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UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613 403 - TAMIL NADU

SCHOOL OF ARTS OF SCIENCE

DEPARTMENT OF CHEMISTRY

B.Sc CHEMISTRY CURRICULUM

REGULATION 2020

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B.Sc CURRICULUM – REGULATION 2020

B.Sc. Graduate Attributes

- Domain knowledge
- Critical thinking
- Effective Communication
- Reflective learning
- Critical thinking

B.Sc Programme Educational Objectives – PEO

- PE01- Acquired the knowledge with facts and figures related to various subjects in pure sciences .
- PE02- Understood the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life.
- PE03- Acquired the skills in handling scientific instruments, planning and performing in laboratory experiments.
- PE04- The skills of observations and drawing logical inferences from the scientific experiments.
- PE05- Analyzed the given scientific data critically and systematically and the ability to draw the objective conclusions.
- PE06- Been able to think creatively (divergently and convergent) to propose novel ideas in explaining facts and figures or providing new solution to the problems.
- PE07-Realized how developments in any science subject helps in the development of other science subjects and vice-versa and how interdisciplinary approach helps in providing better solutions and new ideas for the sustainable developments.
- PE08- Developed scientific outlook not only with respect to science subjects but also in all aspects related to life.
- PE09- Realized that knowledge of subjects in other faculties such as humanities, performing arts, social sciences etc.
- PE10- Can have greatly and effectively influence which inspires in evolving new scientific theories and inventions.
- PE11- Imbibed ethical, moral and social values in personal and social life leading to highly cultured and civilized personality.
- PE12- Developed various communication skills such as reading, listening, speaking, etc., which we will help in expressing ideas and views clearly and effectively.
- PE13- Realized that pursuit of knowledge is a lifelong activity and in combination with untiring efforts and positive attitude and other necessary qualities leads towards a successful life.

B.Sc Programme Outcome – PO

- PO1- To understand basic facts and concepts in Chemistry while retaining the exciting aspects of Chemistry so as to develop interest in the study of chemistry as a discipline.
- PO2- To develop the ability to apply the principles of Chemistry.
- PO3- To appreciate the achievements in Chemistry and to know the role of Chemistry in nature and in society. To develop problem solving skills.
- PO4- To be familiarised with the emerging areas of Chemistry and their applications in various spheres of Chemical sciences and to apprise the students of its relevance in future studies.
- PO5- To develop skills in the proper handling of apparatus and chemicals.
- PO6- To be exposed to the different processes used in industries and their applications.

B.Sc. Course – C

- C1- General Chemistry – I
- C2- Volumetric Analysis Lab
- C3- Mathematics – I
- C4- Mathematics – II
- C5- General Chemistry – II
- C6- Organic Analysis Lab
- C7- Mathematics - III
- C8- Mathematics – IV
- C9- Research Led Seminar
- C10- General Chemistry – III
- C11- Physical Chemistry Lab – I
- C12- Physics - I & II
- C13- Physics Lab – I & II
- C14- Research Methodology
- C15- General Chemistry - IV
- C16- Physical Chemistry Lab – II
- C17- Inorganic Chemistry – I
- C18- Organic Chemistry – I
- C19- Physical Chemistry – I
- C20- Inorganic Qualitative Analysis Lab
- C21- Gravimetric Analysis Lab
- C22-Participation in Bounded Research
- C23- Inorganic Chemistry – II
- C24- Organic Chemistry – II
- C25- Physical Chemistry – II
- C26- Project Work
- C27- Package Lab I to VI
- C28- Communication Lab I to VI

B.Sc Curriculum Mapping

Programme Educational Objectives Vs Programme Outcome

Programme Outcome-PO Programme Educational Outcome - PEO	PO1	PO2	PO3	PO4	PO5	PO6
PE01	✓					
PE02						
PE03		✓				
PE04			✓			
PE05						
PE06					✓	
PE07				✓		
PE08						✓
PE09	✓			✓		
PE10		✓	✓			
PE11						
PE12				✓		
PE13	✓		✓		✓	

B.Sc Curriculum Mapping

Programme Outcome vs Courses Outcome

Programme Outcome-PO Courses Outcome-CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1			*	*		*
CO2		*		*	*	*
CO3	*	*			*	
CO4			*	*		*
CO5			*	*		*
CO6		*		*	*	*
CO7	*	*			*	
CO8		*	*		*	
CO9	*	*			*	*
CO10		*	*	*		*
CO11		*		*	*	
CO12	*	*		*	*	
CO13		*	*	*	*	
CO14		*	*	*	*	*
CO15	*		*		*	
CO16		*		*		*
CO17	*		*		*	
CO18		*		*	*	
CO19	*	*		*		*
CO20			*	*	*	
CO21	*		*	*		*
CO22	*	*		*		*
CO23			*	*	*	
CO24	*	*	*		*	*
CO25	*	*		*		*
CO26	*	*		*	*	
CO27		*	*	*		
CO28	*	*			*	

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COURSE STRUCTURE

SEMESTER – I					
COURSE CODE	**COURSE TITLE**	**L**	**T**	**P**	**C**
20110AEC11/ 20111AEC11/ 20132AEC11/ 20135AEC11	Tamil – I / Advanced English – I / Hindi – I / French-I	4	0	0	2
20111AEC12	English – I	4	0	0	2
20114AEC13	General Chemistry – I	6	0	0	4
20114AEC14L	Volumetric Analysis Lab	0	0	3	2
20112AEC15A (OR) 20114AEC17	Calculus and Fourier Series	5	0	0	4
	General and Applied Botany –I	6	0	0	6
20112AEC16A (OR) 20114AEC18L	Algebra and Trigonometry	4	0	0	3
	General Botany Lab –I	0	0	3	2
201INDCONS	Indian Constitution	0	0	0	0
	Universal Human Values	-	-	-	2
	Total	**29**	**0**	**06**	**19**
SEMESTER – II					
20110AEC21/ 20111AEC21/ 20131AEC21/ 20135AEC21	Tamil – II / Advanced English – I I / Hindi – II / French-II	4	0	0	2
20111AEC22	English – II	4	0	0	2
20114AEC23	General Chemistry – II	6	0	0	4
20114AEC24L	Organic Analysis Lab	0	0	3	2
20112AEC25A (OR) 20114AEC29A	ODE, PDE and Laplace Transform	5	0	0	4
	General and Applied Botany –II	6	0	0	6
20112AEC26A 20114AEC20L	Analytical Geometry in Vector Calculus	4	0	0	3
	General Botany Lab –II	0	0	3	2
20114RLC27	Research Led Seminar	_	_	_	1
	Communication Skills	-	-	-	2
	Basic Behavioral Etiquette	-	-	-	2
	Total	**29**	**0**	**06**	**22**

SEMESTER – III					
20110AEC31/ 20111AEC31/ 20131AEC31/ 20135AEC31	Tamil – III / Advanced English – II I / Hindi – III / French-III	4	0	0	2
20111AEC32	English – III	4	0	0	2
20114AEC33	General Chemistry – III	5	0	0	4
20114AEC34L	Physical Chemistry – Non – Electrical Practical	0	0	3	2
20113AEC35	Physics – I	6	0	0	5
20113AEC36L	Physics Lab – I	0	0	3	2
20114RMC37	Research Methodology	2	0	0	2
	Office automation	-	-	-	2
	Total	**21**	**0**	**06**	**21**
SEMESTER – IV					
20110AEC41/ 20111AEC41/ 20131AEC41/ 20135AEC41	Tamil – IV / Advanced English – IV / Hindi – IV / French-IV	4	0	0	2
20111AEC42	English-IV	4	0	0	2
20114AEC43	General Chemistry – IV	5	0	0	4
20114AEC44L	Physical Chemistry – Electrical Practical	0	0	3	2
20113AEC45	Physics – II	6	0	0	5
20113AEC46L	Physics Lab – II	0	0	3	2
201ENVTSTU	Environmental Studies	2	-	-	2
	Leadership and Management Skills	-	-	-	2
	General Aptitude and Quantitative Ability	-	-	-	2
	Total	**21**	**0**	**06**	**23**
SEMESTER – V					
20114AEC51	Inorganic Chemistry – I	5	0	0	4
20114AEC52	Organic Chemistry – I	4	1	0	3
20114AEC53	Physical Chemistry	4	1	0	4
20114AEC54L	Inorganic Qualitative Analysis Lab	0	0	3	2
20114AEC55L	Gravimetric Analysis Lab	0	0	3	2
20114DSC56_	Discipline Specific Elective –I	5	0	0	3
20114BRC57	Participation in Bounded Research	-	-	-	1
	Professional Skills	-	-	-	2
	Interview Skills Training and Mock Test	-	-	-	2
	Total	**18**	**02**	**06**	**23**

SEMESTER – VI					
20114AEC61	Inorganic Chemistry – II	4	1	0	4
20114AEC62	Organic Chemistry – II	5	0	0	5
20114AEC63L	Industrial Chemistry Practical	0	0	3	2
20114AEC64L	Domestic Products Preparation - Practical	0	0	3	2
20114DSC65_	Discipline Specific Elective – II	5	0	0	3
201_ _OEC66_	Open Elective	4	0	0	2
20114PRW67	Project Work	0	0	0	4
	Community Engagement	-	-	-	1
20114PEE	Programme Exit Examination	0	0	0	1
	Total	**18**	**01**	**06**	**24**
	Total Credits of the Program				**132**

DISCIPLINE SPECIFIC ELECTIVE COURSES – I & II

Semester	Elective No.	Course Code	Course Title
V	I	20114DSC56A 20114DSC56B	A) Pharmaceutical Chemistry B) Agricultural Chemistry
VI	II	20114DSC65A 20114DSC65B	A) Polymer Chemistry B) Nano Science

OPEN ELECTIVE COURSES

Semester	Course code	Course Title
VI	20110OEC	Tamil Ilakkiya Varalaru
	20111OEC	Journalism
	20112OEC	Development of Mathematical Skills
	20113OEC	Instrumentation
	20116OEC	Wildlife Conservation
	20120OEC	E-Learning
	20120OEC	Web Technology
	20161OEC	Banking Service

RESEARCH BASED COURSES

Semester	Course Code	Course Title
II	20114RLC27	Research Led Seminar
III	20114RMC37	Research Methodology
IV	20114BRC57	Participation in Bounded Research

AUDIT COURSES

Semester	Course Code	Course Title
I		Universal Human Values
II		Communication Skills
II		Basic Behavioral Etiquette
III		Office automation
IV		Leadership and Management Skills
IV		General Aptitude and Quantitative Ability
V		Professional Skills
V		Interview Skills Training and Mock Test
VI		Community Engagement

CREDIT DISTRIBUTION

SEMESTER	AEC	DSC	OEC	RESEARCH	OTHERS	TOTAL
I	17	-	-	-	02	**19**
II	17	-	-	01	04	**22**
III	17	-	-	02	02	**21**
IV	17	-	-	-	06	**23**
V	15	03	-	01	04	**23**
VI	13	03	02	04	02	**24**
TOTAL	**96**	**06**	**02**	**08**	**20**	**132**

SEMESTER – I

COURSE CODE	COURSE TITLE	L	T	P	C
20110AEC11	Tamil – I	4	0	0	2

தமிழ்

பாடத்திட்டம்

இளங்கலை: பருவம்– பிரிவு –I 19110AEC11

முதல் பருவம் - தாள் -1

இக்கால இலக்கியம், செய்யுள், சிறுகதை, இலக்கணம், இலக்கிய வரலாறு மனப்பாடப்பகுதி

அலகு –I

பாரதியார் தேசபக்திப் பாடல்கள்

சுதந்திரப் பெருமை

சுதந்திரப் பயிர்

சுதந்திர தேவியின் துதி

தொண்டு செய்யும் அடிமை

பாரதிதாசன்

வீரத்தாய்

அலகு – II

சுரதா – நல்ல தீர்ப்பு

கண்ணதாசன் - கந்தல் துணியின் கதை

பட்டுக்கோட்டை கல்யாணசுந்தரம் - நண்டு செய்த தொண்டு – காலம் சரியில்லே

மு.மேத்தா – வாழையடி வாழை

வாலி – தாய்

அலகு – III

சிறுகதை - இளவேனிற் குறிப்புகள் - திருவையாறு பாலகுமார்

அலகு – IV

இலக்கணம்

எழுத்து

மனப்பாடப்பகுதி

அலகு – V

இலக்கிய வரலாறு

சிறுகதை, புதினம், நாடகம், உரைநடை, கவிதை,புதுக்கவிதை

தாள் - I

ஒப்படைவு – மதிப்பெண் 40

பாடத்தொடர்புடைய கட்டுரை – 20 மதிப்பெண்

ஆத்திச்சூடி – 20 மதிப்பெண்

அறம் செய விரும்பு, ஆறுவது சினம், இயல்வது கரவேல், ஈவது விலக்கேல், உடையது விளம்பேல், ஊக்கமது கைவிடேல், எண் எழுத்து இகழேல்,ஏற்பது இகழ்ச்சி, ஐயம் இட்டு உண், ஒப்புரவு ஒழுகு, ஓதுவது ஒழியேல்,ஔவியம் பேசேல், கண்டு ஒன்று சொல்லேல், ஞயம்பட உரை, இடம்பட வீடு எடேல், இணக்கம் அறிந்து இணங்கு, தந்தை தாய்ப்பேன்,நன்றி மறவேல்,பருவத்தே பயிர்செய், இயல்பு அலாதன செயேல்,வஞ்சகம் பேசேல்,இளமையில் கல்,அனந்தல்ஆடேல்,கடிவது மற,கீழ்மை அகற்று,குணமது கைவிடேல்,கெடுப்பது ஒழி, கேள்வி முயல்,சான்றோர் இனத்து இரு, சோம்பித்திரியேல்.

(மேற்கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு அல்லது புதுக்கவிதை) கதை,கட்டுரை,நாடகம் எழுதி வரச் செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC11	Advanced English-I	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the glossary terms, figures of speech
- To improve vocabulary
- To learn how to edit and proof read
- To know the comparison and contrast and cause and effect forms
- To understand the impact of the speeches of famous people

Outcome:

- Develop vocabulary
- Read and comprehend literature

UNIT –I

Glossary of grammar terms

Figures of speech

UNIT – II

Foreign words and phrases

British and American Vocabulary

UNIT – III

Speeches of famous people:

Mahatma Gandhi-Abraham Lincoln-Swami Vivekananda-John F. Kennedy

UNIT – IV

Editing

Proof reading

UNIT – V

Comparison and contrast

Cause and effect

References:

English Grammar -Wren and Martin

English Grammar and Composition -Radhakrishna Pillai

Essentials of Business Communication -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

English for writers and translators -Robin Macpherson

Technical Communication -Meenakshi Sharma & Sangeetha Sharma

The World's Great Speeches - Sudhir Kumar Sharma Galaxy Publishers

English Work Book-I&II -Jewelcy Jawahar

COURSE CODE	COURSE TITLE	L	T	P	C

20111AEC12	English-I	4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To improve English delightfully through simple poems, essays
- To throw light on fiction
- To read and comprehend literature

Outcome:

- Read and comprehend literature

UNIT –I

The Art of Reading - Lin Yutang

An Eco-Feminist Vision -Aruna Gnanadason

UNIT – II

The Merchant of Death -Nanda Kishore Mishra & John Kennet

She Spoke for all Nature -Young world 'The Hindu'

UNIT –III

Because I could not Stop for Death -Emily Dickinson

Stopping by Woods on a Snowy Evening -Robert Frost

UNIT –IV

Enterprise -Nissim Ezekiel

Love poem for a wife -A.K Ramanujam

UNIT –V

Oliver Twist -Charles Dickens

References:-

The Art of Reading/ Experiencing Poetry, S.Murugesan and Dr.K.Chellappan, Emerald Publishers

COURSE CODE	COURSE TITLE	L	T	P	C
20114AEC13	General Chemistry - I	6	1	0	5

Aim:

- To study about the theoretical and molecular models of chemical compounds.

Objective:

- To provide a broad foundation in chemistry that stresses scientific reasoning and analytical problem solving with a molecular perspective.
- To expose the students to a breadth of experimental techniques using modern instrumentation.

Outcome:

- The student will learn the laboratory skills needed to design, safely conduct and interpret **chemical** research.
- The student will acquire a foundation of **chemistry** of sufficient breadth and depth to enable them to understand and critically interpret the primary **chemical** literature.

UNIT – I

Basic concepts in organic chemistry -Electron displacement effects – Inductive, electrometric and mesmeric effects, resonance, hyperconjugation and steric effects. Homolytic and heterolytic fission of carbon - carbon bonds. Reaction intermediates: - free radicals, carbocations, carbocations, carbones, nitrenes and arynes - their stability.

UNIT II

Standard solution - primary and secondary standards solution, Types of titrimetric reactions - redox and precipitation titrimetric reactions. Indicators - effect of change in pH - neutralization – mixed and fluorescent indicators. Halogen family comparative study of halogens and their compounds- unique nature of fluorides and Oxides and oxyacids of halogens - preparation and properties

UNIT III

Nomenclature of organic compounds - IUPAC naming of simple and substituted
Aliphatic, aromatic and alicylic compounds_Alkanes : Mechanism of free radical substitution in alkanes. Petroleum-thermal and catalytic process of cracking Synthetic petrol - Fischer, Tropsch and Bergtus processes, flash point, fire point, smoke point, knocking, octane number

UNIT IV

Liquid State: Liquid crystals classification, structures Properties and applications. Colloidal State: Size of colloidal particles-gold number- peptisation, stability of colloids, coagulation and protection. Reverse Osmosis and desalination of sea water. Electrophoresis and endosmosis.

UNIT V

Solid state: Nature of the solid state - seven crystal systems - Bravais lattice unit cell, law of rational indices (Weiss indices), Miller indices, symmetry) elements in crystals (for cubic system)
X-Ray diffraction by crystals — derivation of Bragg's equation – Bragg method -
Crystal structure of NaCI, KCI, ZnS, CsCl determination of Avogadro number

References:

1. R.D. Madan, J.S.Tiwari and G.L.Mudhara, A Text book of First Year B.Sc.Chemistry, S.Chand&Co.
2. G.S.Manku, Theoretical Principles of Inorganic Chemistry, Tata McGraw Hill, New Delhi.
3. Paula Yaukanis Bruice- Organic Chemistry, Prentice Hall.
4. J.D.Lee,Concise Inorganic Chemistry, 5th Edition, Blackwell Science Ltd, Oxford, 2002.
5. B.S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand and Co., New Delhi.
6. B.R.Puri and Sharma, Principles of Physical Chemistry.

COURSE CODE	COURSE TITLE	L	T	P	C

20112AEC15A	Calculus and Fourier Series	4	0	0	4

Aim:

- To equip the students with basic differentiation, integration and Fourier se**ries.**

Objectives:

- This course is designed to give students, basic elementary calculus to allow them to tackle to solve Fourier series problems.

Outcomes:

- By the end of this course, the student should solve the differentiation, integration and Fourier series.

Unit – I

Leibnitz theorem (Proof not needed) and its applications – curvature and radius of curvature in Cartesian only (Proof not needed) – total differential coefficient (Proof not needed) – Jacobians of two & three variables – Simple problems in all these.

Unit – II

Reduction formula (when n is a +ve integer) for (i)

i. $\int_a^b e^{ax}x^n dx$

ii. $\int_a \ sin^n x \ dx$

iii. $\int_a \ cos^n x \ dx$

iv. $\int_0^x e^{ax}x^n dx$

v. $\int_0 \ sin^n x \ dx$

vi. without proof $\int_0 \ sin^n x \, cos^n x \, dx$ and illustrations

Unit – III

Beta and Gamma functions

Unit – IV

Evaluation of double and tripe integrals in simple cases – changing the order and evaluating of the double integration (Cartesian only)

Unit – V

Definition of Fourier series – Finding fourier coefficients for a given periodic function with period 2π and with period $2l$ – use of odd and even functions in evaluating fourier coefficients – half range sine and cosine series.

Reference:

1. Calculus – T.K.M. Pillai
2. Trigonometry & Fourier series – T.K.M. Pillai.

COURSE CODE	COURSE TITLE	L	T	P	C
20112AEC16A	Algebra and Trigonometry	4	0	0	4

Aim:

- To study Algebra and Trigonometry to solve various applications in chemistry.

Objectives:

- This course is designed to give students, the student should know the algebra and trigonometry.

Outcomes:

- By the end of this course, the student should solve the algebra and Trigonometry concepts to solve the problems.

Unit – I

Binomial, Exponential & Logarithmic series (Formulae only) – Summation

Unit – II

Nonsingular, symmetric, skew symmetric, orthogonal, Hermitian, skew Hermitian and unitary matrices – Characteristics equation, eigen values, eigen vector – Cayley Hamilton's theorem (proof not needed) Simple application only.

Unit – III

Expansion of sinnθ, cosnθ, tann(n being a positive integer) – Expansion of $sin^n\theta, cos^n\theta, sin^n\theta\ cos^m\theta$ in a series of sines and cosines of multiples of θ (θ – given in radius) Expansion of sinθ, cosθ and tanθ in terms of powers of θ (only problems in all the above)

Unit – IV

Euler's formula for $e^{i\theta}$ – definition of hyperbolic functions – formulae involving hyperbolic functions – relation between hyperbolic and circular function – expansion of sinhx, coshx, tanhx in power of x.

Unit – V

Expansion of inverse hyperbolic function – sinh-1x, cosh-1x and tanh-1x - Separation of real and imaginary parts of sin(x+iy), cos(x+iy), tan(x+iy), sinh(x+iy), cosh(x+iy), tanh(x+iy)

References:

1. T.K.M. Pillai, T.Natarajan, K.S. Ganapathi, Algebra, Vol I. S.Viswanathan Pvt.Ltd., Chennai – 2004

2. S.Narayanan, T.K.M.Pillai, S.Viswanathan Pvt.Ltd. & Vijay Nicole imprint Pvt. Ltd. 2004.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC14L	Volumetric Analysis Lab	0	0	3	2

1. Strong acid vs strong base.
2. Weak acid vs strong base.
3. Estimation of ferrous sulphate.
4. Estimation of oxalic acid.
5. Estimation of copper.
6. Estimation of potassium dichromate.
7. Estimation of potassium permanganate.
8. Estimation of Ca by EDTA.

COURSE CODE	COURSE TITLE	L	T	P	C
201INDCONS	Indian Constitution	0	0	0	0

Objectives:

1. To make the students understand about the democratic rule and parliamentarian administration

2. To appreciate the salient features of the Indian constitution

3. To know the fundamental rights and constitutional remedies

4. To make familiar with powers and positions of the union executive ,union parliament and the supreme court .

5. To exercise the adult franchise of voting and appreciate the electoral system of Indian democracy.

Learning Out comes:

1. Democratic values and citizenship training are gained

2. Awareness on fundamental rights are established

3. The function of union government and state government are learnt

4. The power and functions of the judiciary are learnt thoroughly

5. Appreaciation of democratic parliamentary rule is learnt

Unit I::The making of Indian constitution

The constitution assembly organization –character -work salient features of the constitution-written and detailed constitution -socialism –secularism-democracy and republic.

Unit II: Fundamental rights and fundamental duties of the citizens

Right of equality -right of freedom- right against exploitation -right to freedom of religion-cultural and educational rights -right to constitutional remedies -fundamental duties .

Unit III: Directive principles of state policy

Socialistic principles-Gandhi an principles-liberal and general principles -differences between fundamental rights and directive principles

Unit IV: The union executive, union parliament and Supreme Court

Powers and positions of the president -qualification _method of election of president and vice president -prime minister -Rajya Sabah -Lok Sabah .the supreme court -high court -functions and position of supreme court and high court

Unit V: State council -election system and parliamentary democracy in India.

State council of ministers -chief minister -election system in India-main features election commission-features of Indian democracy.

References:

1) Palekar.s.a. Indian constitution government and politics, ABD publications, India

2) Aiyer, alladi krishnaswami, Constitution and fundamental rights 1955.

3) Markandan. k.c.directive Principles in the Indian constitution 1966.

4) Kashyap. Subash c, Our parliament ,National book trust , New Delhi 1989

COURSE CODE	COURSE TITLE	L	T	P	C
	Universal Human Values	0	0	0	2

Objectives :

The present course deals with meaning, purpose, and relevance of universal human values and how to inculcate and practice them consciously to be a good human being and realise one's potentials.

Learning outcomes :

By the end of the course the learners will be able to:

1. Know about universal human values and understand the importance of values in individual, social circles, career path, and national life.
2. Learn from case studies of lives of great and successful people who followed and practised human values and achieved self-actualisation.
3. Become conscious practitioners of human values.
4. Realise their potential as human beings and conduct themselves properly in the ways of the world.

Unit – I Love & Compassion

- Introduction: What is love? Forms of love—for self, parents, family, friend, spouse,
  community, nation, humanity and other beings, both for living and non-living
- Love and compassion and inter-relatedness
- Love, compassion, empathy, sympathy and non-violence
- Individuals who are remembered in history for practicing compassion and love.
- Narratives and anecdotes from history, literature including local folklore
- Practicing love and compassion: What will learners learn gain if they practice love and compassion? What will learners lose if they don't practice love and compassion?
- Sharing learner's individual and/or group experience(s)
- Simulated Situations
- Case studies

Unit - 2: Truth

- Introduction: What is truth? Universal truth, truth as value, truth as fact (veracity, sincerity, honesty among others)
- Individuals who are remembered in history for practicing this value
- Narratives and anecdotes from history, literature including local folklore
- Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practice it?
- Learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Unit - 3: Non-Violence

Introduction: What is non-violence? Its need. Love, compassion, empathy sympathy
for others as pre-requisites for non-violence

- Ahimsa as non-violence and non-killing
- Individuals and organisations that are known for their commitment to non-violence
- Narratives and anecdotes about non-violence from history, and literature including local folklore
- Practicing non-violence: What will learners learn/gain if they practice non- violence? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about non-violence
- Simulated situations
- Case studies

Unit - 4: Righteousness

Introduction: What is righteousness?

- Righteousness and *dharma*, Righteousness and Propriety
- Individuals who are remembered in history for practicing righteousness
- Narratives and anecdotes from history, literature including local folklore
- Practicing righteousness: What will learners learn/gain if they practice righteousness? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Case studies

Unit- 5: Peace

Introduction: What is peace? Its need, relation with harmony and balance

- Individuals and organisations that are known for their commitment to peace
- Narratives and Anecdotes about peace from history, and literature including local Folklore.
- Practicing peace: What will learners learn/gain if they practice peace? What will learners lose if they don't practice it?
- Sharing learner's individual and/or group experience(s) about peace
- Simulated situations
- Case studies

Unit - 6: Service

Introduction: What is service? Forms of service, for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress or disaster.

- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes dealing with instances of service from history, literature including local folklore
- Practicing service: What will learners learn/gain gain if they practice service? What will learners lose if they don't practice it?

- Sharing learners' individual and/or group experience(s) regarding service
- Simulated situations
- Case studies

Unit - 7: Renunciation (Sacrifice)

Introduction: What is renunciation? Renunciation and sacrifice. Self-restrain and Ways of overcoming greed. Renunciation with action as true renunciation.

- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes from history and literature, including local folklore about individuals who are remembered for their sacrifice and renunciation.
- Practicing renunciation and sacrifice: What will learners learn/gain if they practice Renunciation and sacrifice? What will learners lose if they don't practice it?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Case studies

SEMESTER – II

COURSE CODE	COURSE TITLE	L	T	P	C
20110AEC21	Tamil – II	4	0	0	2

தமிழ்

பாடத்திட்டம்

இளங்கலை : பருவம் இரண்டு 19110AEC21

தாள் - II

செய்யுள் - பக்தி இலக்கியம், சிற்றிலக்கியம், இலக்கணம், இலக்கிய வரலாறு.மனப்பாடப்பகுதி

அலகு-I

திருஞானசம்பந்தர் தேவாரம் -இடரினும் தளரினும் - பதிகம்

திருநாவுக்கரசர் தேவாரம் - அன்னம் பாலிக்கும் தில்லை – பதிகம்

திருவாசகம் - கோயிற் திருப்பதிகம்

திருமந்திரம் - 25, 85, 139,238,250,252,270,724,2104,2716

திருஅருட்பா – தெய்வமணி மாலை 1,8,9

அலகு-II

நம்மாழ்வார் - 1 பாசுரம்- திருவாய்மொழி –எம்பெருமானுக்கு ஆட்படுதல் இன்பமே

பெரியாழ்வார் - 1 பாசுரம் - திருப்பல்லாண்டு – தாலப்பருவம்

நாச்சியார் திருமொழி -10 பாடல்கள்- ஆறாம் திருமொழி

அலகு-III

சிற்றிலக்கியம் , **முக்கூடற்பள்ளு**- வளமை, செழுமை

மதுரை மீனாட்சியம்மை பிள்ளைத்தமிழ்- தாலப்பருவம்-ஐந்துபாடல்கள்

அலகு-IV

இலக்கணம்

சொல்

மனப்பாடப்பகுதி

அலகு-V

இலக்கிய வரலாறு

சைவ, வைணவ இலக்கியங்கள்

சிற்றிலக்கியம்.பள்ளு

பிள்ளைத்தமிழ்

பரணி

தாள் II

ஒப்படைவு – மதிப்பெண் 40

பாடத்தொடர்புடைய கட்டுரை 20 மதிப்பெண்

கொன்றை வேந்தன் 20 **மதிப்பெண்**

அன்னையும் பிதாவும் முன்னறி தெய்வம், இல்லறம் அல்லது நல்லறம் அன்று, ஊருடன் பகைக்கின் வேருடன் கெடும்,ஏவா மக்கள் மூவா மருந்து,ஒளவியம் பேசுதல் ஆக்கத்திற்கு அழிவு, அ.ஃகமும் காசும் சிக்கனத்தோடு,கற்பெனப்படுவது சொல்திறம்பாமை,கிட்டாதாயின் வெட்டென மற,கீழோர் ஆயினும் தாழ உரை,குற்றம் பார்க்கின் சுற்றம் இல்லை, கூர் அம்பு ஆயினும் வீரீயம் பேசேல், கெடுவது செய்யின் விடுவது கருமம், கைப்பொருள் தன்னின்,மெய்ப்பொருள் கல்வி,சீரைத்தேடின் ஏரைத்தேடு, சுற்றத்திற்கு அழகு சூழ இருத்தல்,சூதும் வாதும் வேதனை செய்யும்,சேமம்புகினும் யாமத்து உறங்கு, சோம்பர் என்பவர் தேம்பித்திரிவர், தந்தை சொல்மிக்க மந்திரம் இல்லை, தாயிற் சிறந்தது ஒரு கோவிலும் இல்லை, திரைகடல் ஓடியும் திரவியம் தேடு, தீராக் கோபம் போராய் முடியும், தோழனோடும் ஏழமை பேசேல்,நாடெங்கும் வாழக் கேடொன்றும் இல்லை,நீரகம் பொருந்திய ஊரகத்து இரு, பாலோடு ஆயினும் காலம் அறிந்து உண், பையச் சென்றால் வையம் தாங்கும், மருந்தே ஆயினும் விருந்தோடு உண், முற்பகல் செய்யின் பிற்பகல் விளையும், மேழிச் செல்வம் கோழைபடாது.

