Dr. N.G.P. ARTS AND SCIENCE COLLEGE (Autonomous)

REGULATIONS 2024-25 for Post Graduate Programme
(Outcome Based Education model with Choice Based Credit System)

M.Sc. Degree
(For the students admitted during the academic year 2024-25 and onwards)

Programme: M.Sc. Chemistry

Eligibility

A pass in B.Sc. Chemistry as per the norms set by the Government of Tamil Nadu or an Examination accepted as equivalent there to by the Academic Council subject to such conditions as may be prescribed there to are permitted to appear and qualify for the **Master of Science (CHEMISTRY)** Degree Examination of this College after a course study of two academic years.

Programme Educational Objectives

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. To build the firm foundation in the fundamentals and correlate the application with the current developments in chemistry.
2. To get sufficient expertise in the operational knowledge and laboratory skills in all major fields of chemistry.
3. To emphasize on integrating various disciplines of Science and encourage for interdisciplinary approach.
4. To acquire problem solving capacity, interpretation of results with the use of sophisticated instruments and devises new preparation techniques.
5. To motivate the students to prepare for competitive examinations, job carriers and get trained for industrial entrepreneurship.

PROGRAMME OUTCOMES:

On the successful completion of the program, the following are the expected outcomes.

PO Number	PO Statement
PO1	Make use of knowledge in the major fields of Chemistry which would make them to analyze the significant role played in the field of energy, materials, health sector and environment.
PO2	Select the appropriate modern scientific instruments, to plan and execute in laboratory.
PO3	Interpret the Knowledge and skills to develop independent writing reports and to execute the ideas.
PO4	Take part in research- based knowledge in interdisciplinary approach including design of experiments, analysis and interpretation of data for provide better solution in emerging issues.
PO5	Utilize the knowledge for social, economic, and environmental challenges globally and formulate for life–long learning in the broadest context of technological change.

PG CURRICULUM
PROGRAMME NAME – M. Sc Chemistry
A.Y: 2024-25

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
First Semester												
24CEP1CA	Core -I	Organic Reaction Mechanism	4	1	-	5	60	3	25	75	100	4
24CEP1CB	Core -II	Coordination Chemistry	4	1	-	5	60	3	25	75	100	4
24CEP1CC	Core -III	Thermodynamics and Kinetics	4	1	-	5	60	3	25	75	100	4
24CEP1CD	Core -IV	Analytical Chemistry	4	1	-	5	60	3	25	75	100	4
24CEP1CP	Core Practical -I	Organic Chemistry	-	-	6	6	72	6	40	60	100	3
24CEP1DA	DSE-I	Polymer Chemistry	4	-	-	4	48	3	25	75	100	4
24CEP1DB		Industrial Chemistry										
24CEP1DC		Green Chemistry										
		Total	**20**	**4**	**6**	**30**	**360**				**600**	**23**

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Second Semester												
24CEP2CA	Core -V	Stereochemistry and Pericyclic Reactions	4	1	-	5	60	3	25	75	100	4
24CEP2CB	Core -VI	Bio-Inorganic Chemistry	4	-	-	4	48	3	25	75	100	4
24CEP2CC	Core -VII	Molecular Spectroscopy	4	1	-	5	60	3	25	75	100	4
24CEP2CP	Core Practical -II	Inorganic Chemistry	-	-	8	8	96	3	40	60	100	4
24BCP2EA	EDC	Drug Biochemistry	4	-	-	4	48	3	25	75	100	4
24CEP2DA	DSE - II	Cosmetic Chemistry	4	-	-	4	48	3	25	75	100	4
24CEP2DB		Electrochemistry										
24CEP2DC		Organic Reactions and Reagents										
Total			**20**	**2**	**8**	**30**	**360**				**600**	**24**

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Third Semester												
24CEP3CA	Core -VIII	Chemistry of Natural Products	4	1	-	5	60	3	25	75	100	4
24CEP3CB	Core -IX	Inorganic Chemistry	4	1	-	5	60	3	25	75	100	4
24CEP3CC	Core -X	Quantum Chemistry and Group Theory	4	1	-	5	60	3	25	75	100	4
24CEP3CD	Core -XI	Analytical Spectroscopy	4	1	-	5	60	3	25	75	100	4
24CEP3CP	Core Practical – III	Physical Chemistry	-	-	6	6	72	3	40	60	100	3
24CEP3CT	IT	Internship							40	60	100	2
24CEP3DA	DSE - III	Dye and Textile Chemistry	4	-	-	48	48	3	25	75	100	4
24CEP3DB		Nanomaterials and Nanotechnology										
24CEP3DC		Bio-Organic Chemistry										
Total			**20**	**4**	**6**	**30**	**360**				**700**	**25**

Course Code	Course Category	Course Name	L	T	P	Instruction Hours		Exam (h)	Max Marks			Credits
						Week	Total		CIA	ESE	Total	
Fourth Semester												
24CEP4CA	Core-XII	Synthetic Organic Chemistry	4	1	-	5	60	3	25	75	100	4
24CEP4CB	Core-XIII	Statistical Thermodynamics and Computational Chemistry	4	1	-	5	60	3	25	75	100	4
24CEP4CV	Core-XIV	Project and Viva voce	-	-	-	16	192	-	80	120	200	8
24CEP4DA	DSE - IV	Environmental Chemistry	4	-	-	4	48		25	75	100	4
24CEP4DB		Catalysis										
24CEP4DC		Medicinal Chemistry										
		Total	**12**	**2**	**16**	**30**	**360**				**500**	**20**
			***Grand Total**								**2400**	**92**

Theory : CIA 25: ESE 75
Practical/ IT : CIA 40: ESE 60
Project : CIA 80: ESE 120

***Total Credits does not exceed 92 credits**

BoS Chairman/HoD
Department of Chemistry
Dr. N. G. P. Arts and Science College,
Coimbatore – 641 048

Dr.N.G.P. Arts and Science College
APPROVED
BoS- 15th 06-04-24 | AC - 14th 17-04-24 | GB -

Academic Council CHAIRMAN Dr.N.G.P. Arts and Science College

DISCIPLINE SPECIFIC ELECTIVE

Students shall select the desired course of their choice in the listed elective course during Semesters I-IV

Semester I (Elective I)

List of Elective Courses

S.No.	Course Code	Name of the Course
1	24CEP1DA	Polymer Chemistry
2	24CEP1DB	Industrial Chemistry
3	24CEP1DC	Green Chemistry

Semester II (Elective II)

List of Elective Courses

S.No.	Course Code	Name of the Course
1	24CEP2DA	Cosmetic chemistry
2	24CEP2DB	Electrochemistry
3	24CEP2DC	Organic Reactions and Reagents

Semester III (Elective III)

List of Elective Courses

S.No.	Course Code	Name of the Course
1	24CEP3DA	Dye and Textile Chemistry
2	24CEP3DB	Nanomaterials and Nanotechnology
3	24CEP3DC	Bio-Organic Chemistry

Semester IV (Elective IV)

List of Elective Courses

S.No.	Course Code	Name of the Course
1	24CEP4DA	Environmental Chemistry
2	24CEP4DB	Catalysis
3	24CEP4DC	Medicinal Chemistry

EXTRA CREDIT COURSES

The following are the courses offered under self-study to earn extra credits:

Semester III

S.No.	Course Code	Course Name
1	24CEPSSA	Research Methodology
2	24CEPSSB	Forensic Chemistry and Crime Investigation

Semester - I
CORE I: ORGANIC REACTION MECHANISM

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24CEP1CA	ORGANIC REACTION MECHANISM	CORE	48	12	-	4

Preamble	This course has been designed for students to learn and understand • The basic principles of acids and bases, electronic effects and aromaticity of organic compounds • The mechanism involving in the various aliphatic, aromatic electrophilic and nucleophilic substitution reactions • The basic knowledge about addition, elimination reactions involved in multiple bonds
Prerequisite	Knowledge on Organic Chemistry

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Apply the electronic effects in organic chemistry, stability of organic compounds	K3
CO2	Utilize various methods to determine the reaction mechanisms	K3
CO3	Summarize reaction mechanisms of nucleophilic substitution reactions	K3
CO4	Illustrate the reaction mechanisms of electrophilic substitution reactions	K4
CO5	Compare the addition and elimination reactions	K4

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	✓
CO2		✓	✓		
CO3	✓	✓		✓	
CO4			✓		
CO5	✓	✓		✓	✓

