Department of Chemistry, College of Basic Science and Humanities

Class: M. Sc. 2nd Year; Semester: III

Course Code: CHE(C) 5313 Course Title: Matter and Physical Transformation

Name of the faculty: Dr (Mrs) N. Swain and Dr. S. Muni

Lesson Plan

Unit No	Name of the Chapter	Topic Title	No. of Lectures	Name of the Faculty
I	Properties of real gases	Equation of state	5	Dr. S. Muni
		Properties	4	
II	Properties of Liquids	Characteristics of liquid	3	Dr. (Mrs.) N. Swain
		Thermodynamic considerations of internal pressure	2	
		Surface tension and contact angle	2	
		Spreading of liquid and surface phenomenon	3	
III	Electronic Properties and Band Theory	Types of crystals and defects and their defects	4	Dr. S. Muni
		Electronic structure of solids	3	
		Optical properties	2	
		Organic metals and conductors	2	
IV	Physical transformation of pure substances	General introduction	2	Dr. (Mrs.) N. Swain
		Thermodynamic criteria of phase stability	2	
		Phase diagram	4	
		Thermodynamic aspects of phase transition	5	

Course Break Up

Unit – I **Chapter Name: Properties of real gases**

Name of the faculty: Dr. S. Muni

Lecture No.	Details of the topic to be covered
1.	Equation of state for real gases and their range of applicability
2.	van der Waals equation of state
3.	Redlich – Kwong equation of state
4.	Beattie – Bridgeman equation of state
5.	Virial equation of state
6.	Compression factor
7.	Law of corresponding state
8.	Fugacity
9.	Equilibrium constant for real gases

Unit – II **Chapter Name: Properties of Liquids**

Name of the faculty: Dr. (Mrs.) N. Swain

Lecture No.	Details of the topic to be covered
1.	Properties of liquid
2.	Liquid as dense gas, Liquid as disordered solid
3.	Internal pressure and thermodynamic derivations
4.	Implications of internal pressure
5.	liquid – vapour interface
6.	surface tension and its behaviour
7.	contact angle and wetting, Spreading of one liquid on another
8.	Antoff's rule, surface film
9.	Surface layer and surface pressure
10.	Thermodynamics of surface film

Unit – III **Chapter Name: Electronic Properties and Band Theory**

Name of the faculty: Dr. S. Muni

Lecture No.	Details of the topic to be covered
1.	Perfect and imperfect crystals.
2.	Intrinsic and extrinsic defects – point defects, line defects and plane defects
3.	Schottky defects and Frenkel defects
4.	Thermodynamics of Schottky defect formation
5.	Thermodynamics of Frenknel defect formation
6.	Band theory of solids, Band structure of metals
7.	Insulators and semiconductors. Intrinsic and extrinsic semiconductors,
8.	Doping on semiconductors, p-n junctions, super conductors.
9.	Organic metals, Organic charge transfer complex, new superconductors
10.	Optical reflectance
11.	Photoconduction - photoelectric effects

Unit – IV **Chapter Name: Physical transformation of pure substances**

Name of the faculty: Dr. (Mrs.) N. Swain

Lecture No.	Details of the topic to be covered
1.	States of matter, phase and physical change
2.	Phase transition, physical equilibria and phase rule
3.	Molar Gibbs energy and change in Gibbs energy
4.	Thermodynamics of transition and condition of stability
5.	Variation of Gibbs energy with pressure
6.	Variation of Gibbs energy with pressure (continued)
7.	Variation of Gibbs energy with temperature
8.	Variation of Gibbs energy with temperature (continued)
9.	Phase diagram and phase boundaries
10.	Location of phase boundaries
11.	Phase diagram of Helium
12.	Super critical fluids
13.	Response of melting to applied pressure

Course Code: CHE 5314 Course Title: Quantum Chemistry and Chemistry of Special Elements