(மேற்கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு அல்லது புதுக்கவிதை) கதை,கட்டுரை,நாடகம் எழுதி வரச் செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC21	Advanced English-II	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To understand the format of e-mail, fax and memos
- To write itinerary, checklist, invitation, circular, instruction, recommendations
- To understand the impact of the biographies of famous people

Outcome:

- Develop writing skill
- Read and comprehend literature

UNIT –I

E-mail, Fax, Memos

UNIT – II

Itinerary, Checklist

UNIT – III

Invitation, Circular

UNIT – IV

Instruction, Recommendations

UNIT – V

Biographies of famous people:

Mother Teresa-Madam Curie-Charles Chaplin-Vikram Sarabhai

References:

English Grammar -Wren and Martin

English Grammar and Composition -Radhakrishna Pillai

Technical Communication -Meenakshi Sharma & Sangeetha Sharma

Inspiring Lives -Maruthi Publishers

English Work Book-I&II -Jewelcy Jawahar

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC22	English-II	4	0	0	2

Aim:

- To acquaint learners with different trends of writing

Objective:

- To empower students to acquire language skills through literature
- To enable the students to appreciate literature
- To develop the conversational skills through one act plays

Outcome:

- Read and comprehend literature.

UNIT – I

Ecology -A.K. Ramanujan
Gift -Alice Walker
The First Meeting -Sujata Bhatt

UNIT –II

Fueled -Marcie Hans
Asleep -Ernst Jandl
Buying and selling -Khalil Gibran

UNIT –III

The End of living and The Beginning of Survival - Chief Seattle
My Wood - E.M.Forster
The Meeting of Races - Rabindranath Tagore

UNIT – IV

The Refugee -K.A. Abbas
I Have a Dream -Martin Luther king
Those People Next Door -A.G. Gardiner

UNIT – V

Marriage is a private Affair -Chinua Achebe
The Fortune Teller -Karel Capek
Proposal -Anton Chekov

References:-

Gathered Wisdom -GowriSivaraman EmeraldPublishers

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC23	General Chemistry -II	6	1	0	5

Aim:

- Develop an appreciation of chemistry and its application in daily life.

Objective:

- To teach students to analyze data from experiments or from other sources.
- To acquire students a readiness in becoming responsible citizens in a changing world.

Outcome:

- Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
- Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.

UNIT I

Alkynes: Acidity of acetylene, formation of acetylides, addition of water with $HgSO_4$ catalyst, addition of hydrogen halides and halogens, oxidation, ozonolysis and hydroboration (mechanisms).

Cycloalkanes: Preparation using Wurtz's reaction, Dieckmann's ring closure and reductions of aromatic hydrocarbons. Substitution and ring opening reactions. Baeyer's strain theory and theory of stainless rings.

UNIT II

Quantum numbers - principal, Azimuthal, magnetic and spin quantum numbers and their significance - Pauli exclusion principle - Hund's rule - Aufbau principle, (n+1) rule, stability of half-filled and fully filled orbitals - inert pair effect.

UNIT III

Quantum theory: Bohr's model of atoms. Bohr's theory of hydrogen and spectral lines. Limitations of Bohr model. Somerfield's extinction. Photoelectric effect and Compton Effect. Debroglie's equation and verification (Davisson and Germer expt)

UNIT IV

Chemical Kinetics: Rate of reactions, rate laws, rate constant, order and molecularity of reactions. Rate equations for zero, first, second and third order reactions. Derviation of rate constant for Zero, first and second order reactions. Fractional order reactions. Examples- Half-life period, Pseudo first order reactions.

UNIT V

Polymerization: Types- free radical, cationic and anionic polymerizations with mechanisms.

Preparation of polymers - addition polymers (PE, PVC, Teflon and PS)-Condensation polymers (Nylon6.6, tereylene) - synthetic rubbers (Buna, Butyl rubber, SBR, neoprene) - natural rubber.

References:

1. S.S.Dara — A Text Book of Environmental Chemistry and Pollution Control- S.Chand and Co.
2. D.N.Bajpai — Advanced Physical Chemistry — S.Chand and Co.
3. Bruce H.Mahan, University Chemistry, Narosa Publishers, New Delhi, 1989.
4. R.T.Morrison and R.N.Boyd, Organic Chemistry, 6th Edition.
5. I.L.Finar Organic Chemistry , Volume I
6. R.D.Madan, Advanced Inorganic Chemistry.
7. Puri and Sharma, Text Book of Physical Chemistry.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC24L	Organic Analysis Lab	0	0	3	2

A study of the reactions of the following organic compounds,:

a. Carbohydrate,
b. Amide,
c. Aldehyde,
d. Ketone,
e. Acid,
f. Phenol.

The students may be trained to perform the specific reactions like tests for elements (nitrogen only) aliphatic or aromatic saturated or unsaturated and functional group present and record their observations.

Preparation (Single stage) involving

a. Nitration,
b. Hydrolysis
c. Bromination.

COURSE CODE	COURSE TITLE	L	T	P	C
20112AEC25A	ODE, PDE and Laplace Transform	4	0	0	4

Aim:

- To study the Ordinary Differential Equations, Partial Differential Equations and Laplace Transformy to solve mathematical applications in chemistry..

Objectives:

- This course is designed to give students, the student should know the Differential Equations and Laplace Transform.

Outcomes:

- By the end of this course, the student should solve the ODE, PDE and LAPLACE TRANSFORM concepts to solve the problems.

UNIT I:

Ordinary differential equations of first order but of higher degree- Equations solvable for x and y – solvable for dy/dx, clairaut's form (simple case only)- homogeneous linear differential equation(Variable coefficients), variation of parameter.

UNIT II:

Formation of partial differential equation by eliminating constants and by eliminating of arbitrary functions- definition of general, particular and complete solution – singular integral(Geometrical meaning not required) solution of first order equations in the slandered forms f(p,q=0, f(x,p,q)=0, f(z,p,q)=0 f1(x,p=f_2(y,p) z=(x,p+yq=f(p,q).

UNIT III:

Lagrange's method for solving $P_p + Q_q = R$ where p,q,r functions of X, Y, Z- (geometrical meaning is not needed)- (only problem in all the above- No proof needed for any formula) Cherpit's method The four standard forms.

UNIT IV:

Laplace Trnsforms- Definitions-

L(e^{at}) L(cosat), L(sinat), L(t^n) where n is a positive integer – Basic theorem inlaplace (transform only) L (e^{-st} cosbt), L(e^{-st} sinbt), L[e^{-st} f(t)]-L[F(t), L[f(t)], L[f'(t)]

UNIT V:

Inverse Laplace transform related to the above standard forms- solving second order ODE with constant coefficients using laplace transforms and simultaneous equation, variable coeffiecients. Fourier series: Periodic functions — Dirichlet conditions (Without Proof) Odd and Even functions change of interval — Half range series.

References:

1. S. Narayanan – differential equations
2. T.K.M Pillai & S.Naranyanan- calculus
3. M.L.Khanna- differential calculus

COURSE CODE	COURSE TITLE	L	T	P	C
20112AEC26A	Analytical Geometry in Vector Calculus	4	0	0	4

Aim:

- To study analytical geometry in vector calculus for the application in Chemistry.

Objectives:

- This course is designed to give students; the student should know and solve the analytical geometry in vector calculus.

Outcomes:

- By the end of this course, the student should solve problems of analytical Geometry in vector calculus.

UNIT – I

Vector differentiation – velocity & acceleration vectors- Gradient of a vector directional derivative - Init normal vector- tragent plane

Unit- II

Divergence- Curl – Solenoidal & Irrotational vector- Double operators – Properties connecting grad, div & curl of a vector.

Unit –III

Vector integration –Line integrals – Conservative force field – Scalar field- Scalar potential- work done by d Force- Surface integrals – Volume integrals.

Unit –IV

Gauss divergence theorem , Stoke's theorem (statement, application & verification only)

Unit –V

Equation of sphere – Target plane – plane section of a sphere – Finding the centre & radius of the circle of integration – sphere through the circle of integration (only problem in all above)

Reference:

T.K. Manickavasagem Pillai, Analytical Geometry (3D) & Vector calculus, Neq Gamma Publishing House, 1991

COURSE CODE	COURSE TITLE	L	T	P	C
	Communication Skills	0	0	0	2

Objectives :

This course has been developed with the following objectives:

1. Identify common communication problems that may be holding learners back
2. Identify what their non-verbal messages are communicating to others
3. Understand role of communication in teaching-learning process
4. Learning to communicate through the digital media
5. Understand the importance of empathetic listening
6. Explore communication beyond language.

Expected Outcome :

By the end of this program participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit - 1: Listening

Techniques of effective listening

- Listening and comprehensin
- Probing questions
- Barriers to listening

Unit - 2: Speaking

Pronunciation

- Enunciation
- Vocabulary
- Fluency
- Common Errors

Unit - 3: Reading

Techniques of effective reading

- Gathering ideas and information from a given text
  i. Identify the main claim of the text
  ii. Identify the purpose of the text
  iii. Identify the context of the text
  iv. Identify the concepts mentioned
- Evaluating these ideas and information
  i. Identify the arguments employed in the text
  ii. Identify the theories employed or assumed in the text
- Interpret the text
  i. To understand what a text says
  ii. To understand what a text does

iii. To understand what a text means

Unit - 4: Writing and different modes of writing

Clearly state the claims

- Avoid ambiguity, vagueness, unwanted generalisations and oversimplification of Issues.
- Provide background information
- Effectively argue the claim
- Provide evidence for the claims
- Use examples to explain concepts
- Follow convention
- Be properly sequenced
- Use proper signposting techniques
- Be well structured

i. Well-knit logical sequence
ii. Narrative sequence
iii. Category groupings

- Different modes of Writing -

i. E-mails
ii. Proposal writing for Higher Studies
iii. Recording the proceedings of meetings
iv. Any other mode of writing relevant for learners

Unit - 5 : Digital Literacy

Role of Digital literacy in professional life

- Trends and opportunities in using digital technology in workplace
- Internet Basics
- Introduction to MS Office tools

i. Paint
ii. Office
iii. Excel
iv. Powerpoint

Unit - 6 : Effective use of Social Media

Introduction to social media websites

- Advantages of social media
- Ethics and etiquettes of social media
- How to use Google search better
- Effective ways of using Social Media
- Introduction to Digital Marketing

Unit - 7: Non-verbal communication

Meaning of non-verbal communication

- Introduction to modes of non-verbal communication
- Breaking the misbeliefs
- Open and Closed Body language

- Eye Contact and Facial Expression
- Hand Gestures
- Do's and Don'ts
- Learning from experts
- Activities-Based Learning

References:

1. Sen Madhucchanda (2010), *An Introduction to Critical Thinking*, Pearson, Delhi

2. Silvia P. J. (2007), *How to Read a Lot*, American Psychological Association, Washington DC

COURSE CODE	COURSE TITLE	L	T	P	C
	Basic Behavioral Etiquette	0	0	0	2

Objectives:

Etiquette seems like an obsolete term in our modern world, however, more than ever, it is important to learn how to have solid social graces and just plain old good manners.

Learning outcomes:

Demonstrate how to properly introduce yourself to other people..

Describe appropriate etiquette in conversations and describe how to be a good listener.
Identify appropriate etiquette for public places.

Course Topics

Lesson 1 : Introduction to Modern Etiquette

Lesson 2 : Meetings and Introductions

Lesson 3 : Conversation and Listening Skills

Lesson 4 : Telephone/Cell Phone, Texting, Emailing and Internet Etiquette

Lesson 5 : Etiquette in Public Places

Lesson 6 : Employment/Volunteer Etiquette

Lesson 7 : Dining Etiquette

Lesson 8 : Social Gathering Etiquette (Guest and Host/Hostess)

Lesson 9 : School Etiquette

Lesson 10 : Confidence Without Arrogance

SEMESTER – III

COURSE CODE	COURSE TITLE	L	T	P	C
20110AEC31	Tamil –III	4	0	0	2

தமிழ்

பாடத்திட்டம்

இளங்கலை : பருவம் மூன்று-17110AEC31

தாள் - III

செய்யுள் - காப்பியங்கள், இலக்கணம்,இலக்கிய வரலாறு, மனப்பாடப்பகுதி

அலகு-I

சிலப்பதிகாரம்-வழக்குரை காதை

மணிமேகலை-ஆதிரை பிச்சையிட்ட காதை

சீவகசிந்தாமணி-நாட்டுவளம் 10 பாடல்கள்

அலகு-II

பெரியபுராணம்- மெய்ப்பொருள் நாயனார் புராணம்

கம்பராமாயணம்-வாலி வதைப்படலம்

அலகு-III

சீறாப்புராணம் - கரம் பொருத்து படலம்

இயேசுகாவியம் - மழைப்பொழிவு

அலகு-IV

இலக்கணம்

யாப்பு

மனப்பாடப்பகுதி

அலகு-V

இலக்கிய வரலாறு

காப்பியங்கள்

ஐஞ்சிறுகாப்பியங்கள்

புராணங்கள், இதிகாசங்கள்

ஓப்படைவு – மதிப்பெண் 40

பாடத்தொடர்புடையக் கட்டுரை 20 மதிப்பெண்

வெற்றி வேற்கை 20 மதிப்பெண்

எழுத்து அறிவித்தவன் இறைவன் ஆகும், கவ்விக்கு அழகு கசடற மொழிதல், செல்வர்க்கு அழகு செழுங்கிளை தாங்குதல், மன்னவர்க்கு அழகு செங்கோல் முறைமை, வைசியர்க்கு அழகு வளர் பொருள் ஈட்டல், உழவர்க்கு அழகு உழுது ஊண் விரும்பல், மந்திரிக்கு அழகு வரும் பொருள் உரைத்தல், தந்திரிக்கு அழகு தறுகண் ஆண்மை, உண்டிக்கு அழகு விருந்தோடு உண்டல், பெண்டிர்க்கு அழகு எதிர் பேசாதிருத்தல்,அறிஞர்க்கு அழகு கற்றுணர்ந்து அடங்கல், வறிஞர்க்கு அழகு வறுமையில் செம்மை, பெரியோர் எல்லாம் பெரியோரும் அல்லர்.சிறியோர் எல்லாம் சிறியரும் அல்லர்,அடினும் ஆவின் பால் தன் சுவை குன்றாது, சுடினும் செம்பொன் தன்னொளி கெடாது, அறைக்கினும் சந்தனம் தன் மனம் மாறாது பெருமையும் சிறுமையும் தான் தர வருமே, அறிவுடை ஒருவனை அரசும் விரும்பு, யானைக்கு இல்லை தானமும், தருமமும்,பூனைக்கு இல்லை தவமும் தயையும், ஞானிக்கு இல்லை இன்பமும் துன்பமும் , அச்சமும் நாணமும் அறிவிலோருக்கு இல்லை, நாளும் கிழமையும் நலிந்தோருக்கு இல்லை, கேளும் கிளையும் கெட்டோருக்கு இல்லை,உடைமையும் வறுமையும் ஒரு வழி நில்லா,இரந்தோர்க்கு ஈவதும் உடையோர் கடனே,பழியா வருவது மொழியாது ஒழிவது, சுழியா வருபுனல் இழியாது ஒழிவது, துணையோடு அல்லது நெடுவழி போகேல்.

(மேற்கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு அல்லது புதுக்கவிதை) கதை,கட்டுரை,நாடகம் எழுதி வரச் செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC31	Advanced English-III	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the organs of speech and the description and classification of speech sounds
- To understand consonant cluster, syllable, word accent and intonation.
- To know how to interpret graphics
- To write slogans and advertisements

Outcome:

- Understand Phonetics
- Develop writing skill

UNIT –I

The organs of speech, Classification of speech sounds , Vowels and Diphthongs

UNIT –II

Consonants, Consonant cluster

UNIT – III

Syllable, Word accent, Intonation

UNIT – IV

Idiom, Interpretation of graphics

UNIT – V

Slogan writing, Writing advertisement

References:

English Grammar -Wren and Martin
English Grammar and Composition -Radhakrishna Pillai
Technical Communication -Meenakshi Sharma & Sangeetha Sharma
A text book of Phonetics for Indian Students -T.B. Balasubramaniyan

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC32	English-III	4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To sensitize students to language use through prescribed text
- To develop the conversational skills through one act plays

Outcome:

- Read and comprehend literature

UNIT – 1

The Doctor's World - R.K. Narayan

The Postmaster - Rabindranath Tagore

Princess September - E.Somerest Maugham

UNIT – II

The Price of Flowers -Prabhat Kumar Mukhopadhyay

The Open Window -Saki

The Model Millionaire -Oscar Wilde

UNIT –III

My Brother My Brother - Norah Burke

Uneasy Home Coming - Will F. Jenkins

Resignation - Premchand

UNIT –IV

The Referee -W.H. Andrews & Geoffrey Dreamer

The Case of the Stolen Diamonds -Farrell Mitchell

UNIT – V

The Dear Departed -Stanley Houghton

The Princess and the Wood Cutter -Alan Alexander Milne

References:-

Nine Short Stories -Steuart H.King Blackie Books
One-Act plays of Today -T.Prabhakar Emerald Publishers

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC33	General Chemistry - III	5	0	0	5

Aim:

- To acquaint with the knowledge of nature of metals and its characters.

Objective:

- The student will acquire a foundation of **chemistry** of sufficient breadth and depth to enable them to understand and critically interpret the primary **chemical** literature.
- The student will learn the laboratory skills needed to design, safely conduct and interpret **chemical** research.

Outcome:

- Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
- Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large.

UNIT I

Alkali and alkaline earth metals:

Comparative study of alkali and alkaline metal compounds (oxides, halides, hydroxides, carbonates, sulphates). Diagonal relationship between lithium and magnesium, lithium aluminium hydride and sodium borohydride — preparation, properties and uses. **Coinage metals:** Comparative study of coinage metals. **Zinc Group metals:** Comparative study of Zinc group metals. Galvanization, existence of mercurous ion and Hg^{2+} principles of qualitative analysis -solubility product, principles of elimination of interfering radicals, common effect, reactions including spot tests in qualitative analysis.

UNIT II

Inner transition elements:

Lanthanides—occurrence—electronic configuration — oxidation sates, magnetic properties, complexation behaviour. Actinides —occurrence — electronic configuration — oxidation states, magnetic properties and complexation behavior. Lanthanide contraction. Chemistry of thorium and uranium — occurrence, extraction and uses. Mineral wealth of India — minerals found in India. Steel and alloy steels — Heat treatment of steel.

UNIT III

Aromatic hydrocarbons and Aromaticity:

Structure and stability of benzene ring — resonance in benzene — delocalized π electron cloud in benzene. Aromaticity — Huckel's Rule — examples — benzene, naphthalene, anthracene, furan, pyrrole, thiophene and ferrocene. Electrophilic substitution reactions in aromatic compounds. General mechanism of electrophilic substitution reactions — Nitration, sulphonation , halogenation, Friedel-Crafts alkylation and acylation reactions — nuclear and side chain halogenations.

UNIT IV

Polynuclear hydrocarbons-

Napthalene and anthracene — isolation, properties, structure and uses. Aromatic nucleophilic substitution — Benzyne mechanism and intermediate complex formation mechanism — effect of substituents on reactivity.

UNIT V

Magnetic properties of matter- magnetic flux- magnetic permeability —magnetic susceptibility. diamagnetism, paramagnetism, ferro and anti-ferro magnetism — Curie temperature. Determination of magnetic susceptibility —Buoy's method — number of unpaired electrons. Application to structural problems $K_3Fe(CN)_6$, $K_4Fe(CN)_6$ and $Ni(Co)_4$.

References:

1. P.L.Soni & Mohankatyal, Text Book of Inorganic Chemistry 20th Revised edn., Sultan Chand 1992.
2. R.B.Puri & L.R.Sharma, "Principles of Inorganic Chemistry," Sultan Chand, 1989.
3. P.L.Soni & H.M.Chawla "Text book of Organic Chemistry' Sultan Chand & Sons 1994, Delhi.
4. K.S.Tewari, S.N.Mehrotra and N.K.Vishnoi, "A Text book of Organic Chemistry".
5. M.K.JAIN," Organic Chemistry", Shoban Lal Nagin Chand and Co.

6. B.R.Puri,L.R.Sharma and Madan S.Pathania, "Principles of Physical Chemistry" Shoban Lal Nagin Chand and Co., Delhi.
7. Vogel's "Text Book of Quantitative Chemical Analysis" E.L.B.S.
8. R.D.Madan, "Modern Inorganic Chemistry". 1987, S.Chand & Company Ltd.
9. P.L.Soni,"Text book of Organic Chemistry, Sultan Chand & Co., New Delhi.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC34L	Physical Chemistry Lab - I	0	0	3	3

1. Kinetics – Acid hydrolysis of Easter – (Methyl acetate)
   – (IN HCL & 0.5N HCL)
2. Kinetics – Acid hydrolysis of Easter – (Ethyl acetate))
   – (IN HCL & 0.5N HCL)
3. Determination of molecular weight of substance by Rast method
4. Determination of (CST) of phenol – water system
5. Effect of impurities on CST
6. Determination of molecular weight of substances by Transition Temperature method.

COURSE CODE	COURSE TITLE	L	T	P	C
20113AEC35	Physics - I	5	0	0	4

Aim:

- The course presents an introduction to the physics of the objects whose sizes span from atomic dimensions to macroscopic, human scale dimensions, and beyond: atoms, molecules, gases, liquids, and solids.
- The aim is to show how the properties of macroscopic bodies can be derived from the knowledge that matter is made up from atoms.

Objectives:

- Recognize the difference between physical and chemical properties
- Distinguish between extensive and intensive properties

Outcomes:

- On completion successful students will be able to demonstrate an understanding of:
- 1. The relationships between physics on the atomic scale and the properties of matter.
- 2. The roles played by microscopic states of system, their numbers and their accessibility.
- 3. Techniques for finding appropriate averages to predict macroscopic behavior.

Unit I: Mechanics

Center of gravity of a solid hemisphere – Hollow hemisphere – Solid cone. Stability of floating bodies – Meta center – Determination of Meta centic height of a ship.

Unit II: Sound

Simple harmonic motion – comparison of two simple harmonic motion – A long straight line – At right andle to each other Lissa Hou's figures and their application – Acoustics of buildings reverberation – reverberation fire Sabines formula – conditions for good acoustics. Deciber – phon – Intensity measurements by hotwire microscope method.

Unit III: Properties of matter

Diffussion: Fick's law – Coefficients of diffusion – experimental determination of coefficient of diffusion – application.

Osmosis: Laws of osmic pressure Berkely and Hartly method of determining osmotic pressure – elimination of boiling and depression of freezing point – application.

Unit IV

Thermal Physics: Newton's law of cooling – Verification – specific heat capacity of liquid by cooling – bomb calorie meter.

Conduction: Coefficeint of thermal conductivity – good and bad conductor – Stefan's law of radiation - Solar constant – Angstorm's phyro heliometers – temperature of the sun.

Unit V

Optics: Electro magnetic spectrum – spectral response of human eye – UV and IR spectroscopy

Raman effect – experimental arrangement – application of Raman effect.

Fiber optic communication: Introduction – optic fiber – numerical aperture – coherent bundle – fiber optic communication system and its advantage – multimode optic sensors.

Reference:

1. Sound , Saigal, S-Chand & co.
2. Properties of matter, D.S.Matur.
3. Heat and Thermodynamics, Brijal Subramaniyam.
4. Optics, Brijal Subramaniyam.
5. Static, Hydrostatics and Hydrodynamics, Nrayanamoorty & Nagarathinam.

COURSE CODE	COURSE TITLE	L	T	P	C
20113AEC36L	Physics Lab - I	0	0	3	3

List of Experiments

1. Semi-conductor diode characteristics
2. Surface tension – Drop weight method
3. Meter Bridge – Determinations of resistance
4. Post office Box – Resistance
5. Non-uniform Bending – Young's modulus
6. Potentiometer – Voltmeter calibration
7. Sonometer – Verification of laws
8. Spectrometer – Determinations of refractive index
9. Bridge Rectifier
10. Basic Logic Gates – Discrete components

COURSE CODE	COURSE TITLE	L	T	P	C

20114RMC37	Research Methodology	3	0	0	3

AIM:

To create a basic appreciation towards research process and awareness of various research publication

OBJECTIVES:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases
- To give exposure to standard laboratory precautions and best practices for experimental work
- To provide orientation for basic mathematical computation useful in basic research

OUTCOME:

Ability to carry out independent literature survey corresponding to the specific publication type and assess basic experimental as well as conceptual set up.

PREREQUISITES:

Basic mathematical and experimental skills and exposure to window-based computer operation system.

UNIT I: Introduction to Research Methodology

Meaning of research – Objectives of research – Types of research – Significance of research – Research approaches

UNIT II: Research Methods

Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT III: Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Reviews – General treatises – Monographs.

UNIT IV: Database Survey

Database search – NIST – MSDS – PubMed – Scopus – Science citation index – Information about a specific search.

UNIT V: Laboratory Safety

General guidelines. Hygiene – Eye, foot, skin and hand protection – Safety rules Equipment protection – Respiratory protective equipment – safety equipment – Leaking compressed gas cylinders – electrical safety. Fire – fire extinguishers.

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.

2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.

3. D.G Peters, J.M. Hayes and G.M. Hefige, A brief introduction to Modern chemical analysis.

4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.

5. R. Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand and Sons, New Delhi, 2005.

COURSE CODE	COURSE TITLE	L	T	P	C
	Office Automation	0	0	0	2

Course Objective:

To provide an in-depth training in use of office automation, internet and internet tools. The course also helps the candidates to get acquainted with IT.

Learning Outcomes:

After completion of the course, students would be able to documents, spreadsheets, make small presentations and would be acquainted with internet.

Course Modules:

Module 1

Knowing the basics of Computers

Module 2

Word Processing (MS word)

Module 3

Spread Sheet (MS XL)

Module 4

Presentation (MS Power Point)

Module 5

Communicating with Internet

Suggested reading and reference books:

1. Fundamentals of computers - V.Rajaraman - Prentice- Hall of india

2. Microsoft Office 2007 Bible - John Walkenbach,Herb Tyson,Faithe Wempen,cary

N.Prague,Michael R.groh,Peter G.Aitken, and Lisa a.Bucki -Wiley India pvt.ltd.

3. Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay

Nicole Imprints Pvt. Ltd., 2013.

4. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications

5. https://en.wikipedia.org

6. https://wiki.openoffice.org/wiki/Documentation

7. http://windows.microsoft.com/en-in/windows/windows-basics-all-topics

SEMESTER – IV

COURSE CODE	COURSE TITLE	L	T	P	C
20110AEC41	Tamil–IV	4	0	0	2

தமிழ்

பாடத்திட்டம்

இளங்கலை : பருவம் நான்கு-17110AEC41

தாள் - IV

செய்யுள்- சங்க இலக்கியம், இலக்கணம்,இலக்கிய வரலாறு-மனப்பாடப் பகுதி

அலகு-I

எட்டுத்தொகை

நற்றினை – குறிஞ்சி 356,முல்லை-242, பாலை-397

குறுந்தொகை-2,18,25,58,67,69,135,167,283,373

ஐங்குறுநூறு- சிறுவெண் காக்கைப் பத்து

அலகு-II

கலித்தொகை-பாலை 34,குறிஞ்சி-51,நெய்தல்-133

அகநானூறு - 36,147,332

புறநானூறு- 34,173,189,235,279

அலகு-III

முல்லைப்பாட்டு

திருக்குறள்-ஐந்து அதிகாரம்- அறம் 2,பொருள் 2,இன்பம் -1 வான்சிறப்பு,அழுக்காறாமை,இறைமாட்சி,கூடாநட்பு,காதற்சிறப்புரைத்தல்

அலகு-IV

இலக்கணம்

அணி

மனப்பாடப்பகுதி

அலகு-V

இலக்கிய வரலாறு

எட்டுத்தொகை

பத்துப்பாட்டு

அறஇலக்கியங்கள்

தாள் - IV

ஒப்படைவு மதிப்பெண்-40

பாடத்தொடர்புடைய கட்டுரை 20 மதிப்பெண்

பாரதியார், பாரதிதாசன் புதிய ஆத்திச்சூடி 20 மதிப்பெண்

பாரதியார்

அச்சம் தவிர்,ஆண்மை தவறேல்,இளைத்தல் இகழ்ச்சி,உடலினை உறுதி செய்,எண்ணுவது உயர்வு,ஏறுபோல் நட,ஐம்பொறி ஆட்சி கொள்,ஒற்றுமை வலிமையாம்,காலம் அழியேல்,கீழோருக்கு அஞ்சேல்,குன்றென நிமிர்ந்து நில்,கொடுமையை எதிர்த்து நில், சிதையா நெஞ்சு கொள்,செய்வது துணிந்து செய், தீயோருக்கு அஞ்சேல்,பெரிதினும் பெரிது கேள்,வையத்தலைமை கொள்,யாரையும் மதித்து வாழ்

பாரதிதாசன்

காற்றினைத் தூய்மை செய்,குற்ற நினைவு தீர்,தளையினைக் களைந்து வாழ் தூய நீராடு, தெருவெல்லாம் மரம் வளர்,தைக்க இனிதுரை,தொன்மை மாற்று,நிலைவினில் தெளிவு கொள், நீனிலம் உன் இல்லம்,போர்த் தொழில் பழகு,மாறுவது இயற்கை, வையம் வாழ வாழ்.

(மேற்கண்ட தலைப்புகளில் ஏதேனும் ஒன்றனுக்கு கவிதை(மரபு அல்லது புதுக்கவிதை) கதை,கட்டுரை,நாடகம் எழுதி வரச் செய்து சரிப்பார்த்து மதிப்பெண் வழங்கிடவும்)

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC41	Advanced English-IV	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the objectives and types of interview
- To know the types of questions and answering techniques
- To prepare reviews and proposals
- To learn the grammatical forms
- To understand the meaning of a poem and write the content
- To write for and against a topic
- To draw a flowchart
- To write definitions

Outcome:

- Develop communicative skill
- Read and comprehend literature

UNIT –I

Interviews

Objectives, types, ten success factors, ten failure factors - Planning and preparation – Presentation– Type of questions – Answering techniques.

UNIT – II

Flowchart

Proposals

UNIT – III

Discourse markers

Review

UNIT IV

Grammatical forms

Paraphrasing

UNIT –V

Definition

Writing for and against a topic.

