ST. MARY'S COLLEGE (AUTONOMOUS)

Re-accredited with A+ Grade by NAAC

Thoothukudi – 628001, Tamil Nadu

(Affiliated to Manonmaniam Sundaranar University)

Syllabus

B.Sc. Chemistry

School of Physical Sciences

Outcome Based Curriculum

(w.e.f. 2021)

Preamble:

Chemistry is a branch of Physical Science that deals with the composition, structure, behavior and properties of matter. Chemistry is at the center of our knowledge of the physical world around us. Each of us feels the impact of Chemistry in everyday of our lives.

Vision:

To produce knowledgeable Chemists and educate future scientists to enhance services to the community.

Mission:

To equip the students with the conceptual and experimental tools for the holistic development of professional graduates in academia, industry and government to meet the global environmental issues through chemical education.

Programme Outcome

PO.No	Upon completion of B.Sc Degree programme , the graduates will be able to
PO 1	apply the acquired knowledge of fundamental concepts in the field of science and to find solutions to various problems.
PO 2	inculcate innovative skills and team – work among students to meet societal expectations.
PO 3	perform analysis to assess, interpret and create innovative ideas through practical experiments.
PO 4	facilitate to enter multidisciplinary path to solve day-to-day scientific problems.
PO 5	carry out fieldworks and projects, both independently and in collaboration with others and to report in a constructive way.
PO6	improve communication ability and knowledge transfer through ICT aided learning integrated with library resources.
PO 7	transfer the knowledge to the other stakeholders through extensive community development programme.
PO 8	attain competency in job market / entrepreneurship.
PO 9	focus on developing domain specific language skills and knowledge of the students.

Programme Specific Outcome

PSO No.	Students of BSc.Chemistry will be able to	PO Addressed
PSO-1	have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistry.	PO - 1
PSO-2	design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.	PO - 2, 3
PSO-3	excel in problem solving, critical thinking and analytical reasoning as applied to scientific problems.	PO - 4
PSO-4	explore new areas of research in both chemistry and allied fields of science and technology.	PO – 4, 7
PSO-5	appraise the central role of chemistry in our society and use this as a basis for ethical behaviour in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.	PO – 2, 3
PSO-6	synthesize , characterize and elucidate the structure of chemical compounds.	PO - 1
PSO-7	cater to the need of industries in context of the developing needs of the society.	PO - 8
PSO-8	develop a rigorous scientific attitude and provide excellence in teaching and research.	PO - 5
PSO-9	focus on critical thinking of the learners for efficient communication.	PO - 6
PSO-10	develop knowledge, promote professional skillsand improve competency.	PO -9

Department of Chemistry

Course Structure (w.e.f. 2021)

Semester –I

Part	Components	Course Code	CourseTitle	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil French	21ULTA11 21ULFA11	இக்கால இலக்கியம் செய்யுள், இலக்கணம், இலக்கியவரலாறு,உரைநடை சிறுகதை Introductory French Course	6	3	40	60	100
II	General English	21UGEN11	Poetry, Prose, Extensive Reading and Communicative English – I	6	3	40	60	100
III	Core I	21UCHC11	General Chemistry - I	6	5	40	60	100
	Core Practical I	21UCHCR1	Quantitative Analysis	2				
	Allied I	21UMAA11 21UCBA11	Allied Mathematics – I Allied Biochemistry - I	6/4	4/3	40	60	100
	Allied Practical	21UCBAR1	Allied Biochemistry Practical	2				
IV	Skill Enhancemen Course – I	21UCHPE1	Professional English for Chemistry– I	2	2	20	30	50
	Ability Enhancement Course – I	21UAVE11	Value Education	2	2	20	30	50
Total				**30**	**19/18**			

Semester II

Part	Components	Course Code	CourseTitle	Hrs/ Weel	Credi	Max.Marks		
						CIA	ESE	Total
I	Tamil French	21ULTA21 21ULFA21	சமய இலக்கியங்களும் நீதி இலக்கியங்களும், செய்யுள் இலக்கணம், இலக்கியவரலாறு, உரைநடை,வாழ்க்கை வரலாறு Intermediate French Course	6	3	40	60	100
II	General English	21UGEN21	Poetry, Prose, Extensive Reading and Communicative English – II	6	3	40	60	100
III	Core II	21UCHC21	General Chemistry - II	6	5	40	60	100
	Core Practical II	21UCHCR1	Quantitative Analysis	2	2	40	60	100
	Allied I	21UMAA21 21UCBA21	Allied Mathematics – II Allied Biochemistry - II	6/4	4/3	40	60	100
	Allied Practical I	21UCBAR1	Allied Biochemistry Practical	2	2	40	60	100
IV	Skill Enhancement Cour II	21UCHPE2	Professional English for Chemistry– II	2	2	20	30	50
	Ability Enhancement Course	21UAEV21	Environmental Studies	2	2	20	30	50
Total				**30**	**21/22**			

Semester III

Part	Components	Course Code	CourseTitle	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil French	21ULTA31 21ULFA31	காப்பிய இலக்கியம்: செய்யுள்,இலக்கணம்,உரைநடை, சிறுகதை, இலக்கியவரலாறு Advanced French Course	6	4	40	60	100
II	General English	21UGEN31	Poetry, Prose, Extensive Reading and Communicative English-III	6	4	40	60	100
III	Core III	21UCHC31	Physical Chemistry - I	4	4	40	60	100
	Core Practical II	21UCHCR2	Semi micro Inorganic Qualitative Analysis	2				
	Allied II	21UPHA31	Allied Physics-I	4	3	40	60	100
	Allied Practical II	21UPHAR1	Allied Physics Practical	2				
	Skill Based Elective	21UCHS31/ 21UCHS32	Agricultural Chemistry/ Dairy Chemistry	2	2	20	30	50
	NME I	21UCHN31	Every Day Chemistry	2	2	20	30	50
IV	Ability Enhancement Course	21UAWS31	Women's Synergy	2	2	20	30	50
	Self Study/ MOOC / Internship (Compulsory)	21UCHSS1/	Chemistry for competitive exam		2			50
Total				**30**	**23**			

Semester IV

Part	Components	Course Code	CourseTitle	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil French	21ULTA41 21ULFA41	சங்க இலக்கியம்: செய்யுள், இலக்கணம்,உரைநடை,வாழ்க்கைவரலாறு, இலக்கியவரலாறு Language through Literature	6	4	40	60	100
II	General English	21UGEN41	Poetry, Prose, Extensive Reading and Communicative English – IV	6	4	40	60	100
III	Core IV	21UCHC41	Organic Chemistry - I	4	4	40	60	100
	Core Practical II	21UCHCR2	Semi micro Inorganic Qualitative Analysis	2	2	40	60	100
	Allied II	21UPHA41	Allied Physics-I	4	3	40	60	100
	Allied Practical	21UPHAR1	Allied Physics Practical	2	2	40	60	100
	Skill Based Elective	21UCHS41/ 21UCHS42	Medicinal Chemistry/ Forensic Chemistry	2	2	20	30	50
	NME II	21UCHN41	Industrial Chemistry	2	2	20	30	50
	Ability Enhancement	21UAYM41	Yoga & Meditation	2	2	20	30	50

IV	Course							
	Self Study / On-line Course / Internship (Optional)	21UCHSS2/	Applied Chemistry		+2			50
V	NCC, NSS & Sports				1			
	Extension Activities CDP				+1			
Total				**30**	**26+3**			

Semester V

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
III	Core V (Common Core)	21UPCC51	Material Science	6	5	40	60	100
	Core VI	21UCHC51	Inorganic Chemistry -I	4	4	40	60	100
	Core VII	21UCHC52	Organic Chemistry –II	5	5	40	60	100
	Core VIII	21UCHC53	Physical Chemistry –II	5	5	40	60	100
	Core Practical III	21UCHCR3	Physical Chemistry Practical	5	3	40	60	100
	Core Practical IV	21UCHCR4	Organic Analysis and Organic Preparation	3				
IV	Common Skill Based	21UCSB51	Computers for Digital Era and Soft Skills	2	2	20	30	50
	Self Study / On-line Course/ Internship (Optional)	21UCHSS3/	Informative Chemistry		+2			50
Total				**30**	**24 + 2**			

Semester VI

Part	Components	Course Code	Course Title	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
III	Core IX	21UCHC61	Inorganic Chemistry-II	4	4	40	60	100
	Core X	21UCHC62	Organic Chemistry-III	4	4	40	60	100
	Core XI	21UCHC63	Physical Chemistry-III	5	5	40	60	100
	Elective	21UCHE61/ 21UCHE62	Polymer Chemistry/ Essential topics in Chemistry	4	4	40	60	100
	Core Practical I	21UCHCR4	Organic Analysis and Organic Preparation	3	3	40	60	100
	Core Practical V	21UCHCR5	Gravimetry and Inorganic Preparation	5	3	40	60	100
IV	CoreXII/ Project	21UCHC64 21UCHP61	Analytical Chemistry/ Project	5	4	40	60	100 100
Total				**30**	**27**			
Total				**180**	**140+5**			

Semester	Hours	Credits	Extra Credits
I	30	19/18	---
II	30	21/22	---
III	30	21	2
IV	30	26	3
V	30	26	--
VI	30	27	--
Total	**180**	**140**	**5**

Courses	**Number of Courses**	**Hours / week**	**Credits**	**Extra Credits**
Tamil	4	24	14	--
English	4	24	14	--
Core	12 T + 8 P	53 T + 24 P	50T + 13P	
Skill Based Elective	2	4	4	--
Core Elective (Skill based Elective)	1(2)	4	4	--
Group Project	1	5	4	--
Allied	4 T + 4P	20T+8P	14T+4P	
NME	2	4	4	--
Skill Enhancement Course	2	4	4	--
Ability Enhancement Course	4	8	8	--
Common Skill Based	1	2	2	--
NCC, NSS & Sports		--	1	
Extension Activities		--		+1
Self Study Papers (Optional)	2	--	+2	2
Self Study Papers (Compulsory)	1	--	2	--
Total				

SEMESTER - 1			
Part – 1 பொதுத்தமிழ் தாள் - 1 இக்கால இலக்கியம் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, சிறுகதை)			
Course Code: 21ULTA11	**Hrs/Week:6**	**Hrs/Semester: 90**	**Credits: 3**

Objectives:

- மாணவியருக்கு நல்ல மதிப்பீடுகளைக் கற்பித்து வாழ்வில் அவற்றைப் பின்பற்ற வழிவகுத்தல்.
- இலக்கிய மாந்தரின் வாழ்க்கை அனுபவங்கள் மூலம் வாழ்வில் பிரச்சனைகளை எதிர்கொள்ளும் திறம், தன்னம்பிக்கை, ஆளுமைத்திறம், மொழிஅறிவு இவற்றை உருவாக்குதல்.