Name of the faculty: Mr. S. R. Panda, Dr (Mrs) S. Jena and Dr. H. S. Sahu

Lesson Plan

Unit No	Name of the Chapter	Topic Title	No. of Lectures	Name of the Faculty
I	Introduction of Exact Quantum Mechanical Results	Brief review of failure of classical mechanics, The Schrodinger equation, Eigen function and Eigen values postulates of quantum mechanics	4	Dr.(Mrs) S. Jena
		particle in a box,(1-dimentional,3-dimentional), harmonic oscillator	4	
		the energy Eigenvalue of the rigid rotator, the hydrogen atom,	5	
		laguerre and associated laguerre polynomials, Significance of n, l and m.	4	
	Angular Momentum	angular momentum, eigen functions and values for angular momentum	3	
		ladder operators, addition of angular momenta	4	
		spin, anti-symmetry,Pauli's exclusion principle	2	
II	Approximate Methods	variation theorem and its derivation, Perturbation theory	3	
		first order and non-degeneratePerturbation theory, Applications of variation method and perturbation theory	3	
	Molecular Orbital Theory	Huckel theory, bond order and charge density,	3	
		Applications	4	
	Electronic Structure of Atoms	Electronic configuration, Russell-Saunders coupling schemes	3	
		p^n configuration, d^n configuration,	3	
		Term and symbol,magnetic effects, Slater-Condon parameters	3	
III	Chemistry of Inner transition Elements	Introduction to lanthanides occurance and separation tecniques.	5	Mr S. R. Panda
		Oxidation state -size relationships -lanthanide contraction	2	
		spectral and magnetic properties of lanthanides - uses of lanthanides and their compounds	2	
		Actinides: Synthesis of elements -electronic configuration and oxidation states	3	
		spectral and magnetic properties -comparative account of lanthanides and actinides and revision	2	
IV	Chemistry of Some Important elements	Silanes, silicates, silicones, silanols	4	
		germanium, tin and lead organyls	3	
		phosphorous halides, acids and oxyacids of phosphorous, phosphazenes; oxo acids of sulpur.	4	
		Synthesis and reactivity: calixarines, cryptands and crown ethers in complexation chemistry and revision	3	

Course Break Up

Unit – I **Chapter Name: Introduction of Exact Quantum Mechanical Results**

Name of the faculty: Dr.(Mrs) S. Jena

Lecture No.	Details of the topic to be covered
1.	Brief review of failure of classical mechanics
2.	The Schrodinger equation and its derivation
3.	Interpretation of the wave function.
4.	Significance of wave function
5.	Eigen function and Eigen values
6.	postulates of quantum mechanics(1^{st} and 2^{nd})
7.	Related theorems on 1^{st} and 2^{nd} postulates
8.	3^{rd} and 4^{th} postulates and derivation of theorems
9.	Discussion of solutions of the Schrodinger equation to some model systems viz. particle in a box,(1-dimentional)
10.	Discussion of solutions of the Schrodinger equation to some model systems viz. particle in a box,(3-dimentional)
11.	The harmonic oscillator. classical treatment
12.	quantum mechanical treatment of harmonic oscillator
13.	Hermite's differential equation,
14.	the complete Eigenfunctions and the energy Eigenvalue of the rigid rotator
15.	The hydrogen atom. Spherical co-ordinates, the r, θ ,Ø equation
16.	solving radial equation,laguerre and associated laguerre polynomials,
17.	Nature of n & L, Significance of n, l and m.

Unit – I **Chapter Name: Angular Momentum**

Name of the faculty: Dr.(Mrs) S. Jena

Lecture No.	Details of the topic to be covered
1.	Ordinary angular momentum,
2.	generalized angular momentum
3.	eigen functions for angular momentum,
4.	eigenvalues of angular momentum
5.	operator using ladder operators
6.	Theorems based on ladder operator
7.	addition of angular momenta
8.	spin, anti-symmetry
9.	Pauli's exclusion principle

Unit – II **Chapter Name: Approximate methods**

Name of the faculty: Dr.(Mrs) S. Jena

Lecture No.	Details of the topic to be covered
10.	The variation theorem and its derivation
11.	Linear variation principles.
12.	Perturbation theory
13.	Derivation of perturbation theory
14.	first order and non-degeneratePerturbation theory
15.	Applications of variation method and perturbation theory to the helium atom