References:

English Grammar -Wren and Martin

English Grammar and Composition -Radhakrishna Pillai

Essentials of Business Communication -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

Technical Communication -Meenakshi Sharma & Sangeetha Sharma

English for writers and translators -Robin Macpherson

English Work Book-I&II -Jewelcy Jawahar

COURSE CODE	COURSE TITLE	L	T	P	C
20111AEC42	English-IV	4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To introduce learners to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

Outcome:

- Read and comprehend literature

UNIT –I

How to be a Doctor -Stephen Leacock

My Visions for India -A.P.J. Abdul Kalam

Woman, not the weaker sex -M.K. Gandhi

UNIT –II

My Last Duchess -Robert Browning

The Toys -Coventry Patmore

I, too -Langston Hughes

UNIT –III

The Best Investment I ever made-A.J.Cronin

The Verger -W.S Maugham

A Willing Slave -R.K.Narayan

UNIT –IV

Macbeth, As You Like It

UNIT –V

Henry IV, Tempest

References:-

English for Enrichment -.Devaraj Emerald Publishers
Selected Scenes from Shakespeare Book I &II -EmeraldPublishers

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC43	General Chemistry - IV	6	0	0	6

Aim:

- To acquaint with the knowledge of nature of metals and its characters.

Objective:

- The student will acquire a foundation of **chemistry** of sufficient breadth and depth to enable them to understand and critically interpret the primary **chemical** literature.
- The student will learn the laboratory skills needed to design, safely conduct and interpret **chemical** research.

Outcome:

- Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

- Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large.

UNIT I

TRANSITION METALS AND THEIR COMPOUNDS - Group study of Titanium, Vanadium, Chromium, Manganese and Iron. Metallurgy and uses of V, W and Mo. Comparison of lanthanides and actinides and their position in the periodic table. Elements with atomic number 104 and 105; preparation and their position in the periodic table. Chemistry of Thorium and Uranium — occurrence, ores, extraction and uses.

UNIT II

BIOLOGICALLY IMPORTANT COORDINATION COMPOUNDS — Chlorophyll, Hemoglobin, Vitamin B 12 — their structure, application (Structure elucidation is not required). Metal carbonyls — Mono and poly nuclear carbonyls of Ni, Fe, Cr, Co and Mn — synthesis, reactions, structure and uses. Nitrosyl compounds — classification, preparation, properties and structure of nitrosyl chloride and sodium nitroprusside.

UNIT III

ALIPHATIC NUCLEOPHILIC SUBSTITUTIONS — mechanism of S_N^1, S_N^2, and S_N^{ii} reactions, effect of solvents, leaving groups, nucleophiles and structure of substrates.

Elimination reactions — Hoffmann and Saytzeff s eliminations — cis, trans eliminations. Mechanism of El and E2 reactions. Relative reactivity of ethyl, vinyl, allyl and benzyl halides.

UNIT IV

POLYHYDRIC ALCOHOLS: Ethylene glycol, glycerol - properties including oxidation using periodic acid and LTA.

Unsaturated alcohols: Thioalcohols — preparation, properties and uses of ethyl mercaptan. Ethers- Methods of preparation of aliphatic and aromatic ethers — reactions of ethers — 1,4-dioxane — preparation and uses — Epoxides — Preparation and reactions. Thioethers — Preparation and uses.

UNIT V

Thermodynamics: system and surrounding — isolated, closed and open systems — homogeneous & heterogeneous systems, State of the system, intensive and extensive

variables. Thermodynamic process — cyclic processes, reversible and irreversible, isothermal and adiabatic processes — state and path functions, concept of heat and work. First law of thermodynamics — statements, definition of internal energy (U), enthalpy (H), heat capacity. Relation between C_p and C_v;

References:

1. R.D.Madan, G.D.Tuli and S.M. Malik , Selected Topic in Inorganic Chemistry , S.Chand & Co., New Delhi
2. J.D.Lee , Concise Inorganic Chemistry , E.L.B.S., 4th Edn.
3. R.B. Puri & L.R.Sharma , Principles of Inorganic Cheipistry ,Sultan Chand.
4. I.L. Finar , Organic Chemistry , Volume I , E.L.B.S. London.
5. V.S.Parmar & Chawla , Principles of Reaction Mechanisms in Organic Chemistry.
6. P.L.Soni , Text Book of Organic Chemistry.
7. Gurdeep Raj , Advanced Physical Chemistry.
8. Rajaram and Kuriacose , Thermodynamics for Students ofChemistry.
9. Puri and Sharma , Principles of Physical Chemistry.
10. Samuel Glasstone , Thermodynamics

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC44L	Physical Chemistry Lab - II	0	0	3	3

Conductometeric Experiments

1. Cell constant
2. Equivalent conductance
3. Verification of on- Sager equation
4. Acid- base titrations
5. Precipitation titrations

Potentiometric Experiments:

1. FAS vs $KMnO_4$
2. KI Vs KMN_{O4}
3. FAS VS $K_2Cr_2O_7$
4. KI Vs $K_2Cr_20_7$
5. Determination of solubility of silver salts.

COURSE CODE	COURSE TITLE	L	T	P	C
20113AEC45	Physics- II	5	0	0	5

Aim:

- To develop a basic understanding of electric and magnetic fields in free space using the
- Integral forms of Maxwell's laws.

Objectives:

- Describe the electric field and potential and related concepts, for stationary charges.
- Calculate electrostatic properties of simple charge distributions using Coulomb's law,
- Gauss's law and electric potential.

Outcomes:

- Describe the magnetic field for steady currents and moving charges.
- Calculate magnetic properties of simple current distributions using Biot-Savart and Ampere's Laws.
- Describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws.
- Describe the basic physical content of Maxwell's laws in integral form.

Unit I: Electrostatics

Coulomb's law-Gauss theorem, its application Field due to an infinite long plane, Sphere and Cylinder- Mechanical force on the surface of a charged conductor – Electrostatics energy in The Medium – Capacitors – Principles of a capacitor – Capacity of a capacitor – Capacity of an Isolated sphere and cylinder – Energy of a charged capacitor – Sharing charges and loss of energy.

Unit II: Electricity

Kirchoff's law's and their applications to Wheatstone's network – condition for bridge balance – Carey Forster's bridge – Laws of electromagnetic Induction – Expression for induced EMF – Self and Mutual Induction – Self Inductance of a Solenoid – Mutual inductance of a solenoid Inductor – Coefficient of coupling – Determination of coefficient of self induction by Raleigh's method

Unit III: Atomic Physics

Atom models – Summerfield's and Vector atom Models – Pauli's exclusion principle – various quantum numbers and quantization of orbits.
X-rays – Continuous and Characteristic X-ray – Mosle's Law and its importance Bragg's Law – Miller indices – Determination of Crystal structure by Laue's Powder photograph method.

Unit IV: Nuclear Physics

Nucleus – Nuclear size – charge – Mass and spin – Liquid drop and Shell models.
Nuclear Radiations and their properties, particle accelatior – Betatron and Proton Synchrotron, Particle Detectors – Cloud Chamber and Bubble Chambers. Four types of reactions – Elementary particles and their classifications

Unit V: Digital Electronics

Decimal – Binary – Octal and Hexa Decimal number systems and their Mutual conversions – 's and 2's complement of a Binary number and Binary arithmetic (Addition, Subraction,

Multiplication and Division) – Binary subtraction by 1's and 2's complement methods – Basic logic gates – AND, OR, NOT, NOR, NAND and EXOR gates – NAND & NOR as universal building gates – Boolean algebra – Laws of Boolean algebra – De-Morgan's Theorems – Their verifications using truth tables .

Reference:

1. Magnetism and Electricity – Khare and Srivastave – AtmaRam and sons – New Delhi
2. Modern Physics – Murughesan – S.Chand and co
3. Digital principles and their applications – Malvino and Leach – Tata McGraw Hill
4. Hand Book of Electronics – Gupta and Kumar – Pragati Prakasan
5. Ancillary Physics II – A Sundaraveluswami

COURSE CODE	COURSE TITLE	L	T	P	C
20113AEC46L	Physics Lab - II	0	0	3	2

List of Experiments

1. Figure of merits of Galvanometer
2. Potentiometer – Ammeter calibration
3. Carey Forster Bridge
4. Viscosity of Liquid – Poiseulle's flow method
5. Lee's Disc – Thermal conductivity
6. Specific capacity of a liquid
7. Spectrometer – Wavelength determination using Grating
8. Meter Bridge verification of serial and parallel connections of resistance wires
9. Logic Gates – IC Version
10. Zener Diode characteristics

COURSE CODE	COURSE TITLE	L	T	P	C
201ENVTSTU	Environmental Studies	1	0	0	1

Aim:

- To study about the awareness of environmental pollution and its issues.

Objectives:

- Creating the awareness about environmental problems among people.
- Imparting basic knowledge about the environment and its Ancillary problems.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Striving to attain harmony with Nature.

Learning Outcomes:

Students who graduate with a major in environmental science will be able to:

- Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale;
- Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment;
- Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community;
- Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues; and
- Understand how politics and management have ecological consequences.

1. **Nature of Environmental Studies**
   Definition, scope and importance.
   Multidisciplinary nature of environmental studies
   Need for public awareness.

2. **Natural Resources and Associated Problems.**
   a) Forest resources: Use and over — exploitation, deforestation, dams and their effects on forests and tribal people.

b) Water resources: Use and over — utilization Of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources.
d) Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer — pesticide problems.
e) Energy resources: Growing energy needs, renewable and non — renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy.
f) Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification,

3.Ecosystems

Concept of an ecosystem.
Structure and function of an ecosystem.
Producers, consumers and decomposers.
Energy flow in the ecosystem.
Ecological succession.
Food chains, food webs and ecological pyramids.
Introduction, types, characteristics features, structure and function of the following ecosystem:
a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem,
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

4. Biodiversity and its conservation

Introduction — Definition: genetic, species and ecosystem diversity.

Bio — geographical classification of India.

Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.

India as a mega — diversity nation.

Western Ghat as a biodiversity region.

Hot— spot of biodiversity.

Threats to biodiversity habitat loss, poaching of wildlife, man — wildlife conflicts.

Endangered and endemic species of India.

Conservation of biodiversity: In — situ and Ex — situ conservation of biodiversity.

5. Environmental Pollution

Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards.
Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of a individual in prevention of pollution.

6. Social Issues and the Environment

Disaster management: floods, earthquake, cyclone, tsunami and landslides.

Urban problems related to energy Water conservation, rain water harvesting, watershed management

Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issue and possible solutions.

Global wanTling, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation.

Consumerism and waste products.

7. Environmental Protection

From Unsustainable to Sustainable development.

Environmental Protection Act.

Air (Prevention and Control of Pollution) Act.

Water (Prevention and control of Pollution) Act.

Wildlife Protection Act.

Forest Conservation Act.

Population Growth and Human Health, Human Rights.

8. Field Work

Visit to a local area to document environmental assets — River / Forest / Grassland / Hill / Mountain.

or

Visit to a local polluted site — Urban / Rural *I* lad Listrial / Agricultural.

or

Study of common plants, insects, birds.

or

Study of simple ecosystems -— ponds, river, hill slopes, etc.

References:

1) Agarwal, K.C,200l, Environmental Biology, Nidi Pub. Ltd., Bikaner.

2) Bharucha Erach, The l3iodiversity of India, Mapin Publishing Pvt, Ltd., Ahmedabad 380013, India, Email: rn4pin@icenet.net (R)

3) Brunner R.C., 1989, 1-lazardous Waste Incineration, McGraw Hill Inc. 480p

4) Clank R.S., Marine Pollution, Clanderson Press Oxford (TB)

5) Cunningham, W.P. Cooper, T.H. Gorhani, E. & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Pub. Mumbai, Il96p

6) De A.K., Environmental Chemistry, Wiley Wastern Ltd.

7) Down to Earth, Centre for Science and Environment, New Delhi. (R)

8) Gleick, H., 1993, Water in crisis, Pacific Institute for studies in Dcv., Environment & Security. Stockholm Env Institute. Oxford Univ. Press 473p

9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bompay (R)

10) Heywood, V.K. & Watson, R.T.1995, Global Biodiversity Assessment, Crnbridge Univ. Press 1140 p.

COURSE CODE	COURSE TITLE	L	T	P	C
	Leadership and Management Skills	0	0	0	2

Objectives :

The Module is designed to**:**

- Help students to develop essential skills to influence and motivate others
- Inculcate emotional and social intelligence and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional and social contexts.

Expected Outcomes :

Upon completion of the course students will be able to:

1. Examine various leadership models and understand/assess their skills, strengths and abilities that affect their own leadership style and can create their leadership vision
2. Learn and demonstrate a set of practical skills such as time management, self management,

handling conflicts, team leadership, etc.

3. Understand the basics of entrepreneurship and develop business plans
4. Apply the design thinking approach for leadership
5. Appreciate the importance of ethics and moral values for making of a balanced personality.

Unit - 1- Leadership Skills

a. Understanding Leadership and its Importance

- What is leadership?
- Why Leadership required?
- Whom do you consider as an ideal leader?

b. Traits and Models of Leadership

- Are leaders born or made?
- Key characteristics of an effective leader
- Leadership styles
- Perspectives of different leaders

c. Basic Leadership Skills

- Motivation
- Team work
- Negotiation
- Networking

Unit - 2 - Managerial Skills

Basic Managerial Skills

- Planning for effective management
- How to organise teams?
- Recruiting and retaining talent
- Delegation of tasks
- Learn to coordinate
- Conflict management

b. Self Management Skills

- Understanding self concept
- Developing self-awareness
- Self-examination
- Self-regulation

Unit - 3 - Entrepreneurial Skills

a. Basics of Entrepreneurship

- Meaning of entrepreneurship
- Classification and types of entrepreneurship
- Traits and competencies of entrepreneur

b. Creating Business Plan

- Problem identification and idea generation
- Idea validation
- Pitch making

Unit - 4 - Innovative Leadership and Design Thinking

a. Innovative Leadership

- Concept of emotional and social intelligence
- Synthesis of human and artificial intelligence
- Why does culture matter for today's global leaders

b. Design Thinking

- What is design thinking?
- Key elements of design thinking:
  - Discovery
  - Interpretation
  - Ideation
  - Experimentation
  - Evolution.
- How to transform challenges into opportunities?
- How to develop human-centric solutions for creating social good?

Unit - 5- Ethics and Integrity

a.Learning through Biographies

- What makes an individual great?
- Understanding the persona of a leader for deriving holistic inspiration
- Drawing insights for leadership
- How leaders sail through difficult situations?

b. Ethics and Conduct

- Importance of ethics
- Ethical decision making
- Personal and professional moral codes of conduct
- Creating a harmonious life

References:

1. Ashokan, M. S. (2015). *Karmayogi: A Bbiography of E. Sreedharan*. Penguin, UK.
2. Brown, T. (2012). *Change by Design.* Harper Business
3. Elkington, J., & Hartigan, P. (2008). *The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World*. Harvard Business Press.
4. Goleman D. (1995). *Emotional Intelligence*. Bloomsbury Publishing India Private Limited
5. Kalam A. A. (2003). *Ignited Minds: Unleashing the Power within India*. Penguin Books India
6. Kelly T., Kelly D. (2014). *Creative Confidence: Unleashing the Creative Potential Within Us All.* William Collins
7. Kurien V., & Salve G. (2012). *I Too Had a Dream*. Roli Books Private Limited

COURSE CODE	COURSE TITLE	L	T	P	C
	General Aptitude and Quantitative Ability	0	0	0	2

Focus on basics

- Pick a topic and start solving various questions until you are clear
- Practice each concept one by one and gradually move to difficult questions or topics

Prepare time table

- Go through the syllabus and exam pattern of CAT quantitative aptitude 2020
- Identify the topics which are uncovered
- Assess the time to be needed to cover each topic

Take mock tests

- Familiarize with the type of questions asked in the exam by solving mock tests/ previous year question papers
- Helps you give exam environment and prepare you for D-day
- Analyse your performance and weak and strong areas.

Practice as per sectional time limit

- Sectional time limit of quantitative aptitude is 60 minutes, follow the time pattern while solving mock test
- Assign time for each question. Don't waste time over a question

Focus on weak areas

- After giving mock tests of CAT, analyse the weak areas
- Overcome that mistake by practicing various questions on the particular topic from recommended books.

S

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC51	Inorganic Chemistry - I	5	0	0	5

Aim:

- To know about the details of co-ordination compounds and natute of metals.

Objective:

- To know about ligand types and their different methods of coordination
- To know about isomerism in transition metal complexes.
- To know some basic Chemistry of first row transition metal ions.

Outcome:

- Able to tell the name of orbitals by recognizing shapes of orbitals.
- Able to calculate bond order of different molecules.
- The bonding models, structures, reactivities, and applications of coordination complexes, boron hydrides, metal carbonyls, and organometallics

UNIT - I

Coordination Compounds: Types of ligands. IUPAC nomenclature. Theories of coordination compounds — Werner, Sidgwick, valence bond, crystal field, molecular orbital and ligand field theories.

UNIT- II

Isomerism — stability of complexes — factors affecting the stability of complexes. Unimolecular and bimolecular nucleophilic substitution reactions in octahedral and square planar complexes — Trans effect. Application of coordination compounds - Detection of potassium ions, separation of copper and cadmium ions. Estimation of nickel using DMG and aluminium using oxime. Structure of EDTA and its complexes. Complexometric titrations — principles and applications.

UNIT — III

Metallic state: Packing of atoms in metal (BCP,CCP(FCC),HCP).Theories of metallic bonding — electron gas, Pauling and band theories. Structure of alloys — substitutional and interestitial solid solutions — HUME Rothery ratios. Ionic Bond, crystal structure and

advanced covalent bonding: Radius ratio rules — Calculation of some limiting radius ratio values for C.N.3(planar triangle), C.N.4 (tetrahedral) & C.N.6 (octahedral).

UNIT — IV

Binary compounds — hydrides, borides, carbides and nitrides —classification, preparation, properties and uses. Organometallic compounds of alkenes and cyclopentadienes.

UNIT - V

Group Theory and it's Applications: Symmetry elements —symmetry operations — mathematical group of multiplication tables, point group of simple molecules (H_2, HCl, CO_2, H_2O, BF_3 and NH_3).

References:

1. P.L.Soni, Text Book of Inorganic Chemistry, S.Chand & Co., New Delhi.
2. B.R.Poori &L.R. Sharma, Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand & Co., New Delhi.
3. R.D.Madan, G.D.Tuli and S.M.Malik, Selected Topics in Inorganic Chemistry, S. Chand & Co., New Delhi
4. J.D.Lee, Concise Inorganic Chemistry, E.L.B.S., 4^{th} Edn.
5. Jeffery et al., Vogel Text Book of Inorganic Quantitative Analysis, Longman.
6. Cotton and Wilkinson, Advanced Inorganic Chemistry, 5^{th} edn

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC52	Organic Chemistry - I	5	0	0	5

Aim:

- To know about the organic molecules and its reactivity.

Objective:

- To know about isomerism types and their different reactivity.
- To detail about carbonyl compounds and its reactions.
- To know some basic acids and its derivatives .

Outcome:

- Describe bonding models and appreciate how these impact on the properties of a simple molecule.
- Understand the importance of stereo isomerism and carbonyl compounds on a molecule structure and reactivity.

UNIT – I: STEREOISOMERISM - I

Stereoisomerisms — definition — optical and geometrical isomerism —classification of optical isomerism — optical activity — observed and specific rotation — conditions for optical activity in solid, liquid and gaseous phases —criteria for optical activity. Asymmetric center chirality's — achiral molecule — meaning of + and — and D and L notations — elements of symmetry — racemisation — methods of racemisation (by substitution and tautomerism) —resolution — methods of resolution (mechanical separation, seeding, biochemical and conversion to diasteroisomers) — asymmetric synthesis partial and absolute asymmetric synthesis — Walden inversion, Vant Hoff rule of superposition —m Freudenberg's rule of shift. Notations for optical isomers — Cahn — Ingold — Prelog rules — R.S.Notations for optical isomer with one asymmetric carbon — erythro and threo representions. Fischer projections, Sawhorse, Newman projections - representation of molecules with two asymmetric carbon atoms.

UNIT- II: STEREOISOMERISM - II

Optical activity in compounds containing no asymmetric cabons -biphenyls, allenes and spiranes. Optical activity on symmetric system (lactic acid, dissymmetric system (1,2-trans cyclopropane dicarboxylic acid). Geometrical isomerism — cis, —trans, syn and anti and E — Z notations-geometrical isomerism in maleic and fumaric acids and in unsymmetrical ketoximes — methods of distinguishing geometrical isomers (dipole moment, dehydration, heat of hydrogenation, cyclisation , melting points) — methods of determining the configuration of geometrical isomers no details required).Geometrical and optical isomerism in three member rings.

UNIT III: REACTIONS OF CABONYL COMPOUNDS

Carbonyl polarization - reactivity of carbonyl group — acidity of α-hydrogen. Mecanisms of aldol, Perkin, Knovenagal and benzoin condensations. Mechanisms of Clasien, Reformatsky, Wittig and Cannizaro reactions. Mechanisms of reduction (sodium borohydride, $LiA1H_4$,Wolff — Kishner and MPV reductions) — mechanisms of haloform rection and Michael addition and Oppenauer oxidation. Photochemistry of carbonyl compounds — Norrish I and II Types. Problem's and conversion wherever applicable.

UNIT IV: ACIDS AND ACID DERIVATIVES

Ionization of carboxylic acids — acidity constant- comparison of acid strengths of substituted halo acids — acid strengths of substited benzoic acids Hammmet equation. Hell — Volhard — Zeliniski reaction. Dicarboxylic acids — preparation and properties of oxalic, malonic, succinic, glutaric and adipic acids, unsaturated acids and hydroxy acids. malonic acid, acetoacetic esters — characteristics of reactivities of methylene group — synthetics uses of malonic and acetoacetic esters. Tautomerism — definition — keto-enol tautomerism (identification, acid and bases catalysed interconversion mechanisms. Preparations - amido — imido and — acnitro tautomerisms). Nucleophillic acyl substitutions, acid — base hydrolysis of ester, hydrolysis of amides and trans esterification.

UNIT V: HETEROCYCLIC COMPOUNDS

Aromatic characteristics of heterocyclic compounds. Preparation, properties and uses of furan, pyrrole, & thiophene. Synthesis and reactions of pyridine and piperidine — comparative basic characters of pyrrole, pyridine and piperidine with amines. Synthesis and reactions of Quinoline , isoquinoline and indole with reference to Skraup, Bischer Napieralski and Fischer indole synthesis . Structural elucidation of pyridine, quinoline and isoquinolines.

References:

1. B. S. Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co, New Delhi. (1998)
2. P.L Soni And H. M Chawala, Text book of Organic Chemistry — 28th edition (1999)-Sultan Chand, New Delhi.
3. Ravi Bhushan, Stereoisomerism of Carbon Compounds — CBS —Publishers, Delhi ‗ Revised Edn.
4. P.S. Kalsi, Stereochemistry- Conformation and Mechanism, Willey Eastern Ltd., New Delhi
5. O.P.Agarwal Chemistry of Natural Products, Volume I & II.

6. D. Nasipuri, Stereochemistry of Organic Compounds, Wiley Eastern Ltd., New Delhi
7. I.L. finar Organic Chemistry, Vol. I, E.L.B.S, London
8. R.K.Bansal, Organic Reaction Mechanisms, Tata Mc-Graw Hill, 1975
9. P.S.Kalsi , Organic Reactions and Their Mechanisms, New Age International Publishers.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC53	Physical Chemistry – I	4	1	0	4

Aim:

- To know about the physical properties of molecules and its reactivity.

Objective:

- To understand different properties of molecular structure.
- To understand the basic features of spectroscopy.
- To know some basic acids and its derivatives .
- To knowledge about thermodynamics and its applications.

Outcome:

- Able to recognize different regions for thermodynamics.

- Able to explain the concept of thermochemistry.
- Able to explain the concept and applications of surface chemistry.

UNIT- I THERMOCHEMISTRY:

Internal energy and enthalpy△changes△in chemical reactions. Relation between E and H. Relation between enthalpy of reaction at constant volume (q_v) and at constant pressure(q_p). Thermochemical equations, laws of thermochemistry — Hess's law and its applications. Standard states — standard enthalpy of formation, enthalpy of combustion, enthalpy of neutralization, integral and differential heats of solution and dilution. Bond dissociation energy — its calculation from thermobhemical data, temperature dependence of H - Kirchoff s equation.

UNIT - IISECOND LAW OF THERMODYNAMICS:

Need for the law, different statements of the law- concept of entropy. Entropy as a△state function —entropy as a function of P,V and T. Entropy changes in phase△changes△—entropy of mixing. Gibbs and Helmholtz functions. Gibbs function (G) and Helomholtz function (A) as thermodynamic quantities- A and G as criteria for thermodynamic equilibrium and spontaneity — variation of A and G with P,V, T- Gibbs- Helmholtz equation and their applications —Maxwell's relations.

UNIT - III

APPLICATIONS OF II LAW OF THERMODYNAMICS:

Equilibrium constants and free energy change. Thermodynamic derivation of law of mass action. Equilibrium constants in terms of pressure and concentration —NH_3, $PC1_5$, $CaCO_3$. Thermodynamic interpretation of LeChatlier's principle. (concentration, temperature, pressure and addition of inert gases). Equilibrium between different phases — system of variable composition —partial molar quantities — chemical potential of component in an ideal mixture — Gibbs - Duhem equation — variation of chemical potential with T,P,S and X(mole fraction). Reaction isotherm — vant Hoff's equation — vant Hoff's isochore - Clapeyron equation and Clausius Clapeyron equation —Applications.

UNIT - IV

THIRD LAW OF THERMODYNAMICS:

Need for the law. Nernst heat theorem, third law of thermodynamics — statement and concept of residual entropy. Evaluation of absolute entropy from heat capacity data. Exception to third law.(ortho & para hydrogen, CO_2,N_20 and ice). Thermodynamic properties of real gases — fugacity — definition, calculation (real gases) and variation of fugacity with temperature, pressure and composition (Duhem-Margules equation).

UNIT - V

SURFACE PHENOMENA:

Adsorption and free energy reaction relation at interphase — physisorption and chemisomtion — potential energy diagram- Lannord-Jones plot— Langmuir, BET isotherm — surface area determination-heats of adsorption, determination — adsorption from solutions — Gibbs adsorption isotherm. Activity and activity co-efficient—definitions. experimental determination of activity and activity coefficients of non-electrolytes —

activities in electrolytic solutions — determination of activity coefficient of electrolytes by freezing points.

Reference:

1. B.R.Puri & Sharma, Principles of Physical Chemistry.
2. P.L.Soni, Textbook of Physical Chemistry.
3. Gurdeep Raj, Advanced Physical Chemistry.
4. B.S.Bahl, G.D.Tuli & Arun Bahl, Essentials of Physical Chemistry, S.Chand & Co., New Delhi.(1999).
5. Samuel Glasstone, Thermodynamics for Chemists.
6. R.L.Madan, G.D.Tuli, Simplified Course in Physical Chemistr, S.Chand & Co., New Delhi(1999).
7. Rajaram and Kuriacose, Thermodynamics for Students of Chemistry.
8. P.W.Atkins, Physical Chemistry, ELBS, Oxford Univ. Press, 1998.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC54L	Inorganic Qualitative Analysis Lab	0	0	3	3

Analysis of a mixture containing two cations and two anions of which one will be an interfering ion.

Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted.

Cations: Pb, Co, Cd, Fe, Al, Zn, Cu, Ni, Sr, Mg and Sb.

Anions: Sulphide, bromide, chromate, arsenate, fluoride, oxalate, chloride, carbonate and sulphate.

COURSE CODE	COURSE TITLE	L	T	P	C
20114SEC55L	Gravimetric Analysis Lab	0	0	3	3

Estimation of:

1. Barium as barium chromate
2. Nickel as nickel dimethylglyoxime complex.
3. Lead as lead chromate.
4. Calcium as calcium oxalate.
5. Lead as lead sulphate.

COURSE CODE	COURSE TITLE	L	T	P	C
20114DSC56A	Discipline Specific Elective: I Pharmaceutical Chemistry	5	0	0	4

Aim:

To develop pharmaceutical knowledge to the learners.

Objectives:

- Imparting basic knowledge about the drugs.
- Developing knowledge about pharmacy.

Learning Outcomes:

Students who graduate with a major in Pharmaceutical Chemistry will be able to:

- Understand the principles of Pharmaceutical Chemistry.
- To know the knowledge about antiseptic and anaesthetics.
- To have employability.

UNIT I

ALKALOIDS — general methods of extraction from a plant source, colour reaction and detection — morphine and quinine with special refrence to structure relationship (SAR) and uses. Chemistry of sulphonamides — sulphapyridine phthalyl sulphathiazole — sulpha furazole and protosil —preparation and uses — vitamins — classification of vitamins — vitamin A,B 1 and B2, ascorbic acid — their synthesis, estimation and uses.

UNIT II

ENZYMES — characteristics — classification — composition and biological functions — composition of blood and blood plasma — analysis of serum proteins — functions of plasma proteins — osmotic regulation — functions of hemoglobin, transport of oxygen and maintenance of pH of blood — analysis of hemoglobin in blood — Rh factor — blood pressure — normal, high and low and to control — diagnostic test for sugar, salt and cholesterol in serum —medically important compounds of Al, P, As and Fe — their preparation and applications.

UNIT III

SYNTHESIS OF HETEROCYCLICS - drugs derived from — pyridine derivatives — triphenyl amine and mepyramine — quinoline derivatives — chloroquine and primaquine

— pyrimidines — urides and barbiturates. Antibiotics — pharmacological action — structural elucidation — synthesis and rises of chloramphenicol and penidillin.

UNIT IV

ORGANIC DIAGNOSTIC AGENTS — x-ray contrast media (radiopaques) sodium diatrizolate,— evan's blue — indigocarmine — methylene blue — histamine — pentagastrin — xylose and sodium benzoate — clinical estimation of proteins, glucose, urea, blood, cholesterol and hemoglobin — analgesic — classification — narcotic analgesics — morphine and derivatives — totally synthetic analgesic — pethidine and methadones — antipyretic analgesics — salicylic acid derivatives, indolyl derivatives and p-aminophenol derivatives —synthetic — action and uses.

UNIT V

ANAESTHETICS— preparation and uses of general and local gaseous anaesthetics —ether, vinylether, methoxy flourane, halogenated hydrocarbons like choloroform, halothane, tricholoethylene, ethyl chloride, cyclopropane, nitrous oxide. Thiopentane sodium, methohexitone and propanoid- local anahetics- cocaine and its derivatives. Antiseptic and disinfectants- phenols and related compounds, organic mercurials- dyes, cationic surface active agents, chloramine-T, chlorhexidine, diqualinium chloride. Preservatives, antioxidants, coloring, flavoring and sweetening agents, emulsifying agents-and suspending agents- ointment bases- disintegrating agents.

References:

(1) H.S1ingh and Kapoor K.V. Vallabh Prakashan, Organic Pharmaceutical Chemistry, New Delhi.