24CEP1CA - ORGANIC REACTION MECHANISM
Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Electronic Effects and Aromaticity** Electron displacement – Inductive and field effect – Delocalized bonds – Rules of resonance - Steric inhibition of resonance - Steric enhancement of resonance – Hyper conjugation – Hydrogen bonding. Aromaticity: Aromatic systems with 2,6 and 10 electrons - Alternant and non-alternant hydrocarbons, systems of more than 10 electrons – Annulenes - Azulenes - Ferrocene and Syndones - Concept of homo aromaticity	12	Text Book
II	**Methods of Determining Reaction Mechanism** Thermodynamic and kinetic requirements of reactions: Types of mechanism - Thermodynamic and kinetic control – Methods of determination of reaction mechanism – Product analysis – Determination of the presence of intermediate – Isolation - Detection - Trapping – Cross over experiments – Isotopic labeling – Isotopic effect – Kinetic evidence. Kinetic methods of determination of reaction mechanism- Curtin-Hammett principle - Hammett equation – Significance of substitution and reaction constant – Hammond postulates - Limitations and deviations – Taft equation	12	Reference Book
III	**Aliphatic & Aromatic Nucleophilic Substitution Reactions** SN_1, SN_2, SN_i and neighboring group participation - Kinetics - Effect of structure, solvent, leaving and entering group and Stereochemistry. Claisen and Dieckmann condensation - Williamson reactions. Mechanism of aromatic nucleophilic substitution - SNAr and Benzyne mechanism - Chichibabin reaction - Cine substitution - Diazonium group as leaving group	12	Text Book
IV	**Aliphatic & Aromatic Electrophilic Substitution Reactions** SE_1 and SE_2 reactions - Mechanisms and reactivity - Keto-enol tautomerism - Halogenation of carbonyl compounds - Stork enamine reaction - Aromatic electrophilic substitution - Orientation and mechanism - Nitration - Halogenation and sulphonation - Friedel-Crafts alkylation - Friedel Crafts acylation and Scholl reaction - Vilsmeyer- Haack reaction - Gattermann reaction - Bischler Napieralski reaction	12	NPTEL
V	**Addition and Elimination Reaction** Addition to C-C and C-O multiple bonds – Electrophilic - Nucleophilic and free- radical additions - Birch reduction - Michael addition - Diels-Alder reaction - Meerwein - Pondorf reduction - Stobbe condensation. Elimination reactions - E_1	12	You Tube Videos

	and E_2 mechanism - Orientation - Hofmann and Saytzeff rules - Elimination versus substitution - Chugaev reaction - Hofmann degradation and Cope elimination - Mechanism and orientation in pyrolytic elimination		
	Total	**60**	

Text Book	**1.**	Michael B. Smith, 2015, "March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure", 7th edition, Willey & USA.
Reference Books	**1.**	Morrison R.N. Boyd R.N. and Bhattacharjee, 2010, "Organic Chemistry", 7th edition, Pearson Education &UK.
	2.	Bansal R.K., 2012, "Organic Chemistry Reaction mechanisms."7th edition, New Age International Private Ltd & New Delhi.
	3.	Lowry and Richardson, 1997, "Mechanism and theory in organic chemistry", 3rd edition. Pearson Publishers & UK
	4.	Clayden J, Greeves N and Warren S, 2014, "Organic Chemistry" 2nd edition, Oxford University Press & UK.

Journal and Magazines	https://www.sciencedirect.com/topics/chemistry/michael-addition
E-Resources and Website	https://archive.nptel.ac.in/courses/104/101/104101115/

Learning Method	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

Semester - I

CORE II: COORDINATION CHEMISTRY

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24CEP1CB	COORDINATION CHEMISTRY	CORE	48	12	-	4

Preamble	This course has been designed for students to learn and understand • The characteristics of different types of matrices • The basic concept of sequence and series • The rule for finding the limit
Prerequisite	Knowledge on Coordination Chemistry

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Interpret the various theories of coordination compounds, MO diagrams of complexes	K3
CO2	Outline the various types of reaction mechanism of coordination complexes	K3
CO3	Compare the various symmetries and geometries of coordination complexes	K3
CO4	Examine the structure and bonding of metal carbonyls	K4
CO5	Analyze the importance of electronic spectroscopy	K4

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓				✓
CO2		✓	✓		
CO3	✓	✓		✓	✓
CO4			✓		✓
CO5	✓	✓		✓	✓

24CEP1CB - COORDINATION CHEMISTRY

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Theories of coordination compounds** Valence bond and Crystal field theory - Splitting of d orbitals in ligand field and different symmetries - Crystal Field Stabilization Energy - Factors affecting the magnitude of 10 Dq - Evidence for crystal field stabilization - Spectrochemical series - Site selection in spinels - Tetragonal distortion from octahedral symmetry - Jahn-Teller distortion - Nephelauxetic effect – Molecular orbital theory - Octahedral - Tetrahedral and square planar complexes - pi bonding and molecular orbital theory	12	Text Book
II	**Reaction mechanism in coordination complexes** Theories of trans effect - The rate law for nucleophilic substitution reaction and mechanism of square planar complexes - Kinetics and substitution reaction mechanism of octahedral complexes. Ligand field effects and reaction rates - Reaction rates influenced by acid and bases - Racemization and isomerization - Mechanism of redox reaction - Outer sphere mechanism - Excited state outer sphere electron transfer reactions - Inner sphere mechanism	12	Reference Book
III	**Structure of coordination complexes** Complexes with coordination number two, three, four, five six, seven and eight - Site preference in trigonal bipyramidal and square pyramidal complexes - Isomerism in five coordinate complexes - Distortion from perfect octahedral symmetry - Trigonal prism - Geometrical isomerism in octahedral complexes	12	Text Book
IV	**Structure and bonding in metal carbonyls** Metal carbonyl complexes - Classification- synthesis - Structure and properties - 18 electron and EAN rule - Nature of M-CO bonding - Binding mode of CO and IR spectra of metal carbonyls - Metal carbonyl hydrides -Metal nitrosyl complexes	12	NPTEL
V	**Electronic spectra and magnetism** Microstates, terms and energy levels for $d^1 - d^9$ ions in cubic and square fields - Selection rules - Band intensities and band widths - Energy level diagrams of Orgel and Tanabe - Sugano - spectra of V^{3+}, Ni^{2+}, Cr^{3+}, Co^{2+} and Fe^{2+} - Calculation of 10Dq and magnetic moment for V^{3+} (oct) and Ni^{2+} (oct) complexes - Charge transfer spectra - Change in magnetic properties of complexes in terms of spin orbit coupling - Temperature independent paramagnetism	12	You Tube Videos

	Total	**60**	

Text Book	**1.**	Huheey. J.E, Keiter. E.A and Keiter. R.L, 2006, "Inorganic Chemistry, Principles of Structure and Reactivity", 4th edition, Pearson Education & UK.
Reference Books	**1.**	Cotton. F.A, Wilkinson. G, Murillo. C.A and Bochmann. M, 1999, "Advanced Inorganic Chemistry", 6th edition, A Wiley - Interscience Publications, John Wiley and Sons & USA.
	2.	Gopalan. R, Ramalingam. V, 2001, "Concise Coordination Chemistry", 3rd edition, Vikas Publishing house pvt. Ltd & New Dehli.
	3.	Gurdeep Raj, 2014, "Advanced Inorganic Chemistry", 12th edition, Geol Publishing House & New Delhi
	4.	Shriver. D. F, Weller. M.T, Overton. T, Rourke. J and Armstrong. F.A, 2014, "Inorganic Chemistry", 6th Edition, New York, W.H. Freeman and Company & USA.

Journal and Magazines	https://www.tandfonline.com/journals/gcoo20
E-Resources and Website	https://www.dalalinstitute.com/wp-content/uploads/Books/A-Textbook-of-Inorganic-Chemistry-Volume-1/ATOICV1-8-3-Orgel-and-Tanabe-Sugano-Diagrams-for-Transition-Metal-Complexes-d1-d9-States.pdf

Learning Method	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

Semester - I
CORE III: THERMODYNAMICS AND KINETICS

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24CEP1CC	THERMODYNAMICS AND KINETICS	CORE	48	12	-	4

Preamble	This course has been designed for students to learn and understand • The Fundamentals of equilibrium and non- equilibrium thermodynamics • The chemical equilibrium and catalysis • The application-oriented knowledge about electrochemistry
Prerequisite	Knowledge on Basic of Thermodynamics

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Analyze the concepts of equilibrium thermodynamics	K4
CO2	Understand the concepts of non-equilibrium thermodynamics	K3
CO3	Analyze the concepts and functions of electrochemical reactions	K4
CO4	Interpret the knowledge about chemical kinetics in molecular reactions	K4
CO5	Apply concept involved in catalysis and adsorption	K3

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2		✓			✓
CO3	✓			✓	
CO4			✓		
CO5	✓	✓		✓	✓