Unit – II **Chapter Name:Molecular Orbital Theory**

Name of the faculty: Dr.(Mrs) S. Jena

Lecture No.	Details of the topic to be covered
1.	Huckel theory of conjugated systems
2.	bond order and charge density calculations
3.	Applications to ethylene,
4.	Butadiene
5.	cyclopropenyl radical,
6.	Cyclobutadiene
7.	Introduction to extended Huckel theory

Unit – II **Chapter Name: Electronic Structure of Atoms**

Name of the faculty: Dr.(Mrs) S. Jena

Lecture No.	Details of the topic to be covered
1.	Electronic configuration
2.	Russell-Saunders terms and coupling schemes
3.	term separation energies of the p^1 configuration,
4.	term separation energies of the p^2 configuration
5.	term separation energies for the d^2configuration,
6.	Term and symbol in p^nandd^nconfiguration,
7.	magnetic effects: spin-orbit coupling
8.	Zeeman splitting
9.	Slater-Condon parameters

Unit – III **Chapter Name: Chemistry of Inner transition Elements**

Name of the faculty: Mr S. R. Panda

Lecture No.	Details of the topic to be covered
1.	Atomic number ,symbol ,electronic configuration of lanthanide and stability.
2.	Occurance and theories of separation techniques fractional crystallisation, precipitationion-exchange, solvent-extraction
3.	separation of lanthanides by fractional crystallisation, precipitation
4.	separation of lanthanides by ion-exchange, solvent-extraction and
5.	separation of lanthanides by thermal decomposition, selective reduction and oxidation
6.	Size And different oxidation states, its variation and stability along the period
7.	Lanthide contraction, cause of it and consequencies of contraction
8.	spectral and magnetic properties of lanthanides its causes
9.	uses of lanthanides and their compounds in different field
10.	Actinides: Atomic number ,symbol ,electronic configuration of lanthanide
11.	Size and different oxidation states, its variation and stability along the periodand stability - electronic configuration and oxidation states
12.	Synthesis of elements in different process
13.	spectral and magnetic properties of lanthanides its causes
14.	comparative account of lanthanides and actinides in size, oxidation state etc

Unit – IV **Chapter Name: Chemistry of Some Important elements**

Name of the faculty: Mr S. R. Panda

Lecture No.	Details of the topic to be covered
1.	Preparation properties , bonding and uses of Silanes,
2.	Preparation properties , bonding and uses of , silicates
3.	Preparation properties , bonding and uses of silicones,
4.	Preparation properties , bonding and uses of silanols
5.	Preparation properties , bonding and uses of germanium organyls
6.	Preparation properties , bonding and uses of tin organyls
7.	Preparation properties , bonding and uses of lead organyls
8.	Preparation properties , bonding and uses phosphorous halides,
9.	Preparation properties , bonding and usesacids and oxyacids of phosphorous
10.	Preparation properties , bonding and usesphosphazenes;.
11.	Preparation properties , bonding and usesoxo acids of sulpur
12.	Synthesis and reactivity of calixarines, in complexation chemistry
13.	Synthesis and reactivity of cryptands in complexation chemistry
14.	Synthesis and reactivitycrown ethers in complexation chemistry

Course Code: CHE(C) 5315 Course Title: Organic synthesis

Name of the faculty: Dr. P. K. Jena, Dr. H. Nayak and Dr. B. P. Acharya

Lesson Plan

Unit No	Name of the Chapter	Topic Title	No. of Lectures	Name of the Faculty
I	Oxidation	Introduction	1	Dr B. P. Acharya
		Oxidative processes in different organic systems	5	
		Special Oxidising reagents	1	
	Reduction	Introduction	1	
		Different reductive processes in organic systems	5	
		Hydrogenolysis	1	
II	Protecting Groups	Protecting Groups	5	Dr. H. Nayak
	Disconnection Approach	Disconnection Approach	9	Dr. P. K. Jena
III	One Group C-C Disconnections	One Group C-C Disconnections	7	Dr. P. K. Jena
	Two Group C-C Disconnections	Two Group C-C Disconnections	7	
IV	Organometallic Reagents	Principle	1	Dr. H. Nayak
		Preparation, Properties and applications of various Organometallics	9	
	Synthesis of Some Complex Molecules	Camphor	1	
		Cortisne	1	
		Reserpine	1	

Course Break Up

Unit – I **Chapter Name: Oxidation**

Name of the faculty: Dr B. P. Acharya

Lecture No.	Details of the topic to be covered
1.	Introduction, Different oxidative processe
2.	Oxidation of alkenes, ,
3.	Oxidation of aromatic rings
4.	Oxidation of saturated C – H groups (activated and unactivated),
5.	Oxidation of alcohols, aldehydes, ketones
6.	Oxidation of carboxylic acids and amines
7.	Oxidations with ruthenium tetraoxide, iodobenzene diacetate and thallium.