(2) Bently and Drivers, Pharmaceutical Chemistry.

(3) Allion Chidambaram, Pharmaceutical Chemistry.

(4) Chatwal, Organic Pharmaceutical Chemistry.

(5) S. Jayshree Ghosh, Pharmaceutical Chemistry, Chand & Co.

(6) Chatwal, Inorganic Pharmaceutical Chemistry.

COURSE CODE	COURSE TITLE	L	T	P	C
20114DSC56B	Discipline Specific Elective: I Agricultural Chemistry	5	0	0	4

Aim:

To develop agricultural knowledge to the learners.

Objectives:

- Imparting basic knowledge about the soil nature.
- Developing knowledge about fertilizers and pesticides.

Learning Outcomes:

Students who graduate with a major in Agricultural Chemistry will be able to:

- Understand the principles of Agricultural Chemistry.
- To know the knowledge about nutrients and its importance.
- To have employability.

UNIT-I

DEFINITION OF SOIL-SOIL composition.Soil Physical properties-soil separates and particle size distribution-soil texture and structure —Bulk density, particle density, pore space, soil air, soil temperature, soil water , soil consistence-significance of physical properties to plant growth.Soil chemical properties — soil colloids —Inorganic colloids — clay minerals — amorphous — Ion exchange reactions —organic colloids — soil organic matter-Decomposition-Humus formation —significance on soil fertility, soil reaction — Biological properties of soil —nutrient availability.

UNIT-II

FERTILIZER — definition-fertilizer recommendation based on soil testing-Nitrogenous fertilizers — Effect of Nitrogen on plant growth and development .Phosphate fertilizers — Effect of phosphorous on plant growth and development.-super phosphate & Bone meal .Potassium fertilizers — function of Potassium on plant growth. Secondary and micronutrient fertilizers — complex and mixed fertilizer- sources. Manufacture, properties and reactions in soils. Biofertilizersnitrogen fixing biofertilizer- rhizobium, azospirillum-Phosphate Mobilizing.

UNIT-III

ORGANIC MANURES —Agricultural, industrial and urban Wastes — prepartion of enriched farm yard manures — Zinc enriched organics. Green manures-green leaf manure-bulky organic and concentrated organic manures -compost — enriched farm yard manures, oil cakes, bone meal, fish meal, guano poultry manures- Fertilizer use efficiency —integrated nutrient management. Preparation of slow release fertilizer-compatability of fertilizers —fertilizers Blending- preparation of different fertilizer mixtures — fertilizer prescription for different soils and crops.

UNIT - IV

PEST MANAGEMENT AND CONTROL .PESTICIDES — formulations — emulsifiable concentrate, water miscible liquids, wettable powders, dusts, granules , classification of pesticides — mode of action — characteristics — uses — fate of pesticides in soil and plants — impact of pesticides on environment — safety measures in the analysis of pesticides.

Insecticides — plant products — Nicotine, pyrethrum, rotenone, petroleum oils. In organic pesticides — Arsenical fluorides, borates. Organic pesticides — organo chlorine compounds — D.D.T , B.H.C, methoxychlor, chloredane, endousulfon.

UNIT - V

FUNGICIDES-inorgnic-sulphur compounds-copper compounds- Mercuic compounds-organic- dithio carbamates – dithane M.boredeaux mixture Herbicidies: Inorganic herbidea-Arsenical compounds Boron compound- cyanamide- cyanides and thiocyanates, chlorates and sulphamates. Organic herbicides & Nitro – compounds- chlorinated compound – urea herbicides, Alachlor.

REFERENCES:

1.N.C Brady , the Nature and properties of soils Eurasia pudishinghouse,(P) Ltd 9th Ed.1984

2. Biswas,T.D.and Mukeherjee S.K.1987 Text book of soil science.

3.A.J.Daji(1970) A Text book of soil science-Asia publishing house,Madras.

4.Donahue,R.LMiller,R.W.and shuckluna,J.C.1987.soils-An introduction to soils and plant Growth —Prentice Hall of India (p) Ltd, NewDelhi.

5. Colling,G.H.1955,Commercial Fertilizers-McGraw Hill Publishing Co., New york.

COURSE CODE	COURSE TITLE	L	T	P	C
	Professional Skills	0	0	0	2

Objectives :

The Objectives of the course are to help students/candidates:

1. Acquire career skills and fully pursue to partake in a successful career path
2. Prepare good resume, prepare for interviews and group discussions
3. Explore desired career opportunities in the employment market in consideration of an individual SWOT.

Expected Outcomes :

At the end of this course the students will be able to:

1. Prepare their resume in an appropriate template without grammatical and other errors and using proper syntax
2. Participate in a simulated interview
3. Actively participate in group discussions towards gainful employment
4. Capture a self - interview simulation video regarding the job role concerned
5. Enlist the common errors generally made by candidates in an interview
6. Perform appropriately and effectively in group discussions
7. Explore sources (online/offline) of career opportunities
8. Identify career opportunities in consideration of their own potential and aspirations
9. Use the necessary components required to prepare for a career in an identified occupation (as a case study).

Unit - 1: Resume Skills

Resume Skills : Preparation and Presentation

- Introduction of resume and its importance
- Difference between a CV, Resume and Bio data
- Essential components of a good resume

ii. Resume skills : common errors

- Common errors people generally make in preparing their resume
- Prepare a good resume of her/his considering all essential components

Unit - 2: Interview Skills

Interview Skills : Preparation and Presentation

- Meaning and types of interview (F2F, telephonic, video, etc.)
- Dress Code, Background Research, Do's and Don'ts
- Situation, Task, Approach and Response (STAR Approach) for facing an interview
- Interview procedure (opening, listening skills, closure, etc.)
- Important questions generally asked in a job interview (open and closed ended questions)

ii. Interview Skills : Simulation

- Observation of exemplary interviews
- Comment critically on simulated interviews

iii. Interview Skills : Common Errors

- Discuss the common errors generally candidates make in interview
- Demonstrate an ideal interview

Unit - 3: Group Discussion Skills

Meaning and methods of Group Discussion

- Procedure of Group Discussion
- Group Discussion- Simulation
- Group Discussion - Common Errors

Unit - 4: Exploring Career Opportunities

Knowing yourself – personal characteristics

- Knowledge about the world of work, requirements of jobs including self-employment.
- Sources of career information
- Preparing for a career based on their potentials and availability of opportunities

References:

Foundation Skills In IT (FSIT) - Refer the websites like https://www.sscnasscom.com/ssc-projects/capacity-building-and-development/training/fsit/ and

Global Business Foundation Skills (GBFS) – Refer websites like https://www.sscnasscom.

URSE CODE	COURSE TITLE	L	T	P	C
	Interview Skills Training and Mock Test	0	0	0	2

Objectives:

Preparing for your job interview could very well be one of the most important moments of your career.

Learning Outcomes:

Prepare for the interview.

Know common interview questions and questions to ask your future employer.

Describe body language and its impact on the interview.

Course Goalss

Lesson One: Interview Preparation

Lesson Two: Common Interview Questions

Lesson Three: What Employers Want

Lesson Four: Attitude and Effort

Lesson Five: Body Language

Lesson Six: Research

Lesson Seven: The Mock Interview

Lesson Eight: Phone Interviews

Lesson Nine: Behavioral Interviews

Lesson Ten: Closing the Interview

Lesson Eleven: Thank You Notes

COURSE CODE	COURSE TITLE	L	T	P	C
17114SEC61	Inorganic Chemistry - II	5	1	0	5

Aim:

- To develop knowledge about inorganic metals and its characteristics.

Objective:

- To know the differences between transition elements and main group elements.
- To know about ligand types and their different methods of coordination.
- To know about isomerism in transition metal complexes

Outcome:

- Able to write electronic configuration of given atomic number.
- Able to tell the name of orbitals by recognizing shapes of orbitals.
- Able to calculate bond order of different molecules.

UNIT I

NUCLEAR CHEMISTRY: Introduction—composition of nucleus and nuclear forces, nuclear stability — o/p ratio, mass defect, binding energy, packing fraction and magic numbers, shell and drop models. Isotopes —detection and separation. Isotopic constitution of elements and whole number rule-deviation of atomic weights from whole numbers-isobars, isotones and isomers.

UNIT — II

RADIOACTIVITY: Discovery, detection and measurements (Wilson cloud chamber). Radioactive emanations-disintegration theory — decay — group displacement law — rate of disintegration — half-life and average life —Radioactive series. Nuclear transformations — uses of projectiles, nuclear reactors. Applications of radio isotopes — carbon dating — radioactive waste disposal - radiolysis of water and hydrated electron.

UNIT — III

X-RAY CRYSTALLOGRAPHY: Solid state-difference between point groups and space groups — screw axis — glide planes. Crystal symmetry elements-crystal classes-crystal systems-unit cell, Bravais lattices, Asymmetric unit space group-equivalent positions — relations between molecular symmetry and crystallographic symmetry — basic concepts. The concept of reciprocal lattice and its application. X-ray diffraction by single crystal — structure factor — systematic absences. Determination of pace group — heavy atom method. Neutron diffraction — elementary treatment. Comparison of X-ray diffraction, electron diffraction — basic principles.

UNIT — IV

SOME SPECIAL CLASSES OF COMPOUNDS: Clathrates-examples and structures. Interstitial compounds and non-stoichiometric compounds. Silicones-composition, raw materials, manufacture, structures, properties and uses. Metal alkyls, co-ordination polymers and phosphonitrilic polymers. Silicates — classification into discrete anions, one, two and three dimensional structures with typical examples. Composition, properties and uses of beryl, asbestos, talc, mica, zeolites and ultramarines.

UNIT-V

FOSSIL FUELS:- Varieties of coal and petroleum- petroleum refineries in India. Gaseous fuels-natural, gobar, coal, water, semiwater and producer gases, liquefied petroleum gas (LPG). Safety matches, fire-works and explosives, paints and varnishes. Effluents and their treatment (dye, cement, tannery, distillery units).

Reference:

1. P.L. Soni, Mohan Katyal, Text Book of Inorganic Chemistry, 20th Revised Edn., Sultan Chand.
2. Esmarch S.Gilreath, Fundamental Concepts of Inorgaic Chemistry, International Edn., Mc-Graw-Hill Kogakusha, Ltd.,
3. Gurdeep Chatwal and M.S.Yadu, Co-ordination Chemistry, First Edn., Himalaya Publishing House.
4. B.R.Puri and L.R.Sharma, Principles of Inorganic Chemistry, ShobanLal Nagin Chand and Co.,
5. Cotton and Wilkinson, Advanced Inorganic Chemistry, 5th Edn.,
6. R.D.Madan, Modern Inorganic Chemistry,
7. S.Glasstone, Source Book on Atomic Energy, 3rd Edn., East West Press.

COURSE CODE	COURSE TITLE	L	T	P	C
17114SEC62	Organic Chemistry – II	5	1	0	5

- **Aim:** To study about the organic and bioorganic molecules and its characteristics.

Objective:

- Structural theory, Lewis structures, isomers, basic resonance theory.
- Atomic, molecular, and hybrid orbitals, covalent bonding, shapes of molecules.
- Polarity of molecules and bonds.

Outcome:

- Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Organic Chemistry.
- Able to study of biomolecules and its activity.

UNIT — I

NITROCOMPOUNDS AND AMINES : Conversion of nitrobenzene to ortho-, para- and meta- dinitrobenzenes. TNT - aromatic nitro compounds —reduction in neutral, acidic and alkaline media. Relative basic characters of aliphatic and aromatic amines. Ring substitution in aromatic amines, diazotisation and its mechanism. Synthetic applications of diazonium salts, diazomethane and diazoacetic ester —

preparation, structure and their synthetic uses. Phenylene diamines, sulphanilic acid, sulphanailamide, saccharin, chloromine-T, diamide — preparation, properties and uses of urea and thiourea.

UNIT — II

AMINOACIDS AND PROTEINS: Classification of aminoacids. Essential and non-essential amino acids. Preparation of L — amino acids, properties and reactions. Zwitter ions, isoelectric points, peptide synthesis. Structure determinations of polypeptides - end group analysis. Proteins-classification based on physical and chemical properties based on physiological functions. Primary and secondary structures of proteins. Helical and sheet structures (elementary treatment only) - denaturation of proteins. Nucleic acid-structures of nucleobases — adenine, guanine, thiamine, uracil and cytosine-nucleosides-nucleotides- polynucleotides - types of nucleic acids — DNA and RNA — biological functions.

UNIT—III

CARBOHYDRATES: Classification, constitution of glucose and fructose. Reactions of glucose and fructose - oxazone formation, mutarotation, and its mechanism, cyclic structure, pyranose and furanose forms. Determination of ring size, formulas, configuration of monosaccharide. Epimerisation, chain lengthening and chain shortening

UNIT—IV

MOLECULAR REARRANGEMENTS: Classification (anionotrophics, cationotrophic) Intermolecular and intramolecular. Pinacol- Pinacolone rearrangement (Mechanism, Evidences for carbonium ion intermediate formation — Migratory aptitude)Beckmann, Benzidine, Hofmann, Curtius, Benzilic acid rearrangements (mechanisms only) Clasien Rearrangement(sigmatrophic rearrangement) — Evidence for intamolecular nature and allylic carbon attachment paraclasien rearangernnent, cope and oxycope rearrangements , Fries rearrangement (Two mechanisms).

UNIT — V

NATURAL PRODUCTS: Terpenes, gerenial, nerol, menthol, and α - terpinol Alkaloids — geneeral and methods of isolation and general methods of structural determination of

conine, piperine and nicotine. Vitamins — thiamine, riboflavin, pyrodxine and ascorbic acid occurrence and biological importance. Structural elucidations of pyridoxine and ascorbic acid.

REFFERENCES:

1. P.L. Soni and H.M. Chawla, Text Book of Organic Chemistry',27th Edn., Sultan Chand 1997.
2. V.S.Parrnar and H.M.Chawla, Principles of Reaction Mechanisms in Organic Chemistry, 27th Edn., Sultan Chand 1998.
3. Subash. Chandra Rastogi, Satis Kumar, Agarwala Ashok Kumar 'Sharma , Chemistry of Natural Products, Vol.I & II., 1St Edn.1974-75.
4. Ernest L Elliel, Stereochemistry of Cabon Compounds, Tata Mc-Grave Hill Publishing company Ltd., 19th Edn., 1995
5. M.K.Jain, Organic Chemistry, Shoban Lal Nagin Chand and Co., 12 th Edn.

COURSE CODE	COURSE TITLE	L	T	P	C
17114SEC63	Physical chemistry - II	5	1	0	4

Aim:

- To know about the electrical properties and spectroscopy characteristics of molecules.

Objective:

- To understand the shapes of different orbitals.
- To understand different principles for filling electrons.
- To understand how to draw energy diagrams.

Outcome:

- Able to write electronic configuration of given atomic number.
- Able to tell the name of orbitals by recognizing shapes of orbitals.
- Able to calculate bond order of different molecules.

UNIT - I

ELECTRICAL CONDUCTANCE: Electrical transport and ohm's law, conduction in metals and in electrolyte solutions. Specific conductance and equivalent conductance, measurement of equivalent conductance using Kohlrausch's bridge - variation of

equivalent conductance with concentration - migration of ions-Kohlrausch's law and its applications. Arrhenius theory of electrolytic dissociation and its limitations. Weak and strong electrolyteOstwald's dilution law, its uses and limitations. The elementary treatment of the Debye-Huckel-Onsager equation for strong electrolytes. Evidence for ionic atmosphere. The conductance at high fields(Wien effect) and high frequencies(Debye-Falkenhagen effect). Transport number and Hittorf s rule-determination by Hittorf s method and moving boundary method. Application of conductance measurements,determination of α of a strong electrolyte and acids, determination of Ka of acids, determination of solubility product of a sparingly soluble salt, common ion effect and conductometric titrations.

UNIT -II

ELECTROKINETIC'S PHENOMENA: Theories of electrical double layer - electrical double layer potential — theory of multiple layers at electrode and electrolyte interface — double layer capacity — electrqkinetic's phenomena (zeta potential, electro osmosis, sedimentation potential).

UNIT- III

FAST REACTION TECHNIQUES: Flow methods (continuous and stopped flow methods), relaxation methods (T and P jump methods), pulse
techniques (pulse radiolysis, flash photolysis, shock tube method), molecular beam method — lifetime method.

UNIT- IV

EQUILIBRIA IN ELECTROCHEMICAL CELLS: Electrolytic and galvanic cells, reversible and irreversible cells, conventional representation of electrochemical cells. Electromotive force of a cell and its measurements. Computation of cell, e.m.f. calculation of thermodynamic quantities of cell reactions (ΔG, ΔH, ΔS and K). Applications of Gibbs - Helmholtz equation. Types of reversible electrodes — gas/metal ion, metal/metal ion, metal insoluble salt/anion and redox electrodes, electrode reactions. Nernst equation — derivation of cell E.M.F. and single electrode potentials. Standard hydrogen electrode — reference electrodes — standard electrode potentials — sign conventions — electrochemical series and its significance. Concentration cell with and without transport, liquid junction potential. Application of concentration cells — valency of ions, solubility product and activity co-efficient, potentiometric titrations. Determination of pH using hydrogen, quinhydrone and glass electrode. Determination of pKa of acids by potentiometric methods. Corrosion — general theory — electrochemical theory — passivity and prevention of corrosion.

UNIT- V

MOLECULAR SPECTROSCOPY: Definition of spectrum, electromagnetic radiation, interaction of electromagnetic radiation with molecules and quantization of different forms of energies in molecules (translational, rotational, vibrational and electronic).

MICROWAVE SPECTROSCOPY: Theory of microwave spectroscopy —condition — molecular rotation — selection rules. Effect of isotopic substitution, calculation of moment of inertia and bond length of diatomic molecules.

References:

1. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry.

2. R.P.Varma and Pradeep, Physical chemistry.

3. C.N. Banwell, Fundamental Molecular Spectroscopy; Tata Mc-Graw Hill Publications, New Delhi, 1 1 th reprint 1991.

4. William Kemp, Organic spectroscopy, ELBS, 2nd Edn., 1987.

5. Dr. S. Jain and S.P. Jankar, Physical chemistry - Principles and Problems, Tata Mc-Graw Hill, New Delhi, 1990.

6. B.K. Sen Quantum chemistry.

7.K.V. Raman, Spectroscopy and Mathematics of Quantum Chemistry

8.R.Chang, Basic Principles of Spectroscopy.

9.Dyer "Organic Application of Spectroscopy"

10.Y.R. Sharma, Elementary Organic Spectroscopy-Principles and Applications.

11.G.M. Barrow, Introduction to Molecular Spectroscopy, Tata Mc- Graw Hill, New York, 1964.

COURSE CODE	COURSE TITLE	L	T	P	C
17112DSC64A	Discipline Specific Elective:II Nano Science	4	0	0	4

Aim: To study about the importance and applications of Nano science.

Objective:

- To foundational knowledge of the Nanoscience and related fields.
- To make the students acquire an understanding the Nanoscience and Applications.
- To help them understand in broad outline of Nanoscience.

Outcome:

- Learn about the background on Nanoscience
- Understand the synthesis of nanomaterials and their application and the impact of nanomaterials on environment
- Apply their learned knowledge to develop Nanomaterial's.

UNIT I:

INTRODUCTION AND HISTORY

Background to nanotechnology - scientific revolutions –atomic structure-atomic size – bottom up/top down nanotechnology-chemical reactivity-Incremental nanotechnology-Evolutionary

nanotechnology-Radical nanotechnology-Emergence of nanotechnology-Challenging in nanotechnology-Misnomers and misconception of Nanotechnology.

UNIT II:

EVOLUTION AND GROWTH OF NANOSYSTEM

Basic problems and limitations - opportunities of nano scale -evolution of band structures and Fermi surface. Nanoparticles through homogeneous and heterogeneous nucleation-Growth controlled by surface and diffusion process- Oswald ripening process - influence of reducing agents-solid state phase segregation- grain growth and sintering precipitation in solid solutionhume rothery rule.

UNIT III:

NANOMATERIALS AND CLASSIFICATIONS

Carbon Nanotubes (CNT) - Metals (Au, Ag, Pd, Cu) - Metal oxides (TiO_2, CeO_2, ZnO, MgO) - Semiconductors (Si, Ge, CdS, ZnSe). Classifications of nanomaterials-zero dimensional-onedimensional-two dimensional-three dimensional nanostructures- Quantum dots-Quantum wireQuantum well-semiconductors and ceramics.

UNIT IV: SPECIAL NANOMATERIALS

Carbon fullerenes-fullerene derived crystals- carbon nanotubes. Micro and Mesoporous materialOrdered mesoporous materials-Random mesoporous materials-crystalline microporous materials.Core/Shell structures-Metal oxide structures-Metal polymer structures-Intercalation compounds-nanograined materials.

UNIT V: MATERIALS STRUCTURE AND PROPERTIES

Space lattice and unit cells, crystal system, Symmetry operation, Structures of common metallic, Semiconductor ceramic and superconductor materials, Miller Indices, Packing fractions, Formation of dangling bonds-atom like behavior of nanomaterials-physicochemical properties. Optical properties of nanomaterials-semiconductor-metal nanoparticles-Electrical and electronic propertiesThermal properties-Ferro electric properties-mechanical and magnetic properties.

Reference:

1.Introduction to Nan science, By Gabor L. Hornyak, Joydeep Dutta, H.F. Tibbals, Anil Rao

2. Introduction to Nanoscience and Nanotechnology, By Chris Binns

3. Foundations of Nanotechnology, Volume Two: Nanoelements Formation and .,

By Sabu Thomas, Saeedeh Rafiei, Shima Maghsoodlou, Arezo Afzali

4. Nanocomposite structures and dispersions, By Ignac Capek

5. Morphology Control of Materials and Nanoparticles: Advanced Materials ..., edited by Yoshio Waseda, Atsushi Muramatsu

6. Nanomaterials: Synthesis, Properties and Applications, Second Edition, edited by A.S Edelstein, R.C Cammaratra

7. Nanomaterials: New Research, By B. M. Caruta.

COURSE CODE	COURSE TITLE	L	T	P	C
17112DSC66A	Discipline Specific Elective:II Polymer Chemistry	4	0	0	4

Aim:

To develop knowledge about polymers to the learners.

Objectives:

- Imparting basic knowledge about the different types of polymers.
- Developing knowledge about production and advantages of polymers.

Learning Outcomes:

Students who graduate with a major in Polymer Chemistry will be able to:

- Understand the principles of Polymer Chemistry.
- To know the knowledge about various techniques of polymers and its importance.
- To have employability.

UNIT — I

Basic concepts- an introduction of polymers and macromolecules. Natural and synthetic polymers. Molecular forces and chemical bonding polymers. Classification of polymers- addition and condensation polymers. General methods of preparation of polymers. Polymerisation through functional groups, multiple bonds and ring opening. Polymerisation techniques- bulk, solution, suspension and emulsion polymerization.

UNIT—II

Copolymerisation- homo and copolymers. Block copolymers and graft copolymers. Kinetics of free radical and cationic polymerization reactions. Mean kinetic chain length, degree of polymerization. Inhibition and retardation.

UNIT — III

Thermoplastic and thermosetting resins. Constituents of plastics, fillers, dyes, pigments, plasticizers, lubricants and catalysts. Acrylics, polyvinyl and cellulose derivatives of thermoplastic resins. Silicone resins, epoxy resins, phenolic resins and alkyl resins of thermosetting resins.

UNIT — IV

Nylon 66, terylene, viscose rayon, polyesters —definition and polymer requirement. Polymers of acrylic acid, methacrylic acid and poly acrylates.

UNIT — V

Polymer structure- linear, branched and cross-linked polymers- isotactic, sydiotactic and atactic. Properties- melting point, glassy state, glass tranisition temperature. Thermal analysis of polymers, thermal high energy radiation, oxidative and hydrolytic polymer degradation.

REFERENCES:

1. Introduction to Polymers by R. J. Young and P. A. Lovell.
2. Polymer Chemistry: An Introduction" by Malcolm P. Stevens.
3. Polymer Chemistry" by B.K. Sharma.
4. Introductory Polymer Chemistry " by G.S. Misra.
5. Textbook of polymer Science-FW Billmeyer
6. Introduction of Polymer Chemistry, R.P. Seymour Mc-Graw Hill, New York,
7. Polymer Science, V.R. Gowrikar, N. V. Viswanathan,Wiley Eastern Ltd.

Course Code	Course Title	L	T	P	C
17211OEC	Open Elective -Writing for the Media	4	0	0	2

Aim:

- To equip students to enter the realm of mass media.

Objectives:

- To help students to understand the intricacies of mass media
- To know about the barriers to mass communication
- To understand the function of mass media
- To learn the different kinds of news
- To enhance the different kinds of writing for media

Outcome:

- Understand the intricacies of mass media

UNIT-I

Mass communication- Barriers to mass communication and mass culture- Function of mass media - Media effects, Qualities of media men.

UNIT-II

News- Hard and soft news- Expected and unexpected news- Box news- Follow up news- Scoop- Filters- Human interest stories- Recognizing and evaluating news.

UNIT-III

News and views- News analysis, Editorial, Columns, Article, Middle reviews, Letters- Features.

UNIT-IV

Reporting- Crime, Court, Election, Legislature, Sports, Development Investigative, Interpretative depth.

UNIT-V

Writing for Media-Inverted pyramid style-Feature style-TV/Broadcast, New style writing TV/Radio Documentaries- Writing Advertisements-Practical

References-

Journalism -Susan
Professional Journalism -John Hogenberg
News Writing and Reporting -M.James Neal (Surjeet Publication)
Professional Journalism -M.V Komath
The Journalist's Handbook -M.V Komath
Mass Communication & Journalism -D.S Mehta,

Course Code	Course Title	L	T	P	C
17212OEC	Open Elective – Applicable Mathematical Techniques	4	0	0	2

Aim:

- To acquaint with the basic concept of Interpolation.

Objectives:

- Understand the basic concept of Interpolation.
- To enhance the knowledge about Assignment Problems, Replacement Problems, Decision Analysis and Game Theory.

Outcomes:

- Students using OR techniques in business tools for decision making
- Students develop Assignment problem and Replacement problems
- Understand the concept of decision analysis and game theory
- Students gets the knowledge about interpolation

UNIT I

Interpolation with unequal intervals: Newton's, Lagrage's, and inverse interpolation

UNIT II

Assignment Problems

UNIT III

Replacement Problems

UNIT IV

Decision Analysis

UNIT V

Game Theory

References

Unit I, “Numerical Methods in Science and Engineering” M.K.Venkatraman
Units II to V, “Operations Research”, Kantiswarup, P.K. Gupta and Manmohan

Course Code	Course Title	L	T	P	C
17213OEC	Open elective Biomedical Instrumentation	4	0	0	2

Aim:

- To understand the concepts and application of electronic Instrumentation in the Medical field.

Objective:

- Interpret technical aspects of medicine
- Solve Engineering Problems related to medical field
- Understand medical diagnosis and therapy

Outcomes:

- To familiarize students with various medical equipments and their technical aspects
- To introduce students to the measurements involved in some medical equipment.
- Ability to understand diagnosis and therapy related equipments
- Understanding the problem and ability to identify the necessity of an equipment to a specific problem

UNIT – I: Bio Electric Signals And Electrodes

Fundamentals of medical instrumentation – Sources of biomedical signals – basic medical instrumentation – Intelligent medical instrumentation system – Origin of Bio electric signals – Recording Electrodes – Silver – Silver chloride electrodes – Electrodes for ECG – Electrodes for EEG – Electrodes for EMG.

UNIT – II: Recording System And Recorders

Basic recording system – General consideration for signal conditions – Preamplifiers – Biomedical signal analysis technique – main amplifier and driver stage – Writing systems – direct writing recorders – the ink jet recorders – Electrocardiograph, Electroencephalograph – Electromyography and other Biomedical recorders.

UNIT – III: Measurement And Analysis Techniques

Electro cardiography – measurements of Blood pressure - measurements of Blood flow and cardiac output, Respiratory therapy Equipment – Origin of EEG – Action Potentials of the brain – evoked potentials – Placement of electrodes – Recording set up – Analysis of EEG.

UNIT – IV: Magnetic Resonance And Ultrasonic Imaging Systems

Principles of NMR Imaging system – Image reconstruction Techniques – Basic NMR components – Biological efforts of NMR Imaging – Advantages of NMR Imaging System – Diagnostic ultra Sound – Physics of ultrasonic waves – metical ultra sound – basic pulse – echo apparatus, A – Scan – echocardiograph(M mode).

UNIT – V: Advanced Bio Medical Systems

Pacemakers – Need for Cardiac pacemaker – External Pace makes – Implantable Pace makers – recent development in Implantable Pacemakers – Pacing system Analyzer – Defibrillator – Pacer – Cardioverter – Physiotherapy and electro therapy equipment – High frequency heat therapy – short wave diathermy – microwave and ultrasonic therapy – pain relief through electrical simulation.

Books for Study

1. R.S Khandpur, Handbook of Biomedical instrumentation, Tata McGraw Hill publishing company Limited. New Delhi,(2003). (Unit I,II,IV & V)
2. Lestlie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Bio medical instrumentation and measurements, PHI, New Delhi.(Unit-III)

Book for Reference

1. M.Arumugam, Biomedical Instrumentation, Anuradha Agencies, Kumbakonam (2000).

Course Code	Course Title	L	T	P	C
17214OEC	Open Elective-Green Chemistry	4	0	0	2

Aim:

- To reduce the soil and water pollution in environment.

Objectives:

- To learn about the environmental status, public awareness in evolution, principles involved in green chemistry, bio-catalytic reactions, global warming and its control measures, availability of green analytical methods.

Outcomes:

- To understand the environmental status and evolution.
  - To know about the Pollution and its prevention measures.
  - To familiarize the green chemistry.
  - To learn about the bio-catalytic reactions.
  - To understand about the vitamins and antiobiotics.

Unit I - Introduction

Introduction-Current status of chemistry and the Environment-Evolution of the Environmental movement: Public awareness - Dilution is the solution to pollution-Pollution prevention.

Unit II - Principles

Green Chemistry – Definition – Principles of Green Chemistry - Why is this new area of Chemistry getting to much attention - Why should chemist pursue the Goals of Green Chemistry - The roots of innovation – Limitations.

Unit III - Bio Catalytic Reactions

Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentation

Antibiotics – Vitamins - Bio catalyses synthesis of industrial chemicals by bacterial constructs - Future Tends.

Unit IV - Green House Effect

Green house effect and Global Warming – Introduction - How the green house effect is produced - Major sources of green house gases - Emissions of CO2 - Impact of green house effect on global climate - Control and remedial measures of green house effect - Global warming a serious threat - Important points.