Course Outcome:

CO.NO	**இப்பாடத்திட்டம் மாணவியருக்கு**	**அறிவுசார் மதிப்பீடு**
CO-1	பெண் சார்ந்த விடுதலை உணர்வை வளர்க்கிறது.	வளர்ச்சி
CO-2	பொதுமைச் சிந்தனையை வளர்க்கிறது	வளர்ச்சி
CO-3	இனம் சாதி குறித்த பாகுபாட்டிலிருந்து விடுதலை பெறும் வழிவகைகளைக் கற்றுக்கொடுக்கிறது.	நடைமுறைப்படுத்துதல்
CO-4	இயற்கையைப் பேணுதற்கும் வாழ்வின் வளர்ச்சி நிலையை மேம்படுத்திக் கொள்ளுதற்கும் உதவுகிறது.	நடைமுறைப்படுத்துதல்
CO-5	சமய நல்லிணக்கம், ஒற்றுமை உணர்வு, இறை நம்பிக்கை இவற்றை உருவாக்குகிறது.	உருவாக்கம்
CO-6	மொழியைப் பிழையின்றி பேசவும் எழுதவும் உதவுகிறது.	புரிதல் திறன் மேம்பாடு
CO-7	எதார்த்த வாழ்வை மேற்கொள்ள உதவுகிறது.	புரிதல் திறன் மேம்பாடு
CO-8	தனிமனித வாழ்க்கைச் சிக்கல்களை எதிர்கொள்ளும் நிலையை உருவாக்குகிறது.	நடைமுறைப்படுத்துதல்
CO-9	சமுதாயப் பிரச்சனைகளை எதிர்கொள்ளும் திறம் கிடைக்கிறது.	நடைமுறைப்படுத்துதல்
CO-10	போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையில் படைப்பாக்கத் திறனை வளர்க்க உதவுகிறது.	படைப்பாற்றல் திறன் மேம்பாடு

SEMESTER - 1			
Part – 1 பொதுத்தமிழ் தாள் - 1 இக்கால இலக்கியம் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, சிறுகதை)			
Course Code: 21ULTA11	Hrs/Week:6	Hrs/Semester: 90	Credits: 3

அலகு – 1 செய்யுள் - 2 மணி

1. தமிழ்மொழி வாழ்த்து – பாரதியார்
2. புதுமைப் பெண் - பாரதியார்
3. புதிய உலகு செய்வோம் - பாரதிதாசன்
4. உலகை மாற்றுவோம் - கவியரசு முடியரசன்
5. கண்ணீரின் இரகசியம் - அப்துல் ரகுமான்
6. மரங்கள் - மு.மேத்தா
7. கால வித்தியாசம் - வைரமுத்து
8. வையத்தை வெற்றி கொள்ள - சி.சிவரமணி
9. கவிதைப் பூங்காடு – பா.விஜய்
10. பெண் இனமே – மைத்ரேயி
11. ஹைக்கூ கவிதைகள்
12. நாட்டார் பாடல்கள்

அ. தாலாட்டுப் பாடல்

ஆ. மீனவர் பாடல்

அலகு - 2 இலக்கணம் - 1 மணி

எழுத்து

1. எழுத்து - விளக்கம்,
2. முதலெழுத்துகள், சார்பெழுத்துகள்
3. சுட்டெழுத்துகள், வினா எழுத்துகள்
4. மொழி முதல் எழுத்துகள், மொழி இறுதி எழுத்துகள்
5. வல்லினம் மிகும் இடங்கள், வல்லினம் மிகா இடங்கள்
6. மொழிப்பயிற்சி : புதுக்கவிதை, சிறுகதை, பத்திரிகைக்குச் செய்தி அனுப்புதல்

அலகு - 3 இலக்கிய வரலாறு - 1 மணி

1. புதுக்கவிதை தோற்றமும் வளர்ச்சியும்

2. சிறுகதை தோற்றமும் வளர்ச்சியும்

3. உரைநடை தோற்றமும் வளர்ச்சியும்

4. நாட்டுப்புற இயல் அறிமுகம்

அலகு - 4 உரைநடை - 1 மணி

நீயே வெல்வாய் - க.ப.அறவாணன்

அலகு – 5 சிறுகதை - 1 மணி

1. கேதாரியின் தாயார் - கல்கி
2. விடியுமா? - கு.ப.ராஜகோபாலன்
3. காலனும் கிழவியும் - புதுமைப்பித்தன்
4. கருப்பண்ணசாமி யோசிக்கிறார் - அறிஞர் அண்ணா
5. நாற்காலி - கி.ராஜநாராயணன்
6. ராஜா வந்திருக்கிறார் - அழகிரி சாமி
7. ஜோடிப் பொருத்தம் - ஜெயரதி அகஸ்டின்

I B.A., / B.Sc Part I FRENCH

SEMESTER – I			
PART – I French Paper – I Introductory French Course			
Course Code :21ULFA11	**Hrs/week : 6**	**Hrs/ Sem : 90**	**Credits : 3**

Objectives

To initiate a beginner to the francophonic world and to train them to make their maiden efforts in spoken and written French.

To create a number of real-life situations to make the learner express herself in the target language through experiential teaching method.

Course Outcomes

CO	At the end of this course, the students will be able to	CL
1.	greet and introduce oneself and others	Kn, Ap
2.	fill an identity form	Ap, Cr
3.	ask, give and understand directions	Kn, Ap
4.	frame a questionnaire	Cr
5.	place order in a restaurant	Ap, Cr
6.	tell and understand opening and closing time	Kn
7.	express likes and dislikes	Ap
8.	describe an object and to say what it serves for	Kn, Un
9.	ask and say a price of a product	Ap
10.	understand the French and francophonic lifestyle	Kn

SEMESTER – I			
PART – I French Paper – I Introductory French Course			
Course Code :21ULFA11	**Hrs/week : 6**	**Hrs/ Sem : 90**	**Credits : 3**

Unit 1 – Bienvenue !

1.1- Une introductionà la langue française
1.2 – Les Salutations
1.3 – Les pronoms
1.4 – Les couleurs
1.5 – Dans la classe

Unit 2 – Et vous ?

2.1 – Se présenter, demander de se présenter
2.2 – Donner des informations personnelles
2.3 – Demander et donner des coordonnes
2.4 –Artistes francophone
2.5 – Réaliser une fiche d'identité

Unit 3 – On va où ?

3.1 – Demander / Indiquer un chemin
3.2 – Comprendre un itinéraire
3.3 – Se déplacer en métro ou en bus
3.4 – Paris / Montréal : deux villes à découvrir
3.5 – Réaliser un questionnaire sur la vie dans un quartier

Unit 4 – Qu'est-ce qu'on mange ?

4.1 – Comprendre / Donner des horaires
4.2 – Faire des courses / Commander au restaurant
4.3 – Exprimer ses gouts
4.4 – Québec / France : qu'est-ce que vous mangez ?
4.5 – Créer la carte d'un bar a jus

Unit 5 – Les soldes, c'est parti !

5.1 – Situer un moment dans une année
5.2 – Parler du métro
5.3 – Demander / dire la taille et la pointure
5.4 – Décrire un objet, dire à quoi ça sert
5.5 – Demander / Dire un prix

Prescribed Textbook :

Céline Braud, Aurélien Calvez, Guillaume Cornuau, Anne Jacob,Sandrine Vidal, Cécile Pinson, Marion Alcaraz.*Edito A1Méthode de français*. Paris : Didier, 2016.

Céline Braud, Aurélien Calvez, Guillaume Cornuau, Anne Jacob,Sandrine Vidal, Cécile Pinson, Marion Alcaraz. *Edito A1 Cahier d'exercises*. Paris : Didier, 2016.

Books, Journals and Learning Resources

- J.Girardet&J.Pécheur avec la collaboration de C.Gibble.*Echo A1*. Paris : CLE International, 2012.
- Carlo Catherine, Causa Mariella.*Civilisation Progressive du Français – I.* Paris : CLEInternational, 2003.
- Cocton Marie-Noëlle.*Génération 1 Niveau A1, Méthode de français et cahier d'exercices*.Paris : Didier, 2016.
- Dintilhac Anneline, De Oliveira Anouchka, Ripaud Delphine, DupleixDorothée, Cocton Marie-Noëlle.*Saison 1 Niveau 1, Méthode de français et cahierd'exercices*. Paris : Didier, 2015
- www.francaisfacile.com/exercices/
- www.bonjourdefrance.com

SEMESTER-I			
Part II GeneralEnglish	**Poetry, Prose, Extensive Reading and Communicative English-I**		
Course Code 21UGEN11	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

Objectives:

- To provide adequate exposure and opportunities for students to imbibe, develop, practise and use LSRW skills
- To help students read and comprehend contents in English

Course Outcome:

CO. No.	Upon completion of this course, students will be able to	Cognitive Level
CO- 1	improve their listening and writing skills.	Un
CO- 2	apply and incorporate basic grammar and mechanics in writing.	Ap
CO- 3	paraphrase main ideas through reading passages.	Ap
CO- 4	communicate in English with confidence.	Ap
CO- 5	appreciate literary pieces.	Ap
CO- 6	label and paraphrase main ideas through reading passages.	Ap
CO- 7	imbibe ethical and moral values through the study of the literary pieces.	Ev
CO- 8	construct simple sentences and short paragraphs in response to reading and writing.	Cr

SEMESTER-I			
Part II GeneralEnglish	**Poetry, Prose, Extensive Reading and Communicative English –I**		
Course Code 21UGEN11	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

Unit I –Poetry

Rabindranath Tagore – Leave This Chanting

W.W. Gibson – The Stone

Ted Hughes – Hawk Roosting

Unit II – Prose

Stephen Leacock – My Lost Dollar

J.B. Priestley – On Doing Nothing

Robin Sharma – Your Commitment to Self- Mastery: Kaizen

Unit III – Short Story

Oscar Wilde – The Model Millionaire

Leo Tolstoy – Three Questions

K.A. Abbas – The Refugee

Unit IV – Grammar

Parts of Speech – Noun, Pronoun, Article, Adjective, Verb - Modals and Auxiliaries – Types of Sentences - Subject -Verb Agreement

Unit V- Communication Skills

Vocabulary, Listening Comprehension – Speaking – Reading, Filling Forms

(TANSCHE – Module I)

Text Books:

Units I-III – To be compiled by the Research Department of English

Unit IV- Joseph, K.V. *A Textbook of English Grammar and Usage*. Chennai: Vijay Nicole Imprints Private Limited, 2006. Print.

Unit – V – CLIL (Content & Language Integrated Learning) – Module I by TANSCHE (Tamil Nadu State Council for Higher Education)

SEMESTER- I			
Part III	**Core I**	**General Chemistry - I**	
Course Code :21UCHC11	**Hrs/Week:6**	**Hrs/ Sem: 90**	**Credits:5**

Objectives

- To apply methods of balancing redox reactions
- To communicate the concepts and results of their laboratory experiments clearly and concisely to both chemists and non-chemists through effective writing and oral communication skills
- To inculcate the students the basic principles and concepts in Chemistry.
- To understand the basic chemical principles in Inorganic, Organic and Physical Chemistry.

Course Outcome :

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO 1	explain the periodic properties of the different groups of compounds focusing on production methods.	1	Un
CO 2	know the nomenclature of different class of organic compounds.	1	Re
CO 3	associate polarization of a bond with electronegativity.	1	Un
CO 4	know the basic knowledge about the fundamental concept of quantum mechanics.	1	Un
CO 5	understand quantum numbers and to know the rules for filling up of orbitals and predict electronic arrangement in orbits.	4	Ev
CO 6	understand the basis of fundamental particles , natural and artificial radioactivity, nuclear forces and nuclear stability.	1	Un
CO 7	apply the theory of radioactivity and nuclear reactions in various fields.	3	Ap
CO 8	apply the knowledge about interfering radicals, common ion effect and solubility product.	8	Ap

SEMESTER- I			
Part III	**Core I**	**General Chemistry - I**	
Course Code :21UCHC11	**Hrs/Week:6**	**Hrs/ Sem: 90**	**Credits:5**

UNIT I: Periodic Properties and Concept Of Electron Transfer

Modern periodic law- long form of periodic table – merits and demerits– Abundance of elements- cosmic, terrestrial and relative abundance – classification of elements based on their electronic configuration- Major trends in periodic table – Slater's rule- calculation of effective nuclear charge - periodic properties – trends in ionic and covalent radii , ionization energy, electron affinity and electro negativity –factors affecting ionization energy, electron affinity and electro negativity- scales of electro negativity – Alfred-Rochow's scale – Pauling scale – Mulliken approach – applications of electro negativity.

Concept of electron transfer -Oxidation and reduction – Oxidation number concept of oxidation and reduction- Rules for assigning oxidation number –Electronic concept in inorganic reactions – Redox reactions – oxidant- Important Oxidants and their reduction half reaction – Fe(III) and $KMnO_4$–Reductant -important reductants and their oxidation half reaction Fe(II) and oxalic acid. Methods of balancing redox reactions ion electron method, oxidation number method.

UNIT II: Basic Concepts of Organic Chemistry

Classification and nomenclature of organic compounds – Open chain and closed chain compounds- systems of naming organic compounds- rules of IUPAC system of nomenclature branched alkanes, cyclo alkanes – alkenes, alkynes and substituents-compounds having functional groups, poly functional groups.

Molecular weight determination of organic acids and bases by silver salt and platinic chloride methods. Problems arriving empirical and molecular formula using percentage composition of elements and molecular weight.