Unit – I **Chapter Name: Reduction**

Name of the faculty: Dr B. P. Acharya

Lecture No.	Details of the topic to be covered
1.	Introduction, Different reductive processes
2.	Reduction of alkenes, and alkynes
3.	Reduction of aromatic rings
4.	Reduction of Carbonyl compounds: aldehydes, ketones
5.	Reduction of carboxylic acids, Nitro compounds
6.	Reduction of azo compounds
7.	Reduction of oximes. Hydrogenolysis

Unit – II **Chapter Name: Protecting Groups**

Name of the faculty: Dr. H. Nayak

Lecture No.	Details of the topic to be covered
1.	**Protecting Groups:** Introduction and basic principle of protection.
2.	Detailed discussion on protection of alcohol
3.	Detailed discussion on protection of amine
4.	Detailed discussion on protection of carbonyl
5.	Detailed discussion on protection of carboxyl groups.

Unit – II **Chapter Name: Disconnection Approach**

Name of the faculty: Dr. P. K. Jena

Lecture No.	Details of the topic to be covered
1.	An introduction to synthons and synthetic equivalents
2.	Basic principle of disconnection approach
3.	Basic principle of functional group inter-conversions
4.	the importance of the order of events in organic synthesis
5.	Guidelines for order of events
6.	one group C-X
7.	two group C-X disconnections
8.	chemoselectivity, reversal of polarity.
9.	cyclisation reactions and amine synthesis

Unit – III **Chapter Name: One Group C-C Disconnections**

Name of the faculty: Dr. P. K. Jena

Lecture No.	Details of the topic to be covered
1.	**One Group C-C Disconnections:** One Group C-C Disconnections in alcohols
2.	One Group C-C Disconnections in carbonyl compounds
3.	One Group C-C Disconnections in carbonyl compounds contd.
4.	Regioselecitivity in disconnection
5.	Alkene sysnthesis
6.	use of acetylenes in organic synthesis
7.	use of aliphatic nitro compounds in organic synthesis

Unit – III **Chapter Name: Two Group C-C Disconnections**

Name of the faculty: Dr. P. K. Jena

Lecture No.	Details of the topic to be covered
1.	**Two Group C-C Disconnections:** Basic principles of two group C-C disconnections
2.	Diel's – Alder reaction
3.	Disconnection approach on 1,3- difunctionalised compounds
4.	unsaturated carbonyl compounds, control in carbonyl condensations
5.	Disconnection approach on 1,5-difunctionalised compounds
6.	Michael addition
7.	Robinson annellation

Unit – IV **Chapter Name: Organometallic Reagents**

Name of the faculty: Dr. H. Nayak

Lecture No.	Details of the topic to be covered
1.	Organometallic Reagents :Introduction to organometallics Prepation and properties of Organocadmium
2.	Synthetic applications of Organocadmium
3.	Prepation and properties of organo zinc
4.	Synthetic applications of organozinc
5.	Prepation and properties of organocopper
6.	Synthetic applications of organocopper
7.	Prepation and properties of organopalladium
8.	Synthetic applications of organopalladium
9.	Prepation and properties of organo rhodium
10.	Synthetic applications of organorhodium

Unit – IV **Chapter Name: Synthesis of Some Complex Molecules**

Name of the faculty: Dr. H. Nayak

Lecture No.	Details of the topic to be covered
1.	Retrosynthetic approach in synthesis of camphor and synthesis
2.	Retrosynthetic approach in synthesis of cortisone and synthesis
3.	Retrosynthetic approach in synthesis of reserpine and synthesis