Unit V - Green Analytical Methods

Future trends in Green Chemistry - Green analytical methods, Redox reagents, Green catalysts; Green nano-synthesis, Green polymer chemistry, Exploring nature, Biomimetic, Proliferation of solvent-less reactions; Non-covalent derivatization, Biomass conversion, emission control

References:

1. Introduction to Green Chemistry – M.Rayan and M.Tinnes
2. New Trends in Green Chemistry – V.K.Ahluwalia and M.Kidwai

Course Code	Course Title	L	T	P	C
17215OEC	Open elective-Bio-Analytical Techniques	4	0	0	2

Aim:

- Bioanalysis is a sub-discipline of analytical chemistry covering the quantitative measurement of xenobiotics (drugs and their metabolites, and biological molecules in unnatural locations or concentrations) and biotics (macromolecules, proteins, DNA, large molecule drugs, metabolites) in biological

Objectives

- To teach students on various techniques used for the assessment of various diseases and research studies.
- To teach the good laboratory practice required to execute the learned techniques.

Outcomes

- The students learn various techniques and acquire the skills to use appropriate methods.
- The students acquire the good laboratory practices.

Unit I

Separation techniques – Solvent extraction – principles and applications of soxhlet extraction and super critical fluid extraction; Distillation – Theory of distillation, method and application of fractional and steam distillation; Techniques of sublimation and its applications.

Electrochemical techniques – Standard hydrogen electrode, pH measurements; Buffers in biological systems; Henderson-Hassel balch equation. Principle and application of oxygen electrode; Potentiometric titrations of oxidation-reduction reactions.

Unit II

Chromatography – Principles, materials, techniques and applications of Paper chromatography, TLC, Column chromatography, Gel permeation chromatography, Ion-exchange chromatography, Affinity chromatography, HPLC and GLC .

Unit III

Centrifugation – Types of centrifuges; Preparative ultracentrifuges – Principles, techniques and applications of differential and density gradient centrifugation; Principles, instrumentation and applications of analytical ultracentrifuges.Radioisotopes – Radioactivity, types, law of radioactivity, decay processes, units of radioactivity; Applications of radioisotopes in biology.

Unit IV

Electrophoresis – Principles, instrumentations and biological applications of Paper, Cellulose acetate, agar gel, PAGE, SDS-PAGE, immuno and isoelectric focusing electrophoresis.Blotting techniques – Principles, materials, methods and applications of Southern, Northern and Western blotting techniques.

Unit V

Spectroscopy – Principles and components of instruments and applications of Colorimeter, Spectrophotometer, Fluorescence spectrometry, AAS and Flame photometer. Principles and applications of Raman spectroscopy, IR spectrometry, NMR and ESR.

References:

1. **Biophysical Chemistry – Nirmalendu nath**
2. **Biophysical Chemistry – Upadhyay, Upadhyay and nath.**
3. **Principles and techniques of practical Biochemistry – Keith Wilson and Walker.**
4. **Principles of Instrumental analysis – B.K.Sharma.**
5. **Instrumental analysis – Chatwall Anand**

Course Code	Course Title	L	T	P	C
17220OEC	Open Elective-Internet & Web Design	4	0	0	2

Aim :

- To provide the conceptual and technological developments in the field of internet and web designing with the emphasis on comprehensive knowledge of internet.

Objectives:

- To understand the web designing and web development with the knowledge of internet.
- To learn the overview of the design of HTML & Scripting Languages.
- To learn the use of website and internet design and development.

Outcomes:

- Acquire knowledge about functionalities of Internet
- Acquire knowledge about functionalities of world wide web
- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages
- Acquire knowledge about Open source JavaScript libraries
- Able to design front end web page and connect to the back end databases.

UNIT I

Internet, Growth of Internet, Owners of the Internet, Anatomy of Internet, ARPANET and Internet history of the World Wide Web, basic Internet Terminology, Net etiquette. Internet Applications – Commerce on the Internet, Governance on the Internet, Impact of Internet on Society – Crime on/through the Internet. Connectivity types: level one, level two and level three connectivity, Setting up a connection: hardware requirement, selection of a

modem, software requirement, modem configuration, Internet accounts by ISP: Telephone line options, Protocol options, Service options, Telephone line options – Dialup connections through the telephone system, dedicated connections through the telephone system, ISDN, Protocol options – Shell, SLIP, PPP, Service options – E-mail, WWW, News Firewall

UNIT II

Network definition, Common terminologies: LAN, WAN, Node, Host, Workstation, bandwidth, Interoperability, Network administrator, network security, Network Components: Severs, Clients, Communication Media, Types of network: Peer to Peer, Clients Server, Addressing in Internet: DNS, Domain Name and their organization, understanding the Internet Protocol Address. Network topologies: Bust, star and ring, Ethernet, FDDI, ATM and Intranet.

UNIT III

Email Networks and Servers, Email protocols –SMTP, POP3, IMAp4, MIME6, Structure of an Email – Email Address, Email Header, Body and Attachments, Email Clients: Netscape mail Clients, Outlook Express, Web based E-mail. Email encryption- Address Book, Signature File.

UNIT IV

HTML page structure, HTML Text, HTML links, HTML document tables, HTML Frames, HTML Images, multimedia - ASP, VB Script, JAVA Script, JAVA and Front Page, Flash

UNIT V

Overview, SGML, Web hosting, HTML. CGL, Documents Interchange Standards, Components of Web Publishing, Document management, Web Page Design Consideration and Principles, Search and Meta Search Engines, WWW, Browser, HTTP, Publishing Tools Overview of Internet Security, Firewalls, Internet Security, Management Concepts and Information Privacy and Copyright Issues, basics of asymmetric cryptograms.

Text Book

World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.

References

1. Greenlaw R and Hepp E “Fundamentals of Internet and www” 2nd EL, Tata McGrawHill,2007.
2. Ivan Bayross, “HTML, DHTML, JavaScript, Perl CGI”, 3rd Edition, BPB Publications.
3. D. Comer, “The Internet Book”, Pearson Education, 2009.
4. M. L. Young,”The Complete reference to Internet”, Tata McGraw Hill, 2007.
5. Godbole AS & Kahate A, “Web Technologies”, Tata McGrawHill,2008.
6. Jackson, “Web Technologies”, Pearson Education, 2008.
7. B. Patel & Lal B. Barik, ” Internet & Web Technology “, Acme LearningPublishers.
8. Leon and Leon, “Internet for Everyone”, Vikas Publishing House.

Course Code	Course Title	L	T	P	C
17261OEC	Open Elective-Insurance Services	4	0	0	2

Aim:

- To look after the interests of people from uncertainty by providing certainty of compensation.

Objectives:

- To learn the fundamental concepts and principles of insurance.
- To explain the nature of different insurance policies, insurance contracts and settlement of claims.

Outcome:

- The course helped the students to learn the principles of Insurance and the functions of Life and general insurances and the IRDA

UNIT – I

Insurance and Assurance – Importance of Insurance – Functions of Insurance – Insurance contract and their Elements – Fundamental Principles of Insurance contracts

UNIT – II

Types of Insurance contracts – Differences between Life and General Insurance – Concepts in Insurance - Insurer, Insured, Premiums and Claims – Reinsurance – Double Insurance

UNIT – III

Life Insurance – Advantages of Life Insurance – Procedure for Effective Life Insurance – Risk Factors in Life Insurance – Procedure for Settlement of Life Insurance Claims – Different kinds of Life Insurance Policies including Endowment and whole Life Policies.

UNIT – IV

General Insurance – Fire Insurance – Contract of Fire Insurance – Fire Policy Conditions – Subject matter of Fire Insurance – Fire Policy – Marine Insurance – Motor, burglary and Personal Accident Insurance.

UNIT – V

Reforms in Insurance Sector – principles and Types – I.R.D.A., Privatisation of Insurance – Insurance and Employment – Insurance Agents and career Agents – Investments by Insurance companies in housing sector and other infrastructure projects**.**

Reference Books:

Dr.MR.Mishra – Law of Insurance – Central Law Agency Allahabad
Dr.M.M.Verma & R.K.Agarwal – Insurance
Pandy & Ratogi – Insurance
M.N.Mishra & S.Chand - Principles and Practice of Insurance

Course Code	Course Title	L	T	P	C
17280OEC	Open Elective-Counselling Psychology	4	0	0	2

Aim:

- To acquaint with counselling and its process

Objectives:

- To learn the fundamental concepts of counselling.
- To know the nature of different determinates.
- To familiarize with the approaches of counselling

Outcome:

- Learn counselling and its process

UNIT I

Definition of Counselling
Counselling as a Solution to Human Problems
Counselling-Expectations & Goals

UNIT II

Personality Determinates, Intellectual Determinates, Emotional Determinates
Social Determinates

UNIT III

Approaches to Counselling
Counselling Process

UNIT IV

Psychological Testing
Diagnosis

UNIT V

Educational Counselling
Family Counselling

References Book:

1. Hanson, J.C. Stevic, R.R., Warner, R.W., Jr. Counselling Theory & Process (2nd Edition) Boston
2. Hurlock Elizabeth B.(2oo7), Human Development, New York, Grawhill Book Company
3. John W, Santrock (1999), Life Span Development, 7th Edition, New Delhi; Mcgrowhill Company
4.blum And Bolimsky, B. Counselling & Psychology; Bomboy; Asia Publishing House, 1961
5. Bordin, E.S. Psychology Of Counselling New York; Application Century Crafts, 1968
6. Lewis E. C., The Psychology Of Counselling New York Holt, Rinchart And Winston Inc. 1970

COURSE CODE	COURSE TITLE	L	T	P	C
	Community Engagement	0	0	0	1

a) Objectives:

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of learning

b) Learning utcomes:

After completing this course, student will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bonds of mutuality with local community
- Appreciate significant contributions of local communities to Indian society and

economy

- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

c) Credit

2 credit, 30 hours, at least 50% in field, compulsory for all students

d) Contents

Divided into four Modules, field immersion is part of each Unit

Course Structure: 2 Credits Course (1 Credit for Classroom and Tutorials and 1 Credit for Field Engagement)

S. No.	Module Title	Module Content	Assignment	Teaching/ Learning Methodology	No. of Classes
1	**Appreciation of Rural Society**	Rurallifestyle, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages' (Gandhi), rural infrastructure	Prepare a map (physical, visual or digital) of the village you visited and write an essay about inter-family relations in that village.	- Classroom discussions - Field visit** - Assignment Map	2 4 2

2	***Understanding rural economy & livelihood***	Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets	Describe your analysis of rural household economy, its challenges and possible pathways to address them	- Field visit** - Group discussions in class - Assignment	3 4 1
3	***Rural Institutions***	Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration	How effectively are Panchayati raj institutions functioning in the village? What would you suggest to improve their effectiveness? Present a case study (written or audio-visual)	- Classroom - Field visit** - Group presentation of assignment	2 4 2
4	***Rural Development Programmes***	History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM AwaasYojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.	Describe the benefits received and challenges faced in the delivery of one of these programmes in the rural community; give suggestions about improving implementation of the programme for the rural poor.	- Classroom - Each student selects one program for field visit** - Written assignment	2 4 2

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SCHOOL OF ARTS OF SCIENCE

DEPARTMENT OF CHEMISTRY

M.Sc CHEMISTRY CURRICULUM

REGULATION 2020

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SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF CHEMISTRY

M.Sc CHEMISTRY – REGULATION 2020

COURSE STRUCTURE

M.Sc. Graduate Attributes

- Domain knowledge
- Investigative
- Critical thinking
- Resourceful and Responsible
- Effective Communication
- Ethical and Moral values

M.Sc. Programme Educational Objective – PEO

- PEO1-To demonstrate broad knowledge of descriptive Chemistry.
- PEO2-To impart the basic analytical and technical skills to work effectively in the various fields of chemistry.
- PE03- To motivate critical thinking and analysis skills to solve complex chemical problems, e.g., analysis of data, synthetic logic, spectroscopy, structure and modeling, team-based problem solving, etc.
- PEO4-To demonstrate an ability to conduct experiments in the above sub-disciplines with mastery of appropriate techniques and proficiency using core chemical instrumentation and modeling methods.
- PEO5-To demonstrate the ability to perform accurate quantitative measurements with an understanding of the theory and use of contemporary chemical instrumentation, interpret experimental results, perform calculations on these results and draw reasonable, accurate conclusions.
- PEO6-To develop skills in quantitative modeling of static and dynamic chemical systems.
- PEO7-To develop laboratory competence in relating chemical structure to spectroscopic phenomena.
- PEO8-To demonstrate the ability to synthesize, separate and characterize compounds using published reactions, protocols, standard laboratory equipment, and modern instrumentation.

M.Sc Pragramme Outcome –PO

- PO1-Think critically and analyze chemical problems.
- PO2-Present scientific and technical information resulting from laboratory experimentation in both written and oral formats.
- PO3-Work effectively and safely in a laboratory environment.
- PO4-Use technologies/instrumentation to gather and analyze data.
- PO5-Work in teams as well as independently.
- PO6-Apply modern methods of analysis to chemical systems in a laboratory setting.

M.Sc Course -C

- C1-Organic Chemistry-I
- C2-Inorganic Chemistry-I
- C3-Physical Chemistry-I
- C4-Research Led Seminar
- C5-Organic Chemistry-II
- C6-Inorganic Chemistry-II
- C7-Physical Chemistry-II
- C8-Research Methodology
- C9-Participation in Bounded Research
- C10-Organic Chemistry-III
- C11-Inorganic Chemistry-III
- C12-Physical Chemistry-III
- C13- Participation in Scaffold Research
- C14-Project Work

M.Sc Curriculum Mapping

Programme Educational Objectives Vs Programme Outcome

Programme Outcome-PO Programme Educational Outcome - PEO	PO1	PO2	PO3	PO4	PO5	PO6
PE01	✓					
PE02						
PE03		✓				
PE04			✓			
PE05						
PE06					✓	
PE07				✓		
PE08						✓

M.Sc Curriculum Mapping
Programme Outcome vs Courses Outcome

Programme Outcome-PO Courses Outcome-CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1			*	*		*
CO2		*		*	*	*
CO3	*	*			*	
CO4			*	*		*
CO5			*	*		*
CO6		*		*	*	*
CO7	*	*			*	
CO8		*	*		*	
CO9	*	*			*	*
CO10		*	*	*		*
CO11		*		*	*	
CO12	*	*		*	*	
CO13		*	*	*	*	
CO14		*	*	*	*	*

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SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF CHEMISTRY
M.Sc CHEMISTRY – REGULATION 2020
COURSE STRUCTURE

SEMESTER - I					
COURSE CODE	**COURSE TITLE**	**L**	**T**	**P**	**C**
20214SEC11	Organic Chemistry-I	5	0	0	4
20214SEC12	Inorganic Chemistry-I	5	0	0	4
20214SEC13	Physical Chemistry-I	5	0	0	4
20214SEC14L	Organic Chemistry Lab-I	0	0	5	2
20214SEC15L	Inorganic Chemistry Lab-I	0	0	5	2
20214DSC16_	Discipline Specific Elective-I	5	0	0	4
20214RLC17	Research Led Seminar	-	-	-	1
	Total	**20**	**-**	**10**	**21**
SEMESTER - II					
20214SEC21	Organic Chemistry-II	4	0	0	4
20214SEC22	Inorganic Chemistry-II	4	0	0	4
20214SEC23	Physical Chemistry-II	4	0	0	4
20214SEC24L	Organic Chemistry Lab-II	0	0	5	2
20214SEC25L	Inorganic Chemistry Lab-II	0	0	5	2
20214DSC26_	Discipline Specific Elective-II	5	0	0	4
20214RMC27	Research Methodology	3	0	0	2
20214BRC28	Participation in Bounded Research	-	-	-	2
	Total	**20**	**-**	**10**	**24**
SEMESTER - III					
20214SEC31	Organic Chemistry-III	5	0	0	5
20214SEC32	Inorganic Chemistry-III	5	0	0	5
19214DSC35_	Discipline Specific Elective-III	5	0	0	4
20214SEC33L	Physical Chemistry Lab-I	-	0	5	3
20214SEC34L	Physical Chemistry Lab-II	-	0	5	3

202_ _ OEC36	Open Elective	4	0	0	2
19214SRC37	Participation in Scaffold Research (Design and Societal Project)	-	-	-	2
	Total	**19**	**0**	**10**	**24**
SEMESTER - IV					
20214SEC41	Physical Chemistry-III	6	1	0	6
20214SEC32	Industrial Chemistry	6	1	0	5
19214DSC43_	Discipline Specific Elective-IV	5	0	0	4
20214PRW44	Project	-	-	-	10
20214PEE	Programme Exit Examination	-	-	-	2
	Total	**17**	**2**	**0**	**27**
	Total Credits of this Program				**96**

DISCIPLINE SPECIFIC ELECTIVE COURSES –I

Semester	Elective No.	Course Code	Course Title
I	I	20214DSC16A	a) Environmental Chemistry
		20214DSC16B	b) Supramolecular Chemistry

DISCIPLINE SPECIFIC ELECTIVE COURSES –II

Semester	Elective No.	Course Code	Course Title
II	II	20214DSC26A	a) Special Topics in Chemistry
		20214DSC26B	b) Macromolecules as Engineering Materials.

DISCIPLINE SPECIFIC ELECTIVE COURSES –III

Semester	Elective No.	Course Code	Course Title
III	III	20214DSC35A	a) Medicinal Chemistry
		20214DSC35B	b) Green Organic Synthesis: Principles and Applications

DISCIPLINE SPECIFIC ELECTIVE COURSES –IV

Semester	Elective No.	Course Code	Course Title
IV	IV	20214DSC43A	a) Nano Chemistry
		20214DSC43B	b) Material Chemistry

OPEN ELECTIVE COURSES

Semester	Course Code	Course Title
III	20211OEC	Writing for the Media
	20212OEC	Applicable Mathematical Techniques
	20213OEC	Biomedical Instrumentation
	20215OEC	Herbal Medicines
	20220OEC	M-Marketing
	20261OEC	Financial Service
	20280OEC	Counselling and Psychology

CREDIT DISTRIBUTION

SEMESTER	SEC	GEC	DSE	RESEARCH	OTHERS	TOTAL
I	16	-	04	01		**21**
II	16	-	04	04		**24**
III	16	02	04	02		**24**
IV	11	-	04	10	02	**27**
TOTAL	**59**	**02**	**16**	**17**	**02**	**96**

SEMESTER – I

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC11	Organic Chemistry – I	5	0	0	4

Aim:

- To acquaint students with learning Organic Chemistry.

Objective:

- To sensitize students to learn Important components of Organic Chemistry.

Outcome:

Having successfully completed this module you will be able to:

- Recognise many functional groups and their reactivity
- Set up glassware and apparatus to conduct experiments in Organic Chemistry.
- Interpret data from a range of physical techniques to characterise Organic componds.
- Present the results of a practical investigation in a concise manner.
- Recognise many fundamental bond forming reactions and how to apply them in synthesis

Unit - I

Bonding, Structure & Aromaticity

Hybridization with reference to carbon compounds-Shapes of simple organic molecules-bond angle and bond length in organic molecules. Electronegativity of atoms and groups. Dipole moments of molecules-Applications of dipole moment to study the properties of organic molecules. Polarity of solvents. Hydrogen bonding-Inter and Intramolecular hydrogen bonding. E**lectronic Effects**-Inductive, resonance and hyperconjucative effects and their influence-rules of resonance. Tautomerism. Steric effects. Aromatic character-Huckel's rule and applications-Craig's rule and applications-Consequences of aromaticity – non-alteration in bond length-Resonance energy from heat of hydrogenation, heat of combustion and Huckel's MO calculation, antiaromatic compounds.

Unit - II

Essentials of Organic Stereochemistry

Principles of symmetry-concept of chirality. Molecular symmetry and chirality. Newmann, Sawhorse, Fischer and Wedge representations and their interconversions. Types of molecules exhibiting optical activity. Configurational nomenclatures of acyclic and cyclic molecules: *cis-trans* and *E,Z* – and *D*, *L*; *R*, *S*; erythro and threo; *syn* and *anti*; *endo* and *exo*. Stereochemistry of molecules with axial chirality-atropisomerism – biphenyls-allenes, spiranes and analogues. Helicity and chirality. Topocity and prostereoisomerism- Diastereotopic ligands and faces. Resolution –methods of Resolution. Conformations six membered ring systems and their optical activity. Quantitative correlation between conformation and reactivity- Winstein-Eliel equation

Unit - III

Reactive Intermediates Methods of Determining Reaction Mechanisms

Carbocations, Carbanions, Carbenes and Nitrenes – Generation and stability of reactive intermediates. Correlation of reactivity with structure of reactive intermediates. Free radicals – Configurations – Identification by chemical and spectral methods – Free radical halogenation - NBS. Types of reactions: Homolytic and Heterolytic cleavages of bonds. Thermodynamic and kinetic aspects, Hammond's postulate, isotope effects. Energy profile diagrams –Intermediate versus transition state, Product analysis and its importance, Crossover experiments, Kinetic methods, Stereochemical studies, Isotopic and substituent effects

Unit - IV

Nucleophilic Substitutions in Aliphatic and Aromatic Substrates

SN1 and SN2 mechanisms-effect of substrate structure, leaving group, attacking nucleophile and solvent polarity-neighbouring group participation-substitution at vinylic and allylic carbons and reactivity. Ambient nucleophiles and substrates. Hydrolysis of esters-mechanisms. Selected reactions-Von-Braun, Dieckmann, Williamson. SNAr mechanism- SN1 (Aromatic) mechanism with evidences - Benzyne mechanism - Effect of substrate structure, leaving group, attacking nucleophile and solvent.

Unit -V

Heterocycles

Nomenclature of heterocycles having not more than two hetero atoms such as oxygen, nitrogen and sulphur. Synthesis, reactivity and applications of the following heterocycles: Pyrazoles, Oxazoles, Pyridazines, Pyrimidine and Pyrazines.

REFERENCES

1. March J, *Advanced Organic Chemistry,* Fourth Edition, John-Wiley and Sons, New York (1992).

2. Sykes P, *Guide Book to Mechanism in Organic Chemistry,* Sixth Edition, ELBS with Longmann (1997).

3. Eliel E L, *Stereochemistry of Carbon Compounds,* Tata-McGraw Hill Publishing Company, New Delhi (1998).

4. Finar, I.L, *Organic Chemistry Volume* 2, Sixth Edition, ELBS with Longmann, Singapore (1997).

5. Nasipuri D, *Stereochemistry of Carbon Compounds,* Second Edition, New-Age International Publishers, New Delhi (1996).

6..Kalsi P.S, *Stereochemistry – Conformation and mechanism*. Wiley Eastern Limited.

7. Kalsi P.S., *Stereochemistry and mechanism through solved problems*. Second New Age Iunternational Publishers.

8. Nasipuri D., *Stereochemistry of Organic Compounds*., New Age International Publishers.
9. Mukherji S.M. and Singh S.P., *Organic Reaction Mechanism*, Macmillan India.

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC12	Inorganic Chemistry – I	5	0	0	4

Aim:

- To acquaint students with learning Inorganic Chemistry

Objective:

- To learn Important Concepts of Inorganic Chemistry

Outcome:

- Having successfully completed this module you will be able to:
- .
- Present the results of a practical investigation in a concise manner.
- Recognise many fundamental bond forming reactions and how to apply them in synthesis

Unit - I

18 electron rule - EAN rule - theories of coordination compounds - valence bond theory - crystal field theory - splitting of d orbitals in 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 - molecular orbital theory - octahedral complexes - tetrahedral and square planar complexes - pi bonding and molecular orbital theory - experimental evidence for pi bonding.

Unit - II

Term states of dn ions - electronic spectra of coordination compounds - selection rules - band intensities and band widths - energy level diagrams of Orgel and Tanabe - Sugano - spectra of Ti^{3+}, V^{3+}, Ni^{2+}, Cr^{3+}, Co^{2+}, Cr^{2+} and Fe^{2+} - calculation of 10Dq and B for V^{3+} (oct) and Ni^{2+} (oct) complexes. Magnetic properties of coordination compounds - change in magnetic properties of complexes in terms of spin orbit coupling - temperature independent paramagnetism - spin cross over phenomena.

Unit - III

Substitution reactions in square planar complexes - the rate law for nucleophilic substitution in a square planar complex - the trans effect - theories of trans effect - mechanism of nucleophilic substitution in square planar complexes - kinetics of octahedral substitution - ligand field effects and reaction rates - mechanism of substitution in octahedral complexes - reaction rates influenced by acid and bases - racemization and isomerization - mechanisms of redox reactions - outer sphere mechanisms - excited state outer sphere electron transfer reactions - inner sphere mechanisms - mixed valent complexes.

Unit - IV

Structure of coordination compounds with reference to the existence of various coordination numbers - complexes with coordination number two - complexes with coordination number three - complexes with coordination number four - tetrahedral and square planar complexes - complexes with

coordination number five - regular trigonal bipyramidal and square pyramidal - site preference in trigonal bipyramidal complexes - site preference in square planar complexes - isomerism in five coordinate complexes - coordination number six - distortion from perfect octahedral symmerty - trigonal prism - geometrical isomerism in octahedral complexes - coordination number seven and eight.

Unit - V

Inorganic chains - rings - cages and clusters - catenation - heterocatenation - intercalation chemistry - one dimensional conductor - isopolyanions - heteropolyanions - borazines - phosphazenes - phosphazene polymers - ring compounds of sulphur and nitrogen - homocyclic inorganic systems - cages - boron cage compounds - metal clusters - dinuclear clusters - trinuclear clusters - tetranuclear clusters - hexanuclear clusters - structural prediction of organometallic clusters.

References

1. Inorganic Chemistry - Principles of structure and reactivity, Fourth Edition J. E. Huheey, E. A. Keiter and R. L. Keiter - Addition Wesley Publishing Co, NY, 1993.
2. Advanced Inorganic Chemistry - F. A. Cotton and G. Wilkinson
3. Mechanism of Inorganic reactions - F. Basolo and R. G. Pearson
4. Inorganic Chemistry - R. B. Heslop and P. L. Robinson
5. Introduction to Ligand Fields - B. N. Figgis - Wiley Eastern Ltd, New Delhi, 1976.
6. Inorganic Chemistry - Keith F.Purcell and John C.Kotz,, Saunders Golden Sunburst Series, W.B.Saunders Company, Philadelphia, 1977.
7. Inorganic Chemistry - Shriver, Atkins and Longford, ELBS, 1994.

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC13	Physical Chemistry – I	5	0	0	4

Aim:

- The aim of this course is to provide a core for future studies in chemistry and aspects of Physical Chemistry .

Objective:

- To learn the importance of Physical Chemistry.

Outcome:

- Having successfully completed this module you will be able to:
- Determine rate constants and half-life for 0, 1st and 2nd order reactions from experimental datasets.
- Understand and apply the Boltzman distribution and its effect on the observed spectraintegrate most functions encountered in chemical practice.
- Solve separable first-order ordinary differential equations.

UNIT -I

Classical Mechanics

Symmetry of space and its relation to conservation laws-Conservation theorems - conservation of linear momentum, angular momentum and energy-Equations of motion - Newtonian, Lagrangian, Hamiltonian- Definition of classical mechanics, quantum mechanics and relativistic mechanics-Assumptions of classical mechanics. Classical wave equation- Conversion of classical wave equation into Schroedinger wave equation-Failure of Classical mechanics-Black body radiation-Photoelectric effect-Heat capacity of substances-Hydrogen atom spectrum.

UNIT- II

Mathematics for Quantum Chemistry

Functions - definition, classification-Linearly dependent and independent functions, odd and even functions-Inner product - normalization - orthogonality - ortho normal functions-Kronecker delta - Eigen functions - need for normalization. Operators - Linear, angular momentum, energy operators-Linear and non-linear operators. Hermitian operators and their properties- Proof for Hermicity of linear, angular, position and Hamiltonian operators-Commutator of operators-Commutation relation among angular momentum operators Lx, Ly, Lz- Vectors - vector space - Euclidean space, Hermitian space, Hilbert space.

UNIT - III

Basic Quantum Chemistry

Wave - particle dualism-Compton effect-Uncertainty principle and its applications- Postulates of quantum mechanics-Setting up Schrodinger wave equation and solving for particle in a 1D and 3D box, Harmonic oscillator, Rigid rotor, Hydrogen atom-Hydrogen atomic orbitals-Analytical and

graphical representations-Radial probability distribution function-Orthogonality of 1s, 2s, 2p orbitals-Many electron atom – one electron orbital and one electron potential, Pauli's exclusion principle, Slater's determinant.

UNIT -IV

Fundamentals of Statistical Thermodynamics

Permutations and combinations-Combinatory rule – probability theorems. Microstates, macrostates-Methods of counting microstates of distinguishable and indistinguishable particles-Heat capacity of solids-Einstein and Debye models-Maxwell-Boltzmann statistics-Phase space-Thermodynamic probability-Statistical equilibrium. Derivation of M.B. statistics-Relationship between entropy and probability-Statistical meaning of third law of thermodynamics.

UNIT -V

Applications of Statistical Thermodynamics

Partition functions -Translational, rotational and vibrational partition functions of diatomic molecules-Translational, rotational and vibrational partition functions of poly atomic molecules-Electronic partition function-Derivation of thermodynamic quantities E, S, A, H, G, K and Cp, Cv using partition function-Sackur-Tetrode equation- Quantum statistics. Bose Einstein statistics-Behaviour of helium at low temperature-Fermi Dirac statistics.

REFERENCES:

1. Prasad R.K. Quantum Chemistry, I Edition, New Delhi, Wiley Eastern Ltd, (1992) - Unit 1, 2, 3
2. Anderson J. M. Mathematics of Quantum Chemistry, I Edition, Massachusetts, W.A.Benjamine Inc. (1966)- Unit 2
3. Kuriakose. J.C. and Rajaram J.C. Thermodynamics Jalandar Shoban Lal Co., (1996)- Unit 4, 5
4. Gupta and Kumar Classical Mechanics – Unit 1

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC14L	Organic Chemistry Lab – I	0	0	5	3

Aims: The organic laboratory class consists of a series of experiments designed to be completed in either one or two sessions. A written report discussing notable features of each experiment and the significance of the data is to be carried out each week. The course is designed to illustrate and reinforce

concepts covered in the lecturebased part of the course. The students will be introduced to key synthetic techniques and will regularly employ spectroscopic techniques to examine the outcome of experiments.

Objectives: To perform seven experiments that have been divided into 3 topics:
Functional group interconversions, carbon-carbon bond formation / enolate chemistry, and electrophilic aromatic substitution. To take part in spectroscopy workshops that will demonstrate further topics in spectroscopy and the use of spectroscopic techniques in the characterisation of organic compounds. To learn new synthetic techniques: distillation under reduced pressure, reactions involving continuous removal of water and preparative chromatography. To gain experience in the identification and characterisation of unknown products using 1H NMR spectroscopy, ^{13}C NMR spectroscopy, IR spectroscopy and mass spectrometry. To introduce the concept of multi-step organic synthesis.