Structural formula – Shapes of organic molecules. sp^3, sp^2 and sp hybridization in organic compounds with suitable examples.

Polar effects – Inductive (+I, –I), Electromeric effect-Resonance/Mesomeric effect (+R, -R, +M, –M) – examples- Hyper conjugation (Baker Nathan effect) and steric effect.

Bond fission – homolytic and heterolytic fission. Reaction intermediates – carbocation, carbanion, free radicals and carbenes – their generation, shapes and stability. Types of reaction-substitution- elimination –addition – polymerisation-definition and examples.

UNITIII: Basic Quantum Chemistry

Dual character of an electron-de Broglie equation- Heisenberg's uncertainty principle-Introduction to quantum mechanics-fundamental postulates-Schrodinger wave equation- – eigen value – eigen function – significance of ψ and ψ^2-charge cloud concept and orbitals-Shapes of s, p and d atomic orbitals-nodal planes-g and u character in atomic orbitals-Radial and angular parts of the wave functions and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation)-radial and angular nodes and their significance.

Quantum numbers-origin-principal – orbital – angular momentum and spin quantum number-Significance of quantum numbers-Rules for filling electrons in various orbitals-Pauli's exclusion principle-Hund's rule-Aufbau principle- sequence of filling up of orbitals-schematic representation of electronic configuration- anomalous electronic configurations.

UNIT IV: Nuclear Chemistry

Isotopes, isobars and isotones – unit of radioactivity--half-life period – radioactive equilibrium – SoddyFajan's displacement law – Theory of radioactivity – radioactive series – artificial transmutation of elements – natural and induced radioactivity – Constitution of nuclei – stability of nuclei and (n/p) ratio – magic number, mass defect, mass energy relationship, binding energy and calculation of binding energy from mass defect-nuclear fusion and fission reactions – Plutonium and Hydrogen bombs – applications of Radioactivity in medicine-industry-agriculture– tracer technique- carbon dating-rock dating-neutron activation analysis-particle accelerators: linear accelerator – cyclotron.

UNIT V: Analytical Methods

Analytical Chemistry - Chemical Analysis - Types of Chemical Analysis – Qualitative and Quantitative Analysis- Volumetric Analysis – Principle – Standard Solutions – Normality and Molarity – Principles of Titrations – Theory of Indicators - Types of Titrations – Acidimetry, Alkalimetry, Permanganometry, Dichrometry, Iodometry, Argentometry, Complexometry.

Principles of gravimetric analysis – precipitation methods – conditions of precipitation – coprecipitation and post precipitation

Qualitative Inorganic Analysis – Dry Test, Flame Test, Wet Test – Common ion effect and solubility product- Testing of Simple and Interfering Acid Radicals- Test for sulphide, sulphate, nitrate (brown ring test), bromide and iodide (silver nitrate test),chloride and chromate (chromyl chloride test), oxalate and fluoride (calcium chloride test), borate (ethyl borate test), phosphate (ammonium molybdate test) – Elimination of Interfering Acid Radicals – Chromate-Oxalate- fluoride – phosphate -Identifying the Groups of Basic Radicals – Testing of the Basic Radicals belonging to different Groups - Test for lead, copper, cadmium, antimony, bismuth, cobalt, nickel, manganese, zinc, barium, strontium, calcium, magnesium and ammonium-

Error analysis: Accuracy – Precision – Error – Types of Errors – Mean – Median – Mode – Standard Deviation – Variance – Normal Distribution Curve

Text Books:

1. Puri B.R, Sharma L.R., Kalia K.C.. *Principles of Inorganic Chemistry*. Delhi : Milestone publishers and distributers, 2010.
2. Tewari K.S, Vishnoi N.K, Mehrotra S.N. *A Text Book of Organic Chemistry*. Vikas Publishing2nd Revised Editions 1998.
3. ArunBahl, B.S.Bahl, G.D.Tuli.*Essentials of Physical Chemistry*.New Delhi:S.Chand and Company Ltd.,Revised edition 2008.

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Books for Reference:

1. Puri , Sharma B.R, , Madan L.R S. Pathania. *Principles of Physical Chemistry*. Vishal Publishing Co, 2008.
2. Arun Bahl and Bahl B.S. *Advanced Organic chemistry*.S.Chand and Company Ltd., Reprint 2005.
3. Tewari N. *Advance Organic Reaction mechanism Books and allied (P) Ltd*. Kolkata : Second revised edition 2005.
4. Jain M. K and Sharma S. C. *Modern Organic Chemistry*. Vishal Publishing Company, 2008.

SEMESTER I			
Skill Enhancement Course – I Professional English for Chemistry - I			
Course Code: 21UCHPE1	**Hrs/Week : 2**	**Hrs/ Sem : 30**	**Credits : 2**

OBJECTIVES:

- To enhance the language skills of first year chemistry students.
- To acquire knowledge about the effective communication.
- To create competence level of I year students.

Course Outcomes

CO No.	Upon completion of this course, students will be able to	PSOs addressed	CL
CO 1	express their capability in using the language English in Chemistry.	9,10	Un
CO 2	understand the importance of learning English.	9,10	Un
CO 3	express the Language in a confident manner.	9,10	Un
CO 4	compare the need of the English language and its role.	9,10	An
CO 5	demonstrate the importance of writing English.	9,10	Ap
CO 6	familiar with the texts.	9,10	An
CO 7	interpret the importance of listeningand to develop knowledge and to improve competency..	9,10	Cr, Ev
CO 8	know about the professional skills and identify the language level by themselves.	9,10	Re

SEMESTER I			
Skill Enhancement Course –I Professional English for Chemistry - I			
Course Code: 21UCHPE1	**Hrs/Week : 2**	**Hrs/ Sem : 30**	**Credits : 2**

UNIT 1: Communication

Listening: Listening to audio text and answering questions - Listening to Instructions

Speaking: Pair work and small group work.8

Reading: Comprehension passages –Differentiate between facts and opinion

Writing: Developing a story with pictures.

Vocabulary: Register specific - Incorporated into the LSRW tasks

Why Carrot is orange in colour? - Antoine Lavoisier -Father of Chemistry - The invention of Saccharine - Invention of Hydroxychloroquinone - Marie Curie.

UNIT 2: Description

Listening: Listening to process description-Drawing a flow chart.

Speaking: Role play (formal context)

Reading: Skimming/Scanning- Reading passages on products, equipment and gadgets.

Writing: Process Description –Compare and Contrast Paragraph-Sentence Definition and Extended definition- Free Writing.

Vocabulary: Register specific -Incorporated into the LSRW tasks.

The spirit of chemical sciences- the effect of greenhouse gas emission- History of matches and lighters, Invention of Vaseline.

UNIT 3: Negotiation Strategies

Listening: Listening to interviews of specialists / Inventors in fields (Subject specific)

Speaking: Brainstorming.(Mind mapping). Small group discussions (Subject – Specific)
Reading: Longer Reading text.

Writing: Essay Writing (250 words)

Vocabulary: Register specific - Incorporated into the LSRW tasks

Alfred noble- his life and work- The soap Bubble- an introduction to nuclear chemistry- Synthetic polymers -biomass and biofuels.

UNIT 4: Presentation Skills

Listening: Listening to lectures.

Speaking: Short talks.

Reading: Reading Comprehension passages

Writing: Writing Recommendations Interpreting Visuals inputs

Vocabulary: Register specific -Incorporated into the LSRW tasks

Bhopal disaster - Xrays- J.J. Thomson Biography and Noble prize - Invention of Anaestheia - Acid Base Chemistry - Home Volcanoes. .

UNIT 5: Critical Thinking Skills

Listening: Listening comprehension- Listening for information.

Speaking: Making presentations (with PPT- practice).

Reading: Comprehension passages –Note making.

Comprehension: Motivational article on Professional Competence, Professional Ethics and Life Skills)

Writing: Problem and Solution essay– Creative writing –Summary writing

Vocabulary: Register specific - Incorporated into the LSRW tasks

First hydrogen bomb –Detecting Hazards - How molecules are formed ? - Industrial chemistry- Food Adulteration.

References:

Britannica, T. E. (Ed.) Marie Curie from Encyclopædia Britannica, (2020, April 16).

Wikipedia, T. E. (Ed.).. Marie Curie, (16, June 2020)

https://en.wikipedia.org/wiki/Carrot

https://www.historyofinformation.com/detail.php?id=2928

https://www.britannica.com/biography/Antoine-Lavoisier

Audio and Video link

https://www.acs.org/content/acs/en/molecule-of-the-week/archive/s/saccharin.html#:~:text=Saccharin%20was%20the%20first%20widely,sweet%20taste%20on%20his%20hand.

https://en.wikipedia.org/wiki/Marie_Curie

https://en.wikipedia.org/wiki/Hydroxychloroquine

https://www.ukessays.com/essays/chemistry/green-chemistry-and-its-applications.php

https://www.discovermagazine.com/the-sciences/the-accidental-inventor

https://theconversation.com/a-short-history-of-anaesthesia-from-unspeakable-agony-to-unlocking-consciousness-74748

https://edu.rsc.org/resources/collections/on-this-day-in-chemistry

SEMESTER – I			
Part III Allied – I	**Allied Mathematics – I**		
Course Code : 21UMAA11	**Hrs / Week: 6**	**Hrs / Semester: 90**	**Credits: 4**

Vision:

Aims to help physical science students to achieve their goals and to develop their mathematical skills.

Mission:

To help students to appreciate the uses of derivatives and integrals in day to day life and solve real life problems.

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	* PSOs addressed	CL
CO-1	the equations from the given roots & approximate solutions of equations by applying Horner's method and Newton's method	2	Un
CO-2	develop and apply concepts of expressions and equations to investigate and describe relationships	4	An
CO-3	demonstrate problem solving skills	5	Un
CO-4	evaluate eigen values and eigen vectors of square matrices and make use of the properties of determinants in their calculation.	3	Ev
CO-5	calculate the radius of curvature, centre and circle of curvature.	1	Ev
CO-6	compute the gradient of a scalar valued function ,curl, and divergence of vector fields	1	Cr
CO-7	interpret basic definitions and classify the differential equations with respect to their order and linearity	2	Un
CO-8	find complementary functions & evaluate particular integrals of the form e^{ax}, $\sin ax, \cos ax, x^m$ and $e^{ax} f(x)$	3	An

*** PSO ADDRESSED: UG DEPARTMENT MATHEMATICS**

Semester –I			
Part III Allied - I	**Allied Mathematics – I**		
Course Code : 21UMAA11	**Hrs/week :6**	**Hrs/Sem :90**	**Credits :4**

Unit I

Theory of equations - Transformation of equations - Approximate solutions of equations - Horner's method and Newton's method.

Unit II

Matrices Consistency and solution of equations - Characteristic equation of a matrix, Eigen values and Eigen vectors – Cayley - Hamilton theorem and simple problems.

Unit III

Curvature and Radius of Curvature –Cartesian and polar co - ordination - Centre of Curvature – Evolutes.

Unit IV

Vector Differentiation - Gradient - Curl – Divergence.

Unit V

First order differential equations of higher degree - Equations solvable for p,x,y - Clairauts form - Linear equations of second and higher order with constant and variable co - efficients - particular integrals of the form x^n, $e^{ax}f(x)$

Text Book

S.Arumugam&Issac, Allied Mathematics, New Gamma Publishing House, Palayamkottai

Reference Books

1. Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., **Ancillary Mathematics Volume – I**, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010

2. Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., **Ancillary Mathematics Volume – II**, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010

SEMESTER I			
Part III Allied – I	**Allied Biochemistry -I**		
Course Code: 21UCBA11	**Hrs/Week : 4**	**Hrs/ Sem : 60**	**Credits : 3**

OBJECTIVES:

- To acquire knowledge about the chemical composition of life.
- To Understand fundamental biochemical processes.
- To knowledge about vitamins and their deficiency.
- To study the functions of hormones.