24CEP1CC - THERMODYNAMICS AND KINETICS
Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Equilibrium thermodynamics** Gibbs - Helmholtz equation - Maxwell relations - Third law and its limitations - Thermodynamics of systems of variable compositions - Partial molar quantities and their determination - Chemical potential - Gibbs-Duhem equation - Gibbs-Duhem-Margules equation - Fugacity - Determination of fugacity of gases by graphical method and from equations of state – Variation of fugacity with temperature - Fugacity (or activity) coefficient	12	Text Book
II	**Non-equilibrium thermodynamics** Phenomenological laws and Onsager Reciprocal relations - Conservation of mass and energy in closed and open system- Entropy production in heat flow and chemical reactions - Entropy production and entropy flow in open systems - Principles of microscopic reversibility - Onsager's theory - Validity and its verification	12	Reference Book
III	**Electrochemistry** Activity - Mean ion activity and mean activity coefficient of electrolytes in solution - Debye-Huckel theory and limiting law - Debye-Hückel-Onsager equation verification and limitations. The electrical double layer - Structure and models (Helmholtz, Guoy-Chapman and Stern) - Kinetics of electrode processes - Current-potential curve - Butler Volmer relation and its approximations - Tafel equation - Charge transfer resistance	12	Text Book
IV	**Chemical Kinetics - I** Theories of reaction rates – Collision - transition State - Lindemann - Hinshelwood - Rice – Ramsperger – Kassel theory (RRK), Rice–Ramsperger – Kassel–Marcus (RRKM) theory - Slater treatments - Fast reaction kinetics - Stopped flow method - Chemical relaxation method	12	NPTEL
V	**Chemical Kinetics - II** Homogenous catalysis - Hammett acid-base catalysis - Acidity function - Enzyme catalysis – Michaelis - Menton kinetics - Lineweaver Burk plot – Influence of PH and temperature on enzyme catalysis Heterogeneous catalysts - Adsorption and free energy relation at interfaces – Gibbs adsorption isotherm – Adsorption isotherms (Langmuir and BET) – Measurement of surface area – Kinetics of heterogeneous catalysis (Langmuir	12	You Tube Videos

	Hinshelwood mechanism and Eley-Rideal mechanism)		
	Total	**60**	

Text Book	**1.**	Atkins. P and Julio de Paula, 2014, "Physical Chemistry" 10th edition, Oxford University Press & UK.
Reference Books	**1.**	Glasstone. S, 2008, "Thermodynamics for Chemists", 11th edition, Ewp Publishers & USA.
	2.	Grow. D.R, 1994, "Principles and applications of electrochemistry", 4th edition, CRC Press publishers & UK.
	3.	Laidler. K.J, 2003, "Chemical Kinetics", 3rd edition. Pearson Education Publishers & India.
	4.	Bockris. J.O.M and Reddy A. K. N, 1998, "Modern Electrochemistry",4th edition, Plenum Press & USA.

Journal and Magazines	https://link.springer.com/journal/10800
E-Resources and Website	https://archive.nptel.ac.in/courses/104/101/104101128/

Learning Method	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

Semester - I
CORE IV: ANALYTICAL CHEMISTRY

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24CEP1CD	ANALYTICAL CHEMISTRY	CORE	48	12	-	4

Preamble	This course has been designed for students to learn and understand • The nature of errors and their types • Various techniques involved in chromatography • The thermo analytical, Radiochemical, Fluorescence and electroanalytical techniques
Prerequisite	Knowledge on Analytical Chemistry

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Identify the nature of errors and their analysis	K3
CO2	Apply the various methods of chromatographic techniques	K3
CO3	Examine the Spectrophotometry, XRD and Fluorescence Spectroscopy	K3
CO4	Explain the basic analysis of Thermal methods of analysis	K4
CO5	Analyze the various electroanalytical techniques	K4

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2		✓			✓
CO3	✓				✓
CO4		✓	✓	✓	
CO5	✓		✓	✓	✓

24CEP1CD - ANALYTICAL CHEMISTRY
Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Data and error analysis** Types of errors (accuracy, precision, significant figures) – Frequency distributions (Binomial, Poisson and normal). Describing data - Population and sample - Mean - Variance and standard deviation. Way of quoting uncertainty - Robust estimators - Repeatability and reproducibility of measurements. Hypothesis testing - Levels of confidence and significance - Analysis of residuals	12	Text Book
II	**Chromatography** Principles, instrumentation and uses of ion exchange - Paper - Thin-layer and column chromatography – HPTLC (High Performance Thin Layer Chromatography) - HPLC (High Performance Liquid Chromatography) – GC-MS (Gas Chromatography and Mass Spectroscopy) - GC-FID (Gas Chromatography and Field Ionization Detector), GC-ECD (Gas Chromatography and Electron Capture Detector) and GC-PFPD (Gas Chromatography and Pulsed Flame Photometric Detector	12	Reference Book
III	**Spectrophotometry, XRD and fluorescence spectroscopy** Principles, instrumentation and applications of Atomic Absorption Spectrophotometry (AAS) - Flame Emission Spectroscopy (FES) and Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES) - Single crystal and powder XRD (X-ray diffraction) - Fluorescence spectroscopy	12	Text Book
IV	**Thermal methods of analysis** Principles - Instrumentations and applications of thermogravimetry analysis (TGA) - Differential Thermal Analysis (DTA) - TGA and DTA of CaC2O4.H2O (Calcium oxalate monohydrate), CaCO3 (Calcium carbonate) - Differential Scanning Calorimetry (DSC) - PLA (poly lactic acid)	12	NPTEL
V	**Electroanalytical techniques** Electrochemical sensors - Ion-sensitive electrodes - Glass membrane - Solid - liquid membrane - Gas sensor. Principles and instrumentations of polarography - Cyclic voltammetry - Amperometric titrations	12	You Tube Videos
	Total	**60**	

Text Book	**1.**	Skoog and West, 2014, "Instrumental methods of analysis" 6th edition, Cengage Publishers & USA.
Reference Books	**1.**	Sharma B.K, 2011, "Instrumental methods of chemical analysis", 1st edition, Krishna Prakashan Media pvt. Ltd & New Delhi
	2.	Willard H.W, Merrit. L.I, Dean. J.J.A and Settle. F.A, 2004, "Instrumental methods of analysis". 7th edition, CBS Publishers & New Delhi
	3.	Srivastava.V.K and Srivastava. K.K, 1985, "Introduction to Chromatography," 2nd edition, Holden Day & New York.
	4.	Hibbert. D.B and Gooding. J.J, 2006, "Data Analysis for Chemistry", 1st edition, Oxford University Press & UK.

Journal and Magazines	https://www.jscimedcentral.com/journal-info/JSM-Spectroscopy-and-Chromatography
E-Resources and Website	http://www.issp.ac.ru/ebooks/books/open/X-Ray_Spectroscopy.pdf

Learning Method	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

24CEP1CP	ORGANIC CHEMISTRY	SEMESTER I

Total Credits: 3
Total Instructions Hours: 72 h

S.No	Contents
1	Analysis of two component mixtures-separation and characterization of the components-I
2	Analysis of two component mixtures-separation and characterization of the components-II
3	Analysis of two component mixtures-separation and characterization of the components-III
4	Analysis of two component mixtures-separation and characterization of the components-IV
5	Analysis of two component mixtures-separation and characterization of the components-V
6	Estimation of Phenol
7	Estimation of Aniline
8	Estimation of Glucose
9	Preparation of Acetylsalicylic acid from methyl salicylate
10	Preparation of Benzilic acid from benzoin (rearrangement)
11	Preparation of Benzanilide from benzophenone (rearrangement)
12	Preparation of p-Bromoacetanilide from aniline

Note: Any 10 Experiment

References

1 N.S.Gnanaprakasam and Ramamurthy.G,1998, "Organic Chemistry-Lab Manual",S.Viswanathan Co.Pvt.Ltd & Chennai

2 B.S.Furniss, Brain.S, Hannaford A.J, and Antony.J, 2016, "Vogel's Text book of Practical Organic Chemistry", 5th Edition, ELBS/Longman & UK

3 F.G.Mann, Saunders, 2011, "Practical Organic Chemistry", 4th Edition, Pearson & India

4 V.K.Aluwalia, Bhagat.P and Agarwal.R, 2005, " Laboratory Techniques in Organic Chemistry",", 4th Edition I.K .International Publishing House Pvt .Ltd & New Delhi

Semester - I

DSE I: POLYMER CHEMISTRY

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24CEP1DA	POLYMER CHEMISTRY	DSE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • The significance of polymers • Polymer structure, properties and characteristics • Polymer processing techniques and its applications
Prerequisite	Knowledge on Polymer Chemistry

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Summarize the mechanism of polymerization process	K3
CO2	Categorize the different polymerization techniques	K4
CO3	Analyze the various characteristics of polymers	K4
CO4	Examine the structure, properties and fabrication techniques	K4
CO5	Summarize the functionalities of commercial polymers	K3