Course Code: CHE(C) 5316 Course Title: Application of Spectroscopy – I

Name of the faculty: Mr. S. R. Panda, Dr. S. Jena, Dr. H. Nayak and Dr. H. S. Sahu

Lesson Plan

Unit No	Name of the Chapter	Topic Title	No. of Lectures	Name of the Faculty
I	Chemical Application of Group Theory	Molecular orbitals of AB_n type molecules	4	Dr.H. S. Sahoo
		Splitting of d orbitals and energy level diagrams	2	
		Normal modes of vibrations	4	
		Molecular orbitals of Td, Oh and square plannar complexes	4	
II	Vibrational Spectroscopy	Spectra of molecules	2	Dr.H. S. Sahoo
		Mode of bonding	3	
		Ehylenediamine and Diketonato complexes	1	
		Raman spectroscopy - active sites of metalloproteins.	2	
	Election Spin Resonance Spectroscopy	ESR ,Hyperfine coupling, spin polarization	3	Dr.(Mrs) S. Jena
		spin –orbit coupling, g-tensors, application	3	
		Application of ESR spectra	3	
III	MössbauerSpectroscopy	Basic principle, Spectral parameters	3	Dr.(Mrs) S. Jena
		quadrupole interactions, magnetic interactions, temperature-dependent effects,	3	
		iron and tin complexes, miscellaneous applications	3	
	Nuclear Magnetic Resonance of Paramagnetic substances in Solution	General principles and NMR shifts	3	Mr. S. R. Panda
		Relaxation mechanism	1	
		Applications	3	
IV	CMR Spectroscopy	General principle and chemical shift	2	Dr. H. Nayak
		Coupling and decoupling mechanism	4	
		Off resonance decoupling	1	
		FT NMR	1	

Course Breakup

Unit – I Chapter Name: Chemical Application of Group Theory

Name of the faculty: Dr.H. S. Sahoo

Lecture No.	Details of the topic to be covered
1.	Symmetry of AB_n type molecules and orbitals
2.	Terms and splitting of energy levels
3.	Bonding in H_2O, Bonding in NH_3
4.	Ligand field theory
5.	Splitting of energy levels in terms of d-orbitals in different geometry
6.	Construction of energy level diagrams
7.	Molecular orbitals of Oh complexes
8.	Molecular orbitals of Td complexes
9.	Molecular orbitals of square planar complexes
10.	Molecular Vibrations-The symmetry of normal vibrations
11.	selection rules for fundamental vibrational transitions (IR and Raman)
12.	Numerical in UV-Vis spectrum of metal complexes
13.	Normal modes of vibrations in molecules
14.	Determination of Normal modes of vibrations in different geometry

Unit – II Chapter Name: Vibrational Spectroscopy

Name of the faculty: Dr.H. S. Sahoo

Lecture No.	Details of the topic to be covered
1.	Spectra of AB_2, AB_3
2.	Spectra of AB_4, AB_5 and AB_6
3.	Types of bonding in different ligands
4.	Types of bonding in ambidentate ligands
5.	Bonding in Ehylenediamine and Diketonato complexes

6.	Applications of resonance
7.	Discussion on Raman spectroscopy
8.	Active sites of metalloproteins.

Unit – II Chapter Name: Electron Spin Resonance Spectroscopy

Name of the faculty: Dr.(Mrs) S. Jena

Lecture No.	Details of the topic to be covered
1.	Introduction to ESR
2.	Hyperfine coupling
3.	spin polarization for atoms
4.	spin polarization
5.	spin polarization for transition metal irons
6.	spin –orbit coupling
7.	significance of g-tensors
8.	Application to transition metal complexes (having one unpaired electron) including biological systems.
9.	application to transition metal complexes

Unit – III Chapter Name: MössbauerSpectroscopy

Name of the faculty: Dr.(Mrs) S. Jena

Lecture No.	Details of the topic to be covered
1.	Basic principle
2.	conditions for Mossbauer spectroscopy
3.	Spectral parameters (Isomer shift)
4.	electric quadrupole interactions
5.	magnetic interactions
6.	temperature-dependent effects
7.	Numerical based on isomer shift
8.	structural deductions for iron complexes
9.	structural deductions for tin complexes

Unit – III Chapter Name: Nuclear Magnetic Resonance of Paramagnetic substances in Solution