Course Outcomes

CO No.	Upon completion of this course, students will be able to	PSOs addressed	CL
CO 1	explain about the chemical composition and the elements of life.	1	Un
CO 2	differentiate direct and indirect method for the determination of energy requirement of man.	2	Un
CO 3	express the importance of bioenergetics.	7	Un
CO 4	compare the biological reaction such as exergonic reaction and endergonic reaction.	3	An
CO 5	demonstrate about the various energy rich compounds such as adenosine triphosphate, guanosine triphosphate, uridinetriphosphate, cytidinetriphosphate and acyl phosphate.	5	Ap
CO 6	distinguish water soluble and fat-soluble vitamins and analyze their composition, functions and deficiency symptoms.	3	An
CO 7	interpret the hormones producing organs and their functions and to know about the plant as well as animal hormones.	3,5	Cr ,Re
CO 8	identify the antibiotics which are all responsible for affecting cell wall synthesis, cytoplasmic membrane and enzyme systems.	7	Re

SEMESTER I			
Part III Allied – I Allied Biochemistry -I			
Course Code: 21UCBA11	**Hrs/Week : 4**	**Hrs/ Sem : 60**	**Credits : 3**

UNITI: Introduction to Biochemistry

Introduction to biochemistry - scope – chemical composition of life – elements of life – water – biological importance – Energy requirements of the body – Measurement of energy value of foods – Determination of energy requirement of man – Direct method, Indirect method, Respiratory quotients (RQ) of food stuffs – Total heat production – Significance of RQ Basal metabolism – Definition – Conditions for measurement – Factors influencing, Measurement, Significance, Specific dynamic action.

UNIT: II Bioenergetics

Introduction – Importance of bioenergetics - Energy and work – thermodynamic principles - Biological reactions – Exergonic reaction – Endergonic reaction – Energy and its forms - Energy rich compounds – Adenosine triphosphate – Guanosine triphosphate – Uridine triphosphate – Cytidine triphosphate – Acyl phosphate - Energy coupling.

UNIT: III VITAMINS

Introduction – definition - Sources of vitamin – Deficiency diseases – provitamins – biological functions - Properties of Vitamins – Classification of vitamins - water soluble (Vitamin B_1, B_2, B_3, B_5, B_6, B_7, B_9 and B_{12}Vitamin C) and fat soluble vitamins (Vitamin – A, D, E and K) and their composition, functions and deficiency symptoms.

UNIT:IV Hormones

Introduction –Definition – Properties – Biological Functions – Chemical Nature – Hormones secreting glands – Hormones producing organs and their functions - Classification of hormones: based on chemical nature – Functions of Hormones – Plant hormones(Auxins, Gibberllins, Cytokinins, Ethylene, Traumatic acid, Absicisic acid, Morphactins) – Animal hormones (STH, TSH, FSH, LH, LTH, Insulin)

UNIT:V Antibiotics

Introduction – Definition – Antibiotics affecting cell wall synthesis (pencillin, cephalosporin) – Antibiotics affecting the cytoplasmic membrane – Antibiotics interfering with Nucleic acid function – Antibiotics inhibiting protein synthesis (streptomycin, erythromycin, neomycin)– Antibiotics affecting enzyme systems – Drug resistance.

Text Books:

1. Dulsy Fatima, Narayanan L.M, MeyyanPillai R.P, Nallasingam K, Prasanna Kumar S and Arumugam N. *Biochemistry*.Saras Publications, 2010.
2. Patricia trueman.*Nutritional Biochemistry*. MJP publisher, 2011.
3. Veerakumari L. *Biochemistry*. MJP Publishers, 2010.

Reference Books:

1. Dr. Deb A.C. Concepts of *Biochemistry.*Kolkatta:New Central Book Agency, 2001.
2. Powar C.B, Chatwal G.R, *Biochemistry.* Himalaya Publishing Ltd, 2002.

SEMESTER - I			
Ability Enhancement Course -Value Education			
Code : 21UAVE11	**Hrs/Week : 2**	**Hrs / Semester: 30**	**Credits : 2**

Unit I: Introduction to Value Education

Concept of Values -Types of Values- Approaches to values - Benefits of Value Education-Characteristics of Values

Unit II: Human Values

Human Values -Sources of Human Values - Love -Compassion - Gratitude - Courage - Optimism - Forgiveness- the need and urgency to reinforce Human Values

Unit III: Social Values

Role of family and society in teaching values - Role of educational institutions in inculcating values-Three general functions of education for society-Self-Reflection- Our society's needs - Social Responsibilities of a student

Unit IV: Spiritual Values

Spiritual Values - Spiritual Development -Moral Development - Importance of Spiritual Values - Cultivation of Spiritual Values -Five most common spiritual values - Spiritual Resources

Unit V: Values for Life Enrichment

Goal Setting - Building relationship **-** Friendship - Love relationship - Family relationship - Professional relationship Interpersonal Relationship -Essential Life Skills that Help in Students Future Development-Life Enrichment Skills Domain

Books for Reference:

1. Sneha M. & K. Pushpanadham Joshi. *Value Based Leadership in Education Perspective and Approaches*, Anmol Publications Pvt. Limited, 2002.
2. Venkataiah.N. *Value Education*, APH Publishing, 1998
3. Pramod KumarM.*A Handbook on Value Education*, Ramakrishna Mission Institute of Culture (RMIC) 2007
4. Jagdosh Chand.*Value Education*. Shipra Publication 2007
5. Indrani Majhi (Shit)Ganesh Das, *Value Education*, Laxmi Publication Pvt. Ltd., 2017
6. Arumugam, N. S. Mohana, Lr.Palkani, *Value Based Education*, Saras Publication 2014

SEMESTER - II			
Part -1 பொதுத்தமிழ் - தாள் 2 சமய இலக்கியங்களும் நீதி இலக்கியங்களும் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, வாழ்க்கை வரலாறு)			
Course Code: 21ULTA21	**Hrs/Week:6**	**Hrs/ Semester : 90**	**Credits :3**

Objectives:

- வாழ்வியல் நன்னெறிகளான மனிதநேயம், சமத்துவம் போன்றவற்றை வளர்த்துக் கொள்ளக் கற்றுக் கொடுத்தல்
- அறநெறியைக் கடைப்பிடிப்பதே நிலையானதும் நீடித்ததுமான நன்மையைத் தருவது என்பதைச் சான்றோரின் வாழ்க்கை நெறிகள் மூலம் உணரச்செய்தல், மொழி அறிவு, இலக்கிய அறிவு இவற்றை வளர்த்துக் கொள்ளக் கற்றுக் கொடுத்தல்

Course Outcome

Co.No.	**இப்பாடத்திட்டம் மாணவியருக்கு**	**அறிவுசார் மதிப்பீடு**
CO-1	இறை ஆற்றலை உணர்ந்துகொள்ள உதவுகிறது	மதிப்பீடு
CO-2	நல்ல நண்பர்களையும் நல்ல மனிதர்களையம் இனம் கண்டுகொள்ள வழி வகுக்கிறது.	நடைமுறைப்படுத்துதல்
CO-3	அன்பு, இரக்கம், நற்சொல், நற்செயல் போன்ற நற்பண்புகளோடு வாழ வழி வகுக்கிறது.	மதிப்பீடு
CO-4	மனித நேய பண்புகளோடு வாழ்ந்த சான்றோரின் அனுபவங்களைப் பெற்றுக்கொள்ள உதவுகிறது	நடைமுறைப்படுத்துதல்
CO-5	மொழியைப் பிழையின்றி பேசவும் எழுதவும் பயன்படுகிறது	புரிதல், திறன் மேம்பாடு
CO-6	தனிமனித வாழ்க்கைச் சிக்கல்களையும் பிரச்சனைகளையும் எதிர்கொள்ளும் ஆற்றலை உருவாக்குகிறது.	நடைமுறைப்படுத்துதல், திறன் மேம்பாடு
CO-7	இறைவன் முன் அனைவரும் சமம் என்ற சிந்தனையை உருவாக்குகிறது.	மதிப்பீடு
CO-8	போட்டித்தேர்வுகளுக்குப் பயன்படும் வகையில் படைப்பாக்கத் திறனை வளர்க்க உதவுகிறது.	படைப்பாற்றல்

SEMESTER - II			
Part -1 பொதுத்தமிழ் - தாள் 2 சமய இலக்கியங்களும் நீதி இலக்கியங்களும் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, வாழ்க்கை வரலாறு)			
Course Code: 21ULTA21	**Hrs/Week:6**	**Hrs/ Semester : 90**	**Credits :3**

அலகு - 1 செய்யுள் - 2 மணி

சமய இலக்கியங்கள்

இறைவணக்கம் - திருநாவுக்கரசர்

சைவம் 1. தேவாரம் - திருஞான சம்பந்தர், திருநாவுக்கரசர், சுந்தரர்

2. திருவாசகம் - மாணிக்கவாசகர்

3. திருமந்திரம் - திருமூலர்

4. திருப்புகழ் - அருணகிரி நாதர்

வைணவம்: 1. திருப்பாவை - ஆண்டாள்

2. திருவாய்மொழி- நம்மாழ்வார்

பௌத்தம்: மணிமேகலை - சீத்தலைச் சாத்தனார்

கிறித்தவம்: 1. தேம்பாவணி - வீரமாமுனிவர்

2. இயேசு காவியம் - கவிஞர் கண்ணதாசன்

இசுலாமியம்: பேட்டை ஆம்பூர் அப்துல் காதிர் சாகிபு பாடல் - சக்கறாத்து நாமா

நீதி இலக்கியங்கள்

1. திருக்குறள் - ஊக்கமுடைமை
2. நாலடியார் - 1. நன்னிலைக் கண்

2. உறங்கும் துணையது
3. பழமொழி நானூறு- 1. பொல்லாத சொல்லி

2. வருவாய் சிறிதெனினும்

அலகு - 2 இலக்கணம் - 1 மணி

1. சொல்லின் பொது இலக்கணம்
2. ஓரெழுத்து ஒருமொழி, சொல்லின் வகைகள்
3. பெயர்ச்சொல் - அறுவகைப் பெயர்கள்
4. வினைச்சொல் - வகைகள்- முற்று, எச்சம், ஏவல், வியங்கோள், செய்வினை, செயப்பாட்டுவினை, தன்வினை, பிறவினை
5. இடைச்சொல் - ஏகார, ஓகார, உம்மை இடைச்சொற்கள்

6. உரிச்சொல் - இலக்கணம், வகைகள்

மொழிப்பயிற்சி – ஒலி வேறுபாடு அறிதல்

அலகு - 3 இலக்கிய வரலாறு – 1 மணி

1. சைவ இலக்கியங்கள்
2. வைணவ இலக்கியங்கள்
3. கிறித்தவம் தமிழுக்குச் செய்த தொண்டு
4. இசுலாமியம் தமிழுக்குச் செய்த தொண்டு
5. பதினெண் கீழ்க்கணக்கு நூல்களில் 11 அறநூல்கள்

அலகு - 4 உரைநடை - 1 மணி

நிறைவான வாழ்க்கைக்கு நேரம் ஒதுக்குங்கள் - ஜே.மௌரஸ்

(10 முதல் 19 வரை உள்ள கட்டுரைகள்)

அலகு – 5 வாழ்க்கை வரலாறு - 1 மணி

மனிதமே புனிதம் - சுடர்ந்தெழு - முனைவர் அருட்சகோதரி ஆ.மரிய சாந்தி

I B.A., / B.Sc Part I FRENCH

SEMESTER – II			
PART – I French Paper – II Intermediate French Course			
Course Code :21ULFA21	**Hrs/week : 6**	**Hrs/ Sem : 90**	**Credits : 3**

Objectives

To develop and improve upon the acquisition of four competencies of language learning.

To motivate the learner through role plays as to create real life situations. To prepare her for the real communication challenges.

Course Outcomes

CO	At the end of this course, the students will be able to	CL
1.	talk about her activities, hobbies	Kn, Ap
2.	ask and say time	Ap, Cr
3.	fix, accept or refuse a meeting	Kn, Ap, Cr
4.	talk about her family and describe a character	Kn, Un
5.	describe and give information about a lodging	Ap
6.	express her preferences	Ap, Un
7.	write a formal mail and a postcard	Cr, Ap
8.	express emotions and surprise	Ap
9.	get a gist of the French literature	Kn, Un

SEMESTER – II			
PART – I French Paper – II Intermediate French Course			
Course Code :21ULFA21	**Hrs/week : 6**	**Hrs/ Sem : 90**	**Credits : 3**

Unit 1 – C'est quoi le programme ?