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1		✓	✓	✓	✓
CO2		✓			
CO3	✓	✓		✓	
CO4			✓		
CO5	✓	✓		✓	✓

24CEP1DA - POLYMER CHEMISTRY
Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Chemistry of polymers** Addition and Condensation polymers - Mechanism (free radical, ionic, Zeigler-Natta polymerization) – Kinetics of polymerization – Kinetic chain length –Factors affecting chain polymerization - Inhibition and retardation – Carother's equation. Difference between polymers and plastics- Compounding of plastics - Fillers, plasticizers, colourants, auto oxidants, fire retardants and thermal stabilizers	10	Text Book
II	**Polymerization techniques and types** Polymerization Techniques (bulk, solution, suspension, emulsion, melt, interfacial solid-gas phase condensation). Types of copolymerization – Free radical - Ionic – Polycondensation – Copolymer equation – Significance – Monomer and radical reactivity – Q-e scheme - Determination of monomer reactivity ratio – Mayo-Lewis and Fineman Ross methods – Block and graft copolymerization – Methods of preparation and mechanism	08	Reference Book
III	**Polymer characteristics and characterization** Types of degradation – Thermal- Mechanical - Photodegradations - The concept of number average and weight average molecular weight methods. Separation of polymers – Precipitation and analytical methods – Determination of molecular weights – Osmotic pressure - Viscosity - Ultra centrifugation. Analysis and testing of polymers - Spectroscopic methods, x-ray diffraction study	10	Text Book
IV	**Polymer properties and fabrication** Morphology and order in crystalline polymers – Configuration of polymer chain – Tacticity (Mono and disubstitute polyethylene, polypropylene, polybutadiene). Significance of stereoregularity - Polymer structure and physical properties – Crystalline melting point (Tm) – Melting points of homogeneous series – Effect of chain flexibility and heat of fusion - The glass transition temperature (Tg) Relationship between Tm and Tg - Fabrications of polymers – Moulding, casting and spinning	10	NPTEL
V	**Commercial polymers and applications** Preparation, properties and applications of polyethylene - Polyvinyl chloride - Polyamides - Polyesters - Polymethylmethacrylate - Polystyrene - Polycarbonates - Phenolic resins and epoxy resins. Types and applications of dendrimers and conducting polymers. Liquid crystalline	10	You Tube Videos

	polymers		
	Total	**48**	

Text Book	**1.**	Gowariker. V.R and Viswanathan. N.V, 2019, "Polymer science", 3rd Edition, New Age International Publishers & New Delhi
Reference Books	**1.**	Billmeyer. F.W, 2007, "Text book of Polymer science", 3rd Edition, Wiley India Pvt. Ltd & New Delhi.
	2.	Manas Chanda, 2013, "Introduction to Polymer Science and Chemistry", 2nd Edition, CRC Press & USA.
	3.	Goel R. Fried, 2003, "Polymer science and technology", 2nd Edition, Prentice Hall & New Jersey
	4.	George Odian,2007, "Principles of polymerization", 4th Edition, Wiley India Pvt. Ltd & New Delhi.

Journal and Magazines	https://onlinelibrary.wiley.com/journal/26424169
E-Resources and Website	https://nitsri.ac.in/Department/Chemical%20Engineering/M3__Polymer_Technology.pdf

Learning Method	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

Semester - I
DSE I: INDUSTRIAL CHEMISTRY

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24CEP1DB	INDUSTRIAL CHEMISTRY	DSE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • The properties and manufacture of glass products • The coating techniques • The classification and properties of alloys
Prerequisite	Knowledge on industrial chemistry

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Summarize the properties and preparation of glass products	K3
CO2	Utilize the coating process of paint and pigments	K3
CO3	Illustrate the various types and properties of alloying materials	K3
CO4	Analyze the types and manufacturing process of fertilizer	K4
CO5	Develop the various types and manufacturing process of cement and ceramics	K3

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	✓
CO2		✓	✓		
CO3	✓	✓		✓	✓
CO4			✓		
CO5	✓	✓		✓	✓

24CEP1DB - INDUSTRIAL CHEMISTRY

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Silicon industries** Glass: Glassy state and its properties, classification (silicate and non-silicate glasses). Manufacture and processing of glass - Composition and properties of the glasses - Soda lime - Lead - Armoured - Safety - Borosilicate - Fluorosilicate - Coloured -Photosensitive. Chemistry of refractories and Abrasives	10	Text Book
II	**Surface coatings** Objective of coating surfaces - Preliminary treatment of surface - Classification of surface coatings - Paints and pigments - Formulation and composition of Oil paint, Vehicle, Pigments, toners and lakes pigments, Fillers, Thinners, Enamels, emulsifying agents - Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint). Wax polishing-Water and Oil paints - Metallic coatings (electrolytic and electroless). Metal spraying and anodizing	10	Reference Book
III	**Alloys** Classification of alloys (ferrous and non-ferrous) -Specific properties of elements in alloys. Manufacture of Steel (removal of silicon decarbonization, demanganization, desulphurization and dephosphorization, Surface treatment, argon treatment, heat treatment, nitriding, carburizing). Composition and properties of different types of steels	10	Text Book
IV	**Fertilizer** Different types of fertilizers. Manufacture of the following fertilizers: Urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphates, polyphosphate, superphosphate, and triple super phosphate. Compound and mixed fertilizers - Potassium chloride - Potassium sulphate.	10	NPTEL
V	**Ceramics and cements** Ceramics: clays and feldspar-Manufacture of ceramics and their types - High technology ceramics and their applications - Superconducting and semiconducting oxides - Fullerenes - Carbon nanotubes and carbon fibre. Cements: Classification of cement - Ingredients and their role - Manufacture of cement and the setting process- Quick setting cements	8	You Tube Videos
	Total	**48**	

Text Book	**1.**	Jain and Jain , 2017," Engineering Chemistry", 17th edition , Dhanpat Rai & Sons&New Delhi
Reference Books	**1.**	Sharma.B .K , 2003 ,"Industrial Chemistry", 22nd edition , Goel Publishing House & Meerut.
	2.	White. H.L, 1986, "Introduction to Industrial Chemistry", 1st edition, A Wiley Interscience Publication & USA.
	3.	Pawar. R.A, Gugale. G.S, Nagawade. A.V, Gadave. K.M, 2017, "A Book of Industrial Chemistry",1st edition, NiraliPrakashan Publishers & Pune.
	4.	Alan Heaton, 1996, "An Introduction to Industrial chemistry", 3rd edition, Chapman & Hall Publishers & UK.

Journal and Magazines	https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SCH1604.pdf
E-Resources and Website	https://www.scribd.com/document/491788610/Metal-and-Metal-Alloys-Notes#

Learning Method	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

Semester - I
DSE I : GREEN CHEMISTRY

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24CEP1DC	GREEN CHEMISTRY	DSE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • The basics of Green chemistry • The advantages of green synthetic methods of organic compounds • The reactions and applications of green chemistry
Prerequisite	Knowledge on Green Chemistry

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Gain knowledge on green chemistry principles	K3
CO2	Understand various methods of Green synthetic routes	K3
CO3	Develop the basic knowledge of the various green reactions	K3
CO4	Compare Aqueous phase, Solid state and PTC reactions	K4
CO5	Analyze the Photochemical, Microwave, Sonication and Ionic liquid reactions	K3

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	✓
CO2		✓	✓		
CO3	✓	✓		✓	
CO4	✓		✓		✓
CO5	✓	✓		✓	✓

24CEP1DC - GREEN CHEMISTRY
Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Principles of green chemistry** Twelve principles of green chemistry - Explanation. Planning a green synthesis - Percentage atom utilization - Evaluating type of reaction involved - Selection of appropriate solvent – Reagent - Protecting groups - Use of catalyst – Energy requirement	10	Text Book
II	**Green synthesis** Adipic acid - Catechol - Disodiumiminodiacetate - Hoffmann elimination - Benzoic acid from methyl benzoate - Toluene - Diels-Alder reaction- Decarboxylation - Safe marine antifoulant	10	Reference Book
III	**Green reactions** Mechanism and application of Acyloin condensation - Aldol condensation – Arndt-Eistert-synthesis - Baeyer-Villiger oxidation - Baker Venkatraman Rearrangement -Barbier reaction - Barton reaction - Baylis-Hillman Reaction - Backmann rearrangement - Benzil-Benzilic rearrangement - Biginelli reaction	10	Text Book
IV	**Aqueous phase, solid state and PTC reactions** Aqueous phase reaction - Hydrolysis of methyl salicylate – Chalcone - p-ethoxy acetanilide- p-acetamido phenol - Vanillidene acetone. SFE (Super Critical Fluid Extraction) - Liquid CO_2 in green synthesis. Solid state - Diphenyl carbinol - Phenyl benzoate - Azomethines. PTC (Phase Transfer Catalyst) reaction – Phenylisocyanide- Diphenyl-7-Hydroxy-coumarin	10	NPTEL
V	**Photochemical, microwave, sonication and ionic liquid reactions** Photochemical reactions - Benzopinacol, trans Azobenzene to cis-azobenzene, trans stilbene to cis-stilbene. Microwave reactions-3-methyl-1-phenyl-5-pyrazolone, copper phthalocyanine. Sonication reaction - Butyraldehyde, 2-chloro-N-Aryl anthranilic acid. Ionic liquid reactions-1-Acetyl naphthalene - Ethyl-4-methyl-3Cyclohexenecarboxylate	8	You Tube Videos
	Total	**48**	

