic and anaerobic fermentation.	
Production of (i) Ethyl alcohol and citric	
acid, (ii) Antibiotics; Penicillin,	
Cephalosporin, Chloromycetin and	
Streptomycin,	
UNIT-V	
Aerobic and anaerobic fermentation.	
Production of Lysine, Glutamic acid,	
Vitamin B ₂ , Vitamin B12 and Vitamin C.	
Practicals	
1. Preparation of Aspirin and its analysis.	
2. Preparation of magnesium bisilicate	
(Antacid).	
	<u> </u>
BSC304 Basic Analytical Chemistry)	-
BSC304 Basic Analytical Chemistry) Syllabus Change F UNIT-I Syllabus Change	
BSC304 Basic Analytical Chemistry) Syllabus Change F Introduction: Introduction to Analytical Introduction to Analytical	
BSC304 Basic Analytical Chemistry) Syllabus Change F Introduction: Introduction to Analytical Introduction: Introduction to Analytical Introduction: Introduction is interdisciplinary nature. Chemistry and its interdisciplinary nature. Chemistry and its interdisciplinary nature.	
BSC304 Basic Analytical Chemistry) UNIT-I Syllabus Change F Introduction: Introduction to Analytical Introduction: Introduction to Analytical Introduction: Introduction to Analytical Introduction: Introduction to Analytical Introduction: Introduction to Analytical Chemistry and its interdisciplinary nature. Chemistry and its interdisciplinary nature. Chemistry and its interdisciplinary nature. Concept of sampling. Importance of Concept of sampling. Importance of Concept of sampling. Importance of	

analytical measurements.

UNIT-II

Analysis of soil: Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents, use of indicators a. Determination of pH of soil samples. b.

UNIT-III

Analysis of water: Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods.
a. Determination of pH, acidity and alkalinity of a water sample.

b. Determination of dissolved oxygen(DO) of a water sample.

UNIT-IV

Chromatography: Definition, general introduction on principles of chromatography, paper chromatography, TLC etc.

a. Paper chromatographic separation of mixture of metal ion (Fe³⁺ and Al³⁺).
b. To compare paint samples by TLC method.

UNIT-V

Analysis of cosmetics: Major and minor constituents and their function

 Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate. analytical measurements. Presentation of experimental data and results, from the

point of view of significant figures.

UNIT-II

Analysis of soil: Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents, use of indicators a. Determination of pH of soil samples. b. Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration.

UNIT-III

Analysis of water: Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods.

a. Determination of pH, acidity and alkalinity of a water sample.

b. Determination of dissolved oxygen (DO) of a water sample.

Analysis of food products: Nutritional value of foods, idea about food processing and food preservations and adulteration. a. Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, etc.

b. Analysis of preservatives and colouring

UNIT-IV

matter.

	b. Determination of constituents of talcum	Chromatography: Definition, general	
	powder: Magnesium oxide, Calcium oxide,	introduction on principles of	
	Zinc oxide and Calcium carbonate by	chromatography, paper chromatography,	
	complexometric titration.	TLC etc.	
		a. Paper chromatographic separation of	
		mixture of metal ion (Fe^{3+} and Al^{3+}).	
		b. To compare paint samples by TLC	
		method.	
		Ion-exchange: Column, ion-exchange	
		chromatography etc.	
		Determination of ion exchange capacity of	
		anion / cation exchange resin (using batch	
		procedure if use of column is not feasible).	
		UNIT-V	
		Analysis of cosmetics: Major and minor	
		constituents and their function	
		a. Analysis of deodorants and	
		antiperspirants, Al, Zn, boric acid, chloride,	
		sulphate.	
		b. Determination of constituents of talcum	
		powder: Magnesium oxide, Calcium oxide,	
		Zinc oxide and Calcium carbonate by	
		complexometric titration.	
		Practicals:	
		Suggested Applications (Any one):	
		a. To study the use of phenolphthalein in	
		trap cases.	
		b. To analyze arson accelerants.	
		c. To carry out analysis of gasoline.	
		Suggested Instrumental demonstrations:	
		a. Estimation of macro nutrients: Potassium,	
		•	

		Calcium, Magnesium in soil samples by	
		flame photometry.	
		b. Spectrophotometric determination of Iron	
		in Vitamin / Dietary Tablets.	
		c. Spectrophotometric Identification and Determination of Caffeine and Benzoic Acid in Soft Drink.	
BSC305	 Thermal Physics and Statistical Mechanics Lab 1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method. 2. Measurement of Planck's constant using black body radiation. 3. To determine Stefan's Constant. 4. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus. 5. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method. 6. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method. 7. To determine the temperature co- efficient of resistance by Platinum resistance thermometer. 8. To study the variation of thermo emf across two junctions of a thermocouple with temperature. 9. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system 10. To calibrate Resistance Temperature Device (RTD) using Null Method/Off- Balance Bridge 	 To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method. Measurement of Planck's constant using black body radiation. To determine Stefan's Constant. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method. To determine the temperature co-efficient of resistance by Platinum resistance thermometer. To study the variation of thermo emf across two junctions of a thermocouple with temperature. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system To calibrate Resistance Temperature Device (RTD) using Null Method/Off- Balance Bridge 	
BSC306	Solutions, Phase equilibria, Conductance, Electrochemistry & Functional Group Organic Chemistry-II Lab		

Section A: Physical Chemistry	Section A: Physical Chemistry			
Distribution	Distribution			
Study of the equilibrium of one of the	Study of the equilibrium of one of the			
following reactions by the distribution	following reactions by the distribution			
method:	method:			
$I_2(aq) + I^{-}(aq) \square I^{3-}(aq)$	$I_2(aq) + I(aq) \Box I^{3-}(aq)$			
$\operatorname{Cu}^{2+}(\operatorname{aq}) + x\operatorname{NH}_2(\operatorname{aq}) \Box [\operatorname{Cu}(\operatorname{NH}_3)_x]^{2+}$	$\operatorname{Cu}^{2+}(\operatorname{aq}) + x\operatorname{NH}_2(\operatorname{aq}) \Box [\operatorname{Cu}(\operatorname{NH}_3)_x]^{2+}$			
Phase equilibria	Phase equilibria			
a) Construction of the phase diagram of a	a) Construction of the phase diagram of a			
binary system (simple eutectic) using	binary system (simple eutectic) using			
cooling curves.	cooling curves.			
b) Determination of the critical solution	b) Determination of the critical solution			
temperature and composition of the phenol	temperature and composition of the phenol			
water system and study of the effect of	water system and study of the effect of			
impurities on it.	impurities on it.			
c) Study of the variation of mutual	c) Study of the variation of mutual			
solubility temperature with concentration	solubility temperature with concentration			
for the phenol water system and	for the phenol water system and			
determination of the critical solubility	determination of the critical solubility			
temperature.	temperature.			
Conductance	Conductance			
I. Determination of cell constant	I. Determination of cell constant			
II. Determination of equivalent	II. Determination of equivalent			
conductance, degree of dissociation and	conductance, degree of dissociation and			
dissociation constant of a weak acid.	dissociation constant of a weak acid.			
III. Perform the following conductometric	III. Perform the following conductometric			
titrations:	titrations:			
i. Strong acid vs. strong base	i. Strong acid vs. strong base			
ii. Weak acid vs. strong base	ii. Weak acid vs. strong base			
Potentiometry	Potentiometry			
Perform the following potentiometric	Perform the following potentiometric			
		titrations:	titrations:	
---	--------	---	---	--
		i. Strong acid vs. strong base	i. Strong acid vs. strong base	
		ii. Weak acid vs. strong base	ii. Weak acid vs. strong base	
		iii. Potassium dichromate vs. Mohr's salt	iii. Potassium dichromate vs. Mohr's salt	
		Section B: Organic Chemistry	Section B: Organic Chemistry	
		I Systematic Qualitative Organic Analysis	I Systematic Qualitative Organic Analysis	
		of Organic Compounds possessing	of Organic Compounds possessing	
		monofunctional groups (-COOH, phenolic,	monofunctional groups (-COOH, phenolic,	
		aldehydic, ketonic, amide, nitro, amines)	aldehydic, ketonic, amide, nitro, amines)	
		and preparation of one derivative.	and preparation of one derivative.	
		II	п	
		1. Separation of amino acids by paper	1. Separation of amino acids by paper	
		chromatography	chromatography	
		2. Determination of the concentration of	2. Determination of the concentration of	
		glycine solution by formylation method.	glycine solution by formylation method.	
		3. Titration curve of glycine	3. Titration curve of glycine	
		4. Action of salivary amylase on starch	4. Action of salivary amylase on starch	
		5. Effect of temperature on the action of	5. Effect of temperature on the action of	
		salivary amylase on starch.	salivary amylase on starch.	
		6. Differentiation between a reducing and a	6. Differentiation between a reducing and a	
		nonreducing sugar.	nonreducing sugar.	
E	3SC401	Waves and optics Unit 1:	Unit 1:	
		Superposition of Two Collinear	Superposition of Two Collinear	
		Harmonic oscillations: Linearity and	Harmonic oscillations: Linearity and	
		Superposition Principle. (1) Oscillations	Superposition Principle. (1) Oscillations	
		having equal frequencies and (2)	having equal frequencies and (2)	
		Oscillations having different frequencies	Oscillations having different frequencies	
		(Beats). Superposition of Two	(Beats). Superposition of Two	
		Perpendicular Harmonic Oscillations:	Perpendicular Harmonic Oscillations:	
		Graphical and Analytical Methods.	Graphical and Analytical Methods.	
		Lissajous Figures with equal an unequal	Lissajous Figures with equal an unequal	
		frequency and their uses.	frequency and their uses.	
		Waves Motion- General: Transverse	Waves Motion- General: Transverse	

intensity.	intensity.
Plane waves. Spherical waves, Wave	Plane waves. Spherical waves,
string. Group velocity, Phase velocity.	string. Group velocity, Phase ve
waves on a string. Normal Modes of a	waves on a string. Normal Modes
waves on a string. Travelling and standing	waves on a string. Travelling and st

Unit II:

Fluids: Surface Tension: Synclastic and anticlastic surface - Excess of pressure -Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature - Jaegar's method. Viscosity: Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity of a liquid - Variations of viscosity of a liquid with temperature lubrication. Physics of low pressure production and measurement of low pressure - Rotary pump - Diffusion pump -Molecular pump - Knudsen absolute gauge - penning and pirani gauge - Detection of leakage.

UNIT III:

Sound: Simple harmonic motion - forced vibrations and resonance - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity and loudness of sound - Decibels - Intensity levels musical notes - musical scale. Acoustics of buildings: Reverberation and time of reverberation - Absorption coefficient -Sabine's formula - measurement of reverberation time - Acoustic aspects of halls and auditoria.

UNIT IV:

Wave Optics: Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle. Interference: tanding s of a elocity. Wave

Unit II:

Fluids: Surface Tension: Synclastic and anticlastic surface - Excess of pressure -Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature - Jaegar's method. Viscosity: Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula -Determination of coefficient of viscosity of a liquid - Variations of viscosity of a liquid with temperature lubrication. Physics of low pressure - production and measurement of low pressure - Rotary pump - Diffusion pump - Molecular pump - Knudsen absolute gauge - penning and pirani gauge -Detection of leakage.

UNIT III:

Sound: Simple harmonic motion - forced vibrations and resonance - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity and loudness of sound - Decibels - Intensity levels - musical notes - musical scale. Acoustics of buildings: Reverberation and time of reverberation - Absorption coefficient -Sabine's formula measurement of reverberation time - Acoustic aspects of halls and auditoria.

UNIT IV:

Wave Optics: Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle. **Interference:** Interference: Division of amplitude and Interference: Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index.

UNIT V:

Michelson's Interferometer: Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength difference, Refractive index and Visibility fringes. **Diffraction:** Fraunhofer of diffraction: Single slit; Double Slit. Multiple slits & Diffraction grating. Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using halfperiod zone analysis. **Polarization:** Transverse nature of light waves. Plane polarized light - production and analysis. Circular and elliptical polarization.

division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index.

UNIT V:

Michelson's Interferometer: Idea of form of fringes (no theory needed). Determination of wavelength, Wavelength difference, Refractive index and Visibility of fringes. Diffraction: Fraunhofer diffraction: Single slit; Double Slit. Multiple slits & Diffraction grating. Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis. **Polarization:** Transverse nature of light waves. Plane polarized light - production and analysis. Circular and elliptical polarization.

BSC402 Transition Metal & Coordination Chemistry, states and matter Chemical kinetics UNIT-I

> **Transition Elements (3d series):** General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu.Lanthanoids

UNIT-I

Transition Elements (3d series): General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu.Lanthanoids and

and actinoids: Electronic configurations,	actinoids: Electronic configurations,
oxidation states, colour, magnetic	oxidation states, colour, magnetic
properties, lanthanide contraction,	properties, lanthanide contraction,
separation of lanthanides (ion exchange	separation of lanthanides (ion exchange
method only).	method only).

UNIT-II

Coordination Chemistry: Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6). Structural and stereoisomerism in complexes with coordination numbers 4 and 6. Drawbacks of VBT. IUPAC system of nomenclature. Crystal Field Theory: Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry. Factors affecting the magnitude of D. Spectrochemical series. Comparison of CFSE for Oh and Td complexes, Tetragonal distortion of octahedral geometry. Jahn-Teller distortion, Square planar coordination.

Section B: Physical Chemistry-3

UNIT-III

Kinetic Theory of Gases: Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation. Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. van der Waals equation of state for real

UNIT-II

Coordination Chemistry: Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6). Structural and stereoisomerism in complexes with coordination numbers 4 and 6. Drawbacks of VBT. IUPAC system of nomenclature.

Crystal Field Theory: Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry. Factors affecting the magnitude of D. Spectrochemical series. Comparison of CFSE for Oh and Td complexes, Tetragonal distortion of octahedral geometry. Jahn-Teller distortion, Square planar coordination.

Section B: Physical Chemistry-3

UNIT-III

Kinetic Theory of Gases: Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation. Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. van der Waals equation of state for real gases. Boyle gases. Boyle temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation. Andrews isotherms of CO₂. Maxwell Boltzmann distribution laws of molecular velocities and molecular energies representation (graphic derivation not required) and their importance. Temperature dependence of these distributions. Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules. Viscosity of gases and effect of temperature and pressure on coefficient of viscosity (qualitative treatment only).

UNIT-IV

Liquids: Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only). Solids: Forms of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes. Laws of Crystallography -Law of constancy of interfacial angles, Law of rational indices. Miller indices. X-

temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation. Andrews isotherms of CO₂. Maxwell Boltzmann distribution laws of molecular velocities and molecular energies (graphic representation – derivation not required) and their importance. Temperature dependence of these distributions. Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules. Viscosity of gases and effect of temperature and pressure on coefficient viscosity (qualitative of treatment only).

UNIT-IV

Liquids: Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).

Solids: Forms of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes. Laws of Crystallography - Law of constancy of interfacial angles, Law of rational indices. Miller indices. X–Ray

	Ray diffraction by crystals, Bragg's law.	diffraction by crystals, Bragg's law.	
	Structures of NaCl, KCl and CsCl	Structures of NaCl, KCl and CsCl	
	(qualitative treatment only). Defects in	(qualitative treatment only). Defects in	
	crystals. Glasses and liquid crystals.	crystals. Glasses and liquid crystals.	
	UNIT-V	UNIT-V	
	Chemical Kinetics: The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half–life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).	Chemical Kinetics: The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half–life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).	
BSC403	Algebra	Unit I	
	Definition and examples of groups,	Definition and examples of groups,	
	examples of abelian and non-abelian	examples of abelian and non-abelian	
	groups, the group Zn of integers under	groups, the group Zn of integers under	
	addition modulo n and the group U(n) of	addition modulo \boldsymbol{n} and the group $U(\boldsymbol{n})$ of	
	units under multiplication modulo n.	units under multiplication modulo n. Cyclic	
	Cyclic groups from number systems,	groups from number systems, complex	
	complex roots of unity, circle group, the	roots of unity, circle group, the general	
	general linear group GLn (n,R), groups of	linear group GLn (n,R), groups of	
	symmetries of (i) an isosceles triangle, (ii)	symmetries of (i) an isosceles triangle, (ii)	
	an equilateral triangle, (iii) a rectangle, and	an equilateral triangle, (iii) a rectangle, and	
	(iv) a square, the permutation group Sym	(iv) a square, the permutation group Sym	
	(n), Group of quaternions.	(n), Group of quaternions.	
	Unit- II	Unit- II	
	Subgroups, cyclic subgroups, the concept	Subgroups, cyclic subgroups, the concept of	
	of a subgroup generated by a subset and	a subgroup generated by a subset and the	
	the	commutator subgroup of group, examples	
	commutator subgroup of group, examples	of subgroups including the center of a	
	of subgroups including the center of a	group.	
	group.		
		Unit- III	
	Unit- III	Cosets, Index of subgroup, Lagrange's	

	Cosets Index of subgroup Lagrange's	theorem order of an element Normal	
	theorem order of an element Normal	subgroups: their definition examples and	
	subgroups: their definition examples and	characterizations Quotient groups	
	characterizations Quotient groups	enaracterizations, Quotient Broups.	
	enaracterizations, Quotient groups.	Unit IV	
	Unit IV	Definition and examples of rings examples	
	Definition and examples of rings	of commutative and non commutative	
	Definition and examples of rings,	in so, sings from such as sectors. In the	
	examples of commutative and non-	rings: rings from number systems, Zn the	
	commutative rings: rings from number	ring of integers modulo n, ring of real	
	systems, Zn the ring of integers modulo n,	quaternions,	
	ring of real quaternions,		
		Unit- V	
	Unit- V	Rings of matrices, polynomial rings, and	
	Rings of matrices, polynomial rings, and	rings of continuous functions. Subrings and	
	rings of continuous functions. Subrings	ideals, Integral domains and fields,	
	and ideals, Integral domains and fields,	examples of fields: Zp, Q, R, and C. Field	
	examples of fields: Zp, Q, R, and C. Field	of rational functions.	
	of rational functions.		
BSC404	SEC-2 (Choose any one)		
BSC404 A	Vector Calculus		Syllabus Change
BSC404 A	Vector Calculus Unit I	Unit I	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra Operations with	Unit I	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors Scalar and vector product	Unit I Vector Algebra. Operations with	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors.	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Unit II	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors.	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Unit II Vector Calculus Scalar-valued	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors. Unit II	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors. Unit II	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space Vector function of a scalar	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable:	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable:	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable. Curves and Batha, Vector	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Unit III	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Curves and Paths. Vector	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Unit III	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Curves and Paths. Vector fields.	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Unit III Differentiation and partial differentiation	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Curves and Paths. Vector fields. Unit III	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Unit III Differentiation and partial differentiation of a vector function. Derivative of sum, dot	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Curves and Paths. Vector fields. Unit III	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Unit III Differentiation and partial differentiation of a vector function. Derivative of sum, dot product and cross product of two vectors	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Curves and Paths. Vector fields. Unit III Differentiation and partial differentiation of	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Unit III Differentiation and partial differentiation of a vector function. Derivative of sum, dot product and cross product of two vectors	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Curves and Paths. Vector fields. Unit III Differentiation and partial differentiation of a vector function. Derivative of sum, dot	Syllabus Change
BSC404 A	Vector Calculus Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Unit III Differentiation and partial differentiation of a vector function. Derivative of sum, dot product and cross product of two vectors Unit IV	Unit I Vector Algebra. Operations with vectors. Scalar and vector product of three vectors. Product of four vectors. Reciprocal vectors. Unit II Vector Calculus. Scalar-valued functions over the plane and the space. Vector function of a scalar variable: Curves and Paths. Vector fields. Unit III Differentiation and partial differentiation of a vector function. Derivative of sum, dot product and cross product of two vectors	Syllabus Change

		the tangent plane, total differential	
	Gradient, divergence and curl. Vector integration: Path, line,	Unit IV	
	surface, and volume integrals. Line integrals of linear differential forms, integration of total differentials, conservative fields, conditions for line integrals to depend only on the endpoints. Unit V Theorems of Green, Gauss problems based on these.	Gradient, divergence and curl. Vector integration: Path, line, surface, and volume integrals. Line integrals of linear differential forms, integration of total differentials, conservative fields, conditions for line integrals to depend only on the endpoints, the fundamental theorem on exact differentials. Serret-Frenet Formulas. Unit V Theorems of Green, Gauss, Stokes, and problems based on these.	
BSC404 B	Theory of Equations Unit I General properties of polynomials, maximum and minimum values of a polynomials, Unit II General properties of equations, Descarte's rule of signs positive and negative rule, Unit III Symmetric functions, Applications symmetric function of the roots, Unit IV Transformation of equations. Unit V Algebraic solutions of the cubic and biquadratic.	Unit IGeneral properties of polynomials,Graphical representation of a polynomials,maximum and minimum values of apolynomials,Unit IIGeneral properties of equations, Descarte'srule of signs positive and negative rule,Relation between the roots and thecoefficients of equations.Unit IIISymmetric functions, Applicationssymmetric function of the roots,Unit IVTransformation of equations.Solutions ofreciprocal and binomial equations.Unit VAlgebraic solutions of the cubic andbiquadratic.Properties of the derivedfunctions.	Syllabus Change

•			
BSC404 C	Electrical circuit & net work skills Unit I:	Unit I:	Syllabus Change
	Basic Electricity Principles: Voltage,	Basic Electricity Principles: Voltage,	
	Current, Resistance, and Power. Ohm's	Current, Resistance, and Power. Ohm's law.	
	law. Series, parallel, and series-parallel	Series, parallel, and series-parallel	
	combinations. AC Electricity and DC	combinations. AC Electricity and DC	
	Electricity.	Electricity. Familiarization with	
	Unit II:	multimeter, voltmeter and ammeter.	
	Understanding Electrical Circuits: Main	Unit II:	
	electric circuit elements and their	Understanding Electrical Circuits: Main	
	combination. Rules to analyze DC sourced	electric circuit elements and their	
	electrical circuits. Current and voltage	combination. Rules to analyze DC sourced	
	drop across the DC circuit elements	electrical circuits. Current and voltage drop	
	Unit III:	across the DC circuit elements. Single-	
	Electrical Drawing and Symbols:	phase and three-phase alternating current	
	Drawing symbols. Blueprints. Reading	sources. Rules to analyze AC sourced	
	Schematics. Ladder diagrams. Electrical	electrical circuits. Real, imaginary and	
	Schematics. Power circuits. Control	complex power components of AC source.	
	circuits. Reading of circuit schematics.	Power factor. Saving energy and money.	
	Tracking the connections of elements and	Unit III:	
	identify current flow and voltage drop.	Electrical Drawing and Symbols:	
	Generators and Transformers: DC	Drawing symbols. Blueprints. Reading	
	Power sources. AC/DC generators.	Schematics. Ladder diagrams. Electrical	
	Inductance, capacitance, and impedance.	Schematics. Power circuits. Control circuits.	
	Operation of transformers.	Reading of circuit schematics. Tracking the	
	Unit IV:	connections of elements and identify current	
	Solid-State Devices: Resistors, inductors	flow and voltage drop.	
	and capacitors. Diode and rectifiers.	Generators and Transformers: DC Power	
	Components in Series or in shunt.	sources. AC/DC generators. Inductance,	
	Response of inductors and capacitors with	capacitance, and impedance. Operation of	
	DC or AC sources	transformers.	
	Unit V:	Electric Motors: Single-phase, three-phase	
	Electrical Wiring: Different types of	& DC motors. Basic design. Interfacing DC	
	conductors and cables. Basics of wiring-	or AC sources to control heaters & motors.	
	Star and delta connection. Voltage drop	Speed & power of ac motor.	
	and losses across cables and conductors.	Unit IV:	
	Instruments to measure current, voltage,	Solid-State Devices: Resistors, inductors	
	power in DC and AC circuits.	and capacitors. Diode and rectifiers.	
		Components in Series or in shunt. Response	
		of inductors and capacitors with DC or AC	
		sources	
 		_	