Name of the faculty: Mr. S. R. Panda

Lecture No.	Details of the topic to be covered
1.	General NMR principle in paramagnetic substances and effect of electron spin.
2.	Contact shift and pseudo Contact shift
3.	Contact shift and spin density
4.	Nuclear relaxation and factor affecting it in Paramagnetic system.
5.	Application in simple biological systems i.e. Iron Porphyrins, Hemin –Imidazole-Cyanide
6.	NMR of metal nuclides with emphasis on ^{195}Pt
7.	NMR of metal nuclides with emphasis on ^{119}Sn NMR

Unit – IV Chapter Name: CMR Spectroscopy

Name of the faculty: Dr. H. Nayak

Lecture No.	Details of the topic to be covered
1.	General considerations
2.	chemical shift, coupling constants
3.	Chemical shifts in different functional groups
4.	Chemical shifts in different functional groups
5.	Problems associated with ^{13}C.
6.	FT-NMR,
7.	Off resonance decoupling

Course Code: CHE(E) 5317 Course Title: Heterocyclic Chemistry

Name of the faculty: Dr. P. K. Jena, Dr. H. Nayak and Dr. B. P. Acharya

Lesson Plan

Unit No	Name of the Chapter	Topic Title	No. of Lectures	Name of the Faculty
I	Nomenclature of Heterocycles	Hantzsch – Widman system	1	Dr Himansulal Nayak
		Fusion nomenclature	1	
		Replacement nomenclature	2	
	Aromatic Heterocycles	General behaviour	2	
		Criteria of aromaticity	2	
		General reactivity	1	
	Non-aromatic Heterocycles	Strain in heterocycles	3	
		Stereoelectronic effects in heterocycles	2	
II	Principles of Heterocyclic Synthesis Four membered Heterocycles Three membered Heterocycles	Principles of Heterocyclic Synthesis	3	Dr. Pradip Kumar Jena
		Three membered Heterocycles	4	
		Four membered Heterocycles	4	
III	Five membered Heterocycles with one hetero atom Six-Membered Heterocycles with One Heteroatom Six-Membered Heterocycles with Two Heteroatoms	Five membered Heterocycles with one hetero atom	5	Dr Baman Prasad Acharya
		Six-Membered Heterocycles with One Heteroatom	3	
		Six-Membered Heterocycles with Two Heteroatoms	3	
IV	Benzo-Fused Five –membered Heterocycles Meso – ionic Heterocycles	Benzo-Fused Five –membered Heterocycles	6	Dr Baman Prasad Acharya
		Meso – ionic Heterocycles	6	

Course Breakup

Unit – I Chapter Chapter Name: Nomenclature of Heterocycles

Name of the faculty: Dr. Himansulal Nayak

Lecture No.	Details of the topic to be covered
1.	Hantzsch – Widman system for monocyclic heterocycles
2.	fusion nomenclature system
3.	Replacement nomenclature system for monocyclic, fused heterocycles
4.	Nomenclature of spiro and bicyclic molecules

Unit – I Chapter Chapter Name: Aromatic Heterocycles

Name of the faculty: Dr. Himansulal Nayak

Lecture No.	Details of the topic to be covered
1.	General chemical behaviour of aromatic heterocycles, the common structural type – five and six membered,
2.	Benzo and other fused heterocycles
3.	Criteria of aromaticity – bond lengths, ring current and chemical shifts in ^{1}H NMR – spectra for five and six member monocyclic heterocycles;
4.	Criteria of aromaticity – bond lengths, ring current and chemical shifts in ^{1}H NMR – spectra for five and six member monocyclic heterocycles
5.	Heteroaromatic reactivity – basic principle, selectivity and reactivity in five and six membered heteroatomic rings

Unit – I Chapter **Chapter Name: Non-aromatic Heterocycles**

Name of the faculty: Dr. Himansulal Nayak

Lecture No.	Details of the topic to be covered
1.	Introduction; strain – angle strain and bonding in small ring heterocycles
2.	Consequences of angle strain (IR & PMR spectra, conjugative effect, basicity)
3.	Torsional strains about single bond in small ring heterocycles
4.	Basic idea on stereoelectronic effects in saturated six membered heterocycles– anomeric effect and factors affecting it
5.	other related effects and attractive interactions through space.