Text Book	**1.**	Ahluwalia. V. K. 2011, "Green Chemistry-Greener Alternatives to synthetic alternatives to synthetic organic transformations" , 1st edition, Narora Publishing House & New Delhi.
Reference Books	**1.**	Ahluwalia V. K, 2019, "Green Chemistry", 3rd edition, Ane Books India & NewDelhi.
	2.	Asim. K. Das and Madhua. Das, 2012, "Environmental Chemistry with Green Chemistry" , Books and Allied Pvt. Ltd &New Delhi.
	3.	Rashmi S, Srivastava M.M, 2009. "Green Chemistry" 4th edition, NarosaPublishing House & New Delhi.
	4.	Indu Tucker Sidhwani, Rakesh K. Sharma, 2020," An Introductory Text on Green Chemistry: For Undergraduate Students", 1st edition, Wiley & Sons &Germany

Journal and Magazines	https://simons.hec.utah.edu/papers/BOOK2_C7.PDF
E-Resources and Website	https://www.uou.ac.in/sites/default/files/slm/MSCCH-604.pdf

Learning Method	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

BoS Chairman/HoD
Department of Chemistry
Dr. N. G. P Arts and Science College
Coimbatore – 641 048

Dr.N.G.P. Arts and Science College
APPROVED

BoS-	AC -	GB -
06-04-24	17-04-24	

CHAIRMAN
Dr.N.G.P. Arts and Science College

Semester - II
CORE : STEREOCHEMISTRY AND PERICYCLIC REACTIONS

Semester	Course Code	Course Name	Category	L	T		P	Credits
II	24CEP2CA	STEREOCHEMISTRY AND PERICYCLIC REACTIONS	CORE	48	12		-	4

Preamble	This course has been designed for students to learn and understand • The basic principles of stereochemistry and conformational analysis of organic compounds • About photochemistry and pericyclic reaction mechanisms • The basic knowledge about various molecular rearrangement reactions
Prerequisite	Knowledge in organic chemistry, stereochemistry and reaction mechanisms

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Outline the stereochemistry of organic molecules in 3-D arrangements	K3
CO2	Interpret the various methods of conformational analysis of organic molecules	K3
CO3	Categorize the various light induced photo reactions and their rearrangements	K4
CO4	Examine the basic principles involved in the pericyclic reactions	K3
CO5	Analyze the reaction mechanism of various molecular rearrangement reactions	K4

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	
CO2		✓			✓
CO3	✓	✓		✓	✓
CO4	✓	✓	✓	✓	✓
CO5	✓	✓	✓		✓

24CEP2CA	CORE: STEREOCHEMISTRY AND PERICYCLIC REACTIONS

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Stereochemistry** Stereoisomerism – Symmetry – Enantiomers and diastereomers – R and S / E and Z nomenclature. Topicity – Homotopic, heterotopic, enantiotopic and diastereotopic systems. Stereochemistry of biphenyls, allenes, spiranes, ansa compounds and helical structures. Asymmetry synthesis – Cram's and Prelog's rules	12	Text Book
II	**Conformational Analysis** Conformational analysis of acyclic system: Conformations of ethane, butane and halogenoalkanes - Effect of conformation on reactivity - Addition and elimination reaction of acyclic systems. Conformational analysis of cyclic compounds: Cyclohexane - Mono and disubstituted cyclohexane. Conformation and reactivity of cyclohexane derivatives. Conformation of decalins	12	Reference Book
III	**Organic Photochemistry** Fundamental concepts – Energy transfer – Characteristics of photoreactions – Photoreduction, photooxidation and photosensitization. Photoreactions of ketones and enones – Norrish type I and II reactions – Paterno-Buchi reaction – Photo-Fries rearrangement – Photochemistry of alkenes, dienes and aromatic compounds – di- π-methane rearrangement – Barton reaction	12	Text Book
IV	**Pericyclic Reactions** Concerted reactions: Conservation of orbital symmetry – Woodward-Hoffman rules. Electrocyclic reactions – 1,3-dienes and 1,3,5-trienes. Analysis of reaction using orbital correlation diagram and FMO methods. Cycloadditions [2+2] and [4+2] – Analysis using correlation diagram and FMO methods. Sigmatropic rearrangements – Cope and Claisen rearrangements	12	NPTEL
V	**Molecular Rearrangements** Classification – Mechanism and applications of Wagner - Meerwein, Neber, Baeyer–Villiger, Dienone phenol, Favorski, Benzidine, Stevens, Schmidt, Lossen and Wallach rearrangements	12	You Tube Videos
	Total	**60**	

Text Book	**1.**	Nasipuri D, 2018, "Stereochemistry of Organic Compounds: Principles and Applications", 3rd Edition, New Age International Publishers & New Delhi
Reference Books	**1.**	Sanyal S. N, 2019, "Reactions, Rearrangements and Reagents", 4th Edition, Bharati Bhawan Publishers & Distributors & New Delhi
	2.	Michael B Smith B, 2015, "March's Advanced Organic Chemistry: Reactions Mechanisms and Structure", 7th Edition, Wiley & New Delhi
	3.	Kalsi P. S, 2022, "Stereochemistry: Conformation and Mechanism", 11th Edition, New Age International Private Limited & New Delhi
	4.	DePuy C. H, 1972, "Molecular Reactions and Photochemistry", 1st Edition, Prentice Hall & New Delhi

Journal and Magazines	Chatwal G. R, 2010, "Organic Photochemistry", 1st Edition, Himalaya Publications house & New Delhi
E-Resources and Website	https://www.alchemyst.co.uk/pdf/Organic/pericyclics.pdf

Learning Method	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

Semester - II

CORE: BIO-INORGANIC CHEMISTRY

Semester	Course Code	Course Name	Category	L	T	P	Credits
II	24CEP2CB	BIO-INORGANIC CHEMISTRY	CORE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • The structure and bonding of Cobalamines, Heme and Non-Proteins Hemoglobin • The structure and reactions of Metal alkylidene, alkene and alkyne complexes • The importance of trace elements in biological systems and medicinal applications of bioinorganic compounds
Prerequisite	Knowledge on Bio-Inorganic compounds

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Explore the broad idea about the Cobalamines, Heme and Non-Proteins Hemoglobin	K4
CO2	Analyze the synthesis and reactivity of Metal alkylidene, alkene and alkyne complexes	K4
CO3	Examine the synthesis and applications of metallocene compounds	K3
CO4	Interpret toxic and non-toxic metal ions to the biological systems	K4
CO5	Survey the role of inorganic complexes in medicinal applications	K4

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓			✓	✓
CO2		✓	✓		
CO3	✓	✓		✓	
CO4			✓		
CO5	✓	✓		✓	✓

24CEP2CB	CORE: BIO-INORGANIC CHEMISTRY

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Cobalamines, Heme and Non-Proteins Hemoglobin** Reactions of the alkyl cobalamins – One-electron Reduction and Oxidation – Co-C Bond Cleavage – Coenzyme B12 – Alkylation reactions of methyl cobalamin. Hemoglobin and Myoglobin – Oxygen transport and storage – Electron transfer and Oxygen activation. Cytochromes, Ferredoxins and Rubredoxins – Model systems, mononuclear non-heme iron enzymes	10	Text Book
II	**Metal ions in biological system** Classification of elements according to their action in biological systems, Na & K ion transport, Na / K pump. Consequences of excess and deficiency of trace metals. Toxicity of metal ions (Hg, Pb, Cd and As) - Reasons for toxicity. Use of chelating agents in medicine - Cis platin mode of action	09	Reference Book
III	**Nitrogen fixation and Photosynthesis** Nitrogenase enzyme: Introduction, types of nitrogen fixing microorganisms, metal clusters in nitrogenase. Nitrogen fixation pathway. Biological redox reactions. Chlorophyll - Light and dark phase reactions of photosynthesis	10	Text Book
IV	**Metal-alkylidene/alkene/alkyne complexes** Synthesis of alkylidene complexes in low oxidation states and in high oxidation states. Alkene complexes - Synthesis – Bonding - Reactivity - Ligand substitution – Reactions with nucleophiles. Alkyne complexes – Synthesis by reduction method. Insertion reactions - Cobalt catalyzed alkyne cycloaddition with nitrile, alkene and alkyne	10	NPTEL
V	**Metallocenes** Cyclopentadienyl complexes - Metallocenes - Synthesis of metallocenes - Reactions of metallocenes – Bonding, redox and substitution reactions of ferrocene - Application of ferrocenes - Blood glucose sensors - Synthesis of bent metallocene complexes – Reactivity of bent metallocenes - Substitution, bonding and structure of arene complexes	09	You Tube Videos
	Total	**48**	