		Electrical Protection: Relays. Fuses and	
		disconnect switches. Circuit breakers.	
		Overload devices. Ground-fault protection.	
		Grounding and isolating. Phase reversal.	
		Surge protection. Interfacing DC or AC	
		sources to control elements (relay protection	
		Device	
		Unit V:	
		Electrical Wiring: Different types of	
		conductors and cables. Basics of wiring-	
		Star and delta connection. Voltage drop and	
		losses across cables and conductors.	
		Instruments to measure current, voltage,	
		power in DC and AC circuits. Insulation.	
		Solid and stranded cable. Conduit. Cable	
		trays. Splices: wirenuts, crimps, terminal	
		blocks, split bolts, and solder. Preparation	
		of extension board	
BSC404	Technical drawing	TT-14 1.	Syllabus Change
D	Unit 1:	Unit 1:	
	their uses lattering; construction and uses	Introduction: Drarting Instruments and	
	of vorious cooles, dimensioning as nor	their uses, lettering: construction and uses	
	LS L (0(1072) Engineering Current	of various scales: dimensioning as per I.S.I.	
	1.5.1. 090-1972. Engineering Curves.	696-1972. Engineering Curves:	
	Parabola.nyperbola: empse: cycloids,	Parabola: hyperbola: ellipse: cycloids,	
	involute: spiral: nelix and loci of points of	involute: spiral: helix and loci of points of	
	simple moving mechanism.2D geometrical	simple moving mechanism.2D geometrical	
	construction.	construction. Representation of 3D objects.	
		Principles of projections.	
	Projections: Straight lines, planes and	Unit II:	
	solids. Development of surfaces of right	Projections : Straight lines, planes and	
	and oblique solids. Section of solids	solids. Development of surfaces of right and	
	Unit III:	oblique solids. Section of solids	
	Object Projections : Orthographic	Unit III:	
	projection. Interpenetration and	Object Projections : Orthographic	
	intersection of solids.	projection. Interpenetration and intersection	
	Unit IV:	of solids <mark>. Isometric and oblique parallel</mark>	
	CAD Drawing: Introduction to CAD and	projection of solids.	
	Auto CAD, precision drawing and drawing	Unit IV:	
	aids, Geometric shapes, Demonstrating	CAD Drawing: Introduction to CAD and	
	CAD- specific skills (graphical user	Auto CAD, precision drawing and drawing	

	interface.Create, retrieve, edit, and use	aids, Geometric shapes, Demonstrating	
	symbol libraries.	CAD- specific skills (graphical user	
	Unit V:	interface.Create, retrieve, edit, and use	
	Demonstrating basic skills to produce 2- D	symbol libraries. Use inquiry commands to	
	and 3-Ddrawings. 3D modeling with Auto	extract drawing data). Control entity	
	CAD (surfaces and solids),.	properties.	
		Unit V:	
		Demonstrating basic skills to produce 2- D	
		and 3-Ddrawings. 3D modeling with Auto	
		CAD (surfaces and solids), 3D modeling	
		with sketch up, annotating in Auto CAD	
		with text and hatching, layers, templates &	
		design center, advanced plotting (layouts,	
		viewports), office standards, dimensioning,	
		symbols attributes extracting data basic	
		printing editing tools Plot/Print drawing to	
		appropriate scale.	
BSC404	Analytical Clinical Biochemistry	INTE I	Syllabus Change
L	0111-1	UIIII-I	
	Carbohydrates: Biological importance of	Carbohydrates: Biological importance of	
	carbohydrates, Metabolism, Cellular	carbohydrates, Metabolism, Cellular	
	currency of energy (ATP), Glycolysis,	currency of energy (ATP), Glycolysis,	
	Alcoholic and Lactic acid fermentations,	Alcoholic and Lactic acid fermentations,	
	Krebs cycle.	Krebs cycle. Isolation and characterization	
	UNIT-II	of polysachharides.	
	Proteins: Classification, biological	UNIT-II	
	importance; Primary and secondary and	Proteins: Classification, biological	
	tertiary structures of proteins: α -helix and	importance; Primary and secondary and	
	β - pleated sheets.	tertiary structures of proteins: α -helix and β -	
	UNIT-III	pleated sheets, Isolation, characterization,	
	Enzymes: Nomenclature, Characteristics	denaturation of proteins.	
	(mention of Ribozymes), Classification;	UNIT-III	
	Active site, Mechanism of enzyme action,	Enzymes: Nomenclature, Characteristics	
	Stereospecificity of enzymes Coenzymes	(mention of Ribozymes) Classification:	

and cofactors, Enzyme inhibitors, Introduction to Biocatalysis: Importance in "Green Chemistry" and Chemical Industry.

UNIT-IV

Lipids: Classification. Biological importance of triglycerides and phosphoglycerides and cholesterol; Lipid membrane, Liposomes and their biological functions and underlying applications.

Lipoproteins: Properties, functions and biochemical functions of steroid hormones. Biochemistry of peptide hormones.

UNIT-V

Biochemistry of disease: A diagnostic approach by blood/ urine analysis.

Blood: Composition and functions of blood, blood coagulation. Blood collection and preservation of samples. Anaemia, Regulation, estimation and interpretation of data for blood sugar, urea, creatinine, cholesterol and bilirubin.

Urine: Collection and preservation of samples. 6. Formation of urine. Composition and estimation of constituents of normal and pathological urine.

Active site, Mechanism of enzyme action, Stereospecificity of enzymes, Coenzymes and cofactors, Enzyme inhibitors, Introduction to Biocatalysis: Importance in "Green Chemistry" and Chemical Industry. Nomenclature, classification, effect of pH, temperature on enzyme activity, enzyme inhibition.

UNIT-IV

Lipids: Classification. Biological importance of triglycerides and phosphoglycerides and cholesterol; Lipid membrane, Liposomes and their biological functions and underlying applications.

Lipoproteins: Properties, functions and biochemical functions of steroid hormones. Biochemistry of peptide hormones.

Structure of DNA (Watson-Crick model) and RNA, Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation, Introduction to Gene therapy.

UNIT-V

Biochemistry of disease: A diagnostic approach by blood/ urine analysis.

Blood: Composition and functions of blood, blood coagulation. Blood collection and preservation of samples. Anaemia, Regulation, estimation and interpretation of data for blood sugar, urea, creatinine, cholesterol and bilirubin.

		Urine: Collection and preservation of	
		samples. 6. Formation of urine.	
		Composition and estimation of constituents	
		of normal and pathological urine.	
		Practicals	
		Identification and estimation of the	
		following:	
		1. Carbohydrates – qualitative and	
		quantitative.	
		2. Lipids – qualitative.	
		3. Determination of the iodine number of	
		<mark>oil.</mark>	
		4. Determination of the saponification	
		number of oil.	
		5. Determination of cholesterol using	
		Liebermann- Burchard reaction.	
		<mark>6. Proteins – qualitative.</mark>	
		7. Isolation of protein.	
		8. Determination of protein by the Biuret	
		reaction.	
DCC		9. Determination of nucleic acids	
F	UNIT-I	UNIT-I	Syllabus Change
	Introduction: Definitions of Green	Introduction: Definitions of Green	
	Chemistry. Brief introduction of twelve	Chemistry. Brief introduction of twelve	
	principles of Green Chemistry, with	principles of Green Chemistry, with	
	examples.	examples, special emphasis on atom	
	UNIT-II	economy, reducing toxicity.	
	Green solvents, Green Chemistry and	UNIT-II	
	catalysis and alternative sources of energy.	Green solvents, Green Chemistry and	
	UNIT-III	catalysis and alternative sources of energy,	
	Real world Cases in Green Chemistry:	Green energy and sustainability.	

		Surfactants for carbon dioxide – Replacing	UNIT-III
		smog producing .	Real world Cases in Green Chemistry:
		UNIT-IV	Surfactants for carbon dioxide – Replacing
		Real world Cases in Green Chemistry:	smog producing and ozone depleting
		Designing of environmentally safe marine	solvents with CO ₂ for precision cleaning
		antifoulant.	and dry cleaning of garments.
		UNIT-V	UNIT-IV
		An efficient, green synthesis of a	Real world Cases in Green Chemistry:
		compostable and widely applicable plastic	Designing of environmentally safe marine
		(poly lactic acid) made from corn.	antifoulant. Right fit pigment: Synthetic azo
			pigments to replace toxic organic and
			inorganic pigments.
			UNIT-V
			An efficient, green synthesis of a
			compostable and widely applicable plastic
			(poly lactic acid) made from corn.
			Practicals
			1. Preparation and characterization of
			biodiesel from vegetable oil.
			2. Extraction of D-limonene from
			orange peel using liquid CO2
			prepared from dry ice.
			3. Mechano chemical solvent free
			synthesis of azomethine.
			Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper(II).
]	BSC405	Waves and optics Lab 1. To investigate the motion of coupled	1. To investigate the motion of coupled
		oscillators	oscillators
		2. To determine the Frequency of an	2. To determine the Frequency of an
		Electrically Maintained Tuning Fork by	Electrically Maintained Tuning Fork by
		T Law.	Melde's Experiment and to verify $\lambda 2 - T$ Law.

	3. To study Lissajous Figures	3. To study Lissajous Figures	
	4. Familiarization with Schuster's	4. Familiarization with Schuster's	
	focussing; determination of angle of prism.	focussing; determination of angle of prism.	
	5. To determine the Coefficient of	5. To determine the Coefficient of Viscosity	
	Viscosity of water by Capillary Flow	of water by Capillary Flow Method	
	Method (Poiseuille's method).	(Poiseuille's method).	
	6. To determine the Refractive Index of the	6. To determine the Refractive Index of the	
	Material of a given Prism using Sodium	Material of a given Prism using Sodium	
	Light.	Light.	
	7. To determine Dispersive Power of the	7. To determine Dispersive Power of the	
	Material of a given Prism using Mercury	Material of a given Prism using Mercury	
	Light	Light	
	8. To determine the value of Cauchy	8. To determine the value of Cauchy	
	Constants of a material of a prism.	Constants of a material of a prism.	
	9. To determine the Resolving Power of a	9. To determine the Resolving Power of a	
	Prism.	Prism.	
	10. To determine wavelength of sodium	10. To determine wavelength of sodium	
	light using Fresnel Biprism.	light using Fresnel Biprism.	
	11. To determine wavelength of sodium	11. To determine wavelength of sodium	
	light using Newton's Rings.	light using Newton's Rings.	
	12. To determine the wavelength of Laser	12. To determine the wavelength of Laser	
	light using Diffraction of Single Slit.	light using Diffraction of Single Slit.	
	13. To determine wavelength of (1)	13. To determine wavelength of (1) Sodium	
	Sodium & (2) spectrum of Mercury	& (2) spectrum of Mercury light using	
	light using plane diffraction Grating	plane diffraction Grating	
	14. To determine the Resolving Power of a	14. To determine the Resolving Power of a	
	Plane Diffraction Grating.	Plane Diffraction Grating.	
	15. To measure the intensity using	15. To measure the intensity using	
	photosensor and laser in diffraction	photosensor and laser in diffraction	
	patterns of single and double slits.	patterns of single and double slits.	
BSC406	Transition Metal & Coordination		
	Chemistry Lab		
	Section A: Inorganic Chemistry	Section A: Inorganic Chemistry	
	Semi-micro qualitative analysis (using	Semi-micro qualitative analysis (using H2S	
	H2S or other methods) of mixtures - not	or other methods) of mixtures - not more	
	more than four ionic species (two anions	than four ionic species (two anions and two	
	and two cations, excluding insoluble salts)	cations, excluding insoluble salts) out of the	
	out of the following:	following:	
	-	5	

Cations : NH^{4+} , Pb^{2+} , Bi^{3+} , Cu^{2+} , Cd^{2+} ,	Cations : NH ⁴⁺ , Pb ²⁺ , Bi ³⁺ , Cu ²⁺ , Cd ²⁺ , Fe ³⁺ ,	
Fe ³⁺ , Al ³⁺ , Co ²⁺ , Ni ²⁺ , Mn ²⁺ , Zn ²⁺ , Ba ²⁺ ,	Al^{3+} , Co^{2+} , Ni^{2+} , Mn^{2+} , Zn^{2+} , Ba^{2+} , Sr^{2+} ,	
Sr^{2+}, Ca^{2+}, K^+	Ca ²⁺ , K ⁺	
Anions : CO_3^{2-} , S^{2-} , SO^{2-} , $S_2O_3^{2-}$, NO_3^{-} ,	Anions : CO_3^{2-} , S^{2-} , SO^{2-} , $S_2O_3^{2-}$, NO_3^{-} ,	
CH ₃ COO ⁻ , Cl ⁻ , Br ⁻ , l ⁻ , NO ₃ ⁻ , SO ₄ ⁻²⁻ , PO ₄ ⁻³⁻ ,	CH ₃ COO ⁻ , Cl ⁻ , Br ⁻ , l ⁻ , NO ₃ ⁻ , SO ₄ ⁻²⁻ , PO ₄ ⁻³⁻ ,	
$BO_3^{3-}, C_2O_4^{2-}, F^{-}$	$BO_3^{3-}, C_2O_4^{2-}, F^-$	
(Spot tests should be carried out wherever	(Spot tests should be carried out wherever	
feasible)	feasible)	
1. Estimate the amount of nickel present in	1. Estimate the amount of nickel present in	
a given solution as	a given solution as	
bis(dimethylglyoximato)nickel(II) or	bis(dimethylglyoximato)nickel(II) or	
aluminium as oximate in a given solution	aluminium as oximate in a given solution	
gravimetrically.	gravimetrically.	
2. Estimation of (i) Mg^{2+} or (ii) Zn^{2+} by	2. Estimation of (i) Mg^{2+} or (ii) Zn^{2+} by	
complexometric titrations using EDTA.	complexometric titrations using EDTA.	
3. Estimation of total hardness of a given	3. Estimation of total hardness of a given	
sample of water by complexometric	sample of water by complexometric	
titration.	titration.	
Section B: Physical Chemistry	Section B: Physical Chemistry	
(I) Surface tension measurement (use of	(I) Surface tension measurement (use of	
organic solvents excluded).	organic solvents excluded).	
a) Determination of the surface tension of	a) Determination of the surface tension of a	
a liquid or a dilute solution using a	liquid or a dilute solution using a	
stalagmometer.	stalagmometer.	
b) Study of the variation of surface tension	b) Study of the variation of surface tension	
of a detergent solution with concentration.	of a detergent solution with concentration.	
(II) Viscosity measurement (use of organic	(II) Viscosity measurement (use of organic	
solvents excluded).	solvents excluded).	
a) Determination of the relative and	a) Determination of the relative and	
absolute viscosity of a liquid or dilute	absolute viscosity of a liquid or dilute	
solution using an Ostwald's viscometer.	solution using an Ostwald's viscometer.	

	b) Study of the variation of viscosity of an	b) Study of the variation of viscosity of an	
	aqueous solution with concentration of	aqueous solution with concentration of	
	solute.	solute.	
	(III) Chemical Kinetics	(III) Chemical Kinetics	
	Study the kinetics of the following	Study the kinetics of the following	
	reactions.	reactions.	
	1. Initial rate method: Iodide-persulphate	1. Initial rate method: Iodide-persulphate	
	reaction	reaction	
	2. Integrated rate method:	2. Integrated rate method:	
	a. Acid hydrolysis of methyl acetate with	a. Acid hydrolysis of methyl acetate with	
	hydrochloric acid.	hydrochloric acid.	
	b. Saponification of ethyl acetate.	b. Saponification of ethyl acetate.	
	c. Compare the strengths of HCl and	c. Compare the strengths of HCl and H_2SO_4	
	H ₂ SO ₄ by studying kinetics of hydrolysis	by studying kinetics of hydrolysis of methyl	
	of methyl acetate	acetate	
BSC501	SEC-3 (Choose any one)		
BSC501	Probability and Statistics		Syllabus Change
А	Unit I	Unit I	
	Sample space, probability axioms, real	Sample space, probability axioms, real	
	random variables (discrete and	random variables (discrete and continuous),	
	continuous), probability mass/density	cumulative distribution function, probability	
		mass/density functions,	
	Unit in Mathematical avpostation momenta	Unit II	
	moment generating function	maintenation expectation, moments,	
		function	
	Discrete distributions: uniform, binomial.		
	Unit IV	Discrete distributions: uniform, binomial,	
	continuous distributions: uniform, normal.	Poisson.	
	Unit V	Unit IV	
	Joint cumulative distribution function and	continuous distributions: uniform, normal,	
	its properties, joint probability density	exponential.	
	functions.	Unit V	
		Joint cumulative distribution function and	

		its properties, joint probability density	
		functions, marginal and conditional	
		distributions, expectation of function of two	
		random variables, conditional expectations,	
		independent random variables.	
 D00501	Mathematical Madalling		
B	Unit I	Unit I	Syllabus Change
	Introduction, basic steps of Mathematical	Introduction, basic steps of Mathematical	
	Modeling, its needs.	Modeling, its needs, types of models,	
	Unit II	limitations.	
	Elementary ideas of dynamical systems,	Unit II	
	autonomous dynamical systems in the	Elementary ideas of dynamical systems,	
	plane-linear theory.	autonomous dynamical systems in the	
	Unit III	plane-linear theory. <mark>Equilibrium point,</mark>	
	Applications of differential equations: the	node, saddle point, focus, centre and limit-	
	vibrations of a mass on a spring, mixture	cycle ideas with simple illustrations and	
	problem.	figures.	
	Unit IV	Unit III	
	Mechanics of simultaneous differential	Applications of differential equations: the	
	equations. Applications to Traffic Flow.	vibrations of a mass on a spring, mixture	
	Unit V	problem, free damped motion, forced	
	conduction of heat in solids, gravitational	motion, resonance phenomena, electric	
	potential.	circuit problem,	
		Unit IV	
		Mechanics of simultaneous differential	
		equations. Applications to Traffic Flow.	
		Vibrating string, vibrating membrane,	
		Unit V	
		conduction of heat in solids, gravitational	
		potential, conservation laws.	
BSC501 C	Radiology & safety Unit 1:	Unit 1:	Syllabus Change
	Basics of Atomic and Nuclear Physics:	Basics of Atomic and Nuclear Physics:	
	Basic concept of atomic structure; X rays	Basic concept of atomic structure; X rays	
	characteristic and production; concept of	characteristic and production; concept of	
	bremsstrahlung and auger electron, The	bremsstrahlung and auger electron, The	
	composition of nucleus and its properties,	composition of nucleus and its properties,	
	mass number, isotopes of element, spin,	mass number, isotopes of element, spin,	
	binding energy, stable and unstable	binding energy, stable and unstable	
	isotopes, law of radioactive decay, Mean	isotopes, law of radioactive decay, Mean	
1			

life and half life, basic concept of alpha,	life and half life, basic concept of alpha,
beta and gamma decay.	beta and gamma decay, concept of cross
Unit II:	section and kinematics of nuclear reactions,
Interaction of Radiation with matter:	types of nuclear reaction, Fusion, fission

and Mass

Types of Radiation: Alpha, Beta, Gamma Unit II:

Interaction of Radiation with matter: Types of Radiation: Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources, Interaction of Photons -Photoelectric effect, Compton Scattering, Pair Production, Linear and Mass Attenuation Coefficients, Interaction of Charged Particles: Heavy charged particles - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation. Beta Particles- Collision and Radiation loss (Bremsstrahlung), Interaction of Neutrons- Collision, slowing down and Moderation.

Unit III:

Radiation detection and monitoring devices: Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose. equivalent dose, effective dose, collective equivalent dose, Annual Limit of Intake (ALI) and derived Air Concentration (DAC). Radiation detection: Basic concept and working principle of gas detectors (Ionization Chambers, Proportional Counter, Multi-Wire Proportional Counters (MWPC) and Gieger Muller Counter), Scintillation Detectors (Inorganic and Organic Scintillators), Solid States Detectors and Neutron Detectors, Thermo *luminescent Dosimetry.*

Unit IV:

Radiation safety management: *Biological effects of ionizing radiation*, Operational limits and basics of radiation hazards

Radiation detection and monitoring

Unit III:

devices: Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose, Annual Limit of Intake (ALI) and derived Air Concentration (DAC).

and Neutron and their sources, sealed and

unsealed sources, Interaction of Photons

Photoelectric effect, Compton Scattering,

Pair Production, Linear

Attenuation Coefficients.

Unit IV:

Radiationsafetymanagement:Biological effects of ionizing radiation,Operational limits and basics of radiationhazards evaluation and control: radiationprotectionstandards,InternationalCommission on Radiological Protection(ICRP)principles,justification,optimization, limitation.

Unit V:

Applicationofnucleartechniques:Application in medical science (e.g., MRI,PET, Projection Imaging Gamma Camera,radiationtherapy),Archaeology,Art,Crime detection, Mining and oil. IndustrialUses:Tracing,Gauging,MaterialModification,Sterization,Foodpreservation.

evaluation and control: radiation protection standards, International Commission on Radiological Protection (ICRP) principles, justification, optimization, limitation, introduction of safety and risk management of radiation. Nuclear waste and disposal management. Brief idea about Accelerator driven Sub-critical system (ADS) for waste management.

Unit V:

Application of nuclear techniques: Application in medical science (e.g., MRI, PET, Projection Imaging Gamma Camera, radiation therapy), Archaeology, Art, Crime detection, Mining and oil. *Industrial Uses:* Tracing, Gauging, Material Modification, Sterization, Food preservation.

Experiments:

 Study the background radiation levels using Radiation meter Characteristics of Geiger Muller (GM) Counter:

 Study of characteristics of GM tube and determination of operating voltage and plateau

length using background radiation as source (without commercial source). 3) Study of counting statistics using

background radiation using GM counter.

4) Study of radiation in various materials

(e.g. KSO4 etc.). Investigation of possible

radiation in different routine materials by

operating GM at operating voltage.

5) Study of absorption of beta particles in

Aluminum using GM counter.