Unit – II Chapter **Chapter Name: Principles of Heterocyclic**

Name of the faculty: Dr. Pradip Kumar Jena

Lecture No.	Details of the topic to be covered
1.	Basic Principles of nucleophile-electrophile cyclisation
2.	1,3-dipolar reaction [3+2→5]
3.	cycloaddition and hetero Diels Alder reaction [4+2→6] cycloaddition

Unit – II Chapter **Chapter Name: Three membered Heterocycles**

Name of the faculty: Dr. Pradip Kumar Jena

Lecture No.	Details of the topic to be covered
1.	Aziridines: synthesis – Gabriel method, Hassner method
2.	Aziridines: reactions – nucleophilic, electrophilic ring opening reaction, Friedel – Craft reaction.
3.	Oxiranes: synthesis – peracid epoxidation of alkene,
4.	Oxiranes: Darzen reaction, reaction–nucleophilic, electrophilic ring opening reaction, reaction with carbonyl compounds

Unit – II Chapter **Chapter NameFour membered Heterocycles**

Name of the faculty: Dr. Pradip Kumar Jena

Lecture No.	Details of the topic to be covered
1.	Azetidines: synthesis – intramolecular cyclisation, cycloaddition reaction
2.	Azetidines: reaction with H_2O_2, HCl, HCHO, CS_2.
3.	Oxetanes:Sythesis by intramolecular cyclisation, photochemical cycloaddition
4.	Oxetanes: reaction – nucleophilic, electrophilic ring opening reaction.

Unit – III Chapter **Chapter Name: Five membered Heterocycles with one hetero atom**

Name of the faculty: Dr Baman Prasad Acharya

Lecture No.	Details of the topic to be covered
1.	**Five membered Heterocycles with one hetero atom:** Pyrrole: Orientation in electrophilic substitution reaction,
2.	reaction – Gattermannformylation, Friedel – Craft alkylation and acylation
3.	Furan: photochemical cyclisation
4.	reaction – with aldehydes and ketones, maleic anhydride
5.	Thiophene: Reaction – Birch reduct ion, reaction with nitrenes.

Unit – III **Chapter Name: Six-Membered Heterocycles with One Hetero atom**

Name of the faculty: Dr Baman Prasad Acharya

Lecture No.	Details of the topic to be covered
1.	Pyridine: Reaction – radical substitution
2.	Pyrylium salts: synthesis from tert-butyl alcohol
3.	reaction – nucleophilic substitution reaction

Unit – III Chapter **Chapter Name: Six-Membered Heterocycles with Two Hetero atoms**

Name of the faculty: Dr Baman Prasad Acharya

Lecture No.	Details of the topic to be covered
1.	Synthesis of pyrimidines from urea and urea derivatives
2.	synthesis of purines from pyrimidines,
3.	synthesis of 1,3-oxazininium cation derivative and its reaction with ammonia.

Unit – IV **Chapter Name: Benzo-Fused Five –membered Heterocycles**

Name of the faculty: Dr Baman Prasad Acharya

Lecture No.	Details of the topic to be covered
1.	Indole: Synthesis – Reissert synthesis
2.	reaction – basicity, reaction with electrophile (general mechanism), nitrosation
3.	Benzo[b]furan: synthesis – from ortho substituted phenol,
4.	reaction – reactivity and orientation, photosensitized cycloaddition
5.	Benzo[c]furan: synthesis – Retro-Diels-Alder reaction,
6.	reaction – photopolymerisation

Unit – IV **Chapter Name: Meso – ionic Heterocycles**

Name of the faculty: Dr Baman Prasad Acharya

Lecture No.	Details of the topic to be covered
1.	Introduction, general classification,.
2.	chemistry of type – A
3.	1,3-oxazolium-4-olates – synthesis from diazoketones, reaction – with carbonyls
4.	1,3-diazolium-4-aminides - synthesis from nitriles, reaction – cycloaddition reaction,
5.	chemistry of type – B
6.	1,2-diazolium-4-aminides – synthesis from amino pyrazole derivative, reaction – thermal isomerisation