Text Book	**1.**	Asim K Das, 2013, "Bioinorganic chemistry", 5th Edition, Books & Allied Pvt Ltd & Kolkatta
Reference Books	**1.**	Stephen J Lippard, 2005, "Principles of Bioinorganic Chemistry", 2nd Edition, Panima publishing corporation & New Delhi
	2.	Rosette M Roat-Malone, 2007, "Bioinorganic chemistry" - A short course, 2nd Edition, A John Wiley & Sons Inc. Publication & US
	3.	Dieter Rehder, 2014, "Bioinorganic chemistry ", 1st Edition, Oxford University Press & New Delhi
	4.	Dharam Prakash, 2018, "Bioinorganic chemistry", 1st Edition, Arjun Publishing House & New Delhi

Journal and Magazines	https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000005CH/P000670/M013991/ET/1455878224CHE_P15_M5_e-Text.pdf
E-Resources and Website	https://books.google.co.in/books/about/Metallocenes_An_Introduction_to_Sandwich.html?id=pwppQgAACAAJ&redir_esc=y

Learning Method	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

Semester - II
CORE: MOLECULAR SPECTROSCOPY

Semester	Course Code	Course Name	Category	L	T	P	Credits
II	24CEP2CC	MOLECULAR SPECTROSCOPY	CORE	48	12	-	4

Preamble	This course has been designed for students to learn and understand • The principle and application of different types of molecular spectroscopy • The basic knowledge on influence of electromagnetic radiation and associated physical events • The use of spectroscopic techniques for structural investigation
Prerequisite	Knowledge on application of electromagnetic spectrum

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Outline the fundamental concepts of microwave spectroscopy	K3
CO2	Apply intense knowledge on the principles and instrumentation of IR and electronic spectroscopy	K4
CO3	Develop the basic principles of NMR spectroscopy	K5
CO4	Analyze the 2D techniques involved in NMR spectroscopy	K4
CO5	Utilize the basic principles involved in ESR spectroscopy to understand the structural features of complexes	K4

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓		✓	✓
CO2		✓	✓		✓
CO3	✓	✓		✓	✓
CO4			✓		
CO5	✓	✓		✓	✓

24CEP2CC	CORE: MOLECULAR SPECTROSCOPY

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Microwave Spectroscopy** Electromagnetic radiation - Interaction of electromagnetic radiation with molecules - Types of molecular spectroscopy - Factors affecting line width and intensity - Signal to noise ratio and resolving power. Microwave Spectroscopy - Rotation of molecules - Rotational spectra of rigid rotator - Intensities of rotational lines - Effect of isotopic substitution - Rotational spectrum of non-rigid rotator - Linear & symmetric top molecules - Stark effect. Applications of microwave spectroscopy - Determination of bond length-Bond angle -Dipole moment -Atomic mass	12	Text Book
II	**Infrared and Electronic spectroscopy** Electronic Spectra of diatomic molecules - Frank Condon principle - Vertical transitions - Selection rules - Parity, symmetry and spin selection rules - Polarization of transitions - Russell Sanders coupling - Different types of electronic transitions -Instrumentation of UV-Visible spectroscopy Infrared Spectroscopy: Vibration of diatomic molecule - Harmonic and anharmonic oscillators – Fermi resonance - Selection rules - Vibrations of polyatomic molecules - Molecular vibrations - Types of molecular vibrations - Rotational vibrational spectra of linear and symmetric top molecules – Factors influencing vibrational frequencies - Fourier transformation in IR spectroscopy - Instrumentation	12	Reference Book
III	**Nuclear Magnetic Resonance (NMR) Spectroscopy-I** Chemical shift - Factors affecting chemical shift - Nuclear spin states and NMR active nuclei - Nuclear magnetic moments - Mechanism of resonance absorption - Population of nuclear spin states. Multiplicity – Coupling constant – First order and second order proton - Dependence of J on dihedral angle – Vicinal and geminal coupling constants – Karplus equation – Long range coupling constants – Factors influencing coupling constant - Splitting of NMR signals - AB, AX and AMX types - Influence of stereochemical factors on chemical shift of protons	12	Text Book
IV	**Nuclear Magnetic Resonance (NMR) Spectroscopy-II** ^{13}C nucleus - Chemical shift - Spin -spin splitting - Double resonance techniques - Homonuclear and hetero nuclear	12	NPTEL

	decoupling - Broad band decoupling - Off resonance decoupling - ^{13}C relaxation mechanism - Overhauser effect FT and 2D NMR spectroscopy: FID-DEPT-J-resolved-H-H-COSY- C-H-COSY -NOESY		
V	**Electron Spin Resonance (ESR) Spectroscopy** Theory - Electron spin - Zeeman effect – Presentation of the spectrum - EPR spectrum of hydrogen and methyl radicals (first order treatment) - g factor - Hyperfine splitting - Nuclear spin interaction with electron spin - Hyperfine coupling constants - EPR spectra of organic radicals (AA and AB type). Theory of EPR spectroscopy – Spin densities and McConnell relationship – Factors affecting the magnitude of g and A-Tensors in metal species – Zero-field splitting- Kramer's degeneracy - Applications of EPR	12	You Tube Videos
	Total	**60**	

Text Book	**1.**	Pavia. D. L, 2011, "Spectroscopy", 5th Edition, Brooks/Cole Publications & UK
Reference Books	**1.**	William Kemp, 2008, "Organic Spectroscopy", 3rd Edition, Palgrave Publications & US
	2.	Banwell, C. N, 2017, "Fundamentals of molecular spectroscopy", 4th Edition, Mc Graw Hill Book Company & London
	3.	Kalsi P. S, 2014, "Spectroscopy of Organic Compounds", 6th Edition, New Age International (P) Ltd & New Delhi
	4.	Silverstein R. M, 2009, "Spectrometric Identification of Organic compounds, 6th Edition, John Wiley Publications & Germany

Journal and Magazines	Sharma Y. R, 2013, "Elementary Organic Spectroscopy", 5th Edition, S. Chand and Company Pvt Ltd & New Delhi
E-Resources and Website	https://ccsuniversity.ac.in/bridge-library/pdf/Msc-chemistry-psct-unit-3.pdf

Learning Method	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

Semester – II CORE PRACTICAL: INORGANIC CHEMISTRY							
Semester	**Corse Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
II	**24CEP2CP**	**INORGANIC CHEMISTRY**	**CORE**	**-**	**-**	**96**	**4**

Preamble	This course has been designed for students to learn and understand • The method of analysis to identify common and rare cations • The practice to estimate metal ions present in the mixture • The procedure to perform complexometric and colorimetric estimations
Prerequisite	Knowledge on classification of metals in to groups

Course Outcomes (Cos)		
CO Number	**Course Outcomes (COs) Statement**	**Bloom's Taxonomy Knowledge Level**
CO1	Evaluate cations present in the inorganic mixtures	K4
CO2	Analyze common and rare cations present in the inorganic mixtures	K4
CO3	Estimate gravimetrically the metals present in the mixture	K3
CO4	Interpret the complexometric titration of metals	K4
CO5	Identify metal concentration using colorimeter	K3

Mapping with Program Outcomes:					
Cos / POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1		✓	✓	✓	✓
CO2	✓	✓			✓
CO3	✓		✓	✓	✓
CO4	✓	✓		✓	✓
CO5	✓	✓	✓	✓	

24CEP2CP	CORE PRACTICAL: INORGANIC CHEMISTRY

Syllabus

S.No	Contents
1	Analysis of Inorganic Mixture - I
2	Analysis of Inorganic Mixture - II
3	Analysis of Inorganic Mixture - III
4	Analysis of Inorganic Mixture - IV
5	Volumetric and gravimetric estimations of Cu and Ni
6	Volumetric and gravimetric estimations of Zn and Cu
7	Volumetric and gravimetric estimations of Fe and Zn
8	Estimation of Calcium
9	Estimation of Magnesium
10	Estimation of Zinc
11	Estimation of Iron
12	Estimation of Copper