6) Detection of α particles using reference

source & determining its half life using

spark counter

7) Gamma spectrum of Gas Light mantle

(Source of Thorium)

BSC501	Weather forecasting		Sullahus Charge
D	Unit I:	Unit I:	Syllabus Change
	Introduction to atmosphere: Elementary	Introduction to atmosphere: Elementary	
	idea of atmosphere: physical structure and	idea of atmosphere: physical structure and	
	composition; compositional layering of the	composition; compositional layering of the	
	atmosphere; variation of pressure and	atmosphere; variation of pressure and	
	temperature with height; air temperature;	temperature with height; air temperature;	
	requirements to measure air temperature.	requirements to measure air temperature;	
		temperature sensors: types; atmospheric	
	Unit II:	pressure: its measurement; cyclones and	
	Measuring the weather: Wind; forces	anticyclones: its characteristics.	
	acting to produce wind; wind speed		
	direction: units, its direction; measuring	Unit II:	
	wind speed and direction; humidity, clouds	Measuring the weather: Wind; forces	
	and rainfall.	acting to produce wind; wind speed	
		direction: units, its direction; measuring	
	Unit III:	wind speed and direction; humidity, clouds	
	Weather systems: Global wind systems;	and rainfall, radiation: absorption, emission	
	air masses and fronts: classifications; jet	and scattering in atmosphere; radiation	
	streams; local thunderstorms.	laws.	
	Unit IV:		
	Climate and Climate Change: Climate:	Unit III:	
	its classification; causes of climate change;	Weather systems: Global wind systems; air	
	global warming and its outcomes.	masses and fronts: classifications; jet	
		streams; local thunderstorms <mark>; tropical</mark>	
	Unit V:	cyclones: classification; tornadoes;	
	Basics of weather forecasting: Weather	hurricanes.	
	forecasting: analysis and its historical		
	background; need of measuring weather;	Unit IV:	
	types of weather forecasting; weather	Climate and Climate Change: Climate: its	
	forecasting methods; criteria of choosing	classification; causes of climate change;	
	weather station; basics of choosing site and	global warming and its outcomes; air	
	exposure; satellites observations in	pollution; aerosols, ozone depletion, acid	
	weather forecasting; weather maps;	rain, environmental issues related to	
	uncertainty and predictability; probability	climate.	
	forecasts.		
		Unit V:	
		Basics of weather forecasting: Weather	
		forecasting: analysis and its historical	

		background; need of measuring weather;	
		types of weather forecasting; weather	
		forecasting methods; criteria of choosing	
		weather station; basics of choosing site and	
		exposure; satellites observations in weather	
		forecasting; weather maps; uncertainty and	
		predictability; probability forecasts.	
		Demonstrations and Experiments:	
		1. Study of synoptic charts & weather	
		reports, working principle of weather	
		station.	
		2. Processing and analysis of weather data:	
		(a) To calculate the sunniest time of	
		the year.	
		(b) To study the variation of rainfall	
		amount and intensity by wind	
		direction.	
		(c) To observe the sunniest/driest day	
		of the week.	
		(d) To examine the maximum and	
		minimum temperature throughout the	
		year.	
		(e) To evaluate the relative humidity	
		of the day.	
		(f) To examine the rainfall amount	
		month wise.	
		3. Exercises in chart reading: Plotting of	
		constant pressure charts, surfaces charts,	
		upper wind charts and its analysis.	
		4. Formats and elements in different types	
		of weather forecasts/ warning (both aviation	
		and non aviation)	
DSC501	Chamistry of Cogneting & Deferrer		Cullabur Ch
E	UNIT-I	UNIT-I	Syllabus Change
	A general study including preparation and	A general study including preparation and	
	uses of the following, shampoo, suntan	uses of the following: Hair dye, hair spray,	
	lotions.	shampoo, suntan lotions.	
	UNIT-II	UNIT-II	

	A concrete study in the diag anonometical and	A compared study, including any anation and	
	A general study including preparation and	A general study including preparation and	
	uses of the following: face powder,	uses of the following: face powder,	
	lipsticks.	lipsticks, <mark>talcum powder, nail enamel</mark> .	
	UNIT-III	UNIT-III	
	A general study including preparation and	A general study including preparation and	
	uses of the following: creams (cold,	uses of the following: creams (cold,	
	vanishing and shaving creams).	vanishing and shaving creams),	
	UNIT-IV	antiperspirants and artificial flavours.	
	Essential oils and their importance in	UNIT-IV	
	cosmetic industries with reference to	Essential oils and their importance in	
	Eugenol, Geraniol.	cosmetic industries with reference to	
	UNIT-V	Eugenol, Geraniol,	
	Essential oils and their importance in	sandalwood oil,	
	cosmetic industries with reference to	UNIT-V	
	eucalyptus, rose oil, 2-phenyl ethyl	Essential oils and their importance in	
	alcohol, Jasmone, Civetone, Muscone.	cosmetic industries with reference to	
		eucalyptus, rose oil, 2-phenyl ethyl alcohol,	
		Jasmone, Civetone, Muscone.	
		Practicals	
		1. Preparation of talcum powder.	
		2. Preparation of shampoo.	
		3. Preparation of enamels.	
		4. Preparation of hair remover.	
		5. Preparation of face cream.	
		6. Preparation of nail polish and nail polish	
		remover.	
 DCC501	Dartiaida Chamister		Culleburg Ch
F	UNIT-I	UNIT-I	Syllabus Change
	General introduction to pesticides (natural	General introduction to pesticides (natural	
	and synthetic).	and synthetic), benefits and adverse effects.	
	UNIT-II	UNIT-II	

	Changing concepts of pesticides, structure	Changing concepts of pesticides, structure	
	activity relationship, synthesis	activity relationship, synthesis	
	UNIT-III	UNIT-III	
	Technical manufacture and uses of	Technical manufacture and uses of	
	representative pesticides in the following	representative pesticides in the following	
	classes: Organochlorines (DDT,	classes: Organochlorines (DDT,	
	Gammexene,).	Gammexene,); Organophosphates	
	UNIT-IV	(Malathion, Parathion).	
	Technical manufacture and uses of	UNIT-IV	
	representative pesticides in the following	Technical manufacture and uses of	
	classes: Carbamates (Carbofuran);	representative pesticides in the following	
	UNIT-V	classes: Carbamates (Carbofuran and	
	Technical manufacture and uses of	<mark>carbaryl</mark>);	
	representative pesticides in the following	UNIT-V	
	classes: Quinones (Chloranil).	Technical manufacture and uses of	
	Practicals	representative pesticides in the following	
	To calculate acidity/alkalinity in given	classes: Quinones (Chloranil), Anilides	
	sample of pesticide formulations as per	(Alachlor and Butachlor).	
	BIS specifications.	Practicals	
		1 To calculate acidity/alkalinity in given	
		sample of pesticide formulations as per BIS	
		specifications.	
		2 Preparation of simple organophosphates,	
		phosphonates and thiophosphates	
 DSC502	DSE 14 (Choose any and)		
B2C202	DSE-1A (Cnoose any one)		
BSC502 A	Matrices Unit- I	Unit- I	Syllabus Change
	R, R2, R3 as vector spaces over R.	R, R2, R3 as vector spaces over R. Standard	
	Standard basis for each of them. Concept	basis for each of them. Concept of Linear	
	of Linear Independence and examples of	Independence and examples of different	
	different bases.	bases. Subspaces of R2, R3.	

	Unit- II	Unit- II	
	Translation Dilation Rotation Reflection	Translation Dilation Rotation Reflection	
	in a point line and plane Matrix form of	in a point line and plane. Matrix form of	
	hasic geometric transformations	hasic geometric transformations	
		Interpretation of eigen values and eigen	
	Unit- m	uppeters for such transformations and eigen	
	Types of matrices. Kank of a matrix.	vectors for such transformations and eigen	
	Invariance of rank under elementary	spaces as invariant subspaces.	
	transformations. Reduction to normal		
	form.	Types of matrices. Rank of a matrix.	
	Unit- IV	Invariance of rank under elementary	
	Matrices in diagonal form. Reduction to	transformations. Reduction to normal form,	
	diagonal form upto matrices of order 3.	Solutions of linear homogeneous and non-	
	Unit- V	homogeneous equations with number of	
	Rank of matrix. Solutions of a system of	equations and unknowns upto four.	
	linear equations using matrices.	Unit- IV	
		Matrices in diagonal form. Reduction to	
		diagonal form upto matrices of order 3.	
		Computation of matrix inverses using	
		elementary row operations.	
		Unit- V	
		Rank of matrix. Solutions of a system of	
		linear equations using matrices. Illustrative	
		examples of above concepts from	
		Geometry, Physics, Chemistry,	
		Combinatorics and Statistics.	
Dagoo			
BSC502 B	Mechanics		Syllabus Change
	Unit- I	Unit- I	
	Conditions of equilibrium of a particle and	Conditions of equilibrium of a particle and	
	of coplanar forces acting on a rigid Body,	of coplanar forces acting on a rigid Body,	
	Laws of friction, Problems of equilibrium	Laws of friction, Problems of equilibrium	
	under forces including friction.	under forces including friction, Centre of	
	Unit- II	gravity, Work and potential energy.	
	Velocity and acceleration of a particle		
	along a curve: radial and transverse	Unit- II	
	components (plane curve).	Velocity and acceleration of a particle along	
		a curve: radial and transverse components	
	Unit- III	(plane curve), tangential and normal	
	Motion of a particle in three dimensions.	components (space curve).	
	Motion on a smooth sphere, cone.		
	Unit- IV	Unit- III	

	Newton's Laws of motion, Simple	Motion of a particle in three dimensions.	
	harmonic motion, Simple Pendulum,	Motion on a smooth sphere, cone, and on	
		any surface of revolution.	
	Unit- V		
	Projectile Motion. Motion of a projectile in	Unit- IV	
	a resisting medium.	Newton's Laws of motion, Simple	
		harmonic motion Simple Pendulum	
		Unit- V	
		Projectile Motion Motion of a projectile in	
		a resisting medium Motion of a particle in a	
		plane under different laws of resistance	
		plate under unterent laws of resistance.	
BSC502	Linear Algebra		Syllabus Change
С	Unit I	Unit I	- /
	Vector spaces, subspaces, algebra of	Vector spaces, subspaces, algebra of	
	subspaces, linear combination of vectors,	subspaces, quotient spaces, linear	
	linear independence,	combination of vectors, linear span, linear	
	Unit II	independence,	
	basis and dimension, dimension of	Unit II	
	subspaces.	basis and dimension, dimension of	
	Unit III	subspaces.	
	Linear transformations, null space, range,	Unit III	
	rank and nullity of a linear transformation.	Linear transformations, null space, range,	
	Unit IV	rank and nullity of a linear transformation	
	Eigen values and Eigen vectors.	matrix representation of a linear	
	Characteristic Polynomial	transformation algebra of linear	
	Unit V	transformations	
	change of coordinate matrix		
		Dual Space Dual Basis Double Dual	
		Figen values and Figen vectors	
		Characteristic Delumential	
		isomorphisms, isomorphism theorems,	
		invertibility and isomorphisms, change of	
		coordinate matrix.	
BSC503	DSE-2A (Choose any one)		
BSC503	Analytical Methods in Chemistry		Syllabus Change
Α	UNIT-I	UNIT-I	
	Qualitative and quantitative aspects of	Qualitative and quantitative aspects of	

analysis:

Sampling, evaluation of analytical data, errors, accuracy and precision, methods of their expression, normal law of distribution if indeterminate errors, statistical test of data; F, Q and t test, rejection of data, and confidence intervals.

Optical methods of analysis I:

analysis:

Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law.

UV-Visible Spectrometry: Basic principles of instrumentation (choice of source, monochromator and detector) for single and double beam instrument.

UNIT-II

Optical methods of analysis II:

Flame Atomic Absorption and Emission Spectrometry: Basic principles of instrumentation (choice of source, monochromator, detector, choice of flame and Burner designs. Techniques of atomization and sample introduction.

UNIT-III

Thermal methods of analysis:

Theory of thermogravimetry (TG), basic principle of instrumentation. Techniques for quantitative estimation of Ca and Mg from their mixture. Sampling, evaluation of analytical data, errors, accuracy and precision, methods of their expression, normal law of distribution if indeterminate errors, statistical test of data; F, Q and t test, rejection of data, and confidence intervals.

Optical methods of analysis I:

Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law.

UV-Visible Spectrometry: Basic principles of instrumentation (choice of source, monochromator and detector) for single and double beam instrument;

Basic principles of quantitative analysis: estimation of metal ions from aqueous solution, geometrical isomers, *keto-enol* tautomers. Determination of composition of metal complexes using Job's method of continuous variation and mole ratio method. *Infrared Spectrometry:* Basic principles of instrumentation (choice of source, monochromator & detector) for single and double beam instrument; sampling techniques. Structural illustration through interpretation of data, Effect and importance of isotope substitution.

UNIT-II

Optical methods of analysis II:

UNIT-IV Separation techniques I: Solvent extraction: Classification, principle and efficiency of the technique. Mechanism of extraction: extraction by solvation and chelation. Technique of

extraction: batch, continuous and counter current extractions. Qualitative and quantitative aspects of solvent extraction: extraction of metal ions from aqueous solution, extraction of organic species from the aqueous and nonaqueous media.

UNIT-V

Separation techniques II:

Stereoisomeric separation and analysis: Measurement of optical rotation, calculation of Enantiomeric excess (ee)/ diastereomeric excess (de) ratios and determination of enantiomeric composition using NMR, Chiral solvents and chiral shift reagents. Chiral chromatographic techniques using chiral columns (GC and HPLC).

Flame Atomic Absorption and Emission Basic principles of Spectrometry: instrumentation (choice of source, monochromator, detector, choice of flame and Burner designs. Techniques of introduction; atomization and sample Method of background correction, sources of chemical interferences and their method of removal. Techniques for the quantitative estimation of trace level of metal ions from water samples.

UNIT-III

Thermal methods of analysis:

Theory of thermogravimetry (TG), basic principle of instrumentation. Techniques for quantitative estimation of Ca and Mg from their mixture.

Electroanalytical methods:

Classification of electroanalytical methods, basic principle of pH metric, potentiometric and conductometric titrations. Techniques used for the determination of equivalence points. Techniques used for the determination of pKa values.

UNIT-IV

Separation techniques I:

Solvent extraction: Classification, principle and efficiency of the technique. Mechanism of extraction: extraction by solvation and chelation. Technique of extraction: batch, continuous and counter current extractions.

		Qualitative and quantitative aspects of	
		solvent extraction: extraction of metal ions	
		from aqueous solution, extraction of organic	
		species from the aqueous and nonaqueous	
		media.	
		Chromatography: Classification, principle	
		and efficiency of the technique. Mechanism	
		of separation: adsorption, partition & ion	
		exchange. Development of chromatograms:	
		frontal, elution and displacement methods.	
		Qualitative and quantitative aspects of	
		chromatographic methods of analysis: IC,	
		GLC, GPC, TLC and HPLC.	
		UNIT-V	
		Separation techniques II:	
		Stereoisomeric separation and analysis: Measurement of optical rotation calculation	
		of Enantiomeric excess (ee)/ diastereomeric	
		enantiomeric composition using NMR,	
		Chiral solvents and chiral shift reagents. Chiral chromatographic techniques using	
		chiral columns (GC and HPLC). Role of computers in instrumental methods of	
 BSC503	Novel Inorganic Solids	analysis.	Syllabus Change
В	UNIT-I	UNIT-I	Synabus Change
	Synthesis and modification of inorganic	Synthesis and modification of inorganic	
	solids:	solids:	
	Conventional heat and beat methods, Co-	Conventional heat and beat methods, Co-	
	precipitation method, Sol-gel methods,	precipitation method, Sol-gel methods,	
	Hydrothermal method, Ion-exchange and	Hydrothermal method, Ion-exchange and	
	Intercalation methods.	Intercalation methods.	
		Inorganic solids of technological	
	UNIT-II	importance:	
	Nanomaterials:	Solid electrolytes – Cationic, anionic, mixed	

Overview of nanostructures and nanomaterials: classification. Preparation of gold and silver metallic nanoparticles, self-assembled nanostructurescontrol of nanoarchitecture-one dimensional control. Carbon nanotubes and inorganic nanowires. Bio-inorganic nanomaterials.

UNIT-III

Introduction to engineering materials for mechanical construction:

Composition, mechanical and fabricating characteristics and applications of various types of cast irons, plain carbon and alloy steels, copper, aluminium and their alloys like duralumin, brasses and bronzes cutting tool materials, super alloys thermoplastics, thermosets and composite materials.

UNIT-IV

Composite materials:

Introduction, limitations of conventional engineering materials, role of matrix in composites, classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites.

UNIT-V

Speciality polymers:

Conducting polymers - Introduction, conduction mechanism, polyacetylene, polyparaphenylene and polypyrrole, applications of conducting polymers, Ionexchange resins and their applications. Inorganic pigments – coloured solids, white and black pigments. Molecular material and fullerides, molecular materials & chemistry – onedimensional metals, molecular magnets, inorganic liquid crystals.

UNIT-II

Nanomaterials:

Overview of nanostructures and nanomaterials: classification. Preparation of gold and silver metallic nanoparticles, selfassembled nanostructurescontrol of nanoarchitecture-one dimensional control. Carbon nanotubes and inorganic nanowires. Bio-inorganic nanomaterials, DNA and nanomaterials, natural and antisical nanomaterials, bionano composites.

UNIT-III

Introduction to engineering materials for mechanical construction:

Composition, mechanical and fabricating characteristics and applications of various types of cast irons, plain carbon and alloy steels, copper, aluminium and their alloys like duralumin, brasses and bronzes cutting tool materials, super alloys thermoplastics, thermosets and composite materials.

UNIT-IV

Composite materials:

Introduction, limitations of conventional engineering materials, role of matrix in composites, classification, matrix materials,

		reinforcements, metal-matrix composites,	
		polymer-matrix composites, <mark>fibre-</mark>	
		reinforced composites, environmental	
		effects on composites, applications of	
		composites.	
		UNIT-V	
		Speciality polymers:	
		Conducting polymers - Introduction, conduction mechanism, polyacetylene, polyparaphenylene and polypyrrole, applications of conducting polymers, Ionexchange resins and their applications. Ceramic & Refractory: Introduction, classification, properties, raw materials, manufacturing and applications.	
BSC503 C	Organometallics, Bioinorganic chemistry, Polynuclear hydrocarbons and UV, IR		Syllabus Change
	Spectroscopy UNIT-I	UNIT-I	
	Chemistry of 3d metals:	Chemistry of 3d metals:	
	Oxidation states displayed by Cr, Fe, Co,	Oxidation states displayed by Cr, Fe, Co, Ni	
	Ni and Co. A study of the following	and Co. A study of the following	
	compounds (including preparation and	compounds (including preparation and	
	important properties); Peroxo compounds	important properties); Peroxo compounds of	
	of Cr, $K_2Cr_2O_7$, $KMnO_4$, $K_4[Fe(CN)_6]$,	Cr, K ₂ Cr ₂ O ₇ , KMnO ₄ , K ₄ [Fe(CN) ₆], sodium	
	sodium nitroprusside, [Co(NH ₃) ₆]Cl ₃ ,	nitroprusside, [Co(NH ₃) ₆]Cl ₃ ,	
	$Na_3[Co(NO_2)_6].$	$Na_3[Co(NO_2)_6].$	
	UNIT-II	Organometallic Compounds:	
	Bio-Inorganic Chemistry:	Definition and Classification with	
	A brief introduction to bio-inorganic	appropriate examples based on nature of	
	chemistry. Role of metal ions present in	metalcarbon bond (ionic, s, p and	
	biological systems with special reference	multicentre bonds). Structures of methyl	
	to Na ⁺ , K ⁺ and Mg ²⁺ ions: Na/K pump;	lithium, Zeiss salt and ferrocene. EAN rule	
	Role of Mg ²⁺ ions in energy production	as applied to carbonyls. Preparation,	
	and chlorophyll.	structure, bonding and properties of	
	UNIT-III	mononuclear and polynuclear carbonyls of	

	2d motols in accounter heheriour of carbon
Folynuclear and neteronuclear aromatic	Su metals, p-acceptor benaviour or carbon
compounds:	monoxide. Synergic effects (VB approach)-
Properties of the following compounds	(MO diagram of CO can be referred to for
with reference to electrophilic and	synergic effect to IR frequencies).
nucleophilic substitution: Naphthalene.	UNIT-II
UNIT-IV	Bio-Inorganic Chemistry:
Active methylene compounds:	A brief introduction to bio-inorganic
Preparation: Claisen ester condensation.	chemistry. Role of metal ions present in
Keto-enol tautomerism.	biological systems with special reference to
UNIT-V	Na ⁺ , K ⁺ and Mg ²⁺ ions: Na/K pump; Role of
Application of Spectroscopy to Simple	Mg ²⁺ ions in energy production and
Organic Molecules	chlorophyll. Role of Ca ²⁺ in blood clotting,
Application of visible, ultraviolet and	stabilization of protein structures and
molecules. Electromagnetic radiations,	structural role (bones).
chromophore, auxochrome, bathochromic	UNIT-III
and hypsochromic shifts.	Polynuclear and heteronuclear aromatic
	compounds:
	Properties of the following compounds with
	reference to electrophilic and nucleophilic
	substitution: Nanhthalene Anthracene
	substitution. ruphtnatene, runnacene,
	Furan, Pyrrole, Thiophene, and Pyridine.
	Furan, Pyrrole, Thiophene, and Pyridine. UNIT-IV
	Furan, Pyrrole, Thiophene, and Pyridine. UNIT-IV Active methylene compounds:
	Furan, Pyrrole, Thiophene, and Pyridine. UNIT-IV Active methylene compounds: Preparation: Claisen ester condensation.
	Furan, Pyrrole, Thiophene, and Pyridine. UNIT-IV Active methylene compounds: <i>Preparation:</i> Claisen ester condensation. Keto-enol tautomerism.
	Furan, Pyrrole, Thiophene, and Pyridine. UNIT-IV Active methylene compounds: <i>Preparation:</i> Claisen ester condensation. Keto-enol tautomerism. <i>Reactions:</i> Synthetic uses of
	Furan, Pyrrole, Thiophene, and Pyridine. UNIT-IV Active methylene compounds: <i>Preparation:</i> Claisen ester condensation. Keto-enol tautomerism. <i>Reactions:</i> Synthetic uses of ethylacetoacetate (preparation of non-
	Furan, Pyrrole, Thiophene, and Pyridine. UNIT-IV Active methylene compounds: <i>Preparation:</i> Claisen ester condensation. Keto-enol tautomerism. <i>Reactions:</i> Synthetic uses of ethylacetoacetate (preparation of non- heteromolecules having upto 6 carbon).
	Furan, Pyrrole, Thiophene, and Pyridine. UNIT-IV Active methylene compounds: <i>Preparation:</i> Claisen ester condensation. Keto-enol tautomerism. <i>Reactions:</i> Synthetic uses of ethylacetoacetate (preparation of non- heteromolecules having upto 6 carbon). UNIT-V
	Furan, Pyrrole, Thiophene, and Pyridine. UNIT-IV Active methylene compounds: <i>Preparation:</i> Claisen ester condensation. Keto-enol tautomerism. <i>Reactions:</i> Synthetic uses of ethylacetoacetate (preparation of non- heteromolecules having upto 6 carbon). UNIT-V Application of Spectroscopy to Simple

	(Pauling scale). General characteristics of	refining, zone refining, van Arkel-de Boer	
	electron gain enthalpy, electronegativity	(Al, Pb, Ti, Fe, Cu, Ni, Zn, Au): electrolytic	
	and ionic size, ionization enthalpy,	silver. Methods of purification of metals	
	respect to electronic configuration, atomic	reference to cyanide process for gold and	
	Periodicity in s- and p-block elements with	reducing agents. Hydrometallurgy with	
	s- and <i>p</i> -Block Elements:	using carbon and carbon monoxide as	
	UNIT-III	diagrams for reduction of metal oxides	
	silver.	on standard electrode potentials, Ellingham	
	reference to cyanide process for gold and	Chief modes of occurrence of metals based	
	reducing agents. Hydrometallurgy with	General Principles of Metallurgy:	
	using carbon and carbon monoxide as	UNIT-II	
	diagrams for reduction of metal oxides	HSAB process.	
	on standard electrode potentials, Ellingham	and bases (HSAB concept), applications of	
	Chief modes of occurrence of metals based	solvent system concept. Hard and soft acids	
	General Principles of Metallurgy:	acids and bases, Lux-Flood concept and	
	UNIT-II	acid-base concept, classification of Lewis	
	differentiating and levelling solvents.	differentiating and levelling solvents. Lewis	
	bases, effects of substituent and solvent,	bases, effects of substituent and solvent,	
	and bases, relative strengths of acids and	and bases, relative strengths of acids and	
	Brönsted-Lowry concept, conjugate acids	Brönsted-Lowry concept, conjugate acids	
	Acids and Bases:	Acids and Bases:	
BSC5 D	503 Chemistry of Main Group Elements, Theories of Acids and Bases		Syllabus Change
	02 Chemistry of Main Group Elements	Application of visible, ultraviolet and Infrared spectroscopy in organic molecules. Electromagnetic radiations, electronic transitions, λ max & emax, chromophore, auxochrome, bathochromic and hypsochromic shifts. Application of electronic spectroscopy and Woodward rules for calculating 1 max of conjugated dienes and α,β – unsaturated compounds. Infrared radiation and types of molecular vibrations, functional group and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on >C=O stretching absorptions).	Sullabus Chango

s-block metals like density, melting and process, Parting l boiling points, flame colour and reducing and Kroll Process. nature.

UNIT-IV

Structure, bonding and properties (acidic/ basic nature, oxidizing/ reducing nature and hydrolysis of the following compounds and their applications in industrial and environmental chemistry wherever applicable:

Diborane and concept of multicentre bonding, hydrides of Groups 13 (EH₃), 14, 15, 16 and 17.

UNIT-V

Noble gases:

Rationalization of inertness of noble gases, clathrates, preparation and properties of XeF_2 , XeF_4 and XeF_6 , bonding in these compounds using VBT and shapes of noble gas compounds using VSEPR Theory.

Inorganic Polymers:

Types of inorganic polymers and comparison with organic polymers, structural features, classification and important applications of silicates.

process, Parting Process, Mond's process

UNIT-III

s- and p-Block Elements:

Periodicity in s- and p-block elements with respect to electronic configuration, atomic and ionic size, ionization enthalpy, electron gain enthalpy, electronegativity (Pauling scale). General characteristics of s-block metals like density, melting and boiling points, flame colour and reducing nature. Oxidation states of s- and p-block elements, inert-pair effect, diagonal relationships and anomalous behaviour of first member of each group. Allotropy in C, P and S. Complex forming tendency of s block elements and a preliminary idea of crown ethers and cryptates, structures of basic beryllium acetate, salicylaldehyde/ acetylacetonato complexes of Group 1 metals. Solutions of alkali metals in liquid ammonia and their properties. Common features, such as ease of formation, solubility and stability of oxides, peroxides, superoxides, sulphates and carbonates of sblock metals.