1.1 –Parler de ses activités quotidiennes
1.2 – Demander/ Dire l'heure
1.3 – Proposer/ fixer / accepter ou refuser un rendez-vous.
1.4 – Réserver par téléphone
1.5 – Créer un mini-article sur un loisir

Unit 2 – Félicitations !

2.1 – Comprendre un arbre généalogique
2.2 – Présenter sa famille
2.3 – Féliciter / adresser un souhait
2.4 – Décrire le physique et le caractère d'une personne
2.5 – Créer les personnages d'une famille pour un film

Unit 3 – Chez moi

3.1 – Comprendre un état des lieux simple
3.2 – Se renseigner sur un logement
3.3 – Comprendre un règlementintérieur d'immeuble
3.4 – Exprimer des règles de vie commune
3.5 – S'excuser dans un message

Unit 4 – Bonnes vacances

4.1 – Comprendre un site de réservation en ligne
4.2 – Exprimer la préférence / Hésiter
4.3 – Ecrire un mail formel / une carte postale
4.4 – Exprimer des sensations, une émotion positive, la surprise
4.5 – Ecrire une liste de voyage

Unit 5 – Le texte littéraire

5.1. Le Petit Prince (Chapitre 1) - Antoine de Saint Exupéry
5.2. La colombe poignardée et le jet d'eau – Calligramme - Guillaume Apollinaire

PrescribedTextbook :

Céline Braud, Aurélien Calvez, Guillaume Cornuau, Anne Jacob,Sandrine Vidal, Cécile Pinson, Marion Alcaraz. *Edito A1Méthode de français*. Paris : Didier, 2016.

Céline Braud, Aurélien Calvez, Guillaume Cornuau, Anne Jacob,Sandrine Vidal, Cécile Pinson, Marion Alcaraz. *Edito A1 Cahier d'exercises*. Paris : Didier, 2016.

Books, Journals and Learning Resources

- J.Girardet&J.Pécheur avec la collaboration de C.Gibble.*Echo A1*. Paris : CLE International, 2012.
- Carlo Catherine, Causa Mariella.*Civilisation Progressive du Français – I.* Paris : CLEInternational, 2003.
- Cocton Marie-Noëlle.*Génération 1 Niveau A1, Méthode de français et cahier d'exercices*.Paris : Didier, 2016.
- Dintilhac Anneline, De Oliveira Anouchka, Ripaud Delphine, DupleixDorothée, Cocton Marie-Noëlle.*Saison 1 Niveau 1, Méthode de français et cahier d'exercices*. Paris : Didier, 2015
- Apollinaire Guillaume, *Calligrammes :Poèmes de la paix et de la guerre 1913-1916*.Paris: Gallimard, 1966.
- Antoine de Saint-Exupéry.*Le Petit Prince*. Paris : Gallimard, 2007.
- www.francaisfacile.com/exercices/
- www.bonjourdefrance.com

SEMESTER-II			
Part II General English	**Poetry, Prose, Extensive Reading and Communicative English –II**		
Course Code 21UGEN21	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

Objectives

- To help students realise how life, literature and language are closely connected
- To expose students to language skills through the core subjects

Course Outcome:

CO.No.	**Upon completion of this course, students will be able to**	**Cognitive Level**
CO-1	comprehend passages.	Un
CO- 2	build effective communication skills.	Un
CO- 3	demonstrate improved oral fluency.	Un
CO- 4	use vocabulary through the study of word parts.	Ap
CO- 5	construct paragraphs and essays through prose writings.	An
CO- 6	develop the skills of interpretation, critical thinking, and clear writing.	An
CO- 7	make use of context clues and analyse poetic content and correlate to experiences.	An
CO- 8	support future academic study by developing a high social, aesthetic and cultural literacy.	Cr

SEMESTER-II			
Part II General English	**Poetry, Prose, Extensive Reading and Communicative English–II**		
Course Code: 21UGEN21	**Hrs/Week: 6**	**Hrs/Semester:90**	**Credits:3**

Unit I –Poetry

William Wordsworth – Resolution and Independence

Henry W. Longfellow – Psalm of Life

Toru Dutt – The Lotus

Unit II – Prose

A.G. Gardiner – On Courage

Desmond Morris – A Little Bit of What You Fancy

Kalpana Chawla – The Sky is the Limit

Unit III – Short Story

Saki – Mrs. Packletide's Tiger

Liam O'Flaherty – The Sniper

Langston Hughes – Thank You Ma'am

Unit IV – Grammar

Tenses: Present, Past and Future

Unit V- Communication Skills

Listening, Reading, Pronunciation, Key Functions, Speaking (TANSCHE - Module - II)

Text Books:

Units I-III – To be compiled by the Research Department of English

Unit – IV - Joseph, K.V. *A Textbook of English Grammar and Usage*. Chennai: Vijay Nicole Imprints Private Limited, 2006.

Unit - V – CLIL (Content & Language Integrated Learning) – Module II by TANSCHE (Tamil Nadu State Council for Higher Education)

SEMESTER- II			
Part III	**Core II**	**General Chemistry-II**	
Course Code :21UCHC22	**Hrs/Week:6**	**Hrs/ Sem: 90**	**Credits:5**

Objectives

- To recall the basic methods of purification of ores.
- To understand the basic concepts of Stereochemistry.
- To know the importance of halogen compounds.
- To have an idea about the properties of alkenes, alkynes and aromatic substitution.
- To acquire knowledge in colligative properties.

Course Outcomes

CO No.	Upon completion of this course, students will be able to	PSOs addressed	CL
CO 1	recall the methods of purification of ores	1	Re
CO 2	understand the concept behind the different types of furnaces	1	Un
CO 3	explain the general characteristics and digital relationship of alkali and alkaline earth metals	2	Un
CO 4	discuss the preparation and uses of some alkali and alkaline earth metal compounds	3	Un
CO 5	interpret the elements of symmetry, chirality, Newman projection ,Sawhorse & Fischer formulae Know about the conformational analysis	1	Un
CO 6	apply the Cahn Ingold Prelog rule for ascertaining the geometric configuration (cis or trans and/or E or Z)	2	Un
CO 7	predict the mechanism of aromatic substitution reactions and effect of o,m& p directing group and discriminate terminal & non-terminal alkynes, the acidic nature of acetylenic hydrogen	3, 6	Cr An
CO 8	apply the principle of colligative properties in day to day life like kidney dialysis, reverse osmosis and know the experimental methods of determining the colligative properties	4	Re Ap

UNITI: General Principles of Extraction of Metals

Minerals and ores -different steps of metallurgy – crushing and grinding of the ore – concentration of the ore – hand picking - gravity separation (Hydraulic Washing) -

electromagnetic separation – electrostatic separation – froth flotation process – leaching-calcination – roasting –difference between calcination and roasting – reduction to free metals – reduction by displacement, thermal decomposition, carbon (smelting), heating in air, an electro positive metal (Gold Schmidt's aluminothermic process) – Kroll's process. Refining of impure metals – thermal refining - distillation, liquation – vapour phase refining - Van Arkel process - Mond's process- electrolytic process- zone refining process. Elingham diagram- Types of furnaces – Fuel fired – blast, reverberatory, vertical retort and muffle – Electric furnace – Arc furnaces – types - resistance furnace.

UNIT II: s and p Block Elements

General characteristics of IA and IIA group elements – diagonal relationship of lithium with magnesium – anomalous behaviour of lithium and beryllium – extraction of lithium and beryllium. Sodium carbonate and sodiumbicarbonate – manufacture – properties and uses – principle of fire extinguisher.Boron – classification and nomenclature of boron hydrides – preparation, structure and uses of diborane – boron trihalides as Lewis acid – relative strength of boron trihalides. Oxo compounds of boron – ortho boric acid – preparation, properties and uses Borax bead test. Carbides – Classification with examples – Preparation, Properties, uses and structure of Calcium Carbide, Boron Carbide, Aluminium Carbide and Silicon Carbide –Preparation, Properties and uses of Carbonyl Chloride and Carbon disulphides.Halogens - Peculiarities of fluorine – manufacture of fluorine – etching on glass. Hydrides of halogens (hydrogen halides) - Interhalogen compounds – preparation and structure of interhalogen compounds. Pseudohalogenpolyhalides and basic nature of iodine.

UNIT III: Stereochemistry

Stereoisomerism – Optical activity of compound with one and two chiral centres. Elements of symmetry – Plane of symmetry, axis of symmetry and centre of symmetry.

Enantiomers and diastereo isomers (d, 1 and meso forms) with examples – asymmetric and dissymmetric molecules.

Conventions used in stereochemistry: Newman, Sawhorse and Fischer notations and their interconversions.

Cahn Ingold Prelog conversion DL and RS configuration.-notations for compounds containing more than one asymmetric C-atoms racemisation and methods of resolution of racemic mixture – Walden inversion – Stereochemistry of diphenyl compounds and allenes with examples. Geometrical isomerism – Definition – cis – trans and syn – anti concept E-Z notation. conformational analysis of cyclohexane.

UNIT IV: Hydrocarbons and Halogen Compounds

Alkenes – Mechanism of addition reaction to alkenes – Markanikow's rule- Peroxide effect epoxidation – ozonolysis. Dienes Classification –Conjugated dienes –(1,2 &1,4-addition)- Diel's Alder reaction. Alkynes – terminal & non-terminal alkynes – acidic nature of acetylenic hydrogen atom. Aromatic hydrocarbon- Concept & Condition – Huckel's Rule-Aromatic, antiaromatic & non- aromatic compounds – Mechanism of aromatic electrophilic & Nucleophilic substitution reactions- Orientation (Electronic concept) – direct influence of substitution o,m & p directing – Benzyne mechanism.

Aliphatic halogen compounds –Mechanism of S_N1, S_N2, E1, E2 reaction – Halogen derivatives- Preparation and properties of Vinyl chloride – Allyl chloride – Preparation & uses of Chloroprene- Aromatic halogen compounds – Preparation and reaction of benzyl chloride – Nuclear & Side chain halogen compounds distinction- relative reactivities of alkyl,aryl, vinyl and allyl halides.

UNIT V: Colligative Properties

Definition- lowering of Vapour Pressure-- Raoult's Law - measurement of vapour pressure lowering-– Ostwald and Walker's Dynamic method – Elevation of boiling point and its determination- Landsberger –walker method. Depression of freezing point and its

determination –Rast's Camphor method –Abnormal molecular masses of electrolytes –

Relation between Van't Hoff factor and degree of association and dissociation

Osmosis-Definition - -Some Interesting Experiments Demonstrating Osmosis-Silica Garden- Semipermeable Membranes -Preparation of Cupric Ferrocyanide Membrane - Osmotic Pressure -Kidney Dialysis-Determination of Osmotic Pressure-Berkeley And Hartley's Method –Modern Osmometer –Isotonic Solutions -Theories of Osmosis - Membrane Solution Theory -Vapour Pressure Theory- Reverse Osmosis-Desalination of Sea Water By Hollow-Fibre Reverse Osmosis-Nanotube Membranes- Laws of Osmotic Pressure –Boyle Van't Hoff Law For Solutions - Charles'-Van't Hoff Law For Solutions- Van't Hoff Equation For Solutions -Avogadro-Van't Hoff Law For Solutions -Van't Hoff Theory of Dilute Solutions - Calculation of Osmotic Pressure-Determination of Molecular Weight – Relation Between Vapour Pressure And Osmotic Pressure Osmotic Pressure of Electrolytes.

Text Books:

1. Puri B.R, Sharma L.R, Kalia K.C . *Principles of Inorganic Chemistry*.Delhi:Milestone Publishers and distributers, 2010.
2. Tewari K.S, Vishnoi N.K, Mehrotra S.N . *A Text Book of Organic Chemistry*. 2nd Revised Editions, 1998.
3. Kalsi P.S .*Stereochemistry Conformation and Mechanism*.New Age International, 2005.
4. ArunBahl, Bahl B.S, Tuli G.D . *Essentials of Physical Chemistry*.New Delhi:S.Chand and Company Ltd.,Revised edition 2008.