Manuals	1.	Venkateswaran V, Veeraswamy R and Kulandaivelu A. R, 2017, "Principles of Practical Chemistry", 1st Edition, Sultan Chand & Sons & New Delhi
	2.	Ramanujam V. V, 1988, "Inorganic Semimicro Qualitative Analysis", 3rd Edition, National Pubs & London

Learning Method	Hands on Experiments

Focus of the Course	Skill Development

Semester - II
EDC: DRUG BIOCHEMISTRY

Semester	Course Code	Course Name	Category	L	T	P	Credits
II	24BCP2EA	DRUG BIOCHEMISTRY	EDC	48	-	-	4

Preamble	This course has been designed for students to learn and understand • The drug types, characteristics, and action of drugs on the body • The basic knowledge on mechanism of action, therapeutic uses, kinetics and adverse effects of drugs used for various clinical conditions • The principles of chemotherapy, treatment strategies for cancer
Prerequisite	Basic knowledge on drug Biochemistry

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Illustrate the concepts of pharmacokinetics	K3
CO2	Explain the key principles of pharmacodynamics	K3
CO3	Analyze the mechanism of drugs acting on Central Nervous system	K4
CO4	Examine the mechanism of action of drugs for peptic ulcer, inflammation, thyroid disorders and diabetes	K4
CO5	Illustrate the mechanism of anticancer drugs and basic concepts in patenting of drugs	K3

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓		✓	✓
CO2		✓	✓	✓	
CO3	✓	✓	✓	✓	✓
CO4		✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓

24BCP2EA	EDC : DRUG BIOCHEMISTRY

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Pharmacology and Pharmacokinetics** Pharmacology: Classification of drugs, sources, Routes of drug administration: sublingual, buccal, oral, rectal, intravenous, intramuscular, subcutaneous, transdermal, inhalational and topical administration. Pharmacokinetics: drug absorption, drug distribution, drug biotransformation (role, formation, and phases), drug excretion: quantitative pharmacokinetics, bioavailability, drug clearance.	10	Text Book, Reference book, NPTEL and E-Resources
II	**Pharmacodynamics** Drug receptors: Types, classification, drug-receptor interaction, Agonist, antagonist, Inverse agonist, partial agonist. Dose-response relationships (graded and quantal). Adverse effects of drugs. Factors affecting drug safety and efficacy.	8	Text Book, Reference book, NPTEL and E-Resources
III	**Antidepressant drugs and neurodegenerative diseases** Antidepressant drugs: Mechanism of action and therapeutic uses of tricyclic antidepressants and monoamine oxidase inhibitors. Treatment of neurodegenerative diseases: Parkinson's Diseases - Introduction, Monoamine oxidase inhibitors. Alzheimer diseases- Mode of action Galantamine, rivastigmine. Hypnotic drug – zolpidem or zaleplon.	10	Text Book, Reference book, NPTEL and E-Resources
IV	**Drugs for peptic ulcer, inflammation, thyroid disorders and Diabetes** Anti-peptic ulcer drugs: H2 receptor antagonists and inhibitors of H+K+ ATP-ase pump. Anti-inflammatory drugs: Mechanism of action, therapeutic uses, pharmacokinetics, and adverse effects of Anti-inflammatory drugs -aspirin and colchicine. Antimicrobial drugs – Sulfonamides trimethoprim, penicillin, aminoglycosides, and bacterial resistance. Thyroid and anti- thyroid drugs, Insulin, and oral anti-diabetic drugs	10	Text Book, Reference book, NPTEL and E-Resources
V	**Anticancer drugs**	10	Text Book, Reference

	Anticancer drugs: Mode of action and its mechanism - Cyclophosphamide & methotrexate. Antibiotics (Dactinomycin & Bleomycin), microtubule inhibitor (Vincristine & Vinblastine). Patenting of Drug, Marketing, and Computer aided drug design.		book, NPTEL and E-Resources
	Total	**48**	

Text Book	**1.**	D George M. Brunner, Craig W. Stevans, 2011,"Pharmacology",Third Edition, Saunders, an imprint of Elsevier Inc, United States.
	2.	Tripathi, K.D., 2019,"Essentials of Medical Pharmacology", Seventh Edition, Jaypee Brothers, Medical Publishers, New Delhi.
Reference Books	**1.**	Satoskar, R. S, Nirmala N, Reje, Bhandarkar S. D, 2011, "Pharmacology and Pharmacotherapeutics", Twenty second Edition, Popular Prakashan Pvt. Ltd, India
	2.	Laurence L. Brunton, Bjorn C. Knollmann, 2023,"Goodman & Gilmans The Pharmacological Basis of Therapeutics", Fourteenth Edition, McGraw Hill / Medical., India.
	3.	Sangeeta Sharma and Dinesh K. Badyal, 2022,"LIR Pharmacology", Second Edition, Wolters India Pvt. Ltd., Haryana.
	4.	Bertram G Katzung, Susan B Masters, Anthony J Trevor, 2012, "Basic & Clinical Pharmacology", Twelfth Edition, McGraw Hill Medical., Newyork.

Journal and Magazines	https://www.scimagojr.com/journalsearch.php?q=20063&tip=sid https://www.sciencedirect.com/journal/biochemical-pharmacology https://www.longdom.org/biochemistry-pharmacology-open-access.html
E-Resources and Website	https://dth.ac.in/medical/courses/pharmacology/1/8/index.php https://www.coursera.org/courses?query=pharmacology

Learning Methods	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

Semester - II
DSE: COSMETIC CHEMISTRY

Semester	Course Code	Course Name	Category	L	T	P	Credits
II	24CEP2DA	COSMETIC CHEMISTRY	DSE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • The basic principles of Skin creams and Humectants • About the methods of Mask and Aroma therapy • The knowledge about the various methods of Oils extraction
Prerequisite	Basic knowledge on cosmetic chemistry

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand basics of Skin Creams and Humectants	K3
CO2	Analyze the Bath and Oils	K3
CO3	Summarize the methods of Mask and aroma therapy	K3
CO4	Illustrate the separation of Essential and Flower oils	K3
CO5	Analyze the various methods of oils	K4

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2		✓		✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓				
CO5	✓	✓	✓		✓

24CEP2DA	DSE: COSMETIC CHEMISTRY

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Skin Creams and Humectants** Skin Creams - Introduction, classification of skin creams, cleansing creams, night and massage creams, moisturizing, vanishing and foundation creams, pigmented foundation creams, hand creams, hand and body cream. Humectants – Introduction, drying out, types, hygroscopicity, stability, safety and applications. Antioxidants and application of antioxidants	10	Text Book
II	**Bath and Oils** Bath Preparation: Foam baths, Introduction, formulation and foam baths, types of products, product assessment, bath salts, ingredient and formulations. Bath Oils: Introduction floating and spreading oils, dispersible or blooming oils soluble oils, foaming oils	10	Reference Book
III	**Mask and Aroma therapy** Setting masks - Peel off masks - Thermal types - Paraffin wax masks - Non-setting masks - Hot oil masks. Aroma therapy - Methods of extraction of essential oils. Blending & precautions, properties of essential oils and carrier oils. Patch testing, safety & precautions - Different aroma therapy formulations for skin and hair care	10	Text Book
IV	**Essential and Flower oils** Essential oils – Methodology of production, steam and water distillation. Treatment of condensate water after distillation - Flower oils – Extraction with cold fat and hot fat, alcoholic extracts, absolute of enfleurages and chassis. Extraction with volatile solvents, selection of solvent and extraction apparatus	10	NPTEL
V	**Isolation of Oils** Isolates – Methods of Isolation, properties and uses of following- Eugenol, pinene, linalool, citral and geraniol. Flavours – Sources and properties of vanilla, rose, pineapple, peppermint, mango, raspberry, orange and lemon	8	You Tube Videos
	Total	**48**	

Text Book	**1.**	Poucher W. A. 2012, "Perfumes, Cosmetics and Soaps: Volume II The Production, Manufacture and Application of Perfumes", 9th Edition, Springer, USA & New York
Reference Books	**1.**	Vimaladevi M, 2019, "Text book of herbal cosmetics", 10th Edition, Satguru Publications, India & New Delhi
	2.	Deore S. V, Gaikwad, S. D, Gaikwad D. D and Gugale G. S. 2022, "Chemistry of Cosmetics and Perfumes", 1st Edition Nirali Prakashan, India & New Delhi
	3.	Butler H. 2010, Poucher's "Perfumes, Cosmetics and Soaps", 10th Edition Springer, USA & New York
	4.	Asha Ram, 1997, "Herbal Indian Perfumes and Cosmetics", 4th Edition Sri Satguru Publications, India & New Delhi