UNIT-IV

Structure, bonding and properties (acidic/ basic nature, oxidizing/ reducing nature and hydrolysis of the following

			compounds and their applications in	
			industrial and environmental chemistry	
			wherever applicable:	
			Diborane and concept of multicentre	
			bonding, hydrides of Groups 13 (EH ₃), 14,	
			15, 16 and 17.	
			Oxides of N and P. Oxoacids of P. S and Cl.	
			Halides and exobalides of P and S (PCl)	
			PCl. SOCI, and SO ₂ Cl.) Interhalogen	
			compounds. A briefides of resude helides	
			compounds. A offer idea of pseudonandes.	
			UNIT-V	
			Noble gases:	
			Rationalization of inertness of noble gases,	
			clathrates, preparation and properties of	
			$XeF_2,\ XeF_4$ and XeF_6 , bonding in these	
			compounds using VBT and shapes of noble	
			gas compounds using VSEPR Theory .	
			Inorganic Polymers:	
			Types of inorganic polymers and comparison with organic polymers, structural features, classification and important applications of silicates. Synthesis, structural features and applications of silicones. Borazines and cyclophosphazenes – preparation, properties and reactions Bonding in (NPCL).	
BS	SC504	DSE-3A (Choose any one)	and reactions. Dorking in (147 612)3.	
BS	SC504	Digital, Analog and Instrumentation		Syllabus Change
A		Digital Circuits	UNIT-I: Digital Circuits	
		Difference between Analog and Digital	Difference between Analog and Digital	
		Circuits. Binary Numbers. Decimal to	Circuits. Binary Numbers. Decimal to	
		Binary and Binary to Decimal Conversion,	Binary and Binary to Decimal Conversion,	
		using Diodes and Transistor) NAND and	AND, UK and NUI Gates (Realization	
		NOR Gates as Universal Gates. XOR and	NOR Gates as Universal Gates. XOR and	
		XNOR Gates. De Morgan's Theorems.		

Boolean Laws.

UNIT-II:

Semiconductor Devices and Amplifiers: Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics. Static Dynamic and Resistance. Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell. Bipolar Junction transistors: n-p-n and p-np Transistors. Characteristics of CB, CE and CC Configurations. Active, Cutoff, and Saturation Regions.

UNIT-III:

Operational Amplifiers (Black Box approach):

Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop& Closedloop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: (1) Inverting and Non-inverting Amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator, (6) Zero Crossing Detector.

UNIT-IV:

Instrumentations:

Introduction to CRO: Block Diagram of CRO. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference.

UNIT-V:

Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, Zener Diode and Voltage XNOR Gates. De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Minterms and Maxterms. Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map. Binary Addition. Binary Subtraction using 2's Complement Method).Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor.

UNIT-II:

Semiconductor Devices and Amplifiers:

Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics. Static Dynamic and Resistance. Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell. Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Active, Cutoff, and Saturation Regions. Current gains α and β . Relations between α and β . Load Line analysis of Transistors. DC Load line and **Qpoint. Voltage Divider Bias Circuit for CE** Amplifier. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains. Class A, B, and C Amplifiers.

UNIT-III:

Operational Amplifiers (Black Box approach): Characteristics of an Ideal and Practical Op-

Amp (IC 741), Open-loop& Closed-loop
	Regulation.	Gain. CMRR, concept of Virtual ground.	
		Applications of Op-Amps: (1) Inverting and	
		Non-inverting Amplifiers, (2) Adder, (3)	
		Subtractor, (4) Differentiator, (5) Integrator,	
		(6) Zero Crossing Detector. Sinusoidal	
		Oscillators: Barkhausen's Criterion for	
		Self-sustained Oscillations. Determination	
		of Frequency of RC Oscillator	
		UNIT-IV:	
		Instrumentations:	
		Introduction to CRO: Block Diagram of	
		CRO. Applications of CRO: (1) Study of	
		Waveform, (2) Measurement of Voltage,	
		Current, Frequency, and Phase Difference.	
		UNIT-V:	
		Power Supply: Half-wave Rectifiers.	
		Centre-tapped and Bridge Full-wave	
		Rectifiers Calculation of Ripple Factor and	
		Rectification Efficiency, Basic idea about	
		capacitor filter, Zener Diode and Voltage	
		Regulation Timer IC: IC 555 Pin diagram	
		and its application as Astable &	
		Monostable, Multivibrator	
BSC504	Elements of Modern Physics		Svllabus Change
В	UNIT I:	UNIT I:	- <i>j</i>
	Planck's quantum, Planck's constant and	Planck's quantum, Planck's constant and	
	light as a collection of photons; Photo-	light as a collection of photons; Photo-	
	electric effect and Compton scattering.	electric effect and Compton scattering. De	
	UNIT II:	Broglie wavelength and matter waves;	
	Problems with Rutherford model-	Davisson-Germer experiment.	
	instability of atoms and observation of		
	discrete atomic spectra; Bohr's	UNIT II:	
	quantization rule and atomic stability;	Problems with Rutherford model- instability	
	calculation of energy levels for hydrogen	of atoms and observation of discrete atomic	
	like atoms and their spectra.	spectra; Bohr's quantization rule and atomic	
		stability; calculation of energy levels for	
	UNIT III:	hydrogen like atoms and their spectra.	
	Two slit interference experiment with	Position measurement- gamma ray	
1 1			

superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles; Momentum and

UNIT IV:

Energy operators.

One dimensional infinitely rigid boxenergy eigenvalues and eigenfunctions, normalization; Quantum dot as an example; Quantum mechanical scattering and tunnelling in one dimension - across a step potential and across a rectangular potential barrier. Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle.

UNIT V:

Fission and fusion - mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty

UNIT III:

principle.

Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for

non-relativistic particles; Momentum and Energy operators; stationary states; physical interpretation of wave function, probabilities and normalization; Probability and probability current densities in one dimension.

UNIT IV:

One dimensional infinitely rigid boxenergy eigenvalues and eigenfunctions, normalization; Quantum dot as an example; Quantum mechanical scattering and tunnelling in one dimension - across a step potential and across a rectangular potential barrier. Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy. Radioactivity: stability of nucleus; Law of radioactive decay; Mean life & half-life; \Box decay; $\Box \Box$ decay - energy released, spectrum and Pauli's prediction of neutrino; -ray emission.

UNIT V: Fission and fusion - mass deficit, relativity

			and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions.	
	BSC504 C	Mathematical Physics UNIT I:	UNIT I:	Syllabus Change
	-	Calculus of functions of more than one	Calculus of functions of more than one	
		variable: Partial derivatives, exact and	variable: Partial derivatives, exact and	
		inexact	inexact	
		differentials. Integrating factor, with	differentials. Integrating factor, with simple	
		simple illustration.	illustration. Constrained Maximization	
		UNIT II:	using Lagrange Multipliers.	
		Fourier Series: Periodic functions.	UNIT II:	
		Orthogonality of sine and cosine functions,	Fourier Series: Periodic functions.	
		Dirichlet	Orthogonality of sine and cosine functions,	
		Conditions (Statement only). Expansion of	Dirichlet	
		periodic functions in a series of sine and	Conditions (Statement only). Expansion of	
		cosine functions and determination of	periodic functions in a series of sine and	
		Fourier coefficients. Complex	cosine functions and determination of	
		representation of Fourier series. Expansion	Fourier coefficients. Complex	
		of functions with arbitrary period.	representation of Fourier series. Expansion	
		UNIT III:	of functions with arbitrary period.	
		Frobenius Method and Special	Expansion of non-periodic functions over	
		Functions: Singular Points of Second	an interval. Even and odd functions and	
		Order Linear Differential Equations and	their Fourier expansions. Application.	
		their importance. Frobenius method and its	Summing of Infinite Series.	
		applications to differential equations.	UNIT III:	
		UNIT IV:	Frobenius Method and Special	
		Some Special Integrals: Beta and Gamma	Functions: Singular Points of Second Order	
		Functions and Relation between them.	Linear Differential Equations and their	
		Expression of Integrals in terms of Gamma	importance. Frobenius method and its	
		Functions. Error Function (Probability	applications to differential equations.	
		Integral).	Legendre, Bessel, Hermite and Laguerre	
		UNIT V:	Differential Equations. Properties of	
		Complex Analysis: Brief Revision of	Legendre Polynomials: Rodrigues Formula,	
		Complex Numbers and their Graphical	Orthogonality. Simple recurrence relations.	
		Representation. Euler's formula, De	UNIT IV:	
		Moivre's theorem, Roots of Complex	Some Special Integrals: Beta and Gamma	
1		Numbers. Functions of Complex	Functions and Relation between them.	
1		Variables. Analyticity and Cauchy-	Expression of Integrals in terms of Gamma	
1		Riemann Conditions. Examples of analytic	Functions. Error Function (Probability	
		runctions.	Integral).	

		Partial Differential Equations: Solutions	
		to partial differential equations, using	
		separation of variables: Laplace's Equation	
		in problems of rectangular, cylindrical and	
		spherical symmetry.	
		UNIT V:	
		Complex Analysis: Brief Revision of	
		Complex Numbers and their Graphical	
		Representation. Euler's formula, De	
		Moivre's theorem, Roots of Complex	
		Numbers. Functions of Complex Variables.	
		Analyticity and Cauchy-Riemann	
		Conditions. Examples of analytic functions.	
		Singular functions: poles and branch points,	
		order of singularity, branch cuts. Integration	
		of a function of a complex variable.	
		Cauchy's Inequality. Cauchy's Integral	
		<mark>formula.</mark>	
DSC504	Calid Classe Diseries		Cullaburg Channer
BSC304 D	UNIT I:	UNIT I:	Syllabus Change
	Crystal Structure: Solids: Amorphous	Crystal Structure: Solids: Amorphous and	
	and Crystalline Materials. Lattice	Crystalline Materials. Lattice Translation	
	Translation Vectors. Lattice with a Basis –	Vectors. Lattice with a Basis – Central and	
	Central and Non-Central Elements. Unit	Non-Central Elements. Unit Cell. Miller	
	Cell. Miller Indices. Reciprocal Lattice.	Indices. Reciprocal Lattice. Types of	
	Types of Lattices.	Lattices. Brillouin Zones. Diffraction of X-	
	UNIT II:	rays by Crystals. Bragg's Law. Atomic and	
	Elementary Lattice Dynamics: Lattice	Geometrical Factor.	
	Vibrations and Phonons: Linear	UNIT II:	
	Monoatomic and Diatomic Chains.	Elementary Lattice Dynamics: Lattice	
	Acoustical and Optical Phonons.	Vibrations and Phonons: Linear	
	Qualitative Description of the Phonon	Monoatomic and Diatomic Chains.	
	Spectrum in Solids.	Acoustical and Optical Phonons. Qualitative	
	UNIT III :	Description of the Phonon Spectrum in	
	Magnetic Properties of Matter: Dia-,	Solids. Dulong and Petit's Law, Einstein	
	Para-, Ferri- and Ferromagnetic Materials.	and Debye theories of specific heat of	
	Classical Langevin Theory of dia - and	solids. T3 law	
	Paramagnetic Domains. Quantum	UNIT III :	
	Mechanical Treatment of Paramagnetism.	Magnetic Properties of Matter: Dia-,	
	Curie's law.	Para-, Ferri- and Ferromagnetic Materials.	
	UNIT IV:	Classical Langevin Theory of dia - and	
1			

	Dielectric Properties of Materials:	Paramagnetic Domains. Quantum
	Polarization. Local Electric Field at an	Mechanical Treatment of Paramagnetism.
	Atom. Depolarization Field. Electric	Curie's law, Weiss's Theory of
	Susceptibility. Polarizability. Clausius	Ferromagnetism and Ferromagnetic
	Mosotti Equation. Classical Theory of	Domains. Discussion of B-H Curve.
	Electric Polarizability.	Hysteresis and Energy Loss.
	UNIT V:	UNIT IV:
	Elementary band theory: Kronig Penny	Dielectric Properties of Materials:
	model. Band Gaps. Conductors,	Polarization. Local Electric Field at an
	Semiconductors and insulators. P and N	Atom. Depolarization Field. Electric
	type Semiconductors. Conductivity of	Susceptibility. Polarizability. Clausius
	Semiconductors, mobility, Hall Effect,	Mosotti Equation. Classical Theory of
	Hall coefficient.	Electric Polarizability. Normal and
		Anomalous Dispersion. Cauchy and
		Sellmeir relations. Langevin-Debye
		equation. Complex Dielectric Constant.
		Optical Phenomena. Application: Plasma
		Oscillations, Plasma Frequency, Plasmons.
		UNIT V:
		Elementary band theory: Kronig Penny
		model. Band Gaps. Conductors,
		Semiconductors and insulators. P and N
		type Semiconductors. Conductivity of
		Semiconductors, mobility, Hall Effect, Hall
		coefficient.
		Superconductivity: Experimental Results.
		Critical Temperature. Critical magnetic
		field.
		Meissner effect. Type I and type II
		Superconductors, London's Equation and
		Penetration
		Depth. Isotope effect.
BSC505	DSE-2A (Choose any one)	
BSC505 A	Analytical Methods in Chemistry Lab I. Separation Techniques	I. Separation Techniques
	1. Chromatography:	1. Chromatography:
	(a) Separation of mixtures	(a) Separation of mixtures
	(a) separation of mixtures	(a) Separation of mixtures

Ī	(i) Paper chromatographic separation of	(i) Paper chromatographic separation of	
	Fe^{3+} , Al^{3+} , and Cr^{3+} .	Fe^{3+} , Al^{3+} , and Cr^{3+} .	
	(ii) Separation and identification of the	(ii) Separation and identification of the	
	monosaccharides present in the given	monosaccharides present in the given	
	mixture (glucose & fructose) by paper	mixture (glucose & fructose) by paper	
	chromatography. Reporting the R_f values.	chromatography. Reporting the R_f values.	
	(b) Separate a mixture of Sudan yellow	(b) Separate a mixture of Sudan yellow and	
	and Sudan Red by TLC technique and	Sudan Red by TLC technique and identify	
	identify them on the basis of their R_f	them on the basis of their R_f values.	
	values.	(c) Chromatographic separation of the	
	(c) Chromatographic separation of the	active ingredients of plants, flowers and	
	active ingredients of plants, flowers and	juices by TLC	
	juices by TLC	II. Solvent Extractions:	
	II. Solvent Extractions:	(i) To separate a mixture of Ni^{2+} & Fe^{2+} by	
	(i) To separate a mixture of Ni^{2+} & Fe^{2+} by	complexation with DMG and extracting the	
	complexation with DMG and extracting	$\mathrm{Ni}^{2+}\text{-}\mathrm{DMG}$ complex in chloroform, and	
	the Ni ²⁺ -DMG complex in chloroform, and	determine its concentration by	
	determine its concentration by	spectrophotometry.	
	spectrophotometry.	(ii) Solvent extraction of zisconium with	
	(ii) Solvent extraction of zisconium with	amberliti LA-1, separation from a mixture	
	amberliti LA-1, separation from a mixture	of irons and gallium.	
	of irons and gallium.	3. Determine the pH of the given aerated	
	3. Determine the pH of the given aerated	drinks fruit juices, shampoos and soaps.	
	drinks fruit juices, shampoos and soaps.	4. Determination of Na, Ca, Li in cola	
	4. Determination of Na, Ca, Li in cola	drinks and fruit juices using flame	
	drinks and fruit juices using flame	photometric techniques.	
	photometric techniques.	5. Analysis of soil:	
	5. Analysis of soil:	(i) Determination of pH of soil.	
	(i) Determination of pH of soil.	(ii) Total soluble salt	
	(ii) Total soluble salt	(iii) Estimation of calcium, magnesium,	
	(iii) Estimation of calcium, magnesium,	phosphate, nitrate	

	phosphate, nitrate	6. Ion exchange:	
	6. Ion exchange:	(i) Determination of exchange capacity of	
	(i) Determination of exchange capacity of	cation exchange resins and anion exchange	
	cation exchange resins and anion exchange	resins.	
	resins.	(ii) Separation of metal ions from their	
	(ii) Separation of metal ions from their	binary mixture.	
	binary mixture.	(iii) Separation of amino acids from organic	
	(iii) Separation of amino acids from	acids by ion exchange chromatography.	
	organic acids by ion exchange	III Spectrophotometry	
	chromatography.	1. Determination of pKa values of indicator	
	III Spectrophotometry	using spectrophotometry.	
	1. Determination of pKa values of	2 Structural characterization of compounds	
	indicator using spectrophotometry.	by infrared spectroscopy.	
	2 Structural characterization of compounds	3 Determination of dissolved oxygen in	
	by infrared spectroscopy.	water.	
	3 Determination of dissolved oxygen in	4 Determination of chemical oxygen	
	water.	demand (COD).	
	4 Determination of chemical oxygen	5 Determination of Biological oxygen	
	demand (COD).	demand (BOD).	
	5 Determination of Biological oxygen	6 Determine the composition of the ferric-	
	demand (BOD).	salicylate/ ferric-thiocyanate complex by	
	6 Determine the composition of the ferric-	Job's method.	
	salicylate/ ferric-thiocyanate complex by		
	Job's method.		
DSC505	Noval Inorgania Solida Lab		
BSC303	1. Determination of cation exchange	1. Determination of cation exchange	
	method	method	
	2. Determination of total difference of	2. Determination of total difference of	
	solids.	solids.	
	3. Synthesis of hydrogel by co-	3. Synthesis of hydrogel by co-precipitation	
	precipitation method.	method.	

	4. Synthesis of silver and gold metal	4. Synthesis of silver and gold metal	
	nanoparticles.	nanoparticles.	
 DOCTOS			
C BSC505	Polynuclear hydrocarbons and UV ,IR Spectroscopy Lab		
	Section A: Inorganic Chemistry	Section A: Inorganic Chemistry	
	1. Separation of mixtures by	1. Separation of mixtures by	
	chromatography: Measure the R_f value in	chromatography: Measure the R_f value in	
	each case. (Combination of two ions to be	each case. (Combination of two ions to be	
	given)	given)	
	Paper chromatographic separation of Fe ³⁺ ,	Paper chromatographic separation of Fe ³⁺ ,	
	A1 ³⁺ and Cr ³⁺ or Paper chromatographic	A1 ³⁺ and Cr ³⁺ or Paper chromatographic	
	separation of Ni^{2+} , Co^{2+} , Mn^{2+} and Zn^{2+}	separation of Ni^{2+} , Co^{2+} , Mn^{2+} and Zn^{2+}	
	2. Preparation of any two of the following	2. Preparation of any two of the following	
	complexes and measurement of their	complexes and measurement of their	
	conductivity:	conductivity:	
	(i) tetraamminecarbonatocobalt (III) nitrate	(i) tetraamminecarbonatocobalt (III) nitrate	
	(ii) tetraamminecopper (II) sulphate	(ii) tetraamminecopper (II) sulphate	
	(iii) potassium trioxalatoferrate (III)	(iii) potassium trioxalatoferrate (III)	
	trihydrate	trihydrate	
	Compare the conductance of the	Compare the conductance of the complexes	
	complexes with that of M/1000 solution of	with that of M/1000 solution of NaCl,	
	NaCl, MgCl ₂ and LiCl ₃ .	MgCl ₂ and LiCl ₃ .	
	Section B: Organic Chemistry	Section B: Organic Chemistry	
	Systematic Qualitative Organic Analysis	Systematic Qualitative Organic Analysis of	
	of Organic Compounds possessing	Organic Compounds possessing	
	monofunctional groups (-COOH, phenolic,	monofunctional groups (-COOH, phenolic,	
	aldehydic, ketonic, amide, nitro, amines)	aldehydic, ketonic, amide, nitro, amines)	
	and preparation of one derivative.	and preparation of one derivative.	
B\$C505	Chemistry of Main Group Flamenta		
D	Theories of Acids and Bases Lab 1. Iodometric estimation of potassium	1. Iodometric estimation of potassium	

	dichromate and copper sulphate	dichromate and copper sulphate	
	2. Iodimetric estimation of antimony in	2. Iodimetric estimation of antimony in	
	tartaremetic	tartaremetic	
	3. Estimation of amount of available	3. Estimation of amount of available	
	chlorine in bleaching powder and	chlorine in bleaching powder and household	
	household bleaches	bleaches	
	4. Estimation of iodine in iodized salts.	4. Estimation of iodine in iodized salts.	
	5. Iodimetric estimation of ascorbic acid in	5. Iodimetric estimation of ascorbic acid in	
	fruit juices.	fruit juices.	
	6. Estimation of dissolved oxygen in water	6. Estimation of dissolved oxygen in water	
	samples.	samples.	
	7. Gravimetric estimation of sulphate as	7. Gravimetric estimation of sulphate as	
	barium sulphate.	barium sulphate.	
	8. Gravimetric estimation of aluminium as	8. Gravimetric estimation of aluminium as	
	oximato complex	oximato complex	
	9. Preparation of the following: potash	9. Preparation of the following: potash	
	alum, chrome alum, tetraamminecopper(II)	alum, chrome alum, tetraamminecopper(II)	
	sulphate monohydrate, potassium	sulphate monohydrate, potassium	
	trioxalatoferrate(III) (any two, including	trioxalatoferrate(III) (any two, including	
	one double salt and one complex).	one double salt and one complex).	
BSC506	DSE-3A (Choose any one)		
BSC506 A	Digital, Analog and Instrumentation Lab 1. To measure (a) Voltage, and (b)	1. To measure (a) Voltage, and (b)	
	Frequency of a periodic waveform using a	Frequency of a periodic waveform using a	
	CRO	CRO	
	2. To verify and design AND, OR, NOT	2. To verify and design AND, OR, NOT	
	and XOR gates using NAND gates.	and XOR gates using NAND gates.	
	3. To minimize a given logic circuit.	3. To minimize a given logic circuit.	
	4. Half adder, Full adder and 4-bit Binary	4. Half adder, Full adder and 4-bit Binary	
	Adder. 19	Adder. 19	
	5. Adder-Subtractor using Full Adder I.C.	5. Adder-Subtractor using Full Adder I.C.	
	6. To design an astable multivibrator of	6. To design an astable multivibrator of	

		given specifications using 555 Timer.	given specifications using 555 Timer.	
		7. To design a monostable multivibrator of	7. To design a monostable multivibrator of	
		given specifications using 555 Timer.	given specifications using 555 Timer.	
		8. To study IV characteristics of PN diode,	8. To study IV characteristics of PN diode,	
		Zener and Light emitting diode	Zener and Light emitting diode	
		9. To study the characteristics of a	9. To study the characteristics of a	
		Transistor in CE configuration.	Transistor in CE configuration.	
		10. To design a CE amplifier of a given	10. To design a CE amplifier of a given	
		gain (mid-gain) using voltage divider bias.	gain (mid-gain) using voltage divider bias.	
		11. To design an inverting amplifier of	11. To design an inverting amplifier of	
		given gain using Op-amp 741 and study its	given gain using Op-amp 741 and study its	
		frequency response.	frequency response.	
		12. To design a non-inverting amplifier of	12. To design a non-inverting amplifier of	
		given gain using Op-amp 741 and study	given gain using Op-amp 741 and study its	
		its Frequency Response.	Frequency Response.	
		13. To study a precision Differential	13. To study a precision Differential	
		Amplifier of given I/O specification using	Amplifier of given I/O specification using	
		Opamp.	Opamp.	
		14. To investigate the use of an op-amp as	14. To investigate the use of an op-amp as a	
		a Differentiator	Differentiator	
		15. To design a Wien Bridge Oscillator	15. To design a Wien Bridge Oscillator	
		using an op-amp.	using an op-amp.	
B	3SC506 3	Elements of Modern Physics Lab 1. To determine value of Boltzmann	1. To determine value of Boltzmann	
		constant using V-I characteristic of PN	constant using V-I characteristic of PN	
		diode.	diode.	
		2. To determine work function of material	2. To determine work function of material	
		of filament of directly heated vacuum	of filament of directly heated vacuum diode.	
		diode.	3. To determine value of Planck's constant	
		3. To determine value of Planck's constant	using LEDs of at least 4 different colours.	
		using LEDs of at least 4 different colours.	4. To determine the ionization potential of	
		4. To determine the ionization potential of	mercury.	
		mercury.	5. To determine the wavelength of H-alpha	
		5. To determine the wavelength of H-alpha	emission line of Hydrogen atom.	
		emission line of Hydrogen atom.	6. To determine the absorption lines in the	
		6. To determine the absorption lines in the	rotational spectrum of Iodine vapour.	
		rotational spectrum of Iodine vapour.	7. To study the diffraction patterns of single	
		7. To study the diffraction patterns of	and double slits using laser source and	
		single and double slits using laser	measure its intensity variation using	
		source and measure its intensity	Photosensor and compare with	

	variation using Photosensor and	incoherent source – Na light.	
	compare with incoherent source - Na	8. Photo-electric effect: photo current	
	light.	versus intensity and wavelength of light;	
	8. Photo-electric effect: photo current	maximum energy of photo-electrons	
	versus intensity and wavelength of	versus frequency of light	
	light; maximum energy of photo-	9. To determine the value of e/m by	
	electrons versus frequency of light	magnetic focusing.	
	9. To determine the value of e/m by	10. To setup the Millikan oil drop apparatus	
	magnetic focusing.	and determine the charge of an electron.	
	10 To setup the Millikan oil drop		
	annaratus and determine the charge of an		
	electron		
BSC506	Mathematical Physics Lab		
С	1. Introduction and Overview:	11. Introduction and Overview:	
	Computer architecture and	Computer architecture and	
	organization, memory and	organization, memory and	
	Input/output devices.	Input/output devices.	
	2. Basics of scientific computing:	12. Basics of scientific computing:	
	Binary and decimal arithmetic,	Binary and decimal arithmetic,	
	Floating point numbers,	Floating point numbers,	
	algorithms, Sequence, Selection	algorithms, Sequence, Selection	
	and Repetition, single and double	and Repetition, single and double	
	precision arithmetic, underflow &	precision arithmetic, underflow &	
	over flow emphasize the	over flow emphasize the	
	importance of making equations	importance of making equations in	
	in terms of dimensionless	terms of dimensionless variables	
	variables Iterative methods	Iterative methods	
	3 Errors and error Analysis	13 Errors and error Analysis	
	Truncation and round off errors	Truncation and round off arrors	
	Absolute and relative errors	Absolute and relative errors	
	Floating point computations	Floating point computations	
	A Review of $C & C^{\pm\pm}$	14 Provide $C \in C \cup D$	
	T. REVIEW OF C & CTT	fundomentales. Later location	
	Introduction to Dramounic	nundamentals: introduction to	
	introduction to Programming,	Programming, constant variables	
	constant variables and data types,	and data types, operators and	
	operators and Expressions, I/O	Expressions, I/O statements, scanf	
	statements, scant and printf, c in	and printf, c in and c out,	
	and c out, Manipulators for data	Manipulators for data formatting,	
	formatting, Control statements	Control statements (decision	

(decision making and looping
statements) (If-statement. If-else
Statement. Nested if Structure.
Else-if Statement. Ternary
Operator. Goto Statement. Switch
Statement. Unconditional and
Conditional Looping. While-
Loop. Do-While Loop. FOR Loop.
Break and Continue Statements.
Nested Loops), Arrays (1D&2D)
and strings, user defined
functions, Structures and Unions,
Idea of classes and objects.