Books for Reference:

1. Puri B.R, Sharma L.R, Madan Pathania S. *Principles of Physical Chemistry*. Vishal Publishing Co. 2008.
2. Arun Bahl and Bahl B.S. *Advanced Organic chemistry*.S.Chand and Company Ltd. Reprint, 2005.
3. Tewari N. *Advance Organic Reaction mechanism*.Kolkata: Books and allied (P) Ltd.Second revised edition 2005.
4. Jain M. K and Sharma S. C. *Modern Organic Chemistry*. Vishal Publishing Company, 2008.

SEMESTER I & II			
Core Practical I	**Quantitative Analysis**		
Course Code : 21UCHCR1	**Hrs/Week : 2**	**Hrs/ Sem : 30**	**Credits : 2**

QUANTITATIVE ANALYSIS (VOLUMETRIC METHODS)

A double titration involving the preparation of a primary standard, standardization of the link solution, making up of the given solution and its estimation. Concepts of acids, bases, oxidants, complex formation — Theory of Indicators. (Use of digital balance is permitted).

TITRIMETRIC QUANTITATIVE ANALYSIS:

	Substance to be estimated	**Primary Standard**
I Acidimetry and alkalimetry.	1. NaOH/ Na_2CO_3	Na_2CO_3
	2. HC1/H_2SO_4 /oxalic acid	Oxalic acid
II Permanganometry	3. Oxalic acid	Oxalic acid
4. Mohr's salt	Mohr's Salt	
	5. Fe^{2+} Mohr's Salt	
III Dichrometry - External indicator method		
	6. Fe^{2+} Mohr's Salt	
IV Iodometry	7.$CuSO_4$ /$K_2Cr_2O_7$	$K_2Cr_2O_7$
	8. $KMnO_4$	$CuSO_4$
V Complexometry	9. Zn^{2+}	$ZnSO_4.7H_2O$
	10. Pb^{2+} $Pb(NO_3)_2$	
	11. Mn^{2+}	$MnSO_4.H_2O$
	12. Ni^{2+}	$ZnSO_4.7H_2O$

VI Estimation of Phenol /Aniline

VIICourse work (Not for external examination)

1. Estimation of acetic acid in vinegar samples.

2. Estimation of oxalate content in vegetables and fruits such as tomato, guava, grapes, etc.
3. Estimation of sodium carbonate and sodium Bicarbonate in a mixture.
4. Estimation of Total Hardness of water.

BOOKS FOR REFERENCE:

1. Arthur D. Vogel.*Vogel's Textbook of Quantitative Chemical Analysis*. Longman's Green & Co Ltd, London, sixth Edition2004.
2. RaghupatiMukhopadhyay, Pratul Chatterjee.*Advanced Practical Chemistry*. Books and Allied (P) Ltd., Third Edition 2007.

SEMESTER II			
Skill Enhancement Course – II Professional English for Chemistry - II			
Course Code: 21UCHPE2	**Hrs/Week : 2**	**Hrs/ Sem : 30**	**Credits : 2**

Objectives:

- To elevate the students creativity and innovation skills.
- To mould the students to develop employability skills.
- To enhance the mind flexibility to meet the workplace competence.
- To improve the writing reports and language skills.

Course Outcomes

CO No.	Upon completion of this course, students will be able to	PSOs addressed	CL
CO 1	discuss with the groups effectively.	9,10	Un
CO 2	understand the importance of writing English.	9,10	Un
CO 3	express the Language without fear.	9,10	Un
CO 4	adapt easily into the workplace environment.	9,10	An
CO 5	inculcate the real values of English and to identify the hidden potential of their own competence.	9,10	Ap, Re
CO 6	familiar with the comprehensional activities and exercises.	9,10	An
CO 7	attend the interview with boldness and enthusiastically.	9,10	Cr
CO 8	know about the impact of English in education.	9,10	Re

Unit 1: Communicative Competence

Listening – Listening to two talks/lectures by specialists on selected subject specific topics - (TED Talks) and answering comprehension exercises (inferential questions).

Speaking: Small group discussions (the discussions could be based on the listening and reading passages- open ended questions.

Reading: Two subject-based reading texts followed by comprehension activities/exercises

Writing: Summary writing based on the reading passages.

Nano technology and applications, Natural and Artificial dyes, Green chemistry and its applications.

Unit 2: Persuasive Communication

Listening: Listening to a product launch- sensitizing learners to the nuances of persuasive communication.

Speaking: Debates – Just-A Minute Activities.

Reading: Reading texts on advertisements (on products relevant to the subject areas) and answering inferential questions.

Writing: Dialogue writing- writing an argumentative /persuasive essay.

Process of photosynthesis- Alchemist - Periodic table for Chemist, Cements.

Unit 3: Digital Competence

Listening to interviews (subject related)

Speaking: Interviews with subject specialists (usingvideo conferencing skills)

Creating Vlogs (How to become a vlogger and use vlogging tonurture interests – subject related)

Reading: Selected sample of Web Page (subject area)

Writing: Creating Web Pages.

Reading Comprehension: Essay on Digital Competence for Academic and Professional Life.

The essay will address all aspects of digital competence in relation to MS Office and how they can be utilized in relation to work in the subject area.

Polymers - Applications of Spectroscopy -fly ash bricks, Composites, Chemistry – The Central Science.

Unit 4: Creativity and Imagination

Listening to short (2 to 5 minutes) academic videos (prepared by EMRC/ other MOOC videos on Indian academic sites .

Speaking: Making oral presentations through short films – subject based

Reading: Essay on Creativity and Imagination (subject based)

Writing – Basic Script Writing for short films (subject based)

- Creating blogs, flyers and brochures (subject based)
- Poster making – writing slogans/captions(subject based)

Photochemistry, Environmental Chemistry, Glass, Abrasives

Unit 5: Workplace Communication& Basics of Academic Writing

Speaking: Short academic presentation using PowerPoint.

Reading & Writing: Product Profiles, Circulars, Minutes of Meeting.

Writing an introduction, paraphrasing.

Punctuation(period, question mark, exclamation point, comma, semicolon, colon, dash, hyphen, parentheses, brackets, braces, apostrophe, quotation marks, and ellipsis)

Capitalization (use of upper case)

Role of Chemist,Antibiotics, Industrial Chemistry, Paints.

References:

1. https://www.nano.gov/you/nanotechnology-benefits
2. https://www.google.com/search?q=natural+and+artificial+dyes&rlz=1C1CHBD_enIN868IN868&oq=natural+and+artificial+dyes&aqs=chrome..69i57j0i22i30l3j0i390l2.1894j0j7&sourceid=chrome&ie=UTF-8
3. https://en.wikipedia.org/wiki/Photosynthesis
4. https://en.wikipedia.org/wiki/Periodic_table
5. https://www.psd1.org/cms/lib/WA01001055/Centricity/Domain/30/The_Spirit_of_Chemical_Science.pdf
6. https://en.wikipedia.org/wiki/The_Alchemist_(novel)
7. https://www.livescience.com/60682-polymers.html#:~:text=Polymers%20are%20materials%20made%20of,tough%2C%20like%20epoxies%20and%20glass.
8. https://en.wikipedia.org/wiki/Pharmaceutical_industry

SEMESTER-II			
Part III Allied - I	**Allied Mathematics-II**		
Course Code : 21UMAA21	**Hrs/Week: 6**	**Hrs/Sem: 90**	**Credits: 4**

Vision:

Aims to help physical science students to achieve their goals and to develop their mathematical skills.

Mission:

To help students to appreciate the uses of derivatives and integrals in day today life and solve real life problems.

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	POs addressed	CL
CO-1	Identify the difference between partial differential equation and ordinary differential equation	2	An
CO-2	Classify various types of partial differential equations and form the partial differential equation	1	Un
CO-3	Solve differential equations using Laplace transform	2	An
CO-4	Use the Jacobian to change variables to ease integration	3	An
CO-5	Set up the regions and integrate double integrals in rectangular and polar coordinates.	8	Ev
CO-6	Use Green's theorem to evaluate line integrals along simple closed contours of the plane	1	Cr
CO-7	identify and understand the concept of Beta integrals and Gamma integrals	3	Ap
CO-8	Use Stoke's and divergence theorem to give a physical interpretation of curl and divergence of a vector field	5	Ap

PSO ADRESSED: UG DEPARTMENT OF MATHEMATICS

Semester –II			
Part III Allied – I	**Allied Mathematics – II**		
Course Code : 21UMAA21	**Hrs/week :6**	**Hrs/Sem :90**	**Credits :4**

Unit I

Partial differential equation –first order formation - types of solutions - four standard forms - Lagrange's form

Unit II

Laplace transforms - inverse Laplace transform - application to solution of differential equations (except simultaneous equations)

Unit III

Jacobian – Vector Integration –Line Integral, Surface Integral

Unit IV

Vector integration - Volume integrals-Verification of Green's, Stoke's and Gauss Divergence theorems (simple problems only).

Unit V

Evaluation of integrals using Beta and Gamma functions

Text Book

S.Arumugam and Issac, Allied Mathematics, New Gamma Publishing House, Palayamkottai

Reference Books

1. Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., **Ancillary Mathematics Volume – I**, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010

2. Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., **Ancillary Mathematics Volume – II**, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010.

SEMESTER II			
Part III Allied - I	**Allied Biochemistry –II**		
Course Code: 21UCBA21	**Hrs/Week : 4**	**Hrs/ Sem : 60**	**Credits : 3**

OBJECTIVES:

- To achieve broad based knowledge in concepts and principles of biochemistry.
- To provide an opportunity in acquiring knowledge about nutritional biochemistry.
- To understand the various pathways involved in cell respiration.
- To grasp in-depth knowledge about the biochemistry of blood and respiration.
- To familiarize the learners with the techniques involved in biochemistry.

Course Outcomes

CO No.	Upon completion of this course, students will be able to	PSOs addressed	CL
CO 1	discuss in detail about the nutritional values of milk, egg, meat, fish, vegetable foods, fruits, tea, coffee, cocoa and alcohol.	1	U
CO 2	demonstrate the theories of biological oxidation decarboxylation, electron transport system and oxidative phosphorylation.	5	C
CO 3	describe the functions of blood and to discuss in brief about red blood cells, white blood cells, blood platelets, plasma and plasma protein.	1	An
CO 4	formulate how the minerals are important in our life.	1	U
CO 5	relate the physical and chemical transport of blood.	1	U
CO 6	interpret the various minerals and their recommended levels in food.	2	R
CO 7	compare the relation between optical and electron microscope.	1	E
CO 8	identify the separated components using paper as well as gel electrophoresis.	6	Ap

SEMESTER II			
Part III Allied - I	**Allied Biochemistry –II**		
Course Code: 21UCBA21	**Hrs/Week : 4**	**Hrs/ Sem : 60**	**Credits : 3**

UNIT I: Nutritional Biochemistry

Nutritive value ofMilk – Egg – Meat - Fish – Vegetable food (Cereals, Pulses, Nuts, Roots and Tubers, Green leafy vegetables) – Fruits – Tea – Coffee – Cocoa – Alcohol – Principles in balancing a diet - Bioavailability – absorption –effect of drugs on food intake, body weight, nutrient requirements and growth, vitamins and minerals – Energy yielding, Body building and Protective foods.

UNIT II: Cell Respiration and Biological Oxidation

Introduction – Importance of Biological oxidation – Theories of biological oxidation : oxygen activation theory, hydrogen activation theory – Hydrogen acceptors – Nicotinamide nucleotide – Flavin nucleotide – Cytochrome – Sites – Pathways – Oxidative decarboxylation – Electron transport system – Oxidative Phosphorylation – Energetics of Biological oxidation.

UNIT III: Biochemistry of Blood

Introduction –Composition -Colour of Blood - Functions of Blood – (Homeostatic functions, Blood as transport system)- Red Blood Cells – White Blood Cells– Blood Platelets – Plasma – Plasma proteins – Albumin, Globulin (alpha, beta and gamma), Fibrinogen – Functions of plasma proteins - Blood groups – Prevention of Blood Loss -Hemoglobin – Variation in structure Hemoglobin with reduced solubility, altered oxygen affinity.