ORGANIC CHEMISTRY LAB – I

Qualitative analysis of an organic mixture containing two components.

a) Pilot separation

b) Bulk separation

c) Analysis

d) Derivatization

Preparation of Organic compounds (Single stage)

a) Glucose pentaacetate from glucose(acetylation)

b) Resorcetophenone from resorcinol (acetylation)

c) Benzophenoneoxime from benzophenone (addition)

d) *p*-Benzoquinone from hydroquinone (oxidation)

e) Phenyl-azo-2-napthol from aniline(diazotization).

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC15L	Inorganic Chemistry Lab – I	0	0	5	3

Aims:

The inorganic laboratory class consists of a series of experiments designed to be completed in either one or two sessions. A written report discussing notable features of each experiment and the significance of the data is to be carried out each week. The course is designed to illustrate and reinforce concepts covered in the lecture-based part of the course. To equip students with the basic skills and expertise required to carry out careful and precise procedures in the modern practical chemistry laboratory whilst providing experiments that illustrate and support the lecture course. To train students in
the art of good scientific report writing and in the use of spectroscopic techniques for the structural elucidation of inorganic compounds. To encourage student to become more aware of the risks and hazards associated with careful laboratory work and to assess risks and methods for minimizing them.

Objectives:
Analytical Experiments:
(1) To be familiar with the use of pipettes, burettes and analytical balances. To be able to transfer quantitatively liquids and solids.
(2) To be familiar with the techniques of gravimetric analysis, complexometric titration, colorimetry and atomic absorption spectrometry for the analysis of inorganic compounds. (3) To learn about gases in the environment and how to analyse for concentrations of gas components via spectrophotometry and IR spectroscopy. In modern analytical chemistry instrumental methods are replacing traditional titration and gravimetric methods. Nevertheless, a good grasp of the basic techniques is essential in all forms of instrumental analysis.
Among these techniques are:
(a) the ability to make up a standard solution
(b) the ability to make careful measurements
(c) an appreciation of errors and significant figures.

INORGANIC CHEMISTRY LAB – I

1. Titrimetry: Complexometric titrations involving estimations of calcium, magnesium, nickel, zinc and hardness of water.

2. Quantitative analysis: Quantitative analysis involving volumetric and gravimetric estimations of at least four mixtures of cations.

3. Preparation of inorganic complexes: About six preparations involving different techniques selected from the following.

(i) Potassium tris(oxalato)aluminate

(ii) Nickel ammonium sulphate

(iii) Tris(thiourea)copper(I) chloride

(iv) Potassium tris(oxalato)ferrate

(v) Hexamminecobalt(III) chloride

(vi) Ammonium hexachloro stannate(IV)

(vii) Tetrammine copper(II) sulphate

(viii) Cis and trans bis(glycinate) copper.

COURSE CODE	COURSE TITLE	L	T	P	C
20214DSC16A	Discipline Specific Elective - I Environmental Chemistry	5	0	0	4

Aim: To learn the important of Environmental Chemistry.

Objective:

- Creating the awareness about environmental problems among people.
- Imparting basic knowledge about the environment and its Ancillary problems.

- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Striving to attain harmony with Nature.

Outcomes:

Students who graduate with a major in environmental science will be able to:

- Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale;
- Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment;
- Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community;
- Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues; and
- Understand how politics and management have ecological consequences.

UNIT – I

Pollution

Environmental pollution - structure of atmosphere - biogeological cycles - oxygen - nitrogen – carbon – phosphorous – sulphur - biodistribution of elements - air pollutions - reactions in atmosphere - primary pollutants - air quality standards - analysis of CO, nitrogen oxides, sulphur oxides, hydrocarbons and particulate matter - particulate pollution - control methods - vechicular pollution - green house effect and global warming - climatic changes – ozone - photochemical smog - acid rain - sampling - monitoring – control.

UNIT – II

Water Pollution

Hydrosphere: Water pollution - hyrological cycle - chemical composition - sea water composition - water quality criteria for domestic and industrial uses - BIS and WHO standards - ground water pollution - surface water pollution - lake and river water - eutrophication - marine pollution - water pollutants - biodgradeability of detergents – pestisides - endosulfan and related case studies.

UNIT – III

Water Treatment

Principles of water and waste water treatment - aerobic and anaerobic treatment - industrial waste water treatment - heavy metal pollution - hard water - softening - purification of water for drinking

purposes - water treatment for industrial use - electrodialysis - reverse osmosis - other purification methods - chemical speciation of elements.

UNIT – IV

Water Analysis

Color - odor - conductivity - TDS - pH - acidity - alkalinity - chloride - residual chlorine - hardness - trace metal analysis - elemental analysis - ammonia - nitrite - nitrate - fluoride - sulphide - phosphate - phenols - surfactants - BOD - COD - DO - TOC - nondispersive IR spectroscopy - anode stripping - ICP - AES - Chromatography - ion selective electrodes - neutron activation analysis.

UNIT – V

Soil Pollution:

Soil humus - soil fertility - inorganic and organic components in soil - acid - base and ion exchange reactions in soils - micro and macro nutrients - wastes and pollutants in soil - introduction to geochemistry - solid waste management - treatment and recycling soil analysis - radioactive pollution - disposal of radioactive waste.

REFERENCES:

1. H. Kaur, Environmental Chemistry, 6th Edn, Pragathi Prakashan, Meerut, 2011.
2. K.H.Mancy and W,.J.Weber Jr. Wiley, Analysis of Industrial Waste Water, Interescience New York, 1971.
3. L.W. Moore and E. A. Moore, Environmental Chemistry, McGraw Hill Publication, New York, 2002.
4. S. M. Khopkar, Environmental Pollution Analysis, New Age International (P) Ltd, 1993.
5. Colid Baird. Environmental Chemistry, W. H. Freemand and Company, 1995.

COURSE CODE	COURSE TITLE	L	T	P	C
20214DSC16B	Discipline Specific Elective - I Supramolecular Chemistry	5	0	0	4

Aim:

- To focuses on non-covalent bonding interactions of molecule.

Objective:

- To explain the chemical reactions and molecular rearrangements of non-covalent bond molecules.
- To forces include hydrogen bonding ,metal coordination, van der waals forces, pi-pi interactions and electrostatic effects.

Outcome:

- Understand the reactivity of non-covalent bonding molecules.
- Develop the interaction and nature of organic solvents to others.

UNIT- I

Definition of supramolecular chemistry: Nature of binding interactions in supramolecular structures: ion-ion, ion-dipole, dipole-dipole, hydrogen bonding, cation-π, anion- π, π- π, and van der Waals interactions.

UNIT -II

Synthesis and structure of crown ethers: lariat ethers, podands, cryptands, spherands, calixarenes, cyclodextrins, cyclophanes, cryptophanes, carcerands and hemicarcerands.

UNIT- III

Host-Guest interactions: pre-organization and complimentarity, lock and key analogy. Binding of cationic, anionic, ion pair and neutral guest molecules.

Crystal engineering: role of H-bonding and other weak interactions.

UNIT- IV

Self-assembly molecules: design, synthesis and properties of the molecules, self assembling by H-bonding, metal-ligand interactions and other weak interactions, metallomacrocycles, catenanes, rotaxanes, helicates and knots.

UNIT -V

Molecular devices: molecular electronic devices, molecular wires, molecular rectifiers, molecular switches, molecular logic.

Relevance of supramolecular chemistry to mimic biological systems: cyclodextrins as enzyme mimics, ion channel mimics, supramolecular catalysis.

REFERENCES:

1. J. -M. Lehn; Supramolecular Chemistry-Concepts and Perspectives (Wiley-VCH, 1995).

2. D. Beer, P. A. Gale, D. K. Smith; Supramolecular Chemistry (Oxford University Press, 1999)

3. W. Steed and J. L. Atwood; Supramolecular Chemistry (Wiley, 2000)

SEMESTER - II

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC21	Organic Chemistry - II	4	0	0	4

Aim:

- To acquaint students with learning Organic Chemistry

Objective:

- To sensitize students to learn Important components of Organic Chemistry

Outcome:

- Having successfully completed this module you will be able to:
- Gaining knowledge about Carbon –Carbon Double bonda
- About rearrangements
- Interpret data from a range of physical techniques to characterise Organic componds.
- Present the results of a practical investigation in a concise manner.
- Recognise many fundamental bond forming reactions and how to apply them in synthesis.

UNIT- I

Addition to Carbon–Carbon Multiple Bonds

Electrophilic and nucleophilic additions, addition to conjugated systems, orientation and reactivity, addition of halogen and nitrosyl chloride to olefins, hydration of olefins and acetylenes, hydroboration, hydroxylation epoxidatoin , Michael addition, 1.3 dipolar addition, Diels-Alder reaction.

UNIT- II

Addition to Carbon–Hetero Atom Multiple Bonds

Mechanism and reactivity, Mannich, Stobbe, Darzen-Glycidic ester condensation, Benzoin condensation, Peterson olefination (Silyl Witting reaction), Strecker synthesis, Witting, Witting Horner, Perkin, Thorpe, Ritter, Prins reactions.

UNIT -III

Elimination Reactions

E_1,E_2,E_1CB mechanisms, Orientation of the double bond, Hofmann and Saytzeff rule, competition between elimination and substitution, dehydration and dehydrohaloganation reactions. Stereochemistry of E_2 eliminations in cyclohexane ring systems, mechanism of pyrolytic eliminations, Chugaev reaction and Cope elimination.

UNIT - IV

Molecular Rearrangements

A detailed study of the mechanism of the following rearrangements: Nucleophilic. Electrophilic and Freeradical rearrangements-memory effects, Migratory aptitudes, Pinacol-Pinacolone. Oppener-Wagner-Meerwin, Demyanov, Dienone-Phenol, Favorski, Baeyer-Villiger, Wolff, Stevens and Von-Richter (a few examples in each rearrangement are to be studied), rearrangements involving nitrenes-Hofmann, Curtius, Lossen, and Beckmann.

UNIT –V

Oxidation and Reduction

Study of the following oxidation reaction with mechanism: Oxidation of alcohols by CrO_3 - DMSO. DMSO in combination with DCC; acetic anhydride and oxylyl chloride, oxidation of aryl methane, allylic oxidation of olefins, oxidative cleavage of glycols, oxidative cleavage of double bonds by ozonolysis., NBS Oxidation.

Study of the following reduction reactions with mechanism: Reduction of carbonyl compounds by hydrides, selectivity in reduction of 4-ter-butylcyclohexanone using selenides, Clemmenson and Wolff-Kishner reductions, Birch reduction, MPV reduction.

References:

1. Advanced Organic Chemistry – Reactions, Mechanisms and Structure, Fourth Edition, Jerry March. John Wiley Sons (1992)
2. Organic Chemistry, Francis A. Carey. Third Edition, The McGraw-Hill Companies. Inc.
3. Organic Chemistry, Hjendrickson, Cram and Hammond, Third Edition, McGraw-Hill Book Company.
4. Organic Reactions and Mechanisms, P.S.Kalsi, Second Edition, New Age International Publishers.
5. Stereochemistry – of Carbon Compounds, Emest L. Eliel.T.M.H Edition, Tata MeGraw-Hill Publishing Company.
6. Stereochemistry – Conformation and mechanism. P.S.Kalsi, Wiley Eastern Limited.
7. Stereochemistry and mechanism through solved problems, P.S.Kalsi, Second Edition, New Age international Publishers.
8. Stereochemistry of Organic Compounds D.Nasipuri, New Age International Publishers.
9. Reation mechanism in Organic Chemistry. S.M.Mukherji and S.P.Singh,Macmillan.
10. Organic Chemistry R.T.Morrison and R.N.Boyd, Prentice-Hall.
11. Principles of Organic Synthesis, R.O.C Nomman, 2nd Edition, Chapman and Hall.

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC22	Inorganic Chemistry - II	4	0	0	4

Aim:

- To acquaint students with learning Inorganic Chemistry

Objective:

- To learn Important Concepts of Inorganic Chemistry

Outcome:

- Having successfully completed this module you will be able to:
- .
- Present the results of a practical investigation in a concise manner.
- Recognise Nuclear chemistryand transition Elements

UNIT- I

Nuclear Chemistry:

Radioactive decay and equilibrium, Nuclear reactions; Q value, cross sections, types of reactions, Chemical effects of nuclear transformations; fission and fusion, fusion products and fission yields. Radioactive techniques; tracer technique, neutron activation analysis, counting techniques such as G.M. ionization ands proportional counter.

UNIT - II

Chemistry of Non-transition Elements:

General discussion on the properties of the no transition element special features of individual elements; synthesis, properties and structure of their halides and oxides, polymorphism of carbon, phosphorus and sulphur. Synthesis, properties and structure of boarnes, carbonates, borazines, silicates carbides, silicons, phosphazenes, sulphur-nitrogen compounds; peroxo compounds of boron, carbon and sulphur; oxy acids of nitrogen, phosphrous, sulphur and halogens, interhalgens pseudochalides and noble gas compounds.

UNIT- III

Chemistry of Transition Elements:

Coordination chemistry of transition metal ions; stability constants of complexes and their determination; stabilization of unusual oxidatrion states. Stereochemistry of coordination compounds. Ligandfield theory, splitting of d-orbital in low-symmetry environments. , John – Teller effect : interpretation of electronic spectra including charge transfer spectra; spectrochemical series , nephelauxetic series Magnetism; Dia, para; ferro-and antiferromagnetism, quenching of orbitial angular moment, spinorbit coupling, inorganic reaction mechanisms; substitution reactions, tarns effect and electron transfer reactions.

UNIT - IV

Chemistry of Lanthanides and Actinides:

Spectral and magnetic properties ; Use of lanthanide compounds as shift reagents molecules metal clusters, Spin crossover in coordinating Photo chemical reaction of chromium and ruthenium complexes. Fluxional compounds.

UNIT -V

Organometallic Chemistry of Transition Elements:

Synthesis, structure and bonding, organ metallic reagents in organic synthesis and in homogeneous catalytic reaction (hydrogenation, hydroformaylation, isomerisation and polymerization); pi-acid metal complexes, activation of small molecules by coordination.

References:

1. Badie E.Duglas and Danl H.McDaniel. Concepts and Models in Inorganic Chemistry, Indian Edition, 1970, Oxford and IBH Publishing Co., New Delhi.
2. J.D.Lee, A.New Concise Inorganic Chemistry , 4th Edition, ELBS, 1995
3. G.Friedlander, J.W. Kennedy and J.M.Miller, Nuclear and Radiochemistry
4. Keith F.Purchell and John. C.Kotz, Inorganic Chemistry, Saunders Golden Sunburst Series, W.B.Sauners Company, Philadelphia.
5. Cotton and Wilkinson, Advanced Inorganic Chemistry, 5th Edition, John Wiley & Sons, New York
6. W.Kain and B.Schwederski, Bioinorganic Chemistry, Inorganic Elements in the Chemistry of life, John Wiley and Sons, New York.
7. James E.Huheey, Ellen A.Keiter and Richard L.Keitre, Inorganic Chemistry; Principles of Structure and Reactivity, 4th Edition, Addison – Wesley, New York, (Unit – I)
8. Shriver and Atkins, Inorganic Chemistry, III Edition Oxford, 1999, India Gopsons Pvt.Ltd, A – 14 sector Noida.

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC23	Physical Chemistry - II	4	0	0	4

Aim:

- The aim of this course is to provide a core for future studies in chemistry and aspects of Physical Chemistry.

Objective:

- To learn the importance of Physical Chemistry.

Outcomes:

- Having successfully completed this module you will be able to:
- Learning various concepts of Surface Phenomenon and Spectroscopy.

UNIT - I

Surface Phenomena:

Adsorption and free energy reaction at inter –phase-physisorption and chemisorption-potential energy diagram-Lennand –Jones Plot-Langmuir,BET isotherm-Gibbs & Freundlich's adsorption isotherms.

Role of surfaces in catalysis- Semiconductor catalysis-n and p type surfaces-kinetics of surface reactions involving adsorbed species-Langmuir-Hinshelwood mechanism of biomolecular reaction-Langmuir-Rideal mechanism of biomolecularr reaction- Rideal-Eley mechanism.

UNIT- II

Partition Functions:

Calculation of thermodynamic probability of a system –difference between thermodynamics and statistical probability-definition of micro and macro states – different methods of counting macro states-distingiusable and indistinguishable particles classical statistics-derivation of Maxwell-Boltzman Distribution law.

Transational ,rotational.vibrational,electronic-calculation of enthalpy internal energy,entropy and other thermodynamic functions – applications of partition functions to monoatomic and diatomic molecules.

UNIT - III

Spectroscopy:

Microwave Spectroscopy - Theory of linear, symmetric top and asymmetric top molecules.

IR Spectroscopy - Vibrational spectra- selection rules-harmonic and unharmonic oscillator-(fundamental absorption, first and second overtones, hot bands etc)-rotation, vibration spectra of diatomic molecules-influence of rotation on the spectra of poly atomic molecules- FT- IR spectrometry.

UNIT- IV

Raman Spectroscopy: Raman's effect – elastic and inelastic scattering- selection rules-pure rotational Raman spectra(linear, spherical top, symmetric top and asymmetric top molecules)-vibrational Raman's spectra-polarisation of lights and Raman effect-comparision of IR and Raman spectra – simple molecules-mutual exclusion principle-fermi resonance- Laser Raman's Spectroscopy (LRS).

UNIT-V

Group Theory: Elements of group theory- properties of subgroup –classes –group multiplication table –isomorphism groups –symmetry element and symmetry operations –inter relation among symmetry operation- generations- points group of molecules- matrix representation theory –construction of character tables- reducible and irreducible representations –MOs for systems like ethylene, butadiene, monocyclic and aromatic compounds.

References:

1. F.A.Cotton ,"Chemical Applications of Group Theory", 2nd ed., Wiley (1981).
2. R.L.Flowry, Jr,Symmentry Groups –Prentice Hall,New Jersy (1980)
3. B.E.Douglas and C.A.Hollingsworth, Symmentry in bonding and spectra- An Introduction,Academic Press Nal(1985)
4. K.Veera Reddy," Symmentry and spectroscopy of molecules", New Age International (p) Limted, Publishers,New Delhi.
5. A.K.Chandra, Introductory quantum Chemistry, 4th ed., Tata McGraw Hill(1994)
6. R.K.Prasad, quantum Chemistry, 2nd ed., New Age International Publishers(2000)
7. S.Glasstone, Introduction to Thearitical Chemistry, Affilated East-West press
8. C.N.Banwell,Fundamentals of Molecular spectroscopy, Tata McGraw Hill(1993)
9. G.M.Barrow , Introduction to Molecular spectroscopy, International McGraw Hill student edition(1984)
10. R.Chang,Basic principles of spectroscopy, McGraw Hill pub.Limited
11. J.D.GrayBeal, Molecular spectroscopy, McGraw Hill International edition(1988)
12. F.W.Sears "Thermodynamics, Kinetic Theory of gases and statistical mechanics", 2nd ed., Addision Wesley(1972)
13. S.Glasstone,"Thoeritical Chemistry", Affilated East-West press

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC24L	Organic Chemistry Lab - II	0	0	5	3

Aims: The organic laboratory class consists of a series of experiments designed to complete in either one or two sessions. A written export discussing notable features of each experiment and the significance of the data is to be carried out each week. The course is designed to illustrate and reinforce concepts covered in the lecture based part of the course. The students will be introduced to key synthetic techniques and will regularly employ spectroscopic techniques to examine the outcome of experiments.

Objectives: To perform seven experiments that have been divided into 3 topics:

Functional group interconversions, carbon-carbon bond formation / enolate chemistry, and electrophilic aromatic substitution. To take part in spectroscopy workshops that will demonstrate further topics in spectroscopy and the use of spectroscopic techniques in the characterisation of organic compounds. To learn new synthetic techniques: distillation under reduced pressure, reactions involving continuous removal of water and preparative chromatography. To gain experience in the identification and characterisation of unknown products using ^{1}H NMR spectroscopy, ^{13}C NMR spectroscopy, IR spectroscopy and mass spectrometry. To introduce the concept of multi-step organic synthesis.

ORGANIC CHEMISTRY LAB – II

Qualitative analysis of Organic Compounds:

Estimation of

a) Phenol

b) Aniline

c) Ketone

d) Glucose

Preparation of Organic Compounds (Double stage)

a) p-bromoacetanilide from aniline (acetylation & bromination)

b) 1,3,5- tribromobenzene from aniline (bromination, diazotization & hydroxylation)

c) p-nitroaniline from acetanilide (nitration & hydrolysis)

d) p-aminobenzoic acid from para- nitrotoluence, (oxidation & reduction).

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC25L	Inorganic Chemistry Lab - II	0	0	5	3

Aims:

The inorganic laboratory class consists of a series of experiments designed to be completed in either one or two sessions. A written report discussing notable features of each experiment and the significance of the data is to be carried out each week. The course is designed to illustrate and reinforce concepts covered in the lecture-based part of the course. To equip students with the basic skills and expertise required to carry out careful and precise procedures in the modern practical chemistry laboratory whilst providing experiments that illustrate and support the lecture course. To train students in the art of good scientific report writing and in the use of spectroscopic techniques for the structural elucidation of inorganic compounds. To encourage student to become more aware of the risks and hazards associated with careful laboratory work and to assess risks and methods for minimizing them.

Objectives:

Analytical Experiments:

(1) To be familiar with the use of pipettes, burettes and analytical balances. To be able to transfer quantitatively liquids and solids.

(2) To be familiar with the techniques of gravimetric analysis, complexometric titration, colorimetry and atomic absorption spectrometry for the analysis of inorganic compounds. (3) To learn about gases in the environment and how to analyse for concentrations of gas components via spectrophotometry and IR spectroscopy. In modern analytical chemistry instrumental methods are replacing traditional titration and gravimetric methods. Nevertheless, a good grasp of the basic techniques is essential in all forms of instrumental analysis.

Among these techniques are:

(a) the ability to make up a standard solution

(b) the ability to make careful measurements

(c) an appreciation of errors and significant figures.

1. Qualitative analysis: Qualitative analysis employing semi-micro methods and spot tests of mixtures of common cations and ions of the following less familiar elements. Molybdenum, tungsten, selenium, tellurium, cerium, thorium, titanium, zirconium, vanadium, uranium and lithium.

2. Colorimetry: Colorimetric estimations of copper, nickel, iron and chromium using photoelectric colorimeter.

COURSE CODE	COURSE TITLE	L	T	P	C
20214DSC26A	Discipline Specific Elective - II Special Topics in Chemistry	5	0	0	4

Aim:

- The aim of this course is to provide a core for future studies in chemistry and aspects of Industrial Chemistry .

Objective:

- To learn the importance of Industrial Chemistry.

Outcomes:

- Having successfully completed this module you will be able to:
- Learning various concepts of industries using Chemicals.

Unit – I

Water conditioning for chemical factories – reuse – methods of conditioning – Demineralisation – Precipitation – Desalting – Industrial and Sewage waste water treatment. Vegetable oils – Refining of edible oils – Solvent extraction – Processing of animal fat – Hydrogenation – Interesterification - Manufacture of soap and detergents . Biodegradability of surfactants – Methods.

Unit – II

Pulp and paper industries – Sulphite, Sulphate, soda, ground wood pulp for paper – Manufacture of paper – Speciality paper – Paper stock – Structural Boards. Plastics – Manufacture – Resin – Manufacturing process – Condensation polymerization – Manufacture of laminates and other derivatives – Hexamethylene tetramine plastics – Vinyl esters.

UNIT – III

Basic ideas – Flow charts – Chemical Conversion – Batch Versus Continuous processing – Design – Chemical Process control and economics – Market evaluation – Plant location – Management for productivity and Creativity – Research & Development and its role in Chemical industries.

Unit – IV

Rubber industries – Natural rubber – Synthetic rubber – Monomer production – Synthetic rubber polymerization – Butadiene – Styrene copolymers – Butadiene acrylonitrile copolymer – Neoprene – Thiokol – Silicon Rubber – Butyl rubber – Urethane rubber – Rubber processing- chemicals – Rubber compounding – Rubber fabrication – Latex compound- reclaimed rubber- Rubber derivatives.

UNIT – V

Industrial and military explosives – Manufacture – Pyrotechniques – Manufacture of safety matches.Colour photography – Theory – material and process – special applications of photography.

REFERENCES:

1. Chemical process Industries – Norrish Shreve, R. and Joseph A. Brink Jr. McGraw Hill, Industrial Book Company, London.
2. Production and Properties of Industrial Chemicals – Brain A.C.S Reinhold – New York.
3. Fermentation Industries – Burgh, A., Interscience, New York.
4. Hand Book of Technology and Engineering – Gilbert, J., Van Nostrand Reinhold, London.
5. Rubber Hand Book – Rubber Manufacturers association – New York.
6. Petroleum Products Hand Book, Guthrie V., McGraw Hill, Tokyo.

COURSE CODE	COURSE TITLE	L	T	P	C
20214DSC26B	Discipline Specific Elective - II Macromolecules as Engineering Materials	5	0	0	4

Aim:

- To study about the macromolecules as engineering materials in various fields.

Objective:

- To develop the concept and reactivity of macromolecules.

Outcome:

- Develop the knowledge of characterization and its applications of macromolecules.

UNIT - I

Concepts - Small molecules to macromolecules. Definitions and nomenclature. Classification of polymers, types of polymerizations (chain growth, step growth and living), molecular weights and distribution.

UNIT- II

Study on physical methods of determining molecular weights and distribution.

Synthesis of macromolecules – thermodynamics and kinetics of chain polymerization with reference to industrially important polymers such as polyethylene, polypropylene, polystyrene, polyvinyl chloride.

UNIT- III

Thermodynamics and kinetics of step polymerization with reference to specialty polymers such as PET, Nylon, PC, and PU. Step growth polymerizations involving crosslinking (gelation) or formation of insoluble polymer mass. Determination of polymer structure via IR and NMR spectroscopies.

UNIT - IV

Characterization of polymer structure in the solid state – Characteristics of Amorphous and semicrystalline polymers. Viscoelasticity. Glass transition temperature and elementary theories of glass transition. Rubber elasticity and thermodynamic theory of rubber elasticity.

UNIT -V

Applications – Engineering and specialty polymers, high performance fibres (Kevlar), Composite materials (BMC and SMC), conducting plastics. Polymers for separation science, biomedical devices, electronics and photonics.

REFERENCES:

1. Polymer Science and Technology, by Joel R. Fried, Prentice Hall of India Pvt. Ltd. 1999.
2. Textbook of Polymer Science, by Fred W. Billmeyer Jr. Fourth Edition, 1999, Wiley-Interscience, Ney York.
3.Principle of Polymerization, by George Odian, Fourth Edition, 1999, Wiley-Interscience, Ney York.
4. Polymer Science, by V. R. Gowarikar, N. V. Viswanathan and S. Jayadev, Halsted Press (John Wiley & Sons), New York.

COURSE CODE	COURSE TITLE	L	T	P	C
20214RMC27	Research Methodology	3	-	-	2

Aim:

To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

Objective:

To understand the approaches towards and constraints in good research.

To identify various statistical tools used in research methodology

To appreciate and compose the manuscript for publication

To train in basic computational and software skills for research in physical and chemical sciences.

Outcome:

Ability to develop research questions and the various research strategies, and compile research results in terms of journal manuscripts.

PREREQUISITES:

Research Methodology course in UG level or equivalent knowledge.

UNIT I:

Introduction to Research Methodology

Objectives of research – Types of research – Significance of research. Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT II:

Database and Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Chemical Abstract Service – Reviews – Monographs – Literature search.

UNIT III:

Data Analysis and Chemical Packages

Precision and accuracy – Reliability – Determinate and random errors – Distribution of random errors – Normal distribution curve – Statistical treatment of finite samples – t test and F test (ANOVA) co -variance (ANCOVA) correlation and multiple regression analysis – Chemical Packages – ChemDraw – ChemSketch – ISIS draw – Origin.

UNIT IV:

Thesis and Paper writing

Conventions in writing – General format – Page and chapter format – Use of quotations and footnotes – Preparations of tables and figures – References – Appendices.

UNIT V:

Laboratory Safety

Basic laboratory guidelines – safety equipment – Leaking compressed gas cylinders – electrical safety. Fire – fire extinguishers. Laboratory injuries and treatment. Chemical spills – Mercury and Biohazardous – clean up procedure - Accident management - Disposal of chemicals and glass wares.

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.

2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.

3. D.G Peters, J.M. Hayes and G.M. Hefige, A brief introduction to Modern chemical analysis.

4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.

5. R. Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand and Sons, New Delhi, 2005.

6. E. Balagurusamy, Numerical methods, Tata McGraw-Hill

7. S.S. Sastry, Introductory Methods of Numerical analysis, PHI, N.Delhi

SEMESTER - III

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC31	Organic Chemistry - III	5	0	0	5

Aim:

- To acquaint students with learning Organic Chemistry

Objective:

- To sensitize students to learn Important components of Organic Chemistry

Outcome:

- Having successfully completed this module you will be able to:
- Gaining knowledge organic Synthesis.

Unit I

Reagents in Organic Synthesis:

Use of the following reagents in organic synthesis and functional group transformations, complex metal hydrides, Gilman's reagent, lithium dimethylcuprate, lithium diazopropylamine (LDA), 1,3-dithiane, trimethylsilyl iodide, tri-n-butyltin hydride, Woodward and Prevost hydroxylation, osmium tetroxide, DDQ, selenium dioxide, Peterson's synthesis, Wilkinson's catalyst, baker yeast.

Unit II

Photochemistry:

Cis-trans isomerism, Paterno-Buchi reaction, Norrish type I and II reactions. Photoreduction of ketones, di-pimethane rearrangement, photochemistry of arenes.

Unit III

Pericyclic Reactions:

Selection rules and stereochemistry of electrocyclic reactions, cycloaddition, and sigmatropic shifts, Sommlet, Hauser, Cope and Claisen rearrangements.

Unit IV

Selective Organic Name Reactions:

Favorski, Mannich, Stork-Enamine reactions, Sharpless asymmetric epoxidation, Ene reaction, Barton reaction, Hoffmann-Loffler-Freytag reaction, Shapiro, Chichibabin and Bayer-Villiger reactions.

Unit V

Spectroscopy:

Applications of Mass, UV-VIS, IR and NMR spectroscopy for structural elucidation of organic molecules.

References:

(1) R.K. Bansal, Organic reaction mechanisms, New Age International, 1996.

(2) F.A. Carey and R.J. Sunberg, Advanced Organic Chemistry.

(3) W. Carruthers, Some Modern Methods in Organic Synthesis, Cambridge, 1971.

(4) E.J. Corey, Reactions and Reagents in Organic Synthesis, VCH, 1988.

(5) I.L.Finar, Organic Chemistry, Vol. II, ELBS, 1977.

(6) C. H. Depuy and O.S. Chapman, Elements of Organic Photochemistry, Prentice Hall, 1975.