- Programs: using C/C++ language: Sum & average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascending-descending order, Binary search
- Random number generation: Area of circle, area of square, volume of sphere, value of pi (π)
- 7. Solution of Algebraic and Transcendental equations by Bisection, Newton Raphson and Secant methods: Solution of linear and quadratic equation, solving $\alpha = tan\alpha; I = I_0 \left(\frac{sin\alpha}{\alpha}\right)^2$ in optics.
- 8. Interpolation by Newton Gregory Forward and Backward difference formula, Error, estimation of linear interpolation: Evaluation of trigonometric functions e.g. sin θ, cos θ, tanθ, etc.
- 9. Numerical differentiation (Forward and Backward difference formula) and Integration (Trapezoidal an d Simpson rules), Monte Carlo method: Given Position with equidistant time data to calculate

making and looping statements) (If-statement. If-else Statement. Nested if Structure. Else-if Statement. Ternary Operator. Goto Statement. Switch Statement. Unconditional and Conditional Looping. While-Loop. Do-While Loop. FOR Loop. Break and Continue Statements. Nested Loops), Arrays (1D&2D) and strings, user defined functions, Structures and Unions, Idea of classes and objects.

- 15. Programs: using C/C++ language: Sum & average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascendingdescending order, Binary search
- Random number generation: Area of circle, area of square, volume of sphere, value of pi (π)
- 17. Solution of Algebraic and Transcendental equations by Bisection, Newton Raphson and Secant methods: Solution of linear and quadratic equation, solving

$$\alpha = tan\alpha; I = I_0 \left(\frac{sin\alpha}{\alpha}\right)^2$$
 in optics

- Interpolation by Newton Gregory Forward and Backward difference formula, Error, estimation of linear interpolation: Evaluation of trigonometric functions e.g. sin θ, cos θ, tanθ, etc.
- 19. Numerical differentiation (Forward and Backward difference formula) and Integration (Trapezoidal an d Simpson rules), Monte Carlo method: Given Position with equidistant time data to calculate velocity and acceleration and viceversa. Find the area of B-H Hysteresis loop

	velocity and acceleration and	20. Solution of Ordinary Differential	
	velocity and acceleration and vice-versa. Find the area of B-H Hysteresis loop 10. Solution of Ordinary Differential Equations (ODE), First order Differential equation Euler, modified Euler and Runge-Kutta (RK), second and fourth order methods: First order differential equation • Radioactive decay • Current in RC, LC circuits with DC source • Newton's law of cooling • Classical equations of motion Attempt following problems using RK 4 order method: • Solve the coupled differential equations $\frac{dx}{dt} = y + x - \frac{x^3}{3}; \frac{dy}{dx} = -x$ for four initial conditions $x(0) = 0; y(0) = -1, -2, -3, -4$ plot x vs y for each of the four initial conditions on the same screen for $0 \le t \le 15$. The differential equation describing the motion of a pendulum is $\frac{d^2\theta}{dt^2} = -sin(\theta)$. The pendulum is released from rest at an angular displacement α , i.e. $\theta(0) = \alpha$ $\alpha = 0.1, 0.5$ and 1.0 and plot θ as a	20. Solution of Ordinary Differential Equations (ODE), First order Differential equation Euler, modified Euler and Runge-Kutta (RK), second and fourth order methods: First order differential equation • Radioactive decay • Current in RC, LC circuits with DC source • Newton's law of cooling • Classical equations of motion Attempt following problems using RK 4 order method: • Solve the coupled differential equations $\frac{dx}{dt} = y + x - \frac{x^3}{3}; \frac{dy}{dx} = -x$ for four initial conditions $x(0) = 0; y(0) = -1, -2, -3, -4$ plot x vs y for each of the four initial conditions on the same screen for $0 \le t \le 15$. The differential equation describing the motion of a pendulum is $\frac{d^2\theta}{dt^2} = -sin(\theta)$. The pendulum is released from rest at an angular displacement α , i.e. $\theta(0) = \alpha$ and $\theta'(0) = 0$. Solve the equation for $\alpha = 0.1, 0.5$ and 1.0 and plot θ as a function of time in the range $0 \le t \le 8\pi$. Also plot the analytic solution valid for	
	$\alpha = 0.105$ and 10 and plot flas a	Also plot the analytic solution valid for	
	function of time in the range $0 < t < t$	small θ , sin(θ) = θ .	
	8π . Also plot the analytic solution valid		
	for small θ , sin(θ) = θ .		
BSC506	Solid State Physics Lab	1 Measurement of suscentibility of	
	paramagnetic solution (Quinck's Tube	paramagnetic solution (Quinck's Tube	
	Method)	Method)	
	2. To measure the Magnetic susceptibility	2. To measure the Magnetic susceptibility	
	of Solids.	of Solids.	
	3. To determine the Coupling Coefficient	3. To determine the Coupling Coefficient of	
	of a Piezoelectric crystal.	a Piezoelectric crystal.	
	4. To measure the Dielectric Constant of a	4. To measure the Dielectric Constant of a	
	dielectric Materials with frequency	dielectric Materials with frequency	
	5. To determine the complex dielectric	5. To determine the complex dielectric	
	constant and plasma frequency of metal	constant and plasma frequency of metal	

Surface Plasmon resonance (SPR)Surface Plasmon resonance (SPR)6. To determine the refractive index of a dielectric layer using SPR6. To determine the refractive index of a dielectric layer using SPR7. To study the PE Hysteresis loop of a Ferroelectric Crystal.7. To study the PE Hysteresis loop of a Ferroelectric Crystal.8. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.8. To draw the BH curve of iron using a Solenoid and determine the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To its fully fourprobe method (from room temperature to 150 oC) and to determine its band gap.5.8BSC601 L Transportation and Game Theory L Unit ILVinit I8Bystlabus Change	
6. To determine the refractive index of a dielectric layer using SPR6. To determine the refractive index of a dielectric layer using SPR7. To study the PE Hysteresis loop of a Ferroelectric Crystal.7. To study the PE Hysteresis loop of a Ferroelectric Crystal.8. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.8. To draw the BH curve of iron using a Solenoid and determine the energy loss9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobeBSC601 ATransportation and Game Theory Unit IUnit IBSC601 ATransportation and Game Theory Unit IUnit I	
dielectric layer using SPRdielectric layer using SPR7. To study the PE Hysteresis loop of a Ferroelectric Crystal.7. To study the PE Hysteresis loop of a Ferroelectric Crystal.8. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.8. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a method (from room temperature to 150 oC) and to determine its band gap.BSC601 ATransportation and Game Theory Unit IUnit ISyllabus Change	
7. To study the PE Hysteresis loop of a Ferroelectric Crystal.7. To study the PE Hysteresis loop of a Ferroelectric Crystal.8. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.8. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. Syllabus Change	
Ferroelectric Crystal.Ferroelectric Crystal.8. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.8. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistiv	
8. To draw the BH curve of iron using a Solenoid and determine the energy loss from 8. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis. 9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe 9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe Method (from room temperature to 150 oC) and to determine its band gap. 9. Transportation and Game Theory Unit I Whit I BSC601 Transportation and Game Theory Unit I Unit I Syllabus Change	
Solenoid and determine the energy loss from Hysteresis.Solenoid and determine the energy loss from Hysteresis.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature to 150 oC) and to determine its band gap.<	
Image: semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap. 9. To measure the resistivity of a semiconductor (Ge) crystal with temperature to 150 oC) and to determine its band gap. Image: semiconductor of temperature to 150 oC) and to determine its band gap. oC) and to determine its band gap. Image: semiconductor of temperature to 150 oC) and to determine its band gap. Syllabus Change Image: semiconductor of temperature to 150 oC) and to determine its band gap. Syllabus Change	
Hysteresis.Hysteresis.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap.BSC601 ATransportation and Game Theory Unit IUnit ISyllabus Change	
9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap. 9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap. BSC601 Transportation and Game Theory A Unit I Unit I Syllabus Change	
semiconductor (Ge) crystal with temperature by fourprobe semiconductor (Ge) crystal with temperature by fourprobe method (from room temperature to 150 oC) and to determine its band gap. method (from room temperature to 150 oC) and to determine its band gap. BSC601 A Transportation and Game Theory Unit I Unit I	
temperature by fourprobe temperature by fourprobe method (from room temperature to 150 method (from room temperature to 150 oC) and to determine its band gap. oC) and to determine its band gap. BSC601 Transportation and Game Theory A Unit I	
method (from room temperature to 150 oC) and to determine its band gap. method (from room temperature to 150 oC) and to determine its band gap. BSC601 A Transportation and Game Theory Unit I Unit I	
oC) and to determine its band gap. oC) and to determine its band gap. BSC601 A Transportation and Game Theory Unit I Unit I Syllabus Change	
BSC601 Transportation and Game Theory Unit I Syllabus Change	
BSC601 Transportation and Game Theory Syllabus Change A Unit I Unit I	
Transportation problem and its Transportation problem and its	
mathematical formulation, northwest- mathematical formulation, northwest-	
corner method, least cost method . method, least cost method and Vogel	
Unit II approximation method for determination of	
algorithm for solving transportation starting basic solution,	
problem, assignment problem and its	
mathematical formulation. Unit II	
algorithm for solving transportation	
Unit III problem, assignment problem and its	
Job Sequencing Problems mathematical formulation, Hungarian	
method for solving assignment problem.	
Unit IV	
Game theory: formulation of two person Unit III	
zero sum games. Job Sequencing Problems	
Unit V	
Games with mixed strategies, graphical Unit IV	
solution procedure. Game theory: formulation of two person	
zero sum games, solving two person zero	
sum games.	
Unit V	
Games with mixed strategies, graphical	
solution procedure. Solution by Simplex	
Method.	

BSC601 B	Graph Theory Unit I Definition, examples and basic properties of graphs, pseudographs, complete graphs. Unit II isomorphism of graphs, paths and circuits.	 Unit I Definition, examples and basic properties of graphs, pseudographs, complete graphs, bi-partite graphs. Unit II isomorphism of graphs, paths and circuits, 	Syllabus Change
	Unit III the adjacency matrix, weighted graph, Unit IV	Eulerian circuits, Hamiltonian cycles, Unit III the adjacency matrix, weighted graph	
	travelling salesman's problem, shortest path. Unit V Trees. Spanning trees.	Unit IV travelling salesman's problem, shortest path, Dijkstra's algorithm, Floyd-Warshall algorithm.	
		Unit V Trees. Spanning trees.	
BSC601 C	Applied optics Unit I: Sources and Detectors Lasers, Spontaneous and stimulated emissions, Theory of laser action, Einstein's coefficients, Light amplification, Characterization of laser beam, He-Ne laser, Semiconductor lasers. Experiments on Lasers: a. Determination of the grating radial spacing of the Compact Disc (CD) by reflection using He-Ne or solid state laser. b. To find the width of the wire or width of the slit using diffraction pattern obtained by a He-Ne or solid state laser. c. To find the polarization angle of laser	 Unit I: Sources and Detectors Lasers, Spontaneous and stimulated emissions, Theory of laser action, Einstein's coefficients, Light amplification, Characterization of laser beam, He-Ne laser, Semiconductor lasers. Experiments on Lasers: a. Determination of the grating radial spacing of the Compact Disc (CD) by reflection using He-Ne or solid state laser. b. To find the width of the wire or width of the slit using diffraction pattern obtained by a He-Ne or solid state laser. c. To find the polarization angle of laser 	Syllabus Change

light using polarizer and analyzer	light using polarizer and analyzer	
d. Thermal expansion of quartz using laser	d. Thermal expansion of quartz using laser	
Unit II:	Experiments on Semiconductor Sources	
Fourier Optics	and Detectors:	
Concept of Spatial frequency filtering,	a. V-I characteristics of LED	
Fourier transforming property of a thin	b. Study the characteristics of solid state	
lens	laser	
Unit III:.	c. Study the characteristics of LDR	
Fourier Transform Spectroscopy	d. Photovoltaic Cell	
Fourier Transform Spectroscopy (FTS) is a	e. Characteristics of IR sensor	
powerful method for measuring emission	Unit II:	
and absorption spectra, with wide	Fourier Optics	
application in atmospheric remote sensing,	Concept of Spatial frequency filtering,	
NMR spectrometry and forensic science.	Fourier transforming property of a thin lens	
Unit IV:	Experiments on Fourier Optics:	
Holography	a. Fourier optic and image processing	
Basic principle and theory: coherence,	1. Optical image addition/subtraction	
resolution, Types of holograms, white light	2. Optical image differentiation	
reflection hologram, application of	3. Fourier optical filtering	
holography in microscopy, interferometry,	4. Construction of an optical 4f system	
and character recognition	Unit III:.	
Unit V:	Fourier Transform Spectroscopy	
Photonics: Fibre Optics	Fourier Transform Spectroscopy (FTS) is a	
Optical fibres and their properties,	powerful method for measuring emission	
Principal of light propagation through a	and absorption spectra, with wide	
fibre, The numerical aperture, Attenuation	application in atmospheric remote sensing,	
in optical fibre and attenuation limit,	NMR spectrometry and forensic science.	
Single mode and multimode fibres, Fibre	Experiment:	
optic sensors: Fibre Bragg Grating.	To study the interference pattern from a	
	Michelson interferometer as a function of	
	mirror separation in the interferometer. The	
	resulting interferogram is the Fourier	
	transform of the power spectrum of the	
	source. Analysis of experimental	
	interferograms allows one to determine the	
	transmission characteristics of several	
	interference filters. Computer simulation	
	can also be done.	
	Unit IV:	
	Holography	
	Basic principle and theory: coherence,	

			resolution, Types of holograms, white light	
			reflection hologram, application of	
			holography in microscopy, interferometry,	
			and character recognition	
			Experiments on Holography and	
			interferometry:	
			1. Recording and reconstructing holograms	
			2. Constructing a Michelson interferometer	
			or a Fabry Perot interferometer	
			3. Measuring the refractive index of air	
			4. Constructing a Sagnac interferometer	
			5. Constructing a Mach-Zehnder	
			interferometer	
			6. White light Hologram	
			Unit V:	
			Photonics: Fibre Optics	
			Optical fibres and their properties, Principal	
			of light propagation through a fibre, The	
			numerical aperture, Attenuation in optical	
			fibre and attenuation limit, Single mode and	
			multimode fibres, Fibre optic sensors: Fibre	
			Bragg Grating	
			Experiments on Photonics: Fibre Optics	
			a. To measure the numerical aperture of an	
			optical fibre	
			b. To study the variation of the bending loss	
			in a multimode fibre	
			c. To determine the mode field diameter	
			(MFD) of fundamental mode in a	
			single-mode fibre by measurements of its	
			far field Gaussian pattern	
			d. To measure the near field intensity	
			profile of a fibre and study its refractive	
			index profile	
			e. To determine the power loss at a splice	
			between two multimode fibre	
	DECCAL	Design in struments (i.e., st. ill.		
	D BSC601	Basic instrumentation skills Unit I:	Unit I:	Syllabus Change
		Basic of Measurement: Instruments	Basic of Measurement: Instruments	
		accuracy, precision, sensitivity, resolution	accuracy, precision, sensitivity, resolution	
		range etc. Errors in measurements and	range etc. Errors in measurements and	
				1

loading effects. Unit II:

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance

Unit III:

Cathode Ray **Oscilloscope:** Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls.

Unit IV:

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis.

Unit V:

Digital **Instruments:** Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter. Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution.

loading effects. **Multimeter:** Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance.

Unit II:

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with input respect to impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. AC millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance

Unit III:

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation onlyno mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

Unit IV:

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing,

analysis. Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic
Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic
diagram of bridge. working principles of basic
basic
(balancing type) RLC bridge. Specifications
of RLC bridge. Block diagram & working
principles of a Q- Meter. Digital LCR
bridges.
Unit V:
Digital Instruments: Principle and
working of digital meters. Comparison of
analog & digital instruments.
Characteristics of a digital meter. Working
principles of digital voltmeter. Digital
Multimeter: Block diagram and working of
a digital multimeter. Working principle of
time interval, frequency and period
measurement using universal counter/
frequency counter, time- base stability,
accuracy and resolution.
The test of lab skills will be of the
following test items:
1. Use of an oscilloscope.
2. CRO as a versatile measuring device.
3. Circuit tracing of Laboratory electronic
equipment,
4. Use of Digital multimeter/VTVM for
measuring voltages
5. Circuit tracing of Laboratory electronic
equipment,
6. Winding a coil / transformer.
7. Study the layout of receiver circuit.
8. Trouble shooting a circuit
9. Balancing of bridges
Laboratory Exercises:
1. To observe the loading effect of a
multimeter while measuring voltage across
a
low resistance and high resistance.
2. To observe the limitations of a

		multimeter for measuring high frequency	
		voltage	
		and currents.	
		3. To measure Q of a coil and its	
		dependence on frequency, using a Q- meter.	
		4. Measurement of voltage, frequency, time	
		5 Measurement of time period, frequency	
		average period using universal counter/	
		frequency counter.	
		6. Measurement of rise, fall and delay times	
		using a CRO.	
		7. Measurement of distortion of a RF signal	
		generator using distortion factor meter.	
		8. Measurement of R, L and C using a LCR	
		bridge/ universal bridge.	
		Open Ended Experiments:	
		1. Using a Dual Trace Oscilloscope	
		2. Converting the range of a given	
		measuring instrument (voltmeter, ammeter)	
BSC601 E	Chemical Technology & Society UNIT-I	UNIT-I	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology:	UNIT-I Chemical Technology:	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology: Basic principles of distillation, solvent	UNIT-I Chemical Technology: Basic principles of distillation, solvent	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and	UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid	UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid Extraction.	UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid Extraction. UNIT-II	UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and adsorption.	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid Extraction. UNIT-II An introduction into the scope of different	UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and adsorption. UNIT-II	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid Extraction. UNIT-II An introduction into the scope of different types of equipment needed in chemical	UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and adsorption. UNIT-II An introduction into the scope of different	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid Extraction. UNIT-II An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation	UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and adsorption. UNIT-II An introduction into the scope of different types of equipment needed in chemical	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid Extraction. UNIT-II An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills,	UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and adsorption. UNIT-II An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid Extraction. UNIT-II An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators.	UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and adsorption. UNIT-II An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills,	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid Extraction. UNIT-II An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. UNIT-III	UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and adsorption. UNIT-II An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid Extraction. UNIT-II An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. UNIT-III Society:	UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and adsorption. UNIT-II An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry. Introduction to clean	Syllabus Change
BSC601 E	Chemical Technology & Society UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid Extraction. UNIT-II An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. UNIT-III Society: Exploration of societal and technological	UNIT-I Chemical Technology: Basic principles of distillation, solvent extraction, solid-liquid leaching and liquidliquid extraction, separation by absorption and adsorption. UNIT-II An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators. Scaling up operations in chemical industry. Introduction to clean technology.	Syllabus Change

	issues from a chemical perspective.	UNIT-III	
	Chemical and scientific literacy as a means	Society:	
	to better understand topics like air and	Exploration of societal and technological	
	water	issues from a chemical perspective.	
	UNIT-IV	Chemical and scientific literacy as a means	
	Energy from natural sources (i.e. solar and	to better understand topics like air and water	
	renewable forms), from fossil fuels and	(and the trace materials found in them that	
	from nuclear fission.	are referred to as pollutants).	
	UNIT-V	UNIT-IV	
	Proteins and nucleic acids, and molecular	Energy from natural sources (i.e. solar and	
	reactivity and interconversions from	renewable forms), from fossil fuels and	
	simple examples like combustion to	from nuclear fission; materials like plastics	
	complex instances.	and polymers and their natural analogues.	
		UNIT-V	
		Proteins and nucleic acids, and molecular	
		reactivity and interconversions from simple	
		examples like combustion to complex	
		instances like genetic engineering and the	
		manufacture of during	
		manufacture of drugs.	
BSC601	Fuel Chemistry		Syllabus Change
BSC601 F	Fuel Chemistry UNIT-I	UNIT-I	Syllabus Change
BSC601 F	Fuel Chemistry UNIT-I Review of energy sources (renewable and	UNIT-I Review of energy sources (renewable and	Syllabus Change
BSC601 F	Fuel Chemistry UNIT-I Review of energy sources (renewable and non-renewable).	UNIT-I Review of energy sources (renewable and non-renewable). Classification of fuels and	Syllabus Change
BSC601 F	Fuel Chemistry UNIT-I Review of energy sources (renewable and non-renewable). UNIT-II	UNIT-I Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value.	Syllabus Change
BSC601 F	Fuel Chemistry UNIT-I Review of energy sources (renewable and non-renewable). UNIT-II <i>Coal:</i> Uses of coal (fuel and nonfuel) in	UNIT-I Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value. UNIT-II	Syllabus Change
BSC601 F	Fuel Chemistry UNIT-I Review of energy sources (renewable and non-renewable). UNIT-II <i>Coal:</i> Uses of coal (fuel and nonfuel) in various industries, its composition,	UNIT-I Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value. UNIT-II Coal: Uses of coal (fuel and nonfuel) in	Syllabus Change
BSC601 F	Fuel Chemistry UNIT-I Review of energy sources (renewable and non-renewable). UNIT-II <i>Coal:</i> Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal.	UNIT-I Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value. UNIT-II Coal: Uses of coal (fuel and nonfuel) in various industries, its composition,	Syllabus Change
BSC601 F	Fuel Chemistry UNIT-I Review of energy sources (renewable and non-renewable). UNIT-II <i>Coal:</i> Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Fractionation of coal tar, uses of coal tar	UNIT-I Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value. UNIT-II <i>Coal:</i> Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas	Syllabus Change
BSC601 F	Fuel Chemistry UNIT-I Review of energy sources (renewable and non-renewable). UNIT-II <i>Coal:</i> Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good	UNIT-I Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value. UNIT-II <i>Coal:</i> Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas—composition and uses.	Syllabus Change
BSC601 F	Fuel Chemistry UNIT-I Review of energy sources (renewable and non-renewable). UNIT-II <i>Coal:</i> Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good metallurgical coke, Coal gasification	UNIT-I Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value. UNIT-II Coal: Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas—composition and uses.Fractionation of coal tar, uses of coal tar	Syllabus Change

	gasification) Coal liquefaction and	metallurgical coke Coal gasification	
	Solvent Refining	(Hydro gasification and Catalytic	
	UNIT-III	gasification). Coal liquefaction and Solvent	
	Petroleum and Petrochemical Industry:	Refining	
	Composition of crude petroleum Refining	UNIT_III	
	and different tupes of netroleum products	Datualoum and Datuachamical Industry	
	and their employees of performing products	Composition of onde notacloum Defining.	
	and their applications.	Composition of crude petroleum, Kellning	
	UNIT-IV	and different types of petroleum products	
	Reforming Petroleum and non-petroleum	and their applications. Fractional	
	fuels (LPG, CNG, LNG, bio-gas, fuels	Distillation (Principle and process),	
	derived from biomass), fuel from waste,	Cracking (Thermal and catalytic cracking).	
	synthetic fuels (gaseous and liquids), clean	UNIT-IV	
	fuels.	Reforming Petroleum and non-petroleum	
	UNIT-V	fuels (LPG, CNG, LNG, bio-gas, fuels	
	Lubricants: Classification of lubricants,	derived from biomass), fuel from waste,	
	lubricating oils (conducting and	synthetic fuels (gaseous and liquids), clean	
	nonconducting) Solid and semisolid	fuels. Petrochemicals: Vinyl acetate,	
	lubricants.	Propylene oxide, Isoprene, Butadiene,	
		Toluene and its derivatives Xylene.	
		UNIT-V	
		Lubricants: Classification of lubricants,	
		lubricating oils (conducting and	
		nonconducting) Solid and semisolid	
		lubricants, synthetic lubricants.	
BSC602 A	Numerical Methods Unit I Algorithms, Convergence, Bisection method, False position method, Fixed point iteration method, Newton's method, Secant method,	Unit I Algorithms, Convergence, Bisection method, False position method, Fixed point iteration method, Newton's method, Secant method,	
	Unit II LU decomposition, Gauss- Jacobi, Gauss-	Unit II	