UNIT IV: Minerals

Introduction – Classification (Macro elements, Micro elements) –Functions, Distribution, Content level in blood , sources, Recommended Dietary allowances, Absorption and excretion, Factors affecting absorption, Deficiency Disease of Calcium, Phosphorous, Sodium, Potassium, Iron, Copper, Iodine, Fluorine, Zinc and Chromium.

UNIT V: Biochemical Techniques

Introduction –Cell Fractionation (Homogenization, Centrifugation) - Centrifuge – Principle, types – Hand Centrifuge, High Speed Centrifuge – pH meter – Principle, Electrodes used, Applications – Microscopy: Optical and electron Microscope – comparison – Ion probe analysis – Electrophoresis – Paper electrophoresis, Gel electrophoresis – Applications.

Text Books:

1. Dulsy Fatima, Narayanan L.M, MeyyanPillai R.P, Nallasingam K, Prasanna Kumar S and Arumugam N. *Biochemistry*. Saras Publications, 2010.
2. Patricia trueman.*NutritionalBiochemistry*. MJP publisher, 2011.
3. Veerakumari L. *Biochemistry*. MJP Publishers, 2010.

Reference Books:

1. Dr. Deb A.C.*Concepts of Biochemistry.*Kolkata: Central Book of Agency, 2001.

2. Powar C.B, Chatwal G. R. *Biochemistry*. Himalaya Publishing Ltd, 2002.

SEMESTER I & II			
Allie Practical – I	**Allied Biochemistry Practical**		
Course Code:21UCBAR1	**Hrs/Week : 2**	**Hrs/ Sem : 30**	**Credits : 1**

OBJECTIVE:

- To train the students to get a clear idea on qualitative analysis of biomolecule.
- To understand the volumetric analysis estimation of biomolecule.
- To know the basic concepts of saponification number and pH metre.

Qualitative and Quantitative Analysis

Analysis of Simple Biomolecule

I. Qualitative analysis of carbohydrates.
II. Qualitative analysis of amino acids.
III. Colour reactions of Proteins.

Volumetric Analysis

I. Estimation of Glycine by formal titration.
II. Estimation of Ascorbic acid.
III. Estimation of Protein by Biuret method.
IV. Determination of Saponification number of oil.
V. Estimation of Carbohydrate by anthrone method.
VI. Preparation of Buffer and Determination of its pH using pH meter.

BOOKS FOR REFERENCE:

1. Arthur D. Vogel.*Vogel's Textbook of Quantitative Chemical Analysis*.sixth Edition. 2004.

2. RaghupatiMukhopadhyay, PratulChatterjee. *Advanced Practical Chemistry*. Books and Allied (P) Ltd., Third Edition.2007.

SEMESTER I			
Part III Allied - I	**ALLIED CHEMISTRY -I**		
Course Code: 21UCHA12	**Hrs/Week : 4**	**Hrs/ Sem : 60**	**Credits : 3**

Objective:

- To develop an appreciation of Chemistry and its application in daily life.
- To understand the importance of quantum numbers.
- To know the fundamental concepts in organic chemistry.
- To know the basic concepts of nuclear reactors.
- To recognize the significance of electrochemical reactions.
- To understand the basic concepts of chemical kinetics and photochemistry.

Course Outcomes

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO 1	Know the quantum numbers and electronic configuration.	**1**	**Un**
CO 2	Compare the configuration of H_2,N_2 ,O_2.	**2**	**Ap**
CO 3	understand hybridization of different organic molecules.	**1**	**Un**
CO 4	Differentiate resonance and tautomerism.	**1**	**An**
CO 5	know the difference between chemical reaction and nuclear reaction.	**1**	**Re**
CO 6	Identify the importance of rock dating and carbon dating and importance of pH in biological systems	**3**	**An**
CO 7	Describe the different types of electrochemical cell.	**5**	**Un**
CO 8	Understand the laws of photochemistry&identify the types of photochemical reaction.	**1, 3**	**Un,An**

UNIT I: Atomic Structure and Chemical Bonding

Quantum numbers and their significance- Pauli's exclusion principle – Aufbau principle – Hund's rule – Electronic configuration of elements (atomic number 1 to 36)

Lattice energy – Born-Haber cycle–Factors affecting the dissolution of ionic compounds – M.O. Theory of covalent bond – Bonding, antibonding and non bonding orbital – M.O. Configuration of H_2,N_2 ,O_2-Bond order – Band theory of metallic bond- Conductors, insulators, semi conductors- Hydrogen bonding – types and effects – Vander Wall's London forces.

UNIT II: Basic Concepts in Organic Chemistry

Hybridization -Hybridization in methane(sp3), ethylene (sp2), acetylene(sp). electrophiles – nucleophiles –Types of organic reactions- Substitution – Addition – elimination- polymerization reactions.

Aromaticity - Huckel's rule - benzenoid and non-benzenoid- aromatic compounds- Examples.

Isomerism-Optical isomerism-symmetry-elements of symmetry-cause of optical activity- Resolution-racemisation- Geometrical isomerism-illustrated by maleic and fumaric acid-keto enol tautomerism-examples- difference between resonance and tautomerism.

UNIT III: Nuclear Chemistry

Fundamental particles of nucleus - isotopes, isobars, isotones and nuclear isomers. Differences between chemical reactions and nuclear reactions-fusion and fission and its applications - radioactive series, group displacement law- mass defect- Applications of radio isotopes-carbon dating-rock dating and medicinal applications.

UNIT IV: Electrochemistry

Specific Conductance, lonic Conductance, Molar Conductance, Equivalent Conductance, Ionic mobility -Definition of pH and its determination by colorimetric method - Buffer solution-Henderson's equation-Applications of pH and buffer in biological systems-Galvanic cells-EMF and electrode potential-reference electrodes-electrochemical series and its application-different types of cells -primary cell, secondary cell and fuel cell.

Applications of conductivity measurement (degree of dissociation of a weak electrolyte, solubility of a sparingly soluble salt in water, conductometric titration-Hydrolysis of salts (qualitative treatment only)

UNIT V: Chemical Kinetics and Photochemistry

Rate of chemical reaction-Differential rate expression-order and molecularity-integrated rate expression for first, second and zero order reactions(derivation)-Methods of determination of order of reaction-Half-life period-Flash photolysis.

Introduction to Photochemistry-Thermal and photochemical reaction-Laws of Photochemistry-Grotthus-Draper law, Beer-Lambert's Law-Stark-Einstein's law, Quantum efficiency – high and low quantum yield – Kinetics of hydrogen chlorine reaction - Photosynthesis –Phosphorescence- Fluorescence-Bioluminescence-Chemiluminescence-Definition with examples.

Text Books:

1. Arun Bahl and B.S. Bahl. *Advanced Organic Chemistry*.S.Chand and Company Ltd., Reprint, 2005.
2. Puri B.R, Sharma L.R. and Kalia K.C. *Principles of Inorganic Chemistry*.Delhi: Milestone Publishers and Distributers,2010.
3. Arun Bahl B.S. and Bahl, Tuli G.D. *Essentials of Physical Chemistry*.New Delhi: S.Chand&Company Ltd.,2008.

Books for Reference :

1. Jerry March. *Advanced Organic Chemistry. Reactions Mechanisms and Structure*. 4th

Edition, 2013.

2. Tewari N,Vishnoi K.S and Mehrotra S.N. *A Text Book of Organic Chemistry*. Vishal Publishing. 2nd Revised Edition, 1998.

3. Puri B.R, Sharma L.R. and Madan Pathania S. *Principles of Physical Chemistry*.Vishal Publishing Co., 2008.

4. Jain M.K. and Sharm S.C .*Modern Organic chemistry*. Vishal Publishing Co.,2012.

SEMESTER II			
Part IIIAllied - I	**Allied Chemistry -II**		
Course Code: 21UCHA22	**Hrs/Week :4**	**Hrs/ Sem : 60**	**Credits : 3**

Objectives:

- To acquire an appropriate knowledge and understanding in Chemistry underlying in metallurgical process and industrial important polymers.
- To know the steps involved in metallurgical process.
- To know the importance of colloids in day to-day life.
- To know the importance of synthetic reagents in organic chemistry.
- To appreciate the importance of error analysis in day today life.

Course outcomes

CO	Upon completion of this course, students	PSO	CL

No.	will be able to	addressed	
CO 1	Explain the methods of purification of ores and differentiate ores and minerals	**1**	**Un**
CO 2	Know the types of furnaces	**1**	**Re**
CO 3	Correlate the importance of colloids in day to day life	**5**	**An**
CO 4	Know the types of emulsions and emulsifiers	**1**	**Re**
CO 5	Know the importance of synthetic reagents	**1**	**Un**
CO 6	Know the importance of Saccharin-chloramine-T-Salicylic acid -Aspirin	**1**	**Un**
CO 7	Identify ideal and non-ideal mixtures and know the various partially miscible liquids	**4, 1**	**An, Un**
CO 8	Describe determinate and indeterminate errorsand classify accuracy and precision	**5, 3**	**An**

UNIT I: Metallurgy

Ores and Minerals- types of ores – methods of ore dressing- roasting –calcination, reduction of metal oxide by aluminium (aluminothermic process)-smelting- flux and slag -purification by electrolysis and ion exchange method – oxidative refining- zone refining- Kroll process - van Arkel de Boer method- types of furnaces – kilns – blast – reverberatory- muffle and electric furnace. Extraction, properties and uses of titanium and vanadium. Preparation of Titanium tetrachloride and Vanadium pentoxide

UNIT II: Colloids

Definition- Classification of Colloids –comparison of lyophilic and lyophobic colloids- Preparation of sols-Dispersion method(Bredig's Arc method) –Aggregation method(oxidation , reduction,double decomposition)-Properties – Optical(Tyndall effect) – kinetic(Brownian movement)Electrical (electrical double layer) – Coagulation of colloids –

Hardy Schulze law – protective colloids – gold number – Gels – classification, preparation properties(imbibition,synerisis and thixotropy). Emulsion – types and their distinctionEmulsifiers – surfactants– applications of colloids-food, medicine, thixotropic paints, clarification of municipal water, formation of delta.

UNIT III: Synthetic Reagents and Some Important Organic Compounds

Synthetic reagents-preparation and synthetic applications- diethyl zinc (Frankland reagent)-methyl lithium-diethyl malonate and tetra ethyl lead (TEL).

Preparation , properties and uses of Saccharin- chloramine-T-Salicylic acid –Aspirin

UNIT IV: Solutions

Liquids in liquids –completely miscible liquids- ideal and non-ideal mixtures-Raoult's law - distillation of homogenous binary liquid mixtures -Theory of fractional distillation – Azeotropic distillation.

Partially miscible liquids – Phenol-water (upper), Triethylamine-water (lower) and Nicotine-water systems (upper and lower)–Variation of solubility with temperature – vapour pressure of partially miscible liquids-critical solution(consolute) temperature - influence of impurity on CST and applications. Immiscible liquid systems- vapour pressure of mixtures of immiscible liquids- theory of steam distillation and its applications.

UNIT V: Analytical Chemistry

Mean – Median – Mode – Errors – Types of errors – Determinate errors and indeterminate errors – Precision – Methods of expressing precision – Average deviation from mean – Standard deviation – Relative standard deviation – Accuracy – Methods of expressing accuracy – Absolute error and relative error – Difference between precision and accuracy – Significant figures – Rounding off the numerical expression.

Text Books:

1. Arun Bahl and Bahl B.S. *Advanced Organic Chemistry*. S.Chand and Company Ltd. Reprint, 2005.

2. Puri, Sharma B.R, L.R. and Kalia K.C. *Principles of Inorganic Chemistry*.Delhi: Milestone Publishers and Distributers, 2010.