(7) D. Dyer, Application of Absorption Spectroscopy of Organic Compounds, Prentice Hall, 1978.

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC32	Inorganic Chemistry - III	5	0	0	5

Aim:

- To acquaint students with learning Inorganic Chemistry

Objective:

- To learn Important Concepts of Inorganic Chemistry

Outcome:

- Having successfully completed this module you will be able to:
- .Recognise Analytical Techniques and Spectroscopy.

UNIT – I

Topics in Analytical Chemistry:

Adsorption partition, exclusion electrochromatography, solvent extraction and ion exchange methods. Application of atomic and molecular absorption and emission spectroscopy in quantitative analysis. Light scattering techniques including nephelometry.Raman Spoectroscopy: Electroanalytical techniques; voltammetry, cyclic voltammetry, polarography, amperometry coulometry and conductometry. Ion-elective electrodes, anodic stripping voltammetry, TGA, DTA, DSC and online analyzer.

UNIT –II

Electronic Spectroscopy:

Electronic confoguration, terms states and microstates, derivation of term symbols (p^2, d^2) and arranging the various terms according to their energies. Spectroscopic terms – effect of inter electronic repulsion and spin – orbit coupling – Racah parameters B and C-R-S coupling and JJ coupling. Selection rules and the breakdown of selection rules- group theoretical explanation. Ground states of free ions for d'' systems- Oh and Td systems and the corresponding energy level disgrams- mixing of orbitals. Orgel diagram – charcteristics – prediction and assignment of transitions for d" weak filed cases. Tanane- Sugano diagrams- characteristics – predication and assignment of transition for weak field and strong filed – d" systems band intensity, band widths – band shapes – factors affecting these – distortion and spin-orbit coupling calculation of B and 10q for simple octahedral complexes of Co and Ni.

UNIT –III

IR and Raman Spectroscopy:

Combined uses of IR and Raman spectroscopy in the structural elucidation of simple molecules like H_2O,ClF_3, NO_3, ClO_3. Effect of co-ordination on legend vibrations – uses of group vibrations in the structural elucidation of metal complexes of urea, thiourea, cyanide, thiocyanate nitrate, sulphate and dimethylsulphoxide. Effect of isotopic substitution on the vibrational spectra of molecules – vibrational spectra of metal carbonyls with reference to the nature of bonding, geometry and number of C-O stretching vibrations (group theoretical treatment).

UNIT – IV

NMR Spectroscopy:

Chemical shifts and coupling constants (spin-spin coupling involving different nuclei ^{1}H, ^{31}P & ^{13}C) interpretation and applications to inorganic compounds. Effects of Quadrapole nuclei (^{1}H, ^{10}B, ^{11}B) on the ^{1}H NMR spectrum. NBR paramagnetic molecules - isotopic shifts, contact and pseudocontact interactions- lanthanide shift reagents. Stereochemistry of non-rigid molecules, satellite spectra – Applications of ^{31}P,^{13}C and ^{1}H NMR of inorganic molecules.

UNIT – V

EPR Spectroscopy:

Basic principles – characteristics of 'g' – hyperfine splitting - selection rules- hyperfine splitting on various structure – bis (salicilyldiaminecopper(II) – factors affecting the magnitude of the 'g' values of transition metal ions – dependence on spin – orbit coupling crystal filed. Three conditions (I) spin-orbit coupling crystal filed (ii) strength of the crystal filed effects, (iii) very large crystal filed. Ni(II) octahedral complex- Cu^{2+} in a tetragonal – field. Zero–field splitting and signal- effecting spins mixing of saturated zero field splitting. Line widths in solid state EPR – spin – lattice – spin – spin

relaxation – exchange processes. Effect of disortion – T, Ag, Eg. ground terms – g (parallel), g (perpendicular), g (average) □^{2}□^{2} and G parameters from EPR and information obtained from them.

References:

1. A.I. Vogel, Quantitative Inorganic Analysis, 3rd Ed., ELBS Longman, London.
2. R.S. Drago, Physical Methods in Inorganic Chemistry, 3rd ed., Wiley Eastern Company.
3. R.S Drago, Physical Methods in Chemistry, W.B. Saunders Company, Thinadelphia, London.
4. P.J. Wheatley, The Determination of Molecular Structure.
5. E.A.V. Ebsworth, Structural Methods in Inorganic Chemistry, 3rd Ed., ELBS, Great Britain, 1987.
6. C.N. Banwell, Fundamentals of Molecular Spectroscopy, 3rd Ed., Mc-Graw Hill, 1983, New Delhi.
7. G.H.H. Stout and L.H. Jenson, X-ray Structure Determination, a Practical Guide.
8. G. Barrow, Introduction to Molecular Spectroscopy, Mc-Graw Hill, New York, 1964
9. P.K. Ghosh, Introduction to Photoelectron Spectroscopy, John Wiley, New York (1989).
10. W.Kemp, NMR in Chemistry – A Multinuclear Introduction, McMillan, 1986.
11. C.D. Becker, High Resolution NMR – Theory and Applications, Academic Press, 2nd Ed., 1980.

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC33L	Physical Chemistry Lab -I	0	0	5	3

Aims: The physical laboratory class consists of a series of experiments designed to be completed in either one or two sessions. The laboratory is designed to illustrate and reinforce concepts covered in the lecture based part of the course. The students will be introduced to a number of spectroscopic and analytical techniques.

Objectives: To perform eight experiments covering analytical chemistry, catalysis, diffraction, IR spectroscopy, kinetics and thermodynamics

1. Kinetics – Acid hydrolysis of Esters - Comparison of strengths of acids.

2. Kinetics – Acid hydrolysis of Esters – Determination of Energy of Activation (E_a)

3. Kinetics – Saponification of Ester - Determination of Energy of Activation (E_a) by conductometry

4. Kinetics – Persulphate – Iodine Reaction - Determination of order,effect of ionic strength on rate constant

5. Distribution Law – Study of Iodine – Iodide equilibrium

6. Distribution law –Study of Association of Benzoic acid in Benzene.

7. Adsorption –Oxalic acid /Acetic acid on charcoal using Freundlich Isotherm.

8. Conductometry –Determination of dissociation constant of weak acids

9. Acid - alkali titrations

10. Displacement titrations

11. Precipitation titrations

12. Solubility product of sparingly soluble silver salts.

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC34L	Physical Chemistry Lab -II	0	0	5	3

Aims: The physical laboratory class consists of a series of experiments designed to be completed in either one or two sessions. The laboratory is designed to illustrate and reinforce concepts covered in the lecture based part of the course. The students will be introduced to a number of spectroscopic and analytical techniques.

Objectives: To perform eight experiments covering analytical chemistry, catalysis, diffraction, IR spectroscopy, kinetics and thermodynamics

1. Determination of molecular weight of substances by cryoscopy
2. Determination of molecular weight of substances by Transition Temperature method
3. Determination of molecular weight of substances by Rast method
4. Determination of Critical Solution Temperature (CST) of phenol – water system and effect of impurity on CST
5. Study of phase diagram of two components forming simple eutectic
6. Study of phase diagram of two components forming a compound.
7. Study of phase Diagram of three components (Acetic acid, Benzene and water)
8. Potentiometric titration's –Acid alkali titration
9. Precipitation titration's

10. Redox titration's
11. Determination of dissociation constant of weak acids.
12. Determination of solubility of silver salts
13. Determination of activity and activity co-efficient of ions

References:

1. Finlays "Practical physical chemistry "Revised and edited by B.pLevitt 9th ed,London 1985
2. J.N.Gurtur and R.Kapoor,'Advaced Experimental Chemistry" Vol.1.chand &co Ltd., New Delhi

COURSE CODE	COURSE TITLE	L	T	P	C
20214DSC35A	Discipline Specific Elective - III Medicinal Chemistry	5	0	0	4

Aim:

- The aim of this course is to provide a core for future studies and aspects of MedicinalChemistry.

Objective:

- To learn the importance of Medicinal Chemistry.

Outcomes:

- Having successfully completed this module you will be able to:
- Learning various concepts of Drugs.
- Learning various concepts in medicinal Chemistry.

UNIT- I

General Introduction

Introduction to medicinal chemistry, general mechanism of drug action on lipids, carbohydrates, proteins and nuleic acids, drug metabolism and inactivation, receptor structure and sites, drug discovery development, design and delivery systems, gene therapy and drug resistance.

UNIT - II

Drugs

Drugs based on structure or pharmacological basis with examples, synthesis of important drugs such as α - methyl dopa, chloramphenicol griseofulvin, cephelosphorins and nystatin. Molecular modeling, conformational analysis, qualitative and quantitative structure activity relationships.

UNIT - III

Antibiotics

Mechanism of action of lactam antibiotics and non lactam anti biotics, antiviral agents, chemistry, stereochemistry, biosynthesis and degradation of penicillins - An account of semisynthetic penicillins - acid resistant, penicillinase resistant and broad spectrum semisynthetic penicillins.

UNIT- IV

DNA Interactions

DNA-protein interaction and DNA-drug interaction. Introduction to rational approach to drug design, physical and chemical factors associated with biological activities, mechanism of drug action.

UNIT V

Enzyme Reactions: Nomenclature and classification of enzymes, Fischer's lock and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors. Enzyme kinetics, Michaleis-Menten and Lineweaver-Burk plots.

References:

1. G. L. PATRICK, INTRODUCTION TO MEDICINAL CHEMISTRY, OXFORD UNIVERISTY PRESS, 2001.
2. I. WILSON, GISWALD AND F. DOERGE, TEXT BOOK OF ORGANIC MEDICINAL AND PHARMACEUTICAL CHEMISTRY, J.B. LIPPINCOTT COMPANY, PHILADELPHIA, 1971.
3. A. BURGER, MEDICINAL CHEMISTRY, WILEY INTERSCIENCE, NEW YORK, VOL. I AND II, 1970.
4. BENTLEY AND DRIVER'S TEXT BOOK OF PHARMACEUTICAL CHEMISTRY REVISED BY L.M. ARTHERDEN, OXFORD UNIVERSITY PRESS, LONDON, 1977.
5. A. GRINGAUZ, INTRODUCTION TO MEDICINAL CHEMISTRY, HOW DRUGS ACT AND WHY?, JOHN WILEY AND SONS, 1997.

COURSE CODE	COURSE TITLE	L	T	P	C
20214DSC35B	Discipline Specific Elective - III Green Organic Synthesis: Principles and Applications	5	0	0	4

Aim:

- To develop the study about green organic synthesis and its principles.

Objective:

- To explain the awareness about soil and water pollution in environment.

Outcome:

- Develop the advanced techniques to reduce chemical waste pollution.

UNIT- I

Green Chemistry: Definition, need for Green chemistry, evolution of Green Chemistry, principles of Green Chemistry.

UNIT - II

Classification of organic reactions under Green chemistry principles: a) Atom economic and non-toxic byproduct reactions: rearrangements, addition reaction, condensations, cascade strategies under catalysis, b) atom uneconomic reactions: substitutions, eliminations, Wittig reactions, degradation reactions.

UNIT - III

Green Strategies and techniques for Organic Synthesis: use of Microwave, Sonochemsitry, Ball mill technique, electrochemical reactions, photochemical reactions.

UNIT- IV

Catalysis: Principles of various catalysis techniques in terms of Green Organic Synthesis i) Homogeneous, ii) Heterogeneous, iii) bio (enzyme) catalysis, iv) catalysis with nontoxic metals (Ca, Fe, Co, etc.), v) solid supported catalysis, vi) metal free/organocatalysis, vii) Visible light catalysis viii) phase transfer catalysis Alternative/Green Solvents for Organic Synthesis i) Water, ii) Ionic liquids, iii) Supercritical liquids (SCL), iv) Poly(ethylene glycol) (PEG), v) Fluorous biphasic Solvents.

UNIT- V

Comparison of greenness of solvents· Understanding the role/effect of these solvents on organic reactions. Solvent Free Organic Synthesis. Reactions at Room Temperature, Applications of the Green strategies in Organic Synthesis. Comparing organic reactions under classical conditions and Green conditions.

REFERENCES:

1. Green Chemistry: An introductory text by Mike Lancaster, RSC publishing, 2nd Edition, 2010.
2. Green Chemistry: Theory and Practice by Paul T. Anastas and John C. Warner, Oxford University Press, Oxford, 1998.
3. Green Chemistry: Environment Friendly Alternatives by Rashmi Sanghi and M M Srivastava, Narosa Publishing House, Delhi, 2003.

Course Code	Course Title	L	T	P	C
20111OEC	Open Elective - Journalism	4	0	0	2

Aim :

- To acquaint with the basic knowledge of journalism so that it may enthuse the students to become journalists.

Objective:

- To instill in the minds of students the different aspects of journalism
- To understand the different kinds of news
- To learn the qualities and duties of a reporter, editor and sub editor
- To familiarize with the style and features of the different sections in a newspaper

Outcome:

- Become a journalist

UNIT- I

Journalism – Definition, Qualities of a journalist, Forms of journalism, Role and elements, Ethics of Journalism, Press

UNIT- II

News – Definition, Kinds, Elements, Sources

UNIT- III
Reporters, Qualities, types

UNIT- IV
The Editor and the Sub Editor-qualities, types, editorial department,

UNIT –V
Language of Journalism, Style
Qualities of a Writer
Writing a News story, Opinion Pieces, Reviews, Headlines, Editorials, articles, middle, features, column

References:-

Journalism -Susan
Professional Journalism - John Hogenberg
News Writing and Reporting - M.James Neal (Surjeet Publication)
Professional Journalism -M.V Komath
The Journalist's Handbook -M.V Komath
Mass Communication & Journalism - D.S Mehta

Course code	Course Title	L	T	P	C
20112OEC	Open Elective: Development of Mathematics Skills	4	0	0	2

Aim:

- To understand the concepts from the five branches of mathematics

Objectives

- Knowledge and understanding are fundamental to study mathematics and form the base from which to explore concepts and develop problem-solving skills. Through knowledge and understanding students develop mathematical reasoning to make deductions and solve problems.
- To develop student's ability to apply both conventional and creative techniques to the solution of mathematical problems

Outcomes

- Know and demonstrate understanding of the concepts from the five branches of mathematics (Operations Research, Set Theory, Statistics, Matrices and Business mathematics)

- Use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
- Select and apply general rules correctly to solve problems including those in real-life contexts.

Unit I
Simple interest and compound interest

Unit II
Sinking fund – discounting – trade discount – quantity discount – cash discount

Unit III
Set theory – Series

Unit IV
Matrices – Determinants

Unit V
Assignment problems

References
P.A.Navanitham, Business Mathematics & Statistics
Kanti Swarup, P.K.Gupta and Manmohan, "Operations Research"

Course Code	Course Title	L	T	P	C
20113GEC	Open Elective- Instrumentation	4	0	0	2

Aim:
- Making and analyzing measurements is the primary task of the experimental physicist. This includes designing experiments. Most experimental work, whether in bench-top situations, or using complex instruments. To many physicists this can be as interesting and involving as the basic physics one is trying to do.

Objectives:
- The use of instruments is of course not confined to physicists and this kind of experience is valuable in many situations which many students will encounter after graduation.
- A good physicist will bring a critical mind aiming to understand not only the result of an investigation but the primary reasons for the behavior of the data. Understand that there are finite limits to our ability to make good measurements, and why.

Outcomes:
- Appreciate important practical aspects of theoretical knowledge: how important components work, when to impedance match, non-ideal behaviour of op-amps etc.
- Acquire a sound understanding of the role of noise in measurement systems and know how to apply noise reduction techniques.

- Be able to apply Fourier and Laplace transforms to analyse the behaviour and stability of complex systems.

UNIT – I: Introduction

Potentiometer - calibration of volt meter and ammeter, measurement of resistance, Principles of network theorems – Thevenin's and Norton's theorem – Bridges : AC bridges – Maxwell, Owen, Schering and De Sauty's bridges – Wien bridges.

UNIT – II: Electronic Instruments – I

Basic characteristics of instruments – resolution – sensitivity - Audio frequency oscillator, Conversion of galvanometer into voltmeter and ammeter – resistance meter - Amplified D.C. meter – Chopper stabilized amplifier – A.C. Voltmeter using
rectifiers – Electronic multimeter – Differential voltmeter – Digital voltmeters –
Component measuring instruments (quantitative studies)

UNIT – III: Electronic Instruments – Ii

Signal conditioning systems – DC and AC carrier systems – Instrumentation
amplifiers – Vibrating capacitor amplifier – Analog to digital data and sampling – A/D and D/A convertor (successive approximation, ladder and dual slope converseons).

Unit IV – Recording Devices

Recorders necessity – Recording requirements – Analog recorders – Graphic recorders – strip chart recorders – Galvanometer types recorders – Null type recorders.

Unit V – CRO

CRO – Construction and action – Beam transit time and frequency limitations –
Measurement of potential, current, resistance, phase and frequency – Special purpose oscilloscopes – Sampling storage oscilloscope.

Books for Study

Electronic Instrumentation and Measurement techniques – W.D. Cooper and A.D. Helfrick – PHI – Third edn. – 1989

Books for Reference:

A Course In Electrical And Electronic Measurements and Instrumentation – A.K.
Sawhmey – Dhanpat Rai and Sons – 1990.
Electronic Measurements And Instrumentation – Oliver Cage – McGraw Hill –1975.

Course Code	Course Title	L	T	P	C
20114OEC	Open Elective-Food and Adulteration	4	0	0	2

Aim:

- To introduce students to food safety and standardization act and quality control of foods.

Objectives:

- To educate about common food adulterants and their detection.
- To impart knowledge in the legislatory aspects of adulteration.
- To educate about standards and composition of foods and role of consumer.

Outcomes:

- The students will have knowledge about different processing and preservation methods and principles involved.

Unit-I Introduction to Food Chemistry

Introduction to Food Chemistry- Water (Structure of water and ice, Physical constants of water, Types of water, Water activity) Composition of Food- Carbohydrates, Proteins, Lipids, Vitamins & Minerals.

Unit- II Food Pigments

Introduction- classification, types of food pigments- chlorophyll, carotenoids, anthocyanins, flavanoids.

Unit – III Food Preservation

Introduction - Importance, principle and Types.

High and low temperatures preservation - Pasteurization - Sterilization- Canning- Freezing- Refrigeration.

Unit – IV Food Additives

introduction- antioxidants, sequestrants, preservatives, nutrient supplement, emulsifiers, stabilizers and thickening agents, bleaching and maturing agent, sweeteners, humectants and anti -caking agents, coloring and flavoring substance.

Unit-V Food Adulteration

Types of adulterants- intentional and incidental adulterants, methods of detection. Detection of common food adulterants in Spices , Grains, Coffee , Tea, Oil fats , Food colours and Milk. Health hazards and risks.

References:

1. The Food Safety and Standard ACT, 2006 – Seth & Capoor
2. Hand book of Food Adulteration and Safety Laws – Sumeet Malik
3. Food Science – B.Srilakshmi

Course Code	Course Title	L	T	P	C
20117OEC	Open Elective-Mushroom Technology	4	0	0	2

Aim:

- Mushrooms represent microbial technology that recycles agricultural residues into food and manure
- Mushroom technological interventions aims to increase productivity, quality, and income of farmers through cultivation of mushrooms.

Objectives:

- To strengthen the promotion of mushroom cultivation by establishing a well-equipped laboratory and offices
- To provide the Unit with appropriately trained personnel for the promotion of mushroom production in the country
- To increase the production and consumption of mushrooms.

Outcomes:

- Light. Mushrooms cannot extract nutrients from the sun as green plants do, so they do not need light.

- Cultivating specialty mushrooms is the most accessible way to growing edible mushrooms for profit. The two most popular specialty mushrooms grown in the United States are shiitake and oyster.

Unit – I

Introduction – history – scope of edible mushroom cultivation – Types of edible mushroom available in India – *Calacybeindica, VolvariellaVolvacea, Pleurotus* sp.*,Agaricusbisporus*

Unit – II

Pure culture – preparation of media (PDA and Oatmeal agar media) sterilization –Preparation of test tube slants to store mother culture – culturing of Pleurotus mycelium on petriplates – Preparation of mother spawn in saline bottle and polypropylene bags and their multiplication.

Unit – III

Cultivation Technology : Infra structure, Substrates (locally available) polythene bag, vessels, Inoculation hood – inoculation loop – low cost stove – sieves – Culturel rack mushroom unit (Thatched house) – Mushroom bed preparation – Paddy straw, sugarcane trash, maize straw, banana leaves.

Unit – IV

Storage and nutrition : Short term storage – Long term storage (scanning, Pickles, papads, drying, storage in salt solutions) – Nutrition : Proteins, amino acids, mineral elements.Nutrition : Carbohydrates – Crude fiber content, vitamins.

Unit – V

Food preparation, Types of foods prepared from mushroom - soup, cutlet, omelette, samosa, pickles, curry. Research Centres – National level and Regional Level Cost benefit ratio – Marketing in India and abroad – Export value

Reference:

1. Marimuthu et al., (1991) Oyster Mushrooms, Dept. of Plant pathology, TNAU, Coimbatore.
2. Nita Bahl (1988) Hand book of Mushrooms, II edition, Vol.I& II.
3. Paul Stamets, J.S. and Chilton, J.S. (2004). Mushroom Cultivator: A practical guide to growing mushrooms at home, Agarikon Press.
4. Shu-Ting Chang, Philip G. Miles, Chang, S.T. (2004). Mushrooms: Cultivation, nutritional value, medicinal effect and environmental impact, 2nd ed, CRC press.
5. Swaminathan M. (1990) Food and Nutrition, Bappco. The Bangalore Printing and Publishing Co. Ltd., Bangalore.

Course Code	Course Title	L	T	P	C
20120OEC	Open Elective -Web Technology	4	0	0	2

Aim:

- To equip the students with basic programming skill in Web Designing

Objective:

- To understand and practice mark up languages
- To learn Style Sheet and Frames

Outcomes:

- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages

UNIT I

Introduction to the Internet – Internet Technologies – Internet browsers.

UNIT II

Introduction to HTML – Head and body sections – Designing the body section.

UNIT III

Ordered and unordered lists – Table handling.

UNIT IV
DHTML and Style Sheet – Frames.

UNIT V
A web page design project – Forms.

Text Book
World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.

Reference Book
Principles of web design – Joel Sklar – Vikas publishing house 2001.

Course Code	Course Title	L	T	P	C
20122OEC	Open Elective- E-Commerce and its Application	4	0	0	2

Aim:
- To organize and promote the exchange of information on communication protocols and information exchange mechanisms for Electronic Commerce.

Objectives:
- To be aware of all aspects of communication and information exchange in Electronic Commerce, including:
- Navigation, brokerage, advertising and catalogue exchange in pre-sales activities.
- Negotiation and contract making protocols in interactions between consumers, businesses, and public administration.
- Secure exchange of documents, content and value in open trading protocols.
- Communication platforms for the e-Economy, including e-commerce, e-business and e-government.

Outcomes:
- Secure exchange of documents, content and value in open trading protocols.
- Communication platforms for the e-Economy, including e-commerce, e-business and e-government

UNIT-I:

History of E-commerce and Indian Business Context: Early Business Information Interchange Effort - Emergence of the Internet-Emergence of the world wide web – The milestones – Advantages of E-Commerce- Disadvantages of E-commerce-Online Extension of a BAM model- Transition to E-commerce in India- The internet and India TELCO-Managing Supply chain on the Internet- Hindustan Lever – Getting the E-advantage – Asian paints – E-transforming the organization - CRISIL – Cost – Effective distribution channels – ICICI Bank – Comprehensive Transactions – E-transition challenges for Indian Corporate – The Information Technology Act,2000 – ITC'S echoupal Business Models for E-Commerce: E-business models based on the Relationship of Transaction parties- E-business model base on the relationship of transaction types.

UNIT-II:

Enabling Technologies of the World Wide Web: Internet client – Server Application – Networks and Internets –Software agents – Internet Service Provider – Broadband Technologies – Hypertext –Java Script – XML.

UNIT- III:

E-Marketing: Traditional Marketing – Identifying web presence Goals –The Browsing Behaviour model – online marketing – E-advertising – Internet Marketing Trends – Target Markets – E-branding – Marketing strategies – The Times of India.

UNIT-IV:

E-Security: Information system security-security on the Internet-E-Business risk Management issues-Information security environment in India.

UNIT-V

E-payment Systems: E-Banking at ICICI bank-Main concerns in internet baking-History's lesson about payments: People drive change-digital payment requirements-digital token-based E-payment systems-classification of new payment system-properties of electronic cash(E-cash)-check payment system on the Internet-risk and E-payment system-Designing E-payment system-digital signature-online financial service in India-online stack trading: The high speed alternative.

Reference Book:

"E-Commerce: An Indian Perspective" P.T.Joseph, S.J. Third Edition.

Course Code	Course Title	L	T	P	C
20161OEC	Open Elective – Indirect Taxes	4	0	0	2

Aim:

- To acquaint with the knowledge of indirect taxes

Objectives:

- To make the students to gain expert knowledge in indirect taxes.
- To have practical knowledge on excise duties and customs duties.
- To learn the fundamentals of service tax, sales tax and VATS.

Outcome

- Students gained knowledge of various provisions of central excise customs law, service tax, VAT and sales tax and their applications in different circumstance**.**

UNIT – I

Objectives of Taxation - contribution to Government revenue- cannons of Taxation – Tax system in India – Direct and Indirect taxes Advantages and
Disadvantages of Indirect taxes.

UNIT – II

Central Excise Duty – Meaning - Levy and collection - Distinction between Excise duty and Customs Duty and Sales Tax. Types of excise duties Methods of Levying Excise Duty – Excise and small scale Industries – Excise and Exports.

UNIT – III

Customs Duty – Levy and collection of customs duty Different types of customs Duties – Prohibition on importation and exportation of goods. Exemptions from customs duty.

UNIT – IV

Service Tax – Growth of Service sector – Meaning of Service Tax – Elements of Service Tax-exempted services from tax - Value of taxable services-Different services on which tax is payable.

UNIT – V

Value Added Tax (VAT)

Meaning of VAT, Justification of VAT – VAT and Sales Tax Advantages and Disadvantages of VAT. Methods of Calculating VAT Levy of VAT and Types of VAT.

Reference Books:

Income Tax Law and Practice - N.Hariharan.

Business Taxation – T.S.Reddy/Hari Prasad Reddy.

SEMESTER - IV

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC41	Physical Chemistry - III	6	1	0	6

Aim:

- The aim of this course is to provide a core for future studies in chemistry and aspects of Physical Chemistry.

Objective:

- To learn the importance of Physical Chemistry.

Outcomes:

- Having successfully completed this module you will be able to:
- Learning various concepts of Electro Chemistry.
- Learning various concepts of QuantumChemistry.
- Learning various concepts of Thermodynamics

UNIT –I

Electrochemistry:

Electrochemical cell reactions, Nernst equation, electrode kinetics, electrical double layer, electrode /electrolyte interface, batteries-primary & secondary fuel cells, corrosion and corrosion prevention.

UNIT –II

Non-Equilibrium Thermodynamics:

Postulates and methodologies, linear laws, Gibbs equation, Onsagar reciprocal theory. **Ideal and Non-Ideal Solutions:**

Excess functions, activities, concept of hydration number, activities in electrolytic solutions, mean ionic activity coefficient, Debye-Huckel treatment of dilute electrolyte solutions.

UNIT –III

Quantum Chemistry:

Planck's quantum theory, wave-particle duality, uncertainity principle, operators and commutation relations, postulates of quantum mechanics, free particle, particle in a box, degeneracy harmonic oscillator, rigid rotator and the hydrogen atom. Angular momentum, including spin coupling of angular momenta including spin-orbit coupling.

UNIT –IV

Born-Oppenheimer Approximation:

Hydrogen molecule ion, LCAO-MO and VB treatments of the hydrogen molecule, electron density, forces, and their role in chemical binding. Hybridization and valence MOs of H_2O, NH_3 and CH_4. Huckel pi-electron theory and its applications to ethylene, butadiene and benzene, idea of self-consistent fields.

UNIT –V

Statistical Thermodynamics:

Thermodynamic probability, and entropy , Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics, partition function, rotational, translational, vibrational and electronic partition functions for diatomic molecules, calculations of thermodynamic functions and equilibrium constants. Theories of specific heat for solids.

REFERENCES:

1. K.Veera Reddy, Symmentry and Spectroscopy of Molecules, New Age International(P) Ltd., Publishers, New Delhi.
2. A.K.Chandra, Introductory Quantum Chemistry, 4th Edn., Tata Mc-Graw Hill(1994)
3. R.K.Prasad, Quantum Chemistry, 2nd Edn., New Age International Publishers(2000)
4. I.N.Levine , Quantum Chemistry, 4th Edn., Prentice Hall of India(1994)
5. D.A.McQuarrie, Quantum Chemistry, University Science Books (1998).
6. P.W.Atkins, Molecular Quantum Mechanics, Clarendon(1973)
7. S.Glasstone, Introduction to Theoretical Chemistry, Affiliated East-West press
8. C.N.Banwell, Fundamentals of Molecular Spectroscopy, Tata McGraw Hill(1993)
9. G.M.Barrow , Introduction to Molecular Spectroscopy, International Mc-Graw Hill student edition(1984)
10. B.P Straughan and S.Walker, Spectroscopy, Champon Hall, London
11. F.W.Sears, Thermodynamics, Kinetic Theory of Gases and Statistical Mechanics, 2nd Edn., Addision Wesley(1972)
12. S.Glasstone, Thoeritical Chemistry, Affiliated East-West press
13. Lee,Sears and Turcotte, Statistical Thermodynamics Addition Wesley(1974)
14. S.Glasstone, Text Book Of Physical chemistry ,Macmillan(1969)
15. G.C.Bond, Hetrogeneous Catalysis-Principles and applications Clarendon(1974)
16. J.C.Kuriacose and Rajaram, Kinetics and Mechamism of Chemical Transformation, Mac-Millan & Co.,(1993)

COURSE CODE	COURSE TITLE	L	T	P	C
20214SEC42	Industrial Chemistry	6	1	0	5

UNIT - I Industrial Corrosion

Introduction - Economic aspects of corrosion - Dry or Chemical Corrosion - Wet or electrochemical corrosion - Mechanism of Electrochemical Corrosion.
Galvanic Corrosion - Concentration Cell Corrosion - Differential aeration corrosion - Pitting Corrosion - Underground or soil corrosion.- Passivity.

UNIT - II Glass and Matches

Glass- Composition, Types, Formation operations – Melting, Blowing, Pressing, Annealing and finishing; Matches – Composition ,Types, Manufacture – safety matches.

Unit - III Pigments, Dyes and Paints

Pigments – Classification, Manufacture and uses; Dyes –Classification, preparation, Dyeing processes; Paints – Composition,Types, Manufacture and testing of Paints.