	Siedel and SOR iterative methods.	LU decomposition, Gauss- Jacobi, Gauss-	
		Siedel and SOR iterative methods.	
	Unit III		
	Lagrange and Newton interpolation: linear	Unit III	
	and higher order, finite difference	Lagrange and Newton interpolation: linear	
	operators.	and higher order, finite difference operators.	
	Unit IV	Unit IV	
	Numerical differentiation: forward	Numerical differentiation: forward	
	difference, backward difference and	difference, backward difference and central	
	central Difference.	Difference.	
	Unit V	Unit V	
	Integration: trapezoidal rule, Simpson's	Integration: trapezoidal rule, Simpson's	
	rule, Euler's method.	rule, Euler's method.	
DSC602	Compley Analysis		
BSC002	Complex Analysis		
	Unit I	Unit I	
	Limits, Limits involving the point at	Limits, Limits involving the point at	
	infinity, continuity. Properties of complex	infinity, continuity. Properties of complex	
	numbers, regions in the complex plane,	numbers, regions in the complex plane,	
	functions of complex variable,	functions of complex variable,	
	Unit II	Unit II	
	mappings.Derivatives, differentiation	mappings.Derivatives, differentiation	
	formulas, Cauchy-Riemann equations,	formulas, Cauchy-Riemann equations,	
	sufficient conditions for differentiability.	sufficient conditions for differentiability.	
	Unit III	Unit III	
	Analytic functions, examples of analytic	Analytic functions, examples of analytic	
	functions, exponential function,	functions, exponential function,	
	Logarithmic	Logarithmic	
	function, trigonometric function,	function, trigonometric function, derivatives	
	derivatives of functions,	of functions,	
	Unit IV	Unit IV	
	Definite integrals of functions. Contours,	Definite integrals of functions. Contours,	
	Contour integrals and its examples, upper	Contour integrals and its examples, upper	
	bounds for moduli of contour integrals.	bounds for moduli of contour integrals.	
	Cauchy-Goursat theorem, Cauchy integral	Cauchy-Goursat theorem, Cauchy integral	
	formula.	formula.	
	Unit V	Unit V	
	Liouville's theorem and the fundamental	Liouville's theorem and the fundamental	

	theorem of algebra. Convergence of	theorem of algebra. Convergence of	
	sequences and series, Taylor series and its	sequences and series, Taylor series and its	
	examples. Laurent series and its examples,	examples. Laurent series and its examples,	
	absolute and uniform convergence of	absolute and uniform convergence of power	
	power series.	series.	
BSC602	Linear Programming)		
C	Unit I	Unit I	
	Linear Programming Problems, Graphical	Linear Programming Problems, Graphical	
	Approach for Solving some Linear	Approach for Solving some Linear	
	Programs.	Programs.	
	Unit II	Unit II	
	Convex Sets, Supporting and Separating	Convex Sets, Supporting and Separating	
	Hyperplanes. Theory of simplex method,	Hyperplanes. Theory of simplex method,	
	optimality and unboundedness, the simplex	optimality and unboundedness, the simplex	
	algorithm,	algorithm,	
	Unit III	Unit III	
	simplex method in tableau format,	simplex method in tableau format,	
	introduction to artificial variables, two-	introduction to artificial variables, two-	
	phase method, Big-M method and their	phase method, Big-M method and their	
	comparison.	comparison.	
	Unit IV	Unit IV	
	Duality, formulation of the dual problem,	Duality, formulation of the dual problem,	
	primal- dual relationships, economic	primal- dual relationships, economic	
	interpretation of the dual, sensitivity	interpretation of the dual, sensitivity	
	analysis.	analysis.	
	Unit V	Unit V	
	Assignment and Transportation problems	Assignment and Transportation problems	
BSC602	Polymer Chemistry		
A	UNIT-I	UNIT-I	
	Introduction and history of polymeric	Introduction and history of polymeric	
	materials:	materials:	
	Different schemes of classification of	Different schemes of election of	
	Binerent senemes of classification of	Different schemes of classification of	

polymers,Polymernomenclature,Molecular forces and chemical bonding inpolymers, Texture of polymers.Functionality and its importance:Criteria for synthetic polymer formation,classification of polymerization processes,Relationships between functionality, extentof reaction and degree of polymerization.Bi-functional systems,Poly-functionalsystems.

UNIT-II

Kinetics of Polymerization:

Mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and coordination polymerizations, Mechanism and kinetics of copolymerization, polymerization techniques.

UNIT-III

Crystallization and crystallinity:

Determination of crystalline melting point and degree of crystallinity, Morphology of crystalline polymers, Factors affecting crystalline melting point.

Nature and structure of polymers-Structure Property relationships.

Determination of molecular weight of polymers (*Mn*, *Mw*, etc) by end group analysis, viscometry, light scattering and osmotic pressure methods. Molecular weight distribution and its significance. polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of polymers.

Functionality and its importance: Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization. Bi-functional systems, Poly-functional systems.

UNIT-II

Kinetics of Polymerization:

Mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and coordination polymerizations, Mechanism and kinetics of copolymerization, polymerization techniques.

UNIT-III

Crystallization and crystallinity:

Determination of crystalline melting point and degree of crystallinity, Morphology of crystalline polymers, Factors affecting crystalline melting point.

Nature and structure of polymers-Structure Property relationships.

Determination of molecular weight of polymers (*Mn*, *Mw*, etc) by end group analysis, viscometry, light scattering and osmotic pressure methods. Molecular weight distribution and its significance.

			Γ
	Polydispersity index.	Polydispersity index.	
	UNIT-IV	UNIT-IV	
	Glass transition temperature (Tg) and	Glass transition temperature (Tg) and	
	determination of Tg, Free volume theory,	determination of Tg, Free volume theory,	
	WLF equation, Factors affecting glass	WLF equation, Factors affecting glass	
	transition temperature (Tg).	transition temperature (Tg).	
	Polymer Solution – Criteria for polymer	Polymer Solution - Criteria for polymer	
	solubility, Solubility parameter,	solubility, Solubility parameter,	
	Thermodynamics of polymer solutions,	Thermodynamics of polymer solutions,	
	entropy, enthalpy, and free energy change	entropy, enthalpy, and free energy change	
	of mixing of polymers solutions, Flory-	of mixing of polymers solutions, Flory-	
	Huggins theory, Lower and Upper critical	Huggins theory, Lower and Upper critical	
	solution temperatures.	solution temperatures.	
	UNIT-V	UNIT-V	
	Properties of Polymers (Physical, thermal, flow & mechanical properties). Brief introduction to preparation, structure, properties and application of the following polymers: polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride) and related polymers, poly(vinyl acetate) and related polymers, acrylic polymers, fluoro polymers, polyamides and related polymers. Phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers, polydienes, Polycarbonates, Conducting Polymers, [polyacetylene, polyaniline, poly(p- phenylene sulphide polypyrrole, polythiophene)]	Properties of Polymers (Physical, thermal, flow & mechanical properties). Brief introduction to preparation, structure, properties and application of the following polymers: polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride) and related polymers, poly(vinyl acetate) and related polymers, acrylic polymers, fluoro polymers, polyamides and related polymers. Phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers, polydienes, Polycarbonates, Conducting Polymers, [polyacetylene, polyaniline, poly(p-phenylene sulphide polypyrrole, polythiophene)]	
BSC603 B	Green Chemistry UNIT-I	UNIT-I	
	Introduction to Green Chemistry:	Introduction to Green Chemistry:	
	What is Green Chemistry? Need for Green	What is Green Chemistry? Need for Green	
	Chemistry. Goals of Green Chemistry.	Chemistry. Goals of Green Chemistry.	
	Limitations/ Obstacles in the pursuit of the	Limitations/ Obstacles in the pursuit of the	
	goals of Green Chemistry.	goals of Green Chemistry.	
	Principles of Green Chemistry and	Principles of Green Chemistry and	
	Designing a Chemical synthesis I:	Designing a Chemical synthesis I:	
			1

Twelve principles of Green Chemistry	Twelve principles of Green Chemistry with	
with their explanations and examples and	their explanations and examples and	
special emphasis on the following (1-2):	special emphasis on the following (1-2):	
1. Designing a Green Synthesis	1. Designing a Green Synthesis using	
using these principles; Prevention	these principles; Prevention of	
of Waste/byproducts; maximum	Waste/byproducts; maximum	
incorporation of the materials	incorporation of the materials used	
used in the process into the final	in the process into the final	
products , Atom Economy,	products , Atom Economy,	
calculation of atom economy of	calculation of atom economy of the	
the rearrangement, addition,	rearrangement, addition,	
substitution and elimination	substitution and elimination	
reactions.	reactions.	
2. Prevention/ minimization of	2. Prevention/ minimization of	
hazardous/ toxic products	hazardous/ toxic products reducing	
reducing toxicity. risk =	toxicity. risk = (function) hazard \times	
(function) hazard \times exposure;	exposure; waste or pollution	
waste or pollution prevention	prevention hierarchy.	
hierarchy.	UNIT-II	
UNIT-II	Principles of Green Chemistry and	
Principles of Green Chemistry and	Designing a Chemical synthesis II:	
Designing a Chemical synthesis II:	Twelve principles of Green Chemistry with	
Twelve principles of Green Chemistry	their explanations and examples and special	
with their explanations and examples and	emphasis on the following (3-6):	
special emphasis on the following (3-6):	3. Green solvents- supercritical	
3. Green solvents- supercritical	fluids, water as a solvent for	
fluids, water as a solvent for	organic reactions, ionic liquids,	
organic reactions, ionic liquids,	fluorous biphasic solvent, PEG,	
fluorous biphasic solvent, PEG,	solventless processes, immobilized	
solventless processes,	solvents and how to compare	
immobilized solvents and how to	greenness of solvents.	

compare	greenness	of so	lvents.
---------	-----------	-------	---------

- Energy requirements for reactions

 alternative sources of energy:
 use of microwaves and ultrasonic
 energy.
- Selection of starting materials; avoidance of unnecessary derivatization –careful use of blocking/protecting groups.
- Use of catalytic reagents (wherever possible) in preference to stoichiometric reagents; catalysis and green chemistry, comparison of heterogeneous and homogeneous catalysis, biocatalysis, asymmetric catalysis and photocatalysis.

UNIT-III

Principles of Green Chemistry and Designing a Chemical synthesis II: Twelve principles of Green Chemistry with their explanations and examples and special emphasis on the following (7-8):

 Prevention of chemical accidents designing greener processes, inherent safer design, principle of ISD "What you don't have cannot harm you", greener alternative to Bhopal Gas Tragedy (safer route to carcarbaryl) and Flixiborough accident (safer route to

- Energy requirements for reactions

 alternative sources of energy: use
 microwaves and ultrasonic
 energy.
- Selection of starting materials; avoidance of unnecessary derivatization –careful use of blocking/protecting groups.
- Use of catalytic reagents (wherever possible) in preference to stoichiometric reagents; catalysis and green chemistry, comparison of heterogeneous and homogeneous catalysis, biocatalysis, asymmetric catalysis and photocatalysis.

UNIT-III

Principles of Green Chemistry and Designing a Chemical synthesis II:

Twelve principles of Green Chemistry with their explanations and examples and special emphasis on the following (7-8):

7. Prevention of chemical accidents designing greener processes, inherent safer design, principle of ISD "What you don't have cannot harm you", greener alternative to Bhopal Gas Tragedy (safer route to carcarbaryl) and Flixiborough accident (safer route to cyclohexanol) subdivision of ISD,

cyclohexanol) subdivision of ISD, minimization, simplification, substitution, moderation and limitation.

 Strengthening/ development of analytical techniques to prevent and minimize the generation of hazardous substances in chemical processes.

UNIT-IV

Examples of Green Synthesis/ Reactions and some real world cases I:

 Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis)

2. Microwave assisted reactions in water: Hofmann Elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols; microwave assisted reactions in organic solvents Diels-Alder reaction and Decarboxylation reaction

 Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to Iodine)
 Surfactants for carbon dioxide – replacing smog producing and ozone depleting solvents with CO2 for precision cleaning and dry cleaning of garments.
 UNIT-V

Examples of Green Synthesis/ Reactions

minimization, simplification, substitution, moderation and limitation.

 Strengthening/ development of analytical techniques to prevent and minimize the generation of hazardous substances in chemical processes.

UNIT-IV

Examples of Green Synthesis/ Reactions and some real world cases I:

1. Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis)

2. Microwave assisted reactions in water: Hofmann Elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols; microwave assisted reactions in organic solvents Diels-Alder reaction and Decarboxylation reaction

 Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to Iodine)

4 Surfactants for carbon dioxide – replacing smog producing and ozone depleting solvents with CO2 for precision cleaning and dry cleaning of garments.

UNIT-V

Examples of Green Synthesis/ Reactions and some real world cases II:

	and some real world cases II:	5 Designing of Environmentally safe marine	
	5 Designing of Environmentally safe	antifoulant.	
	marine antifoulant.	6 Rightfit pigment: synthetic azopigments	
	6 Rightfit pigment: synthetic azopigments	to replace toxic organic and inorganic	
	to replace toxic organic and inorganic	pigments.	
	pigments.	7 An efficient, green synthesis of a	
	7 An efficient, green synthesis of a	compostable and widely applicable plastic	
	compostable and widely applicable plastic	(poly lactic acid) made from corn.	
	(poly lactic acid) made from corn.	8 Healthier fats and oil by Green Chemistry:	
	8 Healthier fats and oil by Green	Enzymatic interesterification for production	
	Chemistry: Enzymatic interesterification	of no Trans-Fats and Oils	
	for production of no Trans-Fats and Oils	9 Development of Fully Recyclable Carpet:	
	9 Development of Fully Recyclable	Cradle to Cradle Carpeting	
	Carpet: Cradle to Cradle Carpeting	Future Trends in Green Chemistry	
	Future Trends in Green Chemistry Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; co crystal ontrolled solid state synthesis (C2S3); Green chemistry in sustainable development.	Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; co crystal ontrolled solid state synthesis (C2S3); Green chemistry in sustainable development.	
BSC603 C	Instrumental Methods of Analysis UNIT-I	UNIT-I	
	Introduction to spectroscopic methods	Introduction to spectroscopic methods of	
	of analysis:	analysis:	
	Recap of the spectroscopic methods	Recap of the spectroscopic methods covered	
	covered in detail in the core chemistry	in detail in the core chemistry syllabus:	
	syllabus: Treatment of analytical data,	Treatment of analytical data, including error	
	including error analysis. Classification of	analysis. Classification of analytical	
	analytical methods and the types of	methods and the types of instrumental	
	instrumental methods. Consideration of	methods. Consideration of electromagnetic	
	electromagnetic radiation.	radiation.	
	Molecular spectroscopy I:	Molecular spectroscopy I:	
	Infrared spectroscopy:	Infrared spectroscopy:	

Interactions with molecules: absorption and scattering. Means of excitation (light sources), separation of spectrum (wavelength dispersion, time resolution), detection of the signal (heat, differential detection), interpretation of spectrum (qualitative, mixtures, resolution), advantages of Fourier Transform (FTIR). Samples and results expected. Applications: Issues of quality assurance and quality control, Special problems for portable instrumentation and rapid detection.

UNIT-II

Molecular spectroscopy II:

UV-Visible/ Near emission. IR _ absorption, fluorescence and photoaccoustic. Excitation sources (lasers, time resolution), wavelength dispersion (gratings, prisms, interference filters, laser, placement of sample relative to dispersion, resolution). Detection of signal (photocells, photomultipliers, diode arrays, sensitivity and S/N), Single and Double Beam instruments, Interpretation (quantification, mixtures, absorption vs. fluorescence and the use of time, photoaccoustic, fluorescent tags).

UNIT-III

Separation techniques

Chromatography: Gas chromatography,

Interactions with molecules: absorption and scattering. Means of excitation (light sources), separation of spectrum (wavelength dispersion, time resolution), detection of the signal (heat, differential detection), interpretation of spectrum (qualitative, mixtures, resolution), advantages of Fourier Transform (FTIR). Samples and results expected. Applications: Issues of quality assurance and quality control, Special problems for portable instrumentation and rapid detection.

UNIT-II

Molecular spectroscopy II:

UV-Visible/Near IR – emission, absorption, fluorescence and photoaccoustic. Excitation sources (lasers, time resolution). wavelength dispersion (gratings, prisms, interference filters, laser, placement of sample relative to dispersion, resolution), Detection of signal (photocells, photomultipliers, diode arrays, sensitivity and S/N), Single and Double Beam instruments, Interpretation (quantification, mixtures, absorption vs. fluorescence and the use of time, photoaccoustic, fluorescent tags).

UNIT-III

Separation techniques

Chromatography: Gas chromatography, liquid chromatography, supercritical fluids,

liquid chromatography, supercritical fluids, Importance of column technology (packing, capillaries), Separation based on increasing number of factors (volatility, solubility, interactions with stationary phase, size, electrical field), Detection: simple vs. specific (gas and liquid), Detection as a means of further analysis (use of tags and coupling to IR and MS), Electrophoresis (plates and capillary) and use with DNA analysis.

Immunoassays and DNA techniques:

Mass spectroscopy: Making the gaseous molecule into an ion (electron impact, chemical ionization), Making liquids and solids into ions (electrospray, electrical discharge, laser desorption, fast atom bombardment), Separation of ions on basis of mass to charge ratio, Magnetic, Time of flight, Electric quadrupole. Resolution, time and multiple separations, Detection and interpretation (how this is linked to excitation).

UNIT-IV

Elemental analysis:

Mass spectrometry (electrical discharges). Atomic spectroscopy: Atomic absorption, Atomic emission, and Atomic fluorescence. Excitation and getting sample into gas phase (flames, electrical discharges, plasmas), Wavelength Importance of column technology (packing, capillaries), Separation based on increasing number of factors (volatility, solubility, interactions with stationary phase, size, electrical field), Detection: simple vs. specific (gas and liquid), Detection as a means of further analysis (use of tags and coupling to IR and MS), Electrophoresis (plates and capillary) and use with DNA analysis.

Immunoassays and DNA techniques:

Mass spectroscopy: Making the gaseous molecule into an ion (electron impact, chemical ionization), Making liquids and solids into ions (electrospray, electrical discharge, laser desorption, fast atom bombardment), Separation of ions on basis of mass to charge ratio, Magnetic, Time of flight, Electric quadrupole. Resolution, time and multiple separations, Detection and interpretation (how this is linked to excitation).

UNIT-IV

Elemental analysis:

Mass spectrometry (electrical discharges). Atomic spectroscopy: Atomic absorption, Atomic emission, and Atomic fluorescence. Excitation and getting sample into gas phase (flames, electrical discharges, plasmas), Wavelength separation and resolution (dependence on technique),

separation and resolution (dependence on	Detection of radiation	
technique), Detection of radiation	(simultaneous/scanning, signal noise),	
(simultaneous/scanning, signal noise),	Interpretation (errors due to molecular and	
Interpretation (errors due to molecular and	ionic species, matrix effects, other	
ionic species, matrix effects, other	interferences).	
interferences).	UNIT-V	
UNIT-V	NMR spectroscopy: Principle,	
NMR spectroscopy: Principle,	Instrumentation, Factors affecting chemical	
Instrumentation, Factors affecting	shift, Spin-coupling, Applications.	
chemical shift, Spin-coupling,	Electroanalytical Methods: Potentiometry	
Applications.	& Voltammetry	
Electroanalytical Methods:	Radiochemical Methods	
Potentiometry & Voltammetry	X-ray analysis and electron spectroscopy	
Radiochemical Methods	(surface analysis)	
X-ray analysis and electron	Reference books:	
spectroscopy (surface analysis)	➢ Skoog, D.A. Holler F.J. &	
Reference books:	Nieman, T.A. Principles	
Skoog, D.A. Holler F.J.	of Instrumental Analysis,	
& Nieman, T.A.	Cengage Learning India	
Principles of	Ed.	
Instrumental Analysis,	➢ Willard, H.H., Merritt,	
Cengage Learning India	L.L., Dean, J. & Settoe,	
Ed.	F.A. Instrumental	
> Willard, H.H., Merritt,	Methods of Analysis, 7th	
L.L., Dean, J. & Settoe,	Ed. Wadsworth	
F.A. Instrumental	Publishing Company Ltd.,	
Methods of Analysis, 7th	Belmont, California,	
Ed. Wadsworth	USA, 1988.	
Publishing Company	➢ P.W. Atkins: Physical	
Ltd., Belmont,	Chemistry.	
California, USA, 1988.	➢ G.W. Castellan: Physical	

	P.W. Atkins: Physical	Chemistry.	
	Chemistry.	C.N. Banwell:	
	G.W. Castellan: Physical	Fundamentals of	
	Chemistry.	Molecular Spectroscopy.	
	➤ C.N. Banwell:	➢ Brian Smith: Infrared	
	Fundamentals of	Spectral Interpretations: A	
	Molecular Spectroscopy.	Systematic Approach.	
	➢ Brian Smith: Infrared	> W.J. Moore: Physical	
	Spectral Interpretations:	Chemistry.	
	A Systematic Approach.		
	➢ W.J. Moore: Physical		
	Chemistry.		
DSC602	Quantum Chamietry, Speetroscopy, &		
D	Photochemistry	UNIT I	
	0111-1	0111-1	
	Quantum Chemistry I:	Quantum Chemistry I:	
	Quantum Chemistry I: Postulates of quantum mechanics, quantum	Quantum Chemistry I: Postulates of quantum mechanics, quantum	
	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation	
	ONTENQuantum Chemistry I:Postulates of quantum mechanics, quantummechanicaloperators,Schrödingerequation and its application to free particle	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and	
	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment),	
	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels,	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point	
	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty	
	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions,	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability	
	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal properties,	
	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal properties, Extension to two and three	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal properties, Extension to two and three dimensional	
	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal properties, Extension to two and three dimensional boxes, separation of variables,	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal properties, Extension to two and three dimensional boxes, separation of variables, degeneracy.	
	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal properties, Extension to two and three dimensional boxes, separation of variables, degeneracy. Qualitative treatment of	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal properties, Extension to two and three dimensional boxes, separation of variables, degeneracy. Qualitative treatment of simple harmonic	
	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal properties, Extension to two and three dimensional boxes, separation of variables, degeneracy. Qualitative treatment of simple harmonic oscillator model of	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal properties, Extension to two and three dimensional boxes, separation of variables, degeneracy. Qualitative treatment of simple harmonic oscillator model of vibrational motion:	
	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal properties, Extension to two and three dimensional boxes, separation of variables, degeneracy. Qualitative treatment of simple harmonic oscillator model of vibrational motion: Setting up of	Quantum Chemistry I: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation and its application to free particle and "particle-in-a-box" (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wavefunctions, probability distribution functions, nodal properties, Extension to two and three dimensional boxes, separation of variables, degeneracy. Qualitative treatment of simple harmonic oscillator model of vibrational motion: Setting up of Schrödinger equation and	

solution and wavefunctions. Vibrational energy of diatomic molecules and zeropoint energy. Angular momentum: Commutation rules, quantization of square of total angular momentum and zcomponent.