3. Arun Bahl B.S. and Bahl, Tuli G. D. *Essentials of Physical Chemistry*.New Delhi: S.Chand&Company Ltd., 2008.

Books for Reference :

1. Jerry March. *Advanced Organic Chemistry Reactions Mechanisms and Structure*. 4th Edition, 2013.

2. Tewari K.S, Vishnoi N.K. and Mehrotra S.N . *A Text Book of Organic Chemistry*. 2nd Revised Edition, 1998.

3. Puri B.R., Sharma L.R. and Madan S. Pathania. *Principles of Physical Chemistry.* Vishal Publishing Co., 2008.

4. Jain M.K. and Sharma S.C .*Modern Organic chemistry*. Vishal Publishing Co.,2012.

SEMESTER II/IV			
Allied Practical I	**Allied Chemistry Practicals**		
Course Code:21UCHAR1	**Hrs/Week : 2**	**Hrs/ Sem : 30**	**Credits : 1**

OBJECTIVE:

- To help students to acquire practical skill in qualitative and quantitative analysis

ORGANIC ANALYSIS:

Analysis of simple organic compounds

a) Nature of the compound- Aromatic / Aliphatic

b) Test for Saturation/ unsaturation.

c) Element present/absent - Nitrogen

d) Characterization of functional groups (Acid, phenol (solid), aldehyde, ester, amide, primary amine, carbohydrates).

VOLUMETRIC ANALYSIS

I. Acidimetry — Alkalimetry

1. Estimation of H_2SO_4 / HCl using standard oxalic acid.

2.Estimation of sodium hydroxide using standard sodium hydroxide.

3. Estimation of sodium carbonate using standard sodium carbonate.

II. Permanganometry

4. Estimation of ferrous ion using standard ferrous ammonium sulphate.

5. Estimation of sodium oxalate /oxalic acid using standard oxalic acid.

III. Complexometry

6. Estimation of Zinc using standard Zinc sulphate.

BOOKS FOR REFERENCE:

1. Vogel.*Vogel's Textbook of Quantitative Chemical Analysis.* sixth Edition, 2004.

2. Raghupati Mukhopadhyay, Pratul Chatterjee.*Advanced Practical Chemistry Books and Allied (P) Ltd.* Third Edition, 2007.

SEMESTER I			
Part III Allied - I	**Allied Chemistry -I**		
Course Code: 21UCH A11	**Hrs/Week :4**	**Hrs/ Sem : 60**	**Credits : 3**

Objective

- To develop an appreciation of Chemistry and its application in daily life.
- To understand the importance of quantum numbers.
- To know the fundamental concepts in organic chemistry.
- To know the basic concepts of nuclear reactors.
- To recognize the significance of Chromatography.
- To develop skills to separate the plant materials using Chromatographic technique.

Course Outcomes

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO 1	Know the quantum numbers and electronic configuration	**1**	**Un**
CO 2	Compare the configuration of H_2,N_2 ,O_2	**2**	**Ap**
CO 3	Understand hybridization of different organic molecules	**1**	**Un**
CO 4	Differentiate resonance and tautomerism	**1**	**An**
CO 5	Know the difference between chemical reaction and nuclear reaction	**1**	**Re**
CO 6	Identify the importance of rock dating and carbon dating	**3**	**An**
CO 7	Describe the configuration of D-glucose, D-fructose, D-mannose and D-galactose and recognize the test for identification of proteins	**5**	**Ap**
CO 8	Identify the good adsorbent for Chromatographyand Correlate the importance of chromatography in the field of phytochemistry	**3, 5**	**An**

UNIT I: Atomic Structure and Chemical Bonding

Quantum numbers and their significance- Pauli's exclusion principle – Aufbau principle – Hund's rule – Electronic configuration of elements (atomic number 1 to 36)

Lattice energy – Born-Harber cycle–Factors affecting the dissolution of ionic compounds – M.O. Theory of covalent bond – Bonding, antibonding and non bonding orbital – M.O. Configuration of H_2,N_2 ,O_2-Bond order – Band theory of metallic bond- Conductors, insulators, semi conductors- Hydrogen bonding – types and effects – Vander Wall's London forces.

UNIT II: Basic Concepts in Organic Chemistry

Hybridization -Hybridization in methane(sp3) , ethylene (sp2), acetylene(sp). electrophilies – nucleophilies –Types of organic reactions- Substitution – Addition – ,elimination- polymerization reactions – Aromaticity - Huckel's rule - benzenoid and non-benzenoid- aromatic compounds-Examples.

Isomerism-Optical isomerism-symmetry-elements of symmetry-cause of optical activity- Resolution-racemisation- Geometrical isomerism-illustrated by maleic and fumaric acid-keto enol tautomerism-examples- difference between resonance and tautomerism.

UNIT III: Nuclear Chemistry

Fundamental particles of nucleus - isotopes, isobars, isotones and nuclear isomers. Differences between chemical reactions and nuclear reactions-fusion and fission and its applications - radioactive series, group displacement law- mass defect- Applications of radio isotopes-carbon dating-rock and medicinal applications.

UNIT IV Biomolecules

Carbohydrates- classification- configurations of D-glucose, D-fructose, D-mannose and D-galactose (structures only) – interconversions of glucose and fructose-interconversions of arabinose and glucose-epimerisation- muta rotation- general study of starch and cellulose.

Amino acids - classification-essential amino acids-isolation from proteins- peptide linkage-polypeptides. Proteins- classification- colour reactions- structure.

UNIT V Chromatography

Chromatography-Classification-AdsorptionChromatography-Principle–Adsorbents Characteristics of good Adsorbents- Principle, Experimental method and applications of Column Chromatography- -Thin layer Chromatography- Ion Exchange Chromatography

Text Books:

1. Arun Bahl and Bahl. B.S. *Advanced Organic Chemistry*. S.Chand and Company Ltd, Reprint, 2005.

2. Puri B.R, Sharma L.R and Kalia K.C .*Principles of Inorganic Chemistry*. Delhi: Milestone Publishers and Distributers, 2010.

3. Arun Bahl B.S. and Bahl, Tuli. G.D. *Essentials of Physical Chemistry*,New Delhi: S.Chand & Company Ltd, 2008.

Books for Reference :

1. Jerry March. *Advanced Organic Chemistry, Reactions Mechanisms and Structure*. 4th Edition, 2013.

2. Tewari, K.S., Vishnoi, N.K. and S.N.Mehrotra.*A Text Book of Organic Chemistry*. 2 nd Revised Edition, 1998.

3. Puri B.R, Sharma L.R and Madan Pathania S. *Principles of Physical Chemistry*. Vishal Publishing Co, 2008.

4. Jain M.K and Sharma S.C.*Modern Organic chemistry*. Vishal Publishing Co.,2012.

SEMESTER II			
PartIIIAllied - I	**ALLIED CHEMISTRY -II**		
Course Code: 21UCHA21	**Hrs/Week :4**	**Hrs/ Sem : 60**	**Credits : 3**

Objective

- To acquire an appropriate knowledge and understanding in Chemistry underlying inmetallurgical process and industrial important polymers.
- To knowledge on steps involved in metallurgical process
- To know the importance of colloids in day to-day life
- To know the importance of synthetic reagents in organic chemistry.
- To appreciate the importance of nanochemistry in various fields.

Course outcomes

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO 1	Explain the methods of purification of ores and differentiate ores and minerals.	**1**	**Un**
CO 2	Know the types of furnaces.	**1**	**Un**
CO 3	Correlate the importance of colloids in day to day life.	**5**	**An**
CO 4	Know the types of emulsions and emulsifiers.	**4**	**Re**
CO 5	Know the importance of synthetic reagents.	**1**	**Re, Un**
CO 6	Know the importance of Saccharin-chloramine-T-Salicylic acid –Aspirin.	**1**	**Un**
CO 7	Determine the structure of various alkaloids and know the importance of isoprene rule in terpenoids.	**4, 1**	**ApRe , Un**
CO 8	Describe the synthesis methods of nano materials and Correlate the importance of nanochemistry in various fields.	**5**	**Un, An**

UNIT I: Metallurgy

Ores and Minerals- types of ores – methods of ore dressing- roasting –calcination, reduction of metal oxide by aluminium (aluminothermic process)-smelting- flux and slag -purification by electrolysis and ion exchange method - oxidative refining- zone refining- Kroll process - van Arkel de Boer method- types of furnaces – kilns – blast – reverberatory- muffle and electric furnace. Extraction, properties and uses of titanium and vanadium. Preparation of Titanium tetrachloride and Vanadium pentoxide.

UNIT II: Colloids and Emulsions

Definition- Classification of Colloids –comparison of lyophilic and lyophobic colloids- Preparationof sols-Dispersion method(Bredig's Arc method) –Aggregation method(oxidation , reduction,double decomposition)-Properties – Optical(Tyndall effect) – kinetic(Brownian movement)Electrical (electrical double layer) – Coagulation of colloids – Hardy Schulze law – protective colloids – gold number – Gels – classification, preparation properties(imbibition,synerisis and thixotropy). Emulsion – types and their distinction.Emulsifiers – surfactants– applications of colloids-food, medicine, thixotropic paints, clarification of municipal water, formation of delta.

UNIT III: Synthetic Reagents and Some Important Organic Compounds

Synthetic reagents-preparation, properties of ethyl zinc-methyl lithium-diethyl malonate and tetra ethyl lead (TEL)

Preparation and properties and uses of Saccharin- chloramines -T-Salicylic acid– Aspirin.

UNIT IV: Alkaloids and Terpenoids

Alkaloids-Definition-General methods of structure determination- Hoffmann's exhaustive methylation with coniine as example- structure and synthesis of coniine and nicotine.

Terpenes-Definition-classification-examples-isoprene rule-general methods of structure determination- structure and synthesis of citral and menthol.

UNITV Nanochemistry

Nanoparticles – Definition – Types– nanoparticles of metals, semiconductors and oxides – Synthesis of nano sized compounds – reduction methods, sol-gel method– nanoclusters – nanorod- nano wire and uses . Carbon nanotubes – single walled nanotube- multiwalled nanotube. Application of nanochemistry in various fields.

Text Books:

1. Arun Bahl and Bahl B.S. .*Advanced Organic Chemistry*. S.Chand and Company Ltd. Reprint, 2005.
2. Puri B.R, Sharma L.R. and Kalia K.C .*Principles of Inorganic Chemistry*.Delhi: Milestone Publishers and Distributers, 2010.
3. Arun Bahl B.S. and Bahl, Tuli G.D. *Essentials of Physical Chemistry*. S.Chand& Company Ltd.New Delhi, 2008.

Books for Reference :

1. Jerry March. *Advanced Organic Chemistry, Reactions Mechanisms and Structure.* 4th Edition,2013.
2. Tewari N, Vishnoi K.S, and Mehrotra S.N. *A Text Book of Organic Chemistry*. 2 nd Revised Edition,1998.
3. Puri B.R, Sharma L.R and Madan S. Pathania. *Principles of Physical Chemistry*. Vishal Publishing Co, 2008.
4. Jain M.K. and Sharma S.C. *Modern Organic chemistry*. Vishal Publishing Co., 2012.

SEMESTER II			
Allied Practical – I	**ALLIED CHEMISTRY PRACTICALS**		
Course Code:21UCHAR1	**Hrs/Week : 2**	**Hrs/ Sem : 30**	**Credits : 2**

OBJECTIVE:

- To help students to acquire practical skill in qualitative and quantitative analysis

ORGANIC ANALYSIS:

Analysis of simple organic compounds

a) Nature of the compound- Aromatic / Aliphatic

b) Test for Saturation/ unsaturation.

c) Element present/absent - Nitrogen

d) Characterization of functional groups (Acid,phenol (solid), aldehyde, ester, amide, primary amine, carbohydrates).

VOLUMETRIC ANALYSIS

I. Acidimetry — Alkalimetry

1. Estimation of H_2SO_4 / HCl using standard oxalic acid.

2.Estimation of sodium hydroxide using standard sodium hydroxide.

3. Estimation of sodium carbonate using standard sodium carbonate.

II. Permanganometry

4. Estimation of ferrous ion using standard ferrous ammonium sulphate.

5. Estimation of sodium oxalate /oxalic acid using standard oxalic acid.

III. Complexometry

6. Estimation of Zinc using standard Zinc sulphate.

BOOKS FOR REFERENCE:

1. Vogel.*Vogel's Textbook of Quantitative Chemical Analysis*. sixth Edition, 2004.

2. Raghupati Mukhopadhyay, Pratul Chatterjee.*Advanced Practical Chemistry*

Books and Allied (P) Ltd.Third Edition, 2007.

Semester – II			