Unit - IV Plastics and Fibres

Fibres – Natural and synthetic fibres, Artificial silk, rayon, nylon and trylene; Plastics – composition, Classification, manufacture, properties and uses.

Unit -V Fertilizers and Fuels

Fertilizers – Organic and Inorganic fertilizers, Preparation and uses. Fuels – Energy resources - Industrial gases, Water gas, Producer gas, Oil gas, natural gas, coal gas, Gobar gas, Indane gas, Petroleum products and coal products.

TEXTBOOKS:

Author name	Title of the Book	Edition/year	Publication
Sharma B.K Units – 1,2,3,4,5	Industrial Chemistry	16th/2011	Goel Publishing House

REFERENCES:

1.Kirk Othmer, Encyclopedia of Chemical Technology. ALL THEFIVE UNITS
2.Charkarabarthy B.N, Industrial Chemistry, Oxford and IBHPrb.Co. IV AND V

COURSE CODE	COURSE TITLE	L	T	P	C
20214DSC43A	Nano Chemistry	5	0	0	4

UNIT 1

Introduction, nanostructures: tubes, fibers, wires, bricks and building blocks, nanostructure formation: lithography, self-assembly, molecular synthesis, crystal growth and polymerization, measurement of nanostructure: spectroscopy, microscopy and electrochemistry, nanoCAD, Material study: nanocomposites, consumer goods, 'smart materials,' Applications to various fields: optics, telecommunication, electronics, digital technology and environment, Biomedical applications: diagnosation, mapping of genes, drug delivery and biomimetics

UNIT II

Novel physical chemistry related to nanoparticles such as colloids and clusters: different equilibrium structures, quantum effects, conductivity and enhanced catalytic activity compared to the same materials in the macroscopic state. Exploitation of self-assembly and self-organization to design functional structures in 1D, 2D or 3D structures. Examples to emphasize on self-assembled monolayers. Role of polymers in lithography resists, as well as self-organization of more complicated polymer architectures such as block copolymers and polymer brushes.

UNIT III

Nanomaterials (Nanoparticles, nanoclusters, quantum dots synthesis): Preparation and Characterization: "Top-Down" and "Bottom-Up" approaches of nanomaterial (nanoparticles, nanoclusters and quantum dots)

UNIT IV

Synthesis: Top-down techniques: photolithography, other optical lithography (EUV, X-Ray, LIL), particle-beam lithographies (e-beam, FIB, shadow mask evaporation), probe lithographies, Bottom-up techniques: self-assembly, self-assembled monolayers, directed assembly, layer-by-layer assembly. Pattern replication techniques: soft lithography, nanoimprint lithography.

UNIT V

Pattern transfer and enhancement techniques: dry etching, wet etching, pattern growth techniques (polymerization, directed assembly). Combination of Top-Down and Bottom-up techniques: current state-of-the-art. Synthesis and purification of carbon nanotubes, Single-walled carbon nanotubes and multiwalled carbon nanotubes, Structure-property relationships, Physical properties and Applications

REFERENCES

1. G.A.Ozin, A.C. Arsenault Nano chemistry, RSC
2. Diwan, Bharadwaj, Nanocomposites, Pentagon
3. Scanning Probe Microscopy: Analytical Methods (NanoScience andTechnology)- Roland Wiesendanger

COURSE CODE	COURSE TITLE	L	T	P	C
20214DSC43B	Material chemistry	5	0	0	4

Unit-1:
Introduction and structure of materials, why study properties of materials? Structure of atoms - Quantum states-Atomic bonding in solids-binding energy-inter atomic spacing - variation in bonding characteristics - Single crystals– polycrystalline - Non crystalline solids - Imperfection in solids – Vacancies –Interstitials - Geometry of dislocation - Schmid´s law - Surface imperfection -Importance of defects - Microscopic techniques - grain size distribution.

Unit-2: Solid solutions and alloys - Phase diagrams - Gibbs phase rule – Single component systems – Eutectic phase diagram – lever rule - Study of properties of phase diagrams - Phase transformation - Nucleation kinetics and growth.

Unit-3:
Batteries and Super capacitors for electrochemical energy storage: Batteries – primary and secondary batteries, Lithium, Solid-state and molten solvent batteries; Lead acid batteries; Nickel Cadmium

Batteries; Advanced Batteries, Super capacitors for energy storage. Role of carbon nanomaterials as electrodes in batteries and super capacitors.

Unit-4:
Materials for energy storage: Synthesis of nanomaterials, top-down and bottom-up approaches, mechanical milling, solgel method, chemical vapour deposition (CVD), Carbon Nano-Tubes (CNT), Carbon Nano-Fibres (CNF),graphene, preparation of graphene. Fabrication of CNTs and CNFs, CNTs and CNFs for hydrogen stora

Unit-5:
Fuel Cells and its applications: Fuel Cells, components of fuel cells, Types of fuel cells, Acid/alkaline fuel cells, polymer electrolyte fuel cell, phosphoric acid fuel cell, molten carbonate fuel cell, solid oxide fuel cell.

Text Book:
1. . W. D. Callister, "Materials Science and Engineering: An Introduction", John Wiley & Sons, 2007

REFERENCES
2. K. Vijayamohanan Pillai and Meera Parthasarathi Functional Materials: A Chemist's Perspective by, Orient Blackswan (21 November 2013)
3. C. Kittel, "Introduction to Solid State Physics" Wiley Eastern Ltd, 2005.
4. V. Raghavan, "Materials Science and Engineering: A First Course", Prentice Hall, 2006
5. Dieter, G. E., "Mechanical Metallurgy", 3rd Ed., 1988,McGraw Hill,.
6. Reed-Hill, R.E. and Abbaschian, R., "Physical Metallurgy Principles",1992, The PWS-KENTSeries in Engg.
7. Hutchings, I.M. "Tribology - Friction and Wear of Engineering Materials", 1992, Edward Arnold Publications Ltd.
8. Linden D. and Reddy Thomas B., "Handbook of Batteries", 2001, McGraw Hill Publications
9. Larminie and A. Dicks, Fuel Cell Systems Explained, 2nd Edition, Wiley (2003)
10.Xianguo Li, Principles of Fuel Cells, Taylor and Francis (2005)

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, changeability, contestability: these are some of the terms that mark out the world of the twenty-first

century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research – Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research – Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research – Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

Level 1: Prescribed Research

Level 2: Bounded Research

Level 3: Scaffolded Research

Level 4: Self actuated Research

Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the MSc-Chemistry curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSB Courses	Credits
I	Research Led Seminar	1
II	Research Methodology	3
II	Participation in Bounded Research	2

III	Design Project/ Socio Technical Project (Scaffolded Research)	4
IV	Project Work	12

Blueprint for assessment of student's performance in Research Led Seminar Course

- **Internal Assessment: 40 Marks**
- Seminar Report (UG)/Concept Note(PG) : 5 X 4= 20 Marks
- Seminar Review Presentation : 10 Marks
- Literature Survey : 10 Marks
- **Semester Examination : 60 Marks**

  (Essay type Questions set by the concerned resource persons)

Blueprint for assessment of student's performance in Socio Technical Project

- **Continuous Internal Assessment through Reviews: 40 Marks**

- Review I : 10 Marks
- Review II : 10 Marks
- Review III : 20 Marks
- **Evaluation of Socio Technical Practice Final Report: 40 Marks**
- **Viva- Voce Examination: 20 Marks**
- **Total: 100 Marks**

Blueprint for assessment of student's performance in Research Methodology Courses

Continuous Internal Assessment: 20 Marks

- Research Tools(Lab) : 10 Marks
- Tutorial: 10 Marks

Model Paper Writing: 40 Marks

- Abstract: 5 Marks
- Introduction: 10 Marks
- Discussion: 10 Marks
- Review of Literature: 5 Marks
- Presentation: 10 Marks

Semester Examination: 40 Marks

Total: 100 Marks

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Course Code	Course Title	L	T	P	C
20214PEE	Programme Exit Examination	-	-	-	2

UNIT - I

General Reasoning: Analytical Reasoning, Syllogisms, Analogies, Directions, Coding-Decoding, Classification Alphabet Series, Symbols and Notations, Similarities and Differences, Number Series, Blood Relationships Arrangements, Statements, Data Sufficiency, Non-verbal Reasoning, Visual Ability, Graphical Analysis Data Analysis

General Aptitude: Simplifications, Number System, Average, Algebra, PercentageTime & Work Simple & Compound Interest, Time & Speed, HCF, LCM Problems, Area, Profit & Loss, Bar Graph, Pictorial Graph, Pie Chart Ratio & Proportion, Permutation & Combination

UNIT - II Inorganic Chemistry

General Chemistry: periodic trends, electronic structure, acid-base theory and reactions, balancing equations, stoichiometry, oxidation states and nuclear chemistry.

Structure and bonding: Lewis diagrams, molecular geometries and VSEPR concept, valence bond description and hybridization, bond energies, van der Waals radii of the elements, molecular orbitals and intermolecular forces

Metallic and ionic substances: lattice structure, lattice energies, theory of metallic bonding, conductors, semiconductors, superconductors and liquid crystals.

Chemistry of the main group elements: physical and chemical properties of the elements and their compounds, and occurrences and recovery.

Chemistry of the transition elements: electronic structures, physical and chemical properties of the elements and their compounds, occurrences and recovery, coordination chemistry, including ligands, stereochemistry, nomenclature, bonding, spectroscopy, thermodynamic and kinetic aspects.

Special topics: bioinorganic chemistry, catalysis, environmental chemistry, organometallic chemistry, including effective atomic number rule, bonding and reactions

Unit - III Organic Chemistry

Molecular structure: bonding, Lewis structures, orbital hybridization, resonance, aromaticity, stereochemistry, conformational analysis, acid base properties, IUPAC nomenclature, IR, NMR, UV/visible spectroscopy and mass spectrometry.

Functional groups: preparation and reactions of alkanes, alkenes, alkynes, dienes, alkyl halides, alcohols, thiols, ethers, sulfides, epoxides, aromatic compounds, aldehydes, ketones, amines, carboxylic acids and their derivatives.

Reaction mechanisms: electrophilic substitutions and eliminations, nucleophilic substitutions and additions, nucleophilic addition-eliminations, cycloadditions, and radical reactions, catalysis, reaction coordinate diagrams, thermodynamic and kinetic control, stereochemistry of reactions, relative reactivities, relative stabilities and reactive intermediates (carbocations, carbanions, radicals, carbenes, enols, enolates, etc.)

Biochemistry: carbohydrates, amino acids, peptides, proteins, lipids, alkaloids, pharmaceuticals, nucleotides and nucleic acids, glycoproteins, polysaccharides, terpenes and steroids

Special topics: catalysis, organometallic chemistry, polymers and rearrangements

Unit - IV Physical Chemistry

Thermodynamics: first, second and third laws; equilibrium constants; spontaneity; LeChatelier's principle; thermochemistry; mixing; phase equilibria; colligative properties; electrochemistry and statistical thermodynamics

Kinetics: kinetic theory of gases, ideal and real gas equations and properties, rate laws, rate constants, half-life, reaction mechanisms, enzyme kinetics, activated complex theory, collision theory, photochemistry and solution dynamics.

Quantum chemistry and applications: classical experiments, principles of quantum mechanics, atomic and molecular structure, molecular spectroscopy

Unit -V Analytical Chemistry

Experimental design and data acquisition: accuracy and precision, random and systematic error, standard deviation, confidence limits, calibration, detection limits, sensitivity and significant figures

Homogeneous equilibria: acid-base equilibria and titrations, redox reactions and titrations, electrochemical cells and complexometric titrations

Heterogeneous equilibria: gravimetric analysis, solubility and chemical separations

Solutions: concentration terms, ionic strength and activity, standardizations and primary standards

Instrumental methods: Beer's law, spectroscopic methods, chromatographic methods, radiochemical methods, electrolysis, potentiometry and lasers

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Institution Deemed to be University

Under Section 3 of UGC Act 1956

THANJAVUR – 613 403, TAMIL NADU, INDIA

M. Phil. REGULATIONS – 2020

(with effect from academic year 2020-21)

M.PHIL REGULATION 2020

(WITH EFFECT FROM THE ACADEMIC YEAR 2020-21)

1. ELIGIBILITY

Full – Time Scholars:

1.1 Candidates for admission to the M. Phil. programme shall have a Master's degree or a professional degree declared equivalent to the Master's degree by the corresponding statutory regulatory body, with at least 55% marks in aggregate or its equivalent grade 'B' in the UGC 7-point scale (or an equivalent grade in a point scale wherever grading system is followed) or an equivalent degree from a foreign educational Institution accredited by an Assessment and Accreditation Agency which is approved, recognized or authorized by an authority, established or incorporated under a law in its home country or any other statutory authority in that country for the purpose of assessing, accrediting or assuring quality and standards of educational institutions.

1.2 A relaxation of 5% of marks, from 55% to 50%, or an equivalent relaxation of grade, may be allowed for those belonging to SC/ST/ OBC(non-creamy layer) / Differently-abled and other categories of candidates as per the decision of the Commission from time to time, or for those who had obtained their Master's degree prior to 19th September, 1991. The eligibility marks of 55% (or an equivalent grade in a point scale wherever grading system is followed) and the relaxation of 5% to the categories mentioned above are permissible based only on the qualifying marks without including the grace mark procedures.

Part-time Scholars:

1.3 Full-time teachers of University Departments / University Campuses / University Colleges, Govt. / Govt. Aided / Self financing Colleges, Govt. / Govt. Aided / Recognized Private Schools and Govt. / Govt. Aided Polytechnics, provided they fulfill the eligibility norms as prescribed in the case of full time scholars.

2. ADMISSION PROCESS

2.1 General Process

Candidates fulfilling the eligibility criteria specified in section 1 may obtain the prescribed application form from the Director (Admissions) of PRIST on payment of prescribed application fee and submit the duly filled-in application form along with

necessary enclosures listed in the application form to the Director (CRD). The Director (CRD) shall follow the selection process given in section 2.2. for the provisional admission of the candidates.

2.2 **Procedure for Admission**

2.2.1 The Institution shall issue the notification through its website or advertise in the news papers for calling applications towards M.Phil. admissions.

2.2.2 The number of available seats in the various specializations under different disciplines shall be determined well in advance and shall be notified in the Institution's website.

2.2.3 Admissions shall be made through an Entrance Test followed by an interview.

The Entrance Test shall be with qualifying marks as 50%, provided that a relaxation of 5% marks shall be allowed for the candidates belonging to SC / ST / OBC(Non-creamy layer) / Differently-abled candidates.

The syllabus of the Entrance test shall consist of 50% of Research Methodology and 50% shall be subject specific.

Question Paper model**:**

Written Examinations Format (PG Syllabus):

Maximum Marks: 40; (50x0.8=40); Objective type (MCQ); Time: 1.30 hours

The candidate who has cleared Entrance Test shall approach the institute where the research supervisor in the specializations are available in the Department and depending upon vacancy position under each research supervisor he/she shall be enrolled for M. Phil. programme.

2.2.4 The admission of students to M. Phil. programmes shall be taken care by the Institution Research Admission Committee which is formed with the following members:

1) Director - CRD
2) Deans of Faculty
3) Heads of the Departments

2.2.5 While granting admission to students to M. Phil. Programmes, the PRIST shall pay due attention to the state reservation policy.

3. DURATION:

The duration of the M. Phil. programme shall be one year consisting of **two semesters / 12 months** for the **Full-time programme**, and **18 months** for the **Part – time programme**.

However, the maximum duration of the full-time M. Phil. programme shall be **24 months** and the maximum duration of the part-time M. Phil. programme shall be **30 months**.

For the full-time candidates **Course – I, Course – II , Course III and Course – IV** will be covered in the first semester and **Course – V (Dissertation)** will be covered in the second semester.

For the **Part-Time candidates Course – I, Course – II, Course III and Course – IV** will be covered in the first year course and **Course – I (Dissertation)** will be covered in the next 6 months (i.e, between 13-18 months of the course duration).

The full-time and part-time programmes shall commence **from September.** For the **Full-time candidates** the semester examinations for Part 1 – Courses (**Course - I, Course – II, Course III and Course – IV)** shall be conducted in **March** and for the **Part time candidates** the semester examinations for Part 1 – Courses (**Course - I, Course – II , Course IIII and Course – IV)** shall be conducted in **September.**

4. ALLOCATION OF RESEARCH SUPERVISORS

4.1 Any regular Professor of the institution with atleast five research publications in refereed journals and any regular Associate/Assistant Professor of the Institution with Ph.D./M.Phil. Degree and atleast Two research publications in refereed journals any be recognized as Research Supervisor.

Provided that in areas/disciplines where there is no or only a limited number of refereed journals, the Condition may be relaxed for recognition of a person as Research Supervisor with reasons recorded in writing.

4.2 Co-supervisor can be allowed in inter-disciplinary area from other departments of the institution with the approval of the Research Advisory Committee

4.3 The Allocation of Research Supervisor for a selected Research Scholar shall be decided by the department concerned depending on the number of Scholars per Research Supervisor, the available specialization among the Supervisors and Research Interests of the Scholars as indicated by them at the time of Interview/ Viva-voce

4.4 In case of topics which are of inter-disciplinary nature where the department concerned feels that the expertise in the department has to be supplement from outside, the department may appoint a Research Supervisor from the department itself, who shall be known as the Research and Co-supervisor form outside the department/faculty/institution on such terms and conditions as may be specified and agreed upon by the consenting institutions

4.5 A Research Supervisor/Co-supervisor who is the Professor, at any given point of time, can guide upto a maximum of three M.Phil. Scholars, an Associate Professor as Research Supervisor can guide upto a maximum of two M.Phil. scholars and an Assistant Professor as Research Supervisor can guide upto a maximum of M.Phil. scholars.

5. RESEARCH ADVISORY COMMITTEE AND ITS FUNCTIONS

5.1 There shall be a Research Advisory Committee for each M.Phil scholar. The Research Supervisor of the scholar shall be the convener of this committee. The other members of the committee shall be one Professor and one Associate Professor of the Department having specialization in the field of research of the M.Phil. scholars.

5.2 The Research Advisory Committee shall have the following responsibilities:

5.2.1 To review the research proposal submitted by the M.Phil. scholars and finalize the topic of research

5.2.2 To guide the M.Phil. scholars to develop the study design and methodology of research and identify the course that he/she may have to do

5.2.3 To periodically review and assist in the progress of the research work of the M.Phil. scholars

5.3 In case the progress of the M.Phil. scholar is unsatisfactory; the Research Advisory Committee shall record the reasons for the same and suggest the corrective measures. If the M.Phil. scholars fails to implement these corrective measures, the Research Advisory Committee may recommend to the institution with specific reasons for cancellation of the registration of the M.Phil. scholar

6. PROGRAMME OF STUDY

Part – I

Course I - Core Course -Research Methodology

Course II	-	Core Course -Research and Publication Ethics
Course III	-	Advanced Core Course
Course IV	-	Elective Course identified by the Research Advisory Committee

The syllabi for all the 4 courses shall consist of five units. The syllabi for Course – I, Course-II and Course – III shall be drafted by the respective department and the syllabus for Course IV may be drafted by the respective Research Advisory Committee

Part – II

Course IV - DISSERTATION

7. SCHEME OF EXAMINATION:

PART – I	**Credit**
Course I (Core Course -Research Methodology)	4
Course II (Core Course -Research and Publication Ethics)	2
Course III (Advanced Core Course)	4
Course IV (Course identified by the Research Advisory Committee)	4

PART – II

Course – IV (Dissertation)	10

7.1 Written Examination for Courses under Part – I

The semester examination for Part 1- Courses (Course – I, Course - II, Course – III and Course-IV) shall be taken by the full - time scholars at the end of the first semester (i.e. in March).

The semester examination for Part 1 Courses (Course – I, Course - II, Course – III and Course-IV) shall be taken by the part-time scholars at the end of first year (i.e. in September).

Full-time M. Phil. Candidates, who have not appeared for any of the Part-I theory courses in the semester examinations within 18 months from the date of their M. Phil. registration, shall not be permitted to continue with their program of study and their registrations shall be terminated. However, in the case of extenuating circumstanced, such candidates may apply for re registration and the period of re registration shall be one year and the candidates are bound to complete the programme successfully within the re registration period of one year.

Part-time M. Phil. Candidates, who have not appeared for any of the Part-I theory courses in the semester examinations within 24 months from the date of their M. Phil. registration, shall not be permitted to continue with their program of study and their registrations shall be terminated. However, in the case of extenuating circumstanced, such candidates may apply for re registration and the period of re registration shall be one year and the candidates are bound to complete the programme successfully within the re registration period of one year.

Each course shall have 60 marks for the written Semester Examination and 40 marks for Continuous Internal Assessment. The duration for each written examination shall be 3 hours. A candidate shall be declared to have passed a course in Part 1 if he/she secures not less than 20 marks out of 40 marks in CIA, 30 marks out of 60 marks in semester examination and 55 marks out of 100 marks in aggregate (i.e., CIA Score + Semester Exam Score).

7.2 **Academic Warning and Academic Probation**

M. Phil Full-Time Program

Full-Time M. Phil candidates who have failed **to successfully complete all courses in Part I within 12 months** from the date of M. Phil registration shall be issued **Academic Warning**.

The M. Phil Registration of Full-Time M. Phil candidates who have failed **to successfully complete all courses in Part I within 18 months** shall be terminated automatically. However, in the case of extenuating circumstances, the scholar may be permitted to apply for re-registration in order to successfully complete the M. Phil. programme within 1 year from the date of re-registration.

M. Phil Part-Time Program

Part-Time M. Phil candidates who have failed **to successfully complete all courses in Part I within 18 months** from the date of M. Phil registration shall be issued **Academic Warning**.

The M. Phil Registration of Part-Time M. Phil candidates who have failed **to successfully complete all courses in Part I within 24 months** shall be terminated automatically. However, in the case of extenuating circumstances, the scholar may be permitted to apply for re-registration in order to successfully complete the M. Phil. programme within 1 year from the date of re-registration.

7.3 **Part-II : Dissertation**

Candidates who have successfully completed the Courses I, II III & IV under Part I in the Semester Examinations (with a minimum of 55 marks in aggregate) are only eligible to continue with the programme and to submit their dissertation for evaluation.

Only candidates who have published research papers in International/National level Journal on some topic related to their title of dissertation work are eligible to submit their dissertation for evaluation. Such eligible candidates have to necessarily submit a reprint of their research publication or a copy of their research paper along with the copy of acceptance communication in respect of publication of their papers in journals at the time of submission of their dissertation for evaluation. Dissertation of M. Phil. scholars who failed to meet this mandatory requirement of paper publication in journals shall not be accepted for evaluation.

Candidates shall submit the dissertation to the Controller of Examinations through the Supervisor and Head of the Department not **earlier than 5 months but within 6 months** from the month in which the candidate has successfully all the courses under Part I. If a candidate is not able to submit his/her dissertation within the period stated above, he/she shall be given an extension time of 6 months in the first instance and another 6 months in the second instance on remittance of Rs.2000/- as fee for each extension. In the case when a candidate is not able to submit his/her dissertation even after the two extensions, he/she has to necessarily renew his/her registration for the programme on payment of Rs.10,000/- towards Re-Registration Fee and other relevant fees as mentioned earlier.

The Research advisor shall conduct two reviews for the candidate's work progress before the preparation of the final draft of the Dissertation work and shall award marks for a maximum of 20 marks for each review depending upon the progress and quality of dissertation work carried out.

The dissertation shall be valued by an External Examiner for a maximum of 40 marks.

7.4 **Viva-Voce Examination**

There shall be a Viva-Voce Examination which shall be conducted by two examiners, one being the supervisor and the other any one of the external examiners who has evaluated the dissertation. The maximum marks for the Viva-Voce shall be 20 (joint

evaluation). A candidate shall be declared to have passed Part – II Examination if he secures a minimum of 50% of the marks prescribed for the reviews conducted by the Research advisor, a minimum of 50% of the marks prescribed for the external evaluation of dissertation, a minimum of 50% of the marks prescribed for the viva-voce Examination and a minimum of 55% marks in aggregate.

If the External Examiner who has valued the dissertation made a recommendation such as revision of dissertation, the candidate shall be advised to revise the dissertation in the light of the suggestions made by the external examiners and to re-submit the dissertation, within a period of six months. A sum of Rs.6000/- shall be charged as fee for Re-Submission of dissertation. The revised dissertation shall be sent to the same examiner who evaluated the dissertation in the first instance.

8. RESTRICTION IN NUMBER OF CHANCES FOR SUBMISSION OF DISSERTATION

No candidate shall be permitted to submit a dissertation or to appear for the viva-voce examination more than twice. Resubmission of a dissertation shall be done within 6 months from the first of the month which follows the month in which result of the first attempt is announced.

9. RENEWAL OF REGISTRATION:

The candidates shall be permitted to renew their registration only based on the merit of individual cases.

The candidates who have renewed their registration are required to successfully complete their M. Phil. programme within **12 months** from the date of re-registration.

No further extension of time shall be given for Successful completion of M. Phil. programme, what so ever the reason may be.

10. CIA PASSING MINIMUM (for Course I, II, III & IV)

CIA Components	Max. Marks	Total Marks	Passing Minimum
Test (Average of Test I and Model Examination)	20	**40**	**20**
Seminar	10		

Assignment	10		

11. ATTENDANCE ELIGIBILITY TO APPEAR FOR THE COURSES I, II, III & IV THE SEMESTER EXAMINATION

Attendance Percentage	Classification	Remedial Measure
Below 65%	N.E. (Not Eligible)	To redo the course
65% - 74%	Eligible with Condonation	To pay a Condonation Fee of Rs.200/- (Subject to the approval of the Condonation Award Committee)
75% and above	Eligible	-

However, candidates who have failed to secure the attendance eligibility due to extenuating circumstances and having attendance percentage in the range 50% to 64% may apply for award of special condonation on remittance of Rs. 5000/-.

Constitution of Special Condonation Award Committee

Vice-Chancellor

Director (M. Phil Studies)

Dean of Faculty

Head of the Department

12. SEMESTER EXAMINATION PASSING MINIMUM

Part I	Internal Marks		External Marks Semester Exam.		Total Marks	
	Max.	Pass Minimum	Max.	Pass Minimum	Max.	Pass Minimum
Course I	40	20	60	30	100	55
Course II	40	20	60	30	100	55
Course III	40	20	60	30	100	55
Course IV	40	20	60	30	100	55

Part II	External / Internal		Viva-Voce	
	Review by Research Supervisor Marks	External Evaluation Marks	Joint Evaluation Marks	Total Marks
Dissertation	40 (Passing	40 (Passing	20 (Passing	100 (Passing

	Minimum 20)	Minimum 20)	Minimum 10)	Minimum 55)

Candidates once failed in the dissertation have to necessarily resubmit the dissertation only after three months, but within six months on getting extension of time to re-submit the dissertation.

13. REGULATIONS FOR SUBMISSION OF DISSERTATION

Eligibility for the submission of dissertation for evaluation	Successful completion of all theory papers under Part – I. Publication of at least one research paper in International / National level Journal.
Date of submission of Dissertation	After 5 months but before 6 months from the date of successful completion of all theory papers under Part I.
Extensions for submission of M. Phil. Dissertation	Maximum two Extensions, each of 6 months duration.
Extension / Fee	Rs. 2000/-
Re-Registration Fee	Rs.10000/-
Fee for Re-Submission of Dissertation	Rs. 6000/-

14. REMEDIAL MEASURES FOR CANDIDATES WHO ARE UNABLE TO SUBMIT THE DISSERTATION WITHIN 2 EXTENSIONS.

Apply for Re-Registration after getting approval from the Director (M. Phil Studies) through the Research Supervisor, H.O.D and Dean of the faculty concerned.

During re-registration the candidates may be given the provision of opting for change of Research Supervisor, if necessary.

Note: Provision for change of guide may be utilized only along with reappearance in Paper III on a course suggested by the new Research Supervisor.

15. CANCELLATION OF REGISTRATION

In the case when a full-time M. Phil. Scholar is not able to successfully complete his/her M. Phil. programme within **24 months** from the date of their registration in M. Phil. programme, his/her registration shall get cancelled. However, in the case of extenuating

circumstances, he/she may be permitted apply for re-registration on remittance of Rs.10,000/- towards re-registration fee and other relevant fees that may be applied.

Further, in the case when a part-time M. Phil. Scholar is not able to successfully complete his/her M. Phil. programme within **30 months** from the date of their registration in M. Phil. programme, his/her registration shall get cancelled. However, in the case of extenuating circumstances, he/she may be permitted apply for re-registration on remittance of Rs.10,000/- towards re-registration fee and other relevant fees that may be applied.

16. COURSE WISE GRADING OF STUDENTS

16.1 Letter Grades and Grade Points

Based on the semester performance, each student is awarded a final letter grade at the end of the semester in each course. The grade points corresponding to various letter grades are given on 10 points scale.

16.2 The grading of Course Performance is carried out as per the following table:

Grading of Course Performance

Marks Secured	Grade	Grade Point
90 – 100	S	10
85 – 89	A+	9.5
80 – 84	A	9
75 – 79	B+	8.5
70 – 74	B	8
65 – 69	C+	7.5
60 – 64	C	7
55 – 59	D	6
<55	F	0

17. GRADE CARD

17.1 The grade card issued at the end of the semester to each student will contain the following:

a) the credits for each course registered for that semester;

b) the letter grade obtained in each course

c) the attendance code in each course

d) the total number of credits earned by the student up to the end of that semester in each of the course categories

e) the Cumulative Grade Point Average (CGPA) of all the courses taken from the first semester

17.2 The Grade Point Average (GPA) in a semester will be calculated by the formula:

$$GPA = \frac{\sum(CxGP)}{\sum C}$$

where C = credit for the course,

GP = the grade point obtained for the course and

$\sum C$ the sum is over all the courses taken in that semester, including those in which the student has secured F grade.

For the cumulative grade point average (CGPA) a similar formula is used where the sum is over all the courses taken in all the semesters completed up to the point in time.

17.3 The overall classification of final result is carried out as per the following table:

Overall Classification of Final Result

CGPA	Over All Grade	Class
6.00 – 6.49	D	Second Class
6.50 – 7.24	C	First Class
7.25 – 7.74	C+	
7.75 – 8.24	B	
8.25 – 8.74	B+	First Class with Distinction *
8.75 – 9.24	A	
9.25 – 9.74	A+	
9.75 and above	S	

* Provided the candidate passed all courses in the first attempt itself

18. RESEARCH SCHOLARS GRIEVANCES REDRESSAL CELL (RSGRC)

The Grievances of M. Phil. Research Scholars may be redressed by making a personal written appeal to Research Scholars Grievances Redressal Cell (RSGRC).

The constitution of Research Scholar's Grievance Cell is as follows:

1. Vice-Chancellor
2. Director (M. Phil. Studies)
3. Dean of Faculty

4. Head of the respective Department.
5. Subject Expert (to be chosen from external members of the respective Board of Studies)

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