UNIT-II

Quantum ChemistryII:

Rigid rotator model of rotation of diatomic molecule. Schrödinger equation, transformation to spherical polar coordinates. Separation of variables. Spherical harmonics. Discussion of solution. Qualitative treatment of hydrogen atom and hydrogen-like ions: setting up of Schrödinger equation in spherical polar coordinates, radial part, quantization of energy (only final energy expression). Average and most probable distances of electron from nucleus. Setting up of Schrödinger equation for many-electron atoms (He, Li). Need for approximation methods. Statement of variation theorem and application simple systems to (particle-in-a-box, harmonic oscillator, hydrogen atom).

UNIT-III

Chemical Bonding:

Covalent bonding, valence bond and molecular orbital approaches, LCAO-MO treatment of H_2^+ . Bonding and antibonding Vibrational energy of diatomic molecules and zero-point energy. Angular momentum: Commutation rules, quantization of square of total angular momentum and zcomponent.

UNIT-II

Quantum ChemistryII:

Rigid rotator model of rotation of diatomic molecule. Schrödinger equation, transformation spherical to polar coordinates. Separation of variables. Spherical harmonics. Discussion of solution. Qualitative treatment of hydrogen atom and hydrogen-like ions: setting up of Schrödinger equation in spherical polar coordinates, radial part, quantization of energy (only final energy expression). Average and most probable distances of electron from nucleus. Setting up of Schrödinger equation for many-electron atoms (He, Li). Need for approximation methods. Statement of variation theorem and application to simple systems (particlein-a-box, harmonic oscillator, hydrogen atom).

UNIT-III

Chemical Bonding:

Covalent bonding, valence bond and molecular orbital approaches, LCAO-MO treatment of H_2^+ . Bonding and antibonding orbitals. Qualitative extension to H_2 . orbitals. Qualitative extension to H_2 . Comparison of LCAO-MO and VB treatments of H₂ (only wavefunctions, detailed solution not required) and their limitations. Refinements of the two approaches (Configuration Interaction for MO, ionic terms in VB). Qualitative description of LCAO-MO treatment of homonuclear and heteronuclear diatomic molecules (HF, LiH). Localised and nonlocalised molecular orbitals treatment of triatomic (BeH2, H2O) molecules. Qualitative MO theory and its application to AH2 type molecules.

UNIT-IV

Molecular Spectroscopy:

Interaction of electromagnetic radiation with molecules and various types of spectra; Born-Oppenheimer approximation.

Rotation spectroscopy: Selection rules, intensities of spectral lines, determination of bond lengths of diatomic and linear triatomic molecules, isotopic substitution. *Vibrational spectroscopy:* Classical equation of vibration, computation of force constant, amplitude of diatomic molecular vibrations, anharmonicity, Morse potential, dissociation energies, fundamental frequencies, overtones, hot bands, degrees of freedom for polyatomic molecules, Comparison of LCAO-MO and VB treatments of H₂ (only wavefunctions, detailed solution not required) and their limitations. Refinements of the two approaches (Configuration Interaction for MO, ionic terms in VB). Qualitative description of LCAO-MO treatment of homonuclear and heteronuclear diatomic molecules (HF, LiH). Localised and nonlocalised molecular orbitals treatment of triatomic (BeH2, H2O) molecules. Qualitative MO theory and its application to AH2 type molecules.

UNIT-IV

Molecular Spectroscopy:

Interaction of electromagnetic radiation with molecules and various types of spectra; Born-Oppenheimer approximation.

Rotation spectroscopy: Selection rules, intensities of spectral lines, determination of bond lengths of diatomic and linear triatomic molecules, isotopic substitution. Vibrational spectroscopy: Classical equation of vibration, computation of force constant, amplitude of diatomic molecular vibrations, anharmonicity, Morse potential, dissociation energies, fundamental frequencies, overtones, hot bands, degrees of freedom for polyatomic molecules, modes of vibration, concept of group frequencies. Vibration-rotation
modes of vibration, concept of group frequencies. Vibration-rotation spectroscopy: diatomic vibrating rotator, P, Q, R branches.

Raman spectroscopy: Qualitative treatment of Rotational Raman effect; Effect of nuclear spin, Vibrational Raman spectra, Stokes and anti-Stokes lines; their intensity difference, rule of mutual exclusion.

UNIT-V

Electronic spectroscopy: Franck-Condon principle, electronic transitions, singlet and triplet states, fluorescence and phosphorescence, dissociation and predissociation, calculation of electronic transitions of polyenes using free electron model.

Nuclear Magnetic Resonance (NMR) spectroscopy: Principles of NMR spectroscopy, Larmor precession, chemical shift and low resolution spectra, different scales, spin-spin coupling and high resolution spectra, interpretation of PMR spectra of organic molecules.

Electron Spin Resonance (ESR) spectroscopy: Its principle, hyperfine structure, ESR of simple radicals.

Photochemistry:

Characteristics of electromagnetic radiation, Lambert-Beer's law and its limitations, physical significance of absorption coefficients. Laws, of photochemistry, quantum yield, actinometry, examples of low and high

group spectroscopy: diatomic vibrating rotator, P,

Q, R branches.

Raman spectroscopy: Qualitative treatment of Rotational Raman effect; Effect of nuclear spin, Vibrational Raman spectra, Stokes and anti-Stokes lines; their intensity difference, rule of mutual exclusion.

UNIT-V

Electronic spectroscopy: Franck-Condon principle, electronic transitions, singlet and triplet states, fluorescence and phosphorescence, dissociation and predissociation, calculation of electronic transitions of polyenes using free electron model.

Nuclear Magnetic Resonance (NMR) spectroscopy: Principles of NMR spectroscopy, Larmor precession, chemical shift and low resolution spectra, different scales, spin-spin coupling and high resolution spectra, interpretation of PMR spectra of organic molecules.

Electron Spin Resonance (ESR) spectroscopy: Its principle, hyperfine structure, ESR of simple radicals.

Photochemistry:

Characteristics of electromagnetic radiation, Lambert-Beer's law and its limitations, physical significance of absorption coefficients. Laws, of photochemistry, quantum yield, actinometry, examples of low and high quantum yields. photochemical equilibrium the and differential rate of photochemical reactions, photosensitized reactions, quenching. Role of photochemical reactions in biochemical

	quantum yields, photochemical equilibrium and the differential rate of photochemical reactions, photosensitized reactions, quenching. Role of photochemical reactions in biochemical processes, photostationary states, chemiluminescence.	processes, photostationary states, chemiluminescence.	
BSC604 A	Quantum Mechanics UNIT I:	UNIT I:	
	Time dependent Schrodinger equation:	Time dependent Schrodinger equation:	
	Time dependent Schrodinger equation and	Time dependent Schrodinger equation and	
	dynamical evolution of a quantum state;	dynamical evolution of a quantum state;	
	Properties of Wave Function.	Properties of Wave Function. Interpretation	
	Interpretation of Wave Function	of Wave Function Probability and	
	Probability and probability current	probability current densities in three	
	densities in three dimensions; Conditions	dimensions; Conditions for Physical	
	for Physical Acceptability of Wave	Acceptability of Wave Functions.	
	Functions. Normalization. Linearity and	Normalization. Linearity and	
	Superposition Principles. Eigenvalues and	Superposition Principles. Eigenvalues and	
	Eigenfunctions. Position, momentum &	Eigenfunctions. Position, momentum &	
	Energy operators; commutator of position	Energy operators; commutator of position	
	and momentum operators; Expectation	and momentum operators; Expectation	
	values of position and momentum. Wave	values of position and momentum. Wave	
	Function of a Free Particle.	Function of a Free Particle.	
	UNIT II:	UNIT II:	
	Time independent Schrodinger	Time independent Schrodinger equation-	
	equation-Hamiltonian, stationary states	Hamiltonian, stationary states and energy	
	and energy eigenvalues; expansion of an	eigenvalues; expansion of an arbitrary	
	arbitrary wavefunction as a linear	wavefunction as a linear combination of	
	combination of energy	energy	
	eigenfunctions; General solution of the	eigenfunctions; General solution of the time	
	time dependent Schrodinger equation in	dependent Schrodinger equation in terms of	
	terms of linear combinations of stationary	linear combinations of stationary states;	
	states; Application to the spread of	Application to the spread of Gaussian	
	Gaussian wavepacket for a free particle in	wavepacket for a free particle in one	
	one dimension; wave packets, Fourier	dimension; wave packets, Fourier	
	transforms and momentum space	transforms and momentum space	
	wavefunction; Position-momentum	wavefunction; Position-momentum	
	uncertainty principle.	uncertainty principle.	
		UNIT III:	
	General discussion of bound states in an	General discussion of bound states in an	

arbitrary potential- continuity of wave
function, boundary condition and
emergence of discrete energy levels;
application to one-dimensional problem-
square well potential; Quantum mechanics
of simple harmonic oscillator-energy
levels and energy eigenfunctions using
Frobenius method.

UNIT IV:

Quantum theory of hydrogen-like

atoms: time independent Schrodinger equation in spherical polar coordinates; separation of variables for the second order partial differential equation; angular momentum operator and quantum numbers; Radial wavefunctions from Frobenius method; Orbital angular momentum quantum numbers l and m; s, p, d,.. shells (idea only)

UNIT V:

Atoms in Electric and Magnetic Fields:-Electron Angular Momentum. Space Quantization. Electron Spin and Spin Angular Momentum. Larmor's Theorem. Spin Magnetic Moment. Stern-Gerlach Experiment. Zeeman Effect: Electron Magnetic Moment and Magnetic Energy, Gyromagnetic Ratio and Bohr Magneton. Atoms in External Magnetic Fields:-Normal and Anomalous Zeeman Effect. Many electron atoms: - Pauli's Exclusion Principle. Symmetric and Antisymmetric Wave Functions. Periodic table. Fine structure. Spin orbit coupling. Spectral Notations for Atomic States. Total Angular Momentum. Vector Model. Spin-orbit coupling in atoms-L-S and J-J couplings.

arbitrary potential- continuity of wave function, boundary condition and emergence of discrete energy levels; application to one-dimensional problemsquare well potential; Quantum mechanics of simple harmonic oscillator-energy levels and energy eigenfunctions using Frobenius method.

UNIT IV:

Quantum theory of hydrogen-like atoms: time independent Schrodinger equation in spherical polar coordinates; separation of variables for the second order partial differential equation; angular momentum operator and quantum numbers; Radial wavefunctions from Frobenius method; Orbital angular momentum quantum numbers l and m; s, p, d,.. shells (idea only)

UNIT V:

Atoms in Electric and Magnetic Fields:-Electron Angular Momentum. Space Quantization. Electron Spin and Spin Angular Momentum. Larmor's Theorem. Spin Magnetic Moment. Stern-Gerlach Experiment. Zeeman Effect: Electron Magnetic Moment and Magnetic Energy, Gyromagnetic Ratio and Bohr Magneton. Atoms in External Magnetic Fields:-Normal and Anomalous Zeeman Effect. Many electron atoms:- Pauli's Exclusion Principle. Symmetric and Antisymmetric Wave Functions. Periodic table. Fine structure. Spin orbit coupling. Spectral Notations for Atomic States. Total Angular Momentum. Vector Model. Spin-orbit coupling in atoms-L-S and J-J couplings.

BSC604 Embedded System: Introduction to B microcontroller UNIT I:

Embedded introduction: system Introduction to embedded systems and general purpose computer systems, architecture of embedded system, classifications, applications and purpose of embedded systems, challenges and design issues in embedded systems, operational and non-operational quality attributes of embedded systems, elemental description of embedded processors and microcontrollers.

UNIT II:

Review of microprocessors: Organization of Microprocessor based system, 8085µp pin diagram and architecture, concept of 8085 data bus and address bus, programming model. instruction classification, subroutines, stacks and its implementation, delay subroutines. hardware and software interrupts.

UNIT III:

8051 microcontroller: Introduction and block diagram of 8051 microcontroller, architecture of 8051, overview of 8051 family, 8051 assembly language programming, Program Counter and ROM memory map, Data types and directives, Flag bits and Program Status Word (PSW) register, Jump, loop and call instructions.

8051 I/O port programming: Introduction of I/O port programming, pin out diagram of 8051 microcontroller, I/O port pins description and their functions, I/O port programming in 8051, (Using Assembly Language), I/O programming: Bit manipulation.

UNIT I:

Embedded system introduction: Introduction to embedded systems and general purpose computer systems, architecture of embedded system, classifications, applications and purpose of embedded systems, challenges and design issues in embedded systems, operational and non-operational quality attributes of embedded systems, elemental description of embedded processors and microcontrollers.

UNIT II:

Review of microprocessors: Organization of Microprocessor based system, 8085µp pin diagram and architecture, concept of bus address 8085 data and bus, programming model. instruction classification, subroutines, stacks and its implementation, delay subroutines. hardware and software interrupts.

UNIT III:

8051 microcontroller: Introduction and block diagram of 8051 microcontroller, architecture of 8051, overview of 8051 family, 8051 assembly language programming, Program Counter and ROM memory map, Data types and directives, Flag bits and Program Status Word (PSW) register, Jump, loop and call instructions.

8051 I/O port programming: Introduction of I/O port programming, pin out diagram of 8051 microcontroller, I/O port pins description and their functions, I/O port programming in 8051, (Using Assembly Language), I/O programming: Bit manipulation.

	UNIT IV:
UNIT IV:	Programming of 8051: 8051addressing
Programming of 8051: 8051addressing	modes and accessing memory using various
modes and accessing memory using	addressing modes, assembly language
various addressing modes, assembly	instructions using each addressing mode,
language instructions using each	arithmetic & logic instructions, 8051
addressing mode, arithmetic & logic	programming in C:- for time delay and I/O
instructions, 8051 programming in C:- for	operations and manipulation, for arithmetic
time delay and I/O operations and	& logic operations, for ASCII and BCD
manipulation, for arithmetic & logic	conversions.
operations, for ASCII and BCD	Timer and counter programming:
conversions.	Programming 8051 timers, counter
Timer and counter programming:	programming.
Programming 8051 timers, counter	Serial port programming with and
programming.	without interrupt: Introduction to 8051
Serial port programming with and	interrupts,
without interrupt: Introduction to 8051	programming timer interrupts,
interrupts,	programming external hardware interrupts
programming timer interrupts,	and serial communication interrupt,
programming external hardware interrupts	interrupt priority in the 8051.
and serial communication interrupt,	
interrupt priority in the 8051.	UNIT V:
	Interfacing 8051 microcontroller to
UNIT V:	peripherals: Parallel and serial ADC, DAC
Interfacing 8051 microcontroller to	interfacing, LCD interfacing.
peripherals: Parallel and serial ADC,	Programming Embedded Systems:
DAC interfacing, LCD interfacing.	Structure of embedded program, infinite
Programming Embedded Systems:	loop, compiling, linking and locating,
Structure of embedded program, infinite	downloading and debugging.
loop, compiling, linking and locating,	Embedded system design and
downloading and debugging.	development: Embedded system
Embedded system design and	development environment, file types
development: Embedded system	generated after cross compilation,
development environment, file types	disassembler/ decompiler, simulator,
generated after cross compilation,	emulator and debugging, embedded product
disassembler/ decompiler, simulator,	development life-cycle, trends in embedded
emulator and debugging, embedded	industry.
product development life-cycle, trends in	
embedded industry.	

Nuclear and Particle Physics **BSC604** (Theory + Tutorials 2*) UNIT I:

С

General **Properties** Nuclei: of Constituents of nucleus and their Intrinsic properties, quantitative facts about size, mass, charge density (matter energy), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot, angular momentum, parity, magnetic moment, electric moments, nuclear excites states.

UNIT II:

Nuclear Models: Liquid drop model approach, semi empirical mass formula and significance of various terms, condition of nuclear stability. Two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force.

Radioactivity decay:(a) Alpha decay: basics of α -decay processes, theory of α emission, Gamow factor, Geiger Nuttall law, α -decay spectroscopy. (b) \Box -decay: energy kinematics for \Box -decay, positron emission, electron capture, neutrino hypothesis. (c) Gamma decay: Gamma rays emission & kinematics, internal conversion.

UNIT III:

Nuclear Reactions: Types of Reactions, Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct reaction, resonance reaction, Coulomb (Rutherford scattering

UNIT I:

General Properties of Nuclei: Constituents of nucleus and their Intrinsic properties, quantitative facts about size, mass, charge density (matter energy), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot, angular momentum, parity, magnetic moment, electric moments, nuclear excites states.

UNIT II:

Nuclear Models: Liquid drop model approach, semi empirical mass formula and significance of various terms, condition of nuclear stability. Two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force.

Radioactivity decay:(a) Alpha decay: basics of α -decay processes, theory of α emission, Gamow factor, Geiger Nuttall law, α -decay spectroscopy. (b) \Box -decay: energy kinematics for \Box -decay, positron emission, electron capture, neutrino hypothesis. (c) Gamma decay: Gamma rays emission & kinematics, internal conversion. UNIT III:

Nuclear Reactions: Types of Reactions, Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct reaction, resonance reaction, Coulomb scattering (Rutherford scattering).

Interaction of Nuclear Radiation with

scattering).

Interaction of Nuclear Radiation with matter: Energy loss due to ionization (Bethe-Block formula), energy loss of electrons, Cerenkov radiation, Gamma ray interaction through matter, photoelectric effect, Compton scattering, pair production, neutron interaction with matter.

UNIT IV:

Detector for Nuclear Radiations: Gas detectors: estimation of electric field, mobility of particle, for ionization chamber and GM Counter. Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT). Semiconductor Detectors (Si & Ge) for charge particle and photon detection (concept of charge carrier and mobility). **Particle Accelerators:** Accelerator facility

available in India: Van-de Graaff generator (Tandem accelerator), Linear accelerator, Cyclotron, Synchrotrons.

UNIT V:

Particle physics: Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model, color quantum number and gluons. **matter**: Energy loss due to ionization (Bethe-Block formula), energy loss of electrons, Cerenkov radiation, Gamma ray interaction through matter, photoelectric effect, Compton scattering, pair production, neutron interaction with matter.

UNIT IV:

Detector for Nuclear Radiations: Gas detectors: estimation of electric field, mobility of particle, for ionization chamber and GM Counter. Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT). Semiconductor Detectors (Si & Ge) for charge particle and photon detection (concept of charge carrier and mobility).

Particle Accelerators: Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator), Linear accelerator, Cyclotron, Synchrotrons.

UNIT V:

Particle physics: Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model, color quantum number and gluons.

UNIT I: PHYSICS OF THE BODY-I

Basic Anatomical Terminology: Standard Anatomical Position, Planes. Familiarity with terms like- Superior, Inferior, Anterior,

PHYSICS OF THE BODY-I				
Basic Anato	omical Ter	rminolog	y: Standard	
Anatomical	Position,	Planes.	Familiarity	

like-

Superior,

Inferior,

Medical Physics

with terms

UNIT I:

BSC604 D Anterior, Posterior, Medial, Lateral, Proximal and Distal.

Mechanics of the body: Skeleton, forces, and body stability. Muscles and dynamics of body movement. Physics of Locomotors Systems: joints and movements, Stability and Equilibrium. Energy household of the body: Energy balance in the body, Energy consumption of the body, Heat losses of the body, Thermal Regulation. Pressure system of body: Physics of breathing, Physics of cardiovascular system. (8 Lectures)

UNIT II: PHYSICS OF THE BODY-II

Acoustics of the body: Nature and characteristics of sound, Production of speech, Physics of the ear, Diagnostics with sound and ultrasound. Optical system of the body: Physics of the eye. Electrical system of the body: Physics of the nervous system, Electrical signals and information transfer. (10 Lectures)

PHYSICS OF DIAGNOSTIC AND THERAPEUTIC SYSTEMS-I

X-RAYS: Electromagnetic spectrum, production of x-rays, x-ray spectra, Brehmsstrahlung, Characteristic x-ray. Xray tubes & types: Coolidge tube, x-ray tube design, tube cooling stationary mode, Rotating anode x-ray tube, Tube rating, quality and intensity of x-ray. X-ray generator circuits, half wave and full wave rectification, filament circuit, kilo voltage circuit, types of X-Ray Generator, high frequency generator, exposure timers and switches, HT cables, HT generation. (7 Lectures)

Posterior, Medial, Lateral, Proximal and Distal.

Mechanics of the body: Skeleton, forces, and body stability. Muscles and dynamics of body movement. Physics of Locomotors Systems: joints and movements, Stability and Equilibrium. Energy household of the body: Energy balance in the body, Energy consumption of the body, Heat losses of the body, Thermal Regulation. Pressure system of body: Physics of breathing, Physics of cardiovascular system. (8 Lectures)

UNIT II: PHYSICS OF THE BODY-II

Acoustics of the body: Nature and characteristics of sound, Production of speech, Physics of the ear, Diagnostics with sound and ultrasound. Optical system of the body: Physics of the eye. Electrical system of the body: Physics of the nervous system, Electrical signals and information transfer. (10 Lectures)

PHYSICS OF DIAGNOSTIC AND THERAPEUTIC SYSTEMS-I

X-RAYS: Electromagnetic spectrum, production of x-rays, x-ray spectra, Brehmsstrahlung, Characteristic x-ray. Xray tubes & types: Coolidge tube, x-ray tube design, tube cooling stationary mode, Rotating anode x-ray tube, Tube rating, quality and intensity of x-ray. X-ray generator circuits, half wave and full wave rectification, filament circuit, kilo voltage circuit, types of X-Ray Generator, high frequency generator, exposure timers and switches, HT cables, HT generation. (7 Lectures)

RADIATION PHYSICS: Radiation units

RADIATION PHYSICS: Radiation units

exposure, absorbed dose, units: rad, gray, relative biological effectiveness, effective dose, inverse square law. Interaction of radiation with matter Compton & photoelectric effect, Rem & Sievert, linear attenuation coefficient. Radiation Detectors: Thimble chamber, condenser chambers. Geiger Muller counter. Scintillation counters and Solid State detectors, ionization chamber, Dosimeters, survey methods, area monitors, TLD, Semiconductor detectors.

UNIT III:

MEDICAL IMAGING **PHYSICS:** Evolution of Medical Imaging, X-ray diagnostics and imaging, Physics of nuclear magnetic resonance (NMR), NMR imaging, MRI Radiological imaging, Ultrasound imaging, Physics of Doppler with applications and modes, Vascular Doppler. Radiography: Filters, grids, cassette, X-ray film, film processing, fluoroscopy. Computed tomography scanner- principle & function, display, generations, mammography. Thyroid uptake system and Gamma camera (Only Principle, function and display).

RADIATION ONCOLOGY PHYSICS:

External Beam Therapy (Basic Idea): Telecobalt, Conformal Radiation Therapy (CRT), 3DCRT, IMRT, Image Guided Radiotherapy, EPID, Rapid Arc, Proton Therapy, Gamma Knife, Cyber Knife. Contact Beam Therapy (Basic Idea): Brachytherapy-LDR and HDR, Intra Operative Brachytherapy. Radiotherapy, kilo voltage machines, deep therapy machines, Telecobalt machines ,Medical linear accelerator. Basics of Teletherapy exposure, absorbed dose, units: rad, gray, relative biological effectiveness, effective dose, inverse square law. Interaction of radiation with matter Compton & photoelectric effect, Rem & Sievert, linear coefficient. attenuation Radiation Detectors: Thimble chamber, condenser chambers, Geiger Muller counter. Scintillation counters and Solid State detectors, ionization chamber, Dosimeters, survey methods, area monitors, TLD, Semiconductor detectors.

UNIT III:

IMAGING MEDICAL **PHYSICS:** Evolution of Medical Imaging, X-ray diagnostics and imaging, Physics of nuclear magnetic resonance (NMR), NMR imaging, MRI Radiological imaging, Ultrasound of Doppler imaging. Physics with applications and modes, Vascular Doppler. Radiography: Filters, grids, cassette, X-ray film, film processing, fluoroscopy. Computed tomography scanner- principle & function, display, generations, mammography. Thyroid uptake system and Gamma camera (Only Principle, function and display).