Journal and Magazines	https://agritech.tnau.ac.in/horticulture/extraction_methods_natural_essential_oil.pdf
E-Resources and Website	https://www.hsrd.research.va.gov/publications/esp/aromatherapy.pdf

Learning Method	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

Semester - II
DSE: ELECTROCHEMISTRY

Semester	Course Code	Course Name	Category	L	T	P	Credits
II	24CEP2DB	ELECTROCHEMISTRY	DSE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • The efficiency of battery and discharge cycle • The different types of fuel cells and other storage devices • The technology behind battery electric and hybrid vehicles
Prerequisite	Basic knowledge on electrochemical concepts applied to energy storage devices

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand the basic concept of electrochemistry related to battery	K3
CO2	Explain the concept of primary and secondary batteries and to explore their operations	K4
CO3	Compare the different batteries used in electric and hybrid vehicles	K3
CO4	Analyze the operations of batteries in hydrogen and other types of fuel cells	K4
CO5	Identify the other energy storage devices such as ultra-capacitors, flywheels and compressed air	K4

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓	✓	✓
CO2		✓		✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓				
CO5	✓	✓	✓		✓

24CEP2DB	DSE: ELECTROCHEMISTRY

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Electrochemistry** The reaction quotient (Q), for a chemical reaction - The potential (E), for non-standard conditions using the Nernst Equation - Rate of reaction and types of over-voltages in galvanic and electrolytic cells and the Tafel Equation - Efficiency of chemical energy conversion: batteries versus heat engines	10	Text Book
II	**Batteries** Primary batteries - Secondary batteries - Battery charging and discharging curves for secondary batteries - Specific power and specific energy, Ragone plot - Energy efficiency of batteries, energy out during discharge - Energy in during charge - Energy efficiency of batteries versus heat engines for converting chemical energy into work	10	Reference Book
III	**Batteries for Electric and Hybrid Vehicles** Battery packs, voltage and state of charge, coulomb counting - Energy in a battery (kWh) and charge in a battery (Ah); C-Rate of charging and discharging, Peukert equation - Coulombic efficiency of batteries and battery lifetime - Button type battery - Difference between cells and batteries	10	Text Book
IV	**Fuel Cells** Fuel cells - Description - Working principle - Anodic, cathodic and cell reactions. Fabrication of electrodes and other components. Applications, advantages, disadvantages and environmental aspects of the following types of fuel cells: Proton Exchange Membrane Fuel Cells - Alkaline fuel cells - Phosphoric acid - Solid oxide, Molten carbonate and direct methanol fuel cells	10	NPTEL
V	**Additional energy storage devices and Renewable energy** Hydrogen fueling system and hydrogen storage aboard vehicles - Comparison of fuel cells and batteries for powering electric vehicles. Capacitors - Super capacitor storing charge - Flywheels: storing kinetic energy - Compressed air: storing potential energy - Renewable energy and synergy with electric vehicles.	8	You Tube Videos
	Total	**48**	

Text Book	**1.**	Aubrecht G, 2005, "Energy: Physical, Environmental, and Social Impact" 3rd Edition, CA: Pearson Addison-Wesley & San Francisco
Reference Books	**1.**	Barbir F, 2012, "PEM Fuel Cells: Theory and Practice", 2rd Edition, Elsevier & USA
	2.	Sharma, B. K, 2014, "Industrial Chemistry", 17th Edition, Krishna Prakashan Media P. Ltd & Meerut
	3.	Stochi E, 1990, "Industrial chemistry", 1st Edition, Ellis Horwood Ltd & UK
	4.	Jain P.C, Jain M, 2015, "Engineering chemistry", 17th Edition, Dhanpat Rai & sons & New Delhi

Journal and Magazines	https://www.sciencedirect.com/journal/electrochemistry-communications
E-Resources and Website	https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/files/NS%20316%20UNIT%20III%20and%20IV%20Supporting%20PPT.pdf

Learning Method	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

Semester - II
DSE: ORGANIC REACTIONS AND REAGENTS

Semester	Course Code	Course Name	Category	L	T	P	Credits
II	24CEP2DC	ORGANIC REACTIONS AND REAGENTS	DSE	48	-	-	4

Preamble	This course has been designed for students to learn and understand • The basic principle and applications of oxidative and reductive reagents involved in organic synthesis • About mechanism and applications of various important organic name reactions • The Reaction and reagents involved in functional group transformations
Prerequisite	Knowledge on application of reagents

Course Outcomes (COs)

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Outline the mechanism and applications of various oxidation reagents	K3
CO2	Interpret the mechanism and applications of reducing reagents involved in organic synthesis	K3
CO3	Analyze the reaction and reagents functional group transformations	K3
CO4	Analyze the various metal mediated and multicomponent name reactions and their applications	K3
CO5	Examine the basic principles and applications involved in name reaction on substitution	K3

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	✓		✓	✓	✓
CO2		✓		✓	✓
CO3	✓	✓	✓	✓	
CO4		✓		✓	✓
CO5	✓	✓	✓		✓

24CEP2DC	DSE: ORGANIC REACTIONS AND REAGENTS

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	**Reagents in Oxidation Reactions** Chromium oxidant - Pyridinium chlorochromate (PCC), pyridinium dichromate (PDC), Chromium trioxide (CrO_3), Chromic acid, Jones reagent, Manganese oxidant - $KMnO_4$, MnO_2 - Peracids - Alkenes, ketones and heterocycles, singlet oxygen, ozone, OsO_4, HIO_4, Ag_2O, Bio-oxidations of *Bacterium aceti* - Invertase - *Pseudomonas putida* - *Micrococcus luteus* - *Gibberella fujikorai* - *Streptomyces albus*	10	Text Book
II	**Reagents in Reduction Reactions** Nickel/Palladium/Platinum based heterogeneous catalysts for hydrogenation, Wilkinson's catalyst, Noyori asymmetric hydrogenation - Reductions using Lithium/Sodium/Calcium in liquid ammonia - Metal hydrides - $LiAlH_4$, $NaBH_4$, $NaBH_3CN$ - Alkoxy borates - Hydrazine - Tin in hydrochloric acid - $NaHSO_3$ - NaSH - Luche reduction	10	Reference Book
III	**Reagents and their Applications** Preparation and synthetic application of Lipoteichoic acid (LTA) - Lithium diisopropylamide (LDA) - Dicyclohexyl carbodiimide (DCC) - 2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ) - TMS-iodide - TMS-cyanide - TBDMS Chloride - 1,3-Dithiane - Merrifield resin - Baker's yeast	10	Text Book
IV	**Name Reactions and their Applications - I** Jacobsen epoxidation - Shi epoxidation - Suzuki coupling - Heck reaction - Sonogashira coupling - Wacker process - Stille Coupling. Multicomponent reactions - Strecker synthesis - Hantszch pyridine synthesis - Biginelli synthesis - Passerini reaction - Ugi-4-component synthesis	10	NPTEL
V	**Name Reactions and their Applications - II** Mechanism and applications of Robinson annulation - Ene reaction - Hofmann isonitrile synthesis - Doebner-Miller synthesis - Nef reaction - Eschweiler Clark reaction - Bucherer reaction - Leukart reaction - Willegerodt - Kindler reaction	8	You Tube Videos
	Total	**48**	

Text Book	**1.**	Ahluwalia V. H and Parashar R. K, 2009, "Organic Reactions and Mechanisms", 4th Edition, Narosa Publishing House & New Delhi
Reference Books	**1.**	Fieser L. S, Fieser M and Tse-Lok Ho, 2016, "Fieser and Fieser's Reagents for Organic Synthesis", 1st Edition, Wiley-Balckwell & USA
	2.	Chatwal G. R, 2015, "Reaction Mechanism and Reagents in Organic Chemistry", 4th Edition, Himalaya Publisher House & Delhi
	3.	Sanyal S. N, 2019, "Reactions, Rearrangements and reagents" 4th Edition, Bharati Bhawan Publishers & Bengaluru
	4.	Mundy B. P, Eller M. G and Favarolo F. G, 2015," Name Reactions and Reagents in Organic Synthesis", 2nd Edition. Wiley-Blackwell & USA

Journal and Magazines	Kalsi P. S, 2010, "Organic Reactions and their Mechanisms", 2nd Edition, New Age International Publishers & New Delhi
E-Resources and Website	https://www.masterorganicchemistry.com/reaction-guide/

Learning Method	Chalk and Talk/Assignment/Seminar

Focus of the Course	Skill Development/Employability

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Dr.N.G.P. Arts and Science College
APPROVED
BoS- 16th 07-11-24 | AC- 18th 26-11-24 | GB-

Academic Council * Dr.N.G.P. Arts and Science College * CHAIRMAN