RADIATION ONCOLOGY PHYSICS: External Beam Therapy (Basic Idea): Telecobalt, Conformal Radiation Therapy (CRT), 3DCRT, IMRT, Image Guided Radiotherapy, EPID, Rapid Arc, Proton Therapy, Gamma Knife, Cyber Knife. Contact Beam Therapy (Basic Idea): Brachytherapy-LDR and HDR, Intra Operative Brachytherapy. Radiotherapy, kilo voltage machines, deep therapy machines, Telecobalt machines ,Medical linear accelerator. Basics of Teletherapy

 units, deep x-ray, Telecobalt units, medical	units, deep x-ray, Telecobalt units, medical
linear accelerator, Radiation protection,	linear accelerator, Radiation protection,
external beam characteristics, dose	external beam characteristics, dose
maximum and build up - bolus, percentage	maximum and build up - bolus, percentage
depth dose, tissue maximum ratio and	depth dose, tissue maximum ratio and tissue
tissue phantom ratio, Planned target	phantom ratio, Planned target Volume and
Volume and Gross Tumour Volume.	Gross Tumour Volume.
UNIT IV:	UNIT IV:
RADIATION AND RADIATION	RADIATION AND RADIATION
PROTECTION: Principles of radiation	PROTECTION: Principles of radiation
protection	protection
, protective materials-radiation effects ,	,protective materials-radiation effects ,
somatic, genetic stochastic and	somatic, genetic stochastic and
deterministic effect. Personal monitoring	deterministic effect. Personal monitoring
devices: TLD film badge , pocket	devices: TLD film badge , pocket
dosimeter, OSL dosimeter. Radiation	dosimeter, OSL dosimeter. Radiation
dosimeter. Natural radioactivity,	dosimeter. Natural radioactivity, Biological
Biological effects of radiation, Radiation	effects of radiation, Radiation monitors.
monitors. Steps to reduce radiation to	Steps to reduce radiation to Patient, Staff
Patient, Staff and Public. Dose Limits for	and Public. Dose Limits for Occupational
Occupational workers and Public. AERB:	workers and Public. AERB: Existence and
Existence and Purpose.	Purpose.

UNIT V:

PHYSICS OF DIAGNOSTIC AND THERAPEUTIC SYSTEMS-II

Diagnostic nuclear medicine: Radiopharmaceuticals for radioisotope imaging, Radioisotope imaging equipment, Single photon and positron emission tomography. Therapeutic nuclear medicine: Interaction between radiation and matter Dose and isodose in radiation treatment. Medical Instrumentation: Basic Ideas of Endoscope and Cautery, Sleep Apnea and Cpap Machines, Ventilator and its modes.

PHYSICS OF DIAGNOSTIC

UNIT V:

THERAPEUTIC SYSTEMS-II

AND

Diagnostic nuclear medicine: Radiopharmaceuticals for radioisotope imaging, Radioisotope imaging equipment, Single photon and positron emission tomography. Therapeutic nuclear medicine: Interaction between radiation and matter Dose and isodose in radiation treatment. Medical Instrumentation: Basic Ideas of Endoscope and Cautery, Sleep Apnea and Cpap Machines, Ventilator and its modes.

BSC605 A	Polymer Chemistry Lab 1. Polymer synthesis	1. Polymer synthesis	
	1. Free radical solution polymerization of	1. Free radical solution polymerization of	
	styrene (St) / Methyl Methacrylate (MMA)	styrene (St) / Methyl Methacrylate (MMA) /	
	/ Methyl Acrylate (MA) / Acrylic acid	Methyl Acrylate (MA) / Acrylic acid (AA).	
	(AA).	a. Purification of monomer	
	a. Purification of monomer	b. Polymerization using benzoyl peroxide	
	b. Polymerization using benzoyl peroxide	(BPO) / 2,2'-azo-bisisobutylonitrile (AIBN)	
	(BPO) / 2,2'-azo-bisisobutylonitrile	2. Preparation of nylon 66/6	
	(AIBN)	1. Interfacial polymerization, preparation of	
	2. Preparation of nylon 66/6	polyester from isophthaloyl chloride (IPC)	
	1. Interfacial polymerization, preparation	and phenolphthalein	
	of polyester from isophthaloyl chloride	a. Preparation of IPC	
	(IPC) and phenolphthalein	b. Purification of IPC	
	a. Preparation of IPC	c. Interfacial polymerization	
	b. Purification of IPC	3. Redox polymerization of acrylamide	
	c. Interfacial polymerization	4. Precipitation polymerization of	
	3. Redox polymerization of acrylamide	acrylonitrile	
	4. Precipitation polymerization of	5. Preparation of urea-formaldehyde resin	
	acrylonitrile	6. Preparations of novalac resin/resold resin.	
	5. Preparation of urea-formaldehyde resin	7. Microscale Emulsion Polymerization of	
	6. Preparations of novalac resin/resold	Poly(methylacrylate).	
	resin.	Polymer characterization	
	7. Microscale Emulsion Polymerization of	1. Determination of molecular weight by	
	Poly(methylacrylate).	viscometry:	
	Polymer characterization	(a) Polyacrylamide-aq.NaNO2 solution	
	1. Determination of molecular weight by	(b) (Poly vinyl proplylidine (PVP) in water	
	viscometry:	2. Determination of the viscosity-average	
	(a) Polyacrylamide-aq.NaNO2 solution	molecular weight of poly(vinyl alcohol)	
	(b) (Poly vinyl proplylidine (PVP) in water	(PVOH) and the fraction of "head-to-head"	
	2. Determination of the viscosity-average	monomer linkages in the polymer.	

			1
	molecular weight of poly(vinyl alcohol)	3. Determination of molecular weight by	
	(PVOH) and the fraction of "head-to-head"	end group analysis: Polyethylene glycol	
	monomer linkages in the polymer.	(PEG) (OH group).	
	3. Determination of molecular weight by	4. Testing of mechanical properties of	
	end group analysis: Polyethylene glycol	polymers.	
	(PEG) (OH group).	5. Determination of hydroxyl number of a	
	4. Testing of mechanical properties of	polymer using colorimetric method.	
	polymers.	Polymer analysis	
	5. Determination of hydroxyl number of a	1. Estimation of the amount of HCHO in the	
	polymer using colorimetric method.	given solution by sodium sulphite method	
	Polymer analysis	2. Instrumental Techniques	
	1. Estimation of the amount of HCHO in	3. IR studies of polymers	
	the given solution by sodium sulphite	4. DSC analysis of polymers	
	method	5. Preparation of polyacrylamide and its	
	2. Instrumental Techniques	electrophoresis	
	3. IR studies of polymers	*at least 7 experiments to be carried out.	
	4. DSC analysis of polymers		
	5. Preparation of polyacrylamide and its		
	electrophoresis		
	*at least 7 experiments to be carried out.		
BSC605 B	Green Chemistry Lab 1. Safer starting materials	1. Safer starting materials	
	Preparation and characterization of	Preparation and characterization of	
	nanoparticles of gold using tea leaves.	nanoparticles of gold using tea leaves.	
	2. Using renewable resources	2. Using renewable resources	
	Preparation of biodiesel from vegetable/	Preparation of biodiesel from vegetable/	
	waste cooking oil.	waste cooking oil.	
	3. Avoiding waste	3. Avoiding waste	
	Principle of atom economy.	Principle of atom economy.	
	Use of molecular model kit to stimulate the	Use of molecular model kit to stimulate the	
	reaction to investigate how the atom	reaction to investigate how the atom	

	economy can illustrate Green Chemistry.	economy can illustrate Green Chemistry.	
	Preparation of propene by two methods	Preparation of propene by two methods can	
	can be studied	be studied	
	(I) Triethylamine ion + $OH^- \rightarrow propene +$	(I) Triethylamine ion + $OH^- \rightarrow propene +$	
	trimethylpropene + water	trimethylpropene + water	
	(II) 1-propanol H_2SO_4/Δ propene + water	(II) 1-propanol H_2SO_4/Δ propene + water	
	Other types of reactions, like addition,	Other types of reactions, like addition,	
	elimination, substitution and	elimination, substitution and rearrangement	
	rearrangement should also be studied for	should also be studied for the calculation of	
	the calculation of atom economy.	atom economy.	
	1. Use of enzymes as catalysts	1. Use of enzymes as catalysts	
	Benzoin condensation using Thiamine	Benzoin condensation using Thiamine	
	Hydrochloride as a catalyst instead of	Hydrochloride as a catalyst instead of	
	cyanide.	cyanide.	
	5. Alternative Green solvents	5. Alternative Green solvents	
	Extraction of D-limonene from orange peel	Extraction of D-limonene from orange peel	
	using liquid CO2 prepared form dry ice.	using liquid CO2 prepared form dry ice.	
	Mechanochemical solvent free synthesis of	Mechanochemical solvent free synthesis of	
	azomethines	azomethines	
	6. Alternative sources of energy	6. Alternative sources of energy	
	Solvent free, microwave assisted one pot	Solvent free, microwave assisted one pot	
	synthesis of phthalocyanine complex of	synthesis of phthalocyanine complex of	
	copper (II).	copper (II).	
	Photoreduction of benzophenone to	Photoreduction of benzophenone to	
	benzopinacol in the presence of sunlight.	benzopinacol in the presence of sunlight.	
BSC605 C	Instrumental Methods of Analysis Lab 1. Safety Practices in the Chemistry	1. Safety Practices in the Chemistry	
	Laboratory	Laboratory	
	2. Determination of the isoelectric pH of a	2. Determination of the isoelectric pH of a	
	protein.	protein.	
	3. Titration curve of an amino acid.	3. Titration curve of an amino acid.	
1		1	

	4. Determination of the void volume of a	4. Determination of the void volume of a	
	gel filtration column.	gel filtration column.	
	5. Determination of a Mixture of Cobalt	5. Determination of a Mixture of Cobalt and	
	and Nickel (UV/Vis spec.)	Nickel (UV/Vis spec.)	
	6. Study of Electronic Transitions in	6. Study of Electronic Transitions in	
	Organic Molecules (i.e., acetone in water)	Organic Molecules (i.e., acetone in water)	
	7. IR Absorption Spectra (Study of	7. IR Absorption Spectra (Study of	
	Aldehydes and Ketones)	Aldehydes and Ketones)	
	8. Determination of Calcium, Iron, and	8. Determination of Calcium, Iron, and	
	Copper in Food by Atomic Absorption	Copper in Food by Atomic Absorption	
	9. Quantitative Analysis of Mixtures by	9. Quantitative Analysis of Mixtures by Gas	
	Gas Chromatography (i.e., chloroform and	Chromatography (i.e., chloroform and	
	carbon tetrachloride)	carbon tetrachloride)	
	10. Separation of Carbohydrates by HPLC	10. Separation of Carbohydrates by HPLC	
	11. Determination of Caffeine in	11. Determination of Caffeine in Beverages	
	Beverages by HPLC	by HPLC	
	12. Potentiometric Titration of a Chloride-	12. Potentiometric Titration of a Chloride-	
	Iodide Mixture	Iodide Mixture	
	13. Cyclic Voltammetry of the	13. Cyclic Voltammetry of the	
	Ferrocyanide/Ferricyanide Couple	Ferrocyanide/Ferricyanide Couple	
	14. Nuclear Magnetic Resonance	14. Nuclear Magnetic Resonance	
	15. Use of fluorescence to do "presumptive	15. Use of fluorescence to do "presumptive	
	tests" to identify blood or other body	tests" to identify blood or other body fluids.	
	fluids.	16. Use of "presumptive tests" for anthrax	
	16. Use of "presumptive tests" for anthrax	or cocaine	
	or cocaine	17. Collection, preservation, and control of	
	17. Collection, preservation, and control of	blood evidence being used for DNA testing	
	blood evidence being used for DNA	18. Use of capillary electrophoresis with	
	testing	laser fluorescence detection for nuclear	
	18. Use of capillary electrophoresis with	DNA (Y chromosome only or multiple	
	laser fluorescence detection for nuclear	chromosome)	

	DNA (Y chromosome only or multiple	19. Use of sequencing for the analysis of	
	chromosome)	mitochondrial DNA	
	19. Use of sequencing for the analysis of	20. Laboratory analysis to confirm anthrax	
	mitochondrial DNA	or cocaine	
	20. Laboratory analysis to confirm anthrax	21. Detection in the field and confirmation	
	or cocaine	in the laboratory of flammable accelerants	
	21. Detection in the field and confirmation	or explosives	
	in the laboratory of flammable accelerants	22. Detection of illegal drugs or steroids in	
	or explosives	athletes	
	22. Detection of illegal drugs or steroids in	23. Detection of pollutants or illegal	
	athletes	dumping	
	23. Detection of pollutants or illegal	24. Fibre analysis	
	dumping	At least 10 experiments to be performed	
	24. Fibre analysis		
	At least 10 experiments to be performed		
BSC605	Quantum Chemistry, Spectroscopy & Photochemistry Lab		
	UV/Visible spectroscopy	UV/Visible spectroscopy	
	I. Study the 200-500 nm absorbance	I. Study the 200-500 nm absorbance spectra	
	spectra of $KMnO_4$ and $K_2Cr_2O_7$ (in 0.1 M	of KMnO ₄ and K ₂ Cr ₂ O ₇ (in 0.1 M H ₂ SO ₄)	
	H_2SO_4) and determine the λ_{max} values.	and determine the λ_{max} values. Calculate the	
	Calculate the energies of the two	energies of the two transitions in different	
	transitions in different units (J molecule-1,	units (J molecule-1, kJ mol-1, cm-1, eV).	
	kJ mol-1, cm-1, eV).	II. Study the pH-dependence of the UV-Vis	
	II. Study the pH-dependence of the UV-	spectrum (200-500 nm) of K ₂ Cr ₂ O ₇ .	
	Vis spectrum (200-500 nm) of $K_2Cr_2O_7$.	III. Record the 200-350 nm UV spectra of	
	III. Record the 200-350 nm UV spectra of	the given compounds (acetone,	
	the given compounds (acetone,	acetaldehyde, 2-propanol, acetic acid) in	
	acetaldehyde, 2-propanol, acetic acid) in	water. Comment on the effect of structure	
	water. Comment on the effect of structure	on the UV spectra of organic compounds.	
	on the UV spectra of organic compounds.	Colourimetry	
	Colourimetry	I. Verify Lambert-Beer's law and determine	
	I. Verify Lambert-Beer's law and	the concentration of	
	determine the concentration of	$CuSO_4/KMnO_4/K_2Cr_2O_7$ in a solution of	
	$CuSO_4/KMnO_4/K_2Cr_2O_7$ in a solution of	unknown concentration.	
	unknown concentration.	II. Determine the concentrations of KMnO ₄	
1 1		•	

	$KMnO_4$ and $K_2Cr_2O_7$ in a mixture.	III. Study the kinetics of iodination of	
	III. Study the kinetics of iodination of	propanone in acidic medium.	
	propanone in acidic medium.	IV. Determine the amount of iron present in	
	IV. Determine the amount of iron present	a sample using 1,10-phenathroline.	
	in a sample using 1,10-phenathroline.	V. Determine the dissociation constant of an	
	V. Determine the dissociation constant of	indicator (phenolphthalein).	
	an indicator (phenolphthalein).	VI. Study the kinetics of interaction of	
	VI. Study the kinetics of interaction of	crystal violet/ phenolphthalein with sodium	
	crystal violet/ phenolphthalein with	hydroxide.	
	sodium hydroxide.	VII. Analyse the given vibration-rotation	
	VII. Analyse the given vibration-rotation	spectrum of HCl(g)	
	spectrum of HCl(g)		
BSC606 A	Quantum Mechanics Lab	Quantum Mechanics Lab 8. Solve the s-wave Schrodinger	
	equation for the ground state and	equation for the ground state and	
	the first excited state of the	the first excited state of the	
	hydrogen atom: $\frac{d^2y}{dt^2} =$	hydrogen atom: $\frac{d^2y}{d^2} =$	
	$A(r)u(r), A(r) = \frac{2m}{r^2} [V(r) - \frac{2m}{r^2}]$	$A(r)u(r), A(r) = \frac{2m}{r^2} [V(r) - $	
	<i>E</i>], where $V(r) = -\frac{e^2}{r}$. Here, m	<i>E</i>], where $V(r) = -\frac{e^2}{r}$. Here, m is	
	is the reduced mass of the	the reduced mass of the electron.	
	electron. Obtain the energy	Obtain the energy eigenvalues and	
	eigenvalues and plot the	plot the corresponding wave	
	corresponding wave functions.	functions. Remember that the	
	Remember that the ground state	ground state energy of the	
	energy of the hydrogen atom is	hydrogen atom is $\approx -13.6 eV$.	
	$\approx -13.6 \ eV.$ Take $e =$	Take $e = 3.795 (eVÅ)^{1/2}$, $\hbar c =$	
	$3.795 (eV { m \AA})^{1/2}$, $\hbar c =$	1973 (<i>eV</i> Å) and $m = 0.511 \times$	
	1973 (<i>eV</i> Å) and $m = 0.511 \times$	$10^{6} eV/c^{2}$.	
	$10^{6} eV/c^{2}$.	9. Solve the s-wave radial	
	2. Solve the s-wave radial	Schrodinger equation for an atom:	
	Schrodinger equation for an atom:	$\frac{d^2y}{dr^2} = A(r)u(r), A(r) =$	
	$\frac{d^2y}{dr^2} = A(r)u(r), A(r) =$	$\frac{2m}{k^2}[V(r) - E]$. Where m is the	
	$\frac{2m}{\hbar^2}[V(r)-E]$. Where m is the	reduced mass of the system (which	
	reduced mass of the system	can be chosen to be the mass of an	
	(which can be chosen to be the	electron), for the screened coulomb	
	mass of an electron), for the	potential $V(r) = e^2 e^{-r/a} \Gamma_{r-1}$	
	screened coulomb potential	potential $v(r) = -\frac{1}{r}e^{-rr}$. Find	
	$V(r) = -\frac{e^2}{2}e^{-r/a}.$ Find the	the energy (in eV) of the ground	
		state of the atom to an accuracy of	

energy (in eV) of the ground state of the atom to an accuracy of three significant digits. Also, plot the corresponding wave function. $= 3.795 (eVÅ)^{1/2}$, hc = Take 1973 (eVÅ), $m = 0.511 \times$ $10^6 eV/c^2$ and a = 3 Å, 5 Å, 7 Å.. The ground state energy is expected to be above -12 eV in all three cases. Solve the s-wave radial 3. Schrodinger equation for particle of mass m: $\frac{d^2y}{dr^2} =$ $A(r)u(r), A(r) = \frac{2m}{k^2} [V(r) - E].$ For the anharmonic oscillator potential $V(r) = \frac{kr^2}{2} + \frac{br^3}{2}$. For the ground state energy (in MeV) of the particle to an accuracy of three significant digits. Also, plot the corresponding wave function. Choose $\hbar c = 197.3 \, MeV \, fm$ $m = 940 MeV/c^2$, k = 100 MeV fm^{-2} and b =0, 10, 30 *MeV* fm^{-3} . The ground state energy I expected to lie between 90 and 110 MeV for all three cases. Solve the 4. s-wave radial Schrodinger equation for the vibrations of hydrogen molecule: $\frac{d^2y}{dr^2} = A(r)u(r), A(r) =$ $\frac{2\mu}{\hbar^2}[V(r)-E]$. where μ is the reduced mass of the two-atom system for the Morse potential $V(r) = D(e^{-2\alpha r'} - e^{-\alpha r'}), r' =$ $\frac{r-r_0}{r}$. Find the lowest vibrational energy (in MeV) of the molecule to an accuracy of three significant

three significant digits. Also, plot the corresponding wave function. $= 3.795 (eV \text{\AA})^{1/2}$, $\hbar c =$ Take 1973 (eVÅ), $m = 0.511 \times$ $10^6 eV/c^2$ and a = 3 Å, 5 Å, 7 Å.The ground state energy is expected to be above -12 eV in all three cases. 10. Solve the s-wave radial Schrodinger equation for a particle of mass m: $\frac{d^2y}{dr^2} = A(r)u(r), A(r) =$ $\frac{2m}{k^2}[V(r)-E]$. For the anharmonic oscillator potential $V(r) = \frac{kr^2}{2} +$

 $\frac{br^3}{3}$. For the ground state energy (in MeV) of the particle to an accuracy of three significant digits. Also, plot the corresponding wave function. Choose $\hbar c = 197.3 \ MeV \ fm, \ m = 940 \ MeV/c^2, \ k = 100 \ MeV \ fm^{-2} \ and \ b = 0.40 \ 0.00 \ MeV \ fm^{-2}$

0, 10, 30 $MeV fm^{-3}$. The ground state energy I expected to lie between 90 and 110 MeV for all three cases.

11. Solve the s-wave radial Schrodinger equation for the vibrations of hydrogen molecule: $\frac{d^2y}{dr^2} = A(r)u(r), A(r) =$ $\frac{2\mu}{\hbar^2} [V(r) - E].$ where μ is the reduced mass of the two-atom system for the Morse potential $V(r) = D(e^{-2\alpha r'} - e^{-\alpha r'}), r' =$ $\frac{r-r_0}{r}.$ Find the lowest vibrational energy (in MeV) of the molecule to an accuracy of three significant digits. Also plot the corresponding

	digits. Also plot the	wave function. Take: $m =$	
	corresponding wave function.	$940 MeV/c^2$,	
	Take: $m = 940 MeV/c^2$, D =	$D = 0.755501 \text{ eV}, \alpha = 1044, r_0 =$	
	$0.755501 \text{ eV}, \alpha = 1044, r_0 =$	0.131349 Å.	
	0.131349 Å.	Laboratory based experiments:	
	Laboratory based experiments:	12. Study of Electron spin resonance-	
	5. Study of Electron spin resonance-	determine magnetic field as a	
	determine magnetic field as a	function of the resonance	
	function of the resonance	frequency.	
	frequency.	13. Study of Zeeman effect: with	
	6. Study of Zeeman effect: with	external magnetic field; Hyperfine	
	external magnetic field;	splitting.	
	Hyperfine splitting.	14. To study the quantum tunnelling	
	7. To study the quantum tunnelling	effect with solid state device, e.g.	
	effect with solid state device, e.g.	tunneling current in backward	
	tunneling current in backward	diode or tunnel diode.	
	diode or tunnel diode.		
BSC606	Embedded System: Introduction to		
B	1. To find that the given numbers is prime	1. To find that the given numbers is prime	
	or not.	or not.	
	2. To find the factorial of a number.	2. To find the factorial of a number.	
	3. Write a program to make the two	3. Write a program to make the two	
	numbers equal by increasing the	numbers equal by increasing the smallest	
	smallest number and decreasing the	number and decreasing the largest	
	largest number.	number.	
	4. Use one of the four ports of 8051 for	4. Use one of the four ports of 8051 for O/P	
	O/P interfaced to eight LED's. Simulate	interfaced to eight LED's. Simulate	
	binary counter (8 bit) on LED's.	binary counter (8 bit) on LED's.	
	5. Program to glow first four LED then	5. Program to glow first four LED then next	
	next four using TIMER application.	four using TIMER application.	
	6. Program to rotate the contents of the	6. Program to rotate the contents of the	
	accumulator first right and then left.	accumulator first right and then left.	
	7. Program to run a countdown from 9-0 in	7. Program to run a countdown from 9-0 in	
	the seven segment LED display.	the seven segment LED display.	
	8. To interface seven segment LED display	8. To interface seven segment LED display	
	'HELP' in the seven segment LED	with 8051 microcontroller and display	
	display	display	
	9 To toggle '1234' as '1324' in the seven	usplay. 0 To toggle (1234) or (1224) in the second	
	segment LED.	segment LED	
	Segment DDD.		

	10. Interface stepper motor with 8051 and	10. Interface stepper motor with 8051 and	
	write a program to move the motor	write a program to move the motor	
	through a given angle in clock wise or	through a given angle in clock wise or	
	counter clockwise direction.	counter clockwise direction.	
	11. Application of embedded systems:	11. Application of embedded systems:	
	Temperature measurement, some	Temperature measurement, some	
	information on LCD display, interfacing	information on LCD display, interfacing a	
	a keyboard.	keyboard.	
BSC606 D	 Medical Physics Lab 1. Understanding the working of a manual Hg Blood Pressure monitor and measure the Blood Pressure. 2. Understanding the working of a manual optical eye-testing machine and to learn eye-testing. 3. Correction of Myopia (short sightedness) using a combination of lenses on an optical bench/breadboard. 4. Correction of Hypermetropia/Hyperopia (long sightedness) using a combination of lenses on an optical bench/breadboard. 5. To learn working of Thermoluminescent dosimeter (TLD) badges and measure the background radiation. 6. Familiarization with Geiger-Muller (GM) Counter and to measure background radiation. 7. Familiarization with Radiation meter and to measure background radiation. 8. Familiarization with the Use of a Vascular Doppler. 	 Understanding the working of a manual Hg Blood Pressure monitor and measure the Blood Pressure. Understanding the working of a manual optical eye-testing machine and to learn eye-testing. Correction of Myopia (short sightedness) using a combination of lenses on an optical bench/breadboard. Correction of Hypermetropia/Hyperopia (long sightedness) using a combination of lenses on an optical bench/breadboard. To learn working of Thermoluminescent dosimeter (TLD) badges and measure the background radiation. Familiarization with Geiger-Muller (GM) Counter and to measure background radiation. Familiarization with Radiation meter and to measure background radiation. Familiarization with the Use of a Vascular Doppler. 	
	Vascular Doppler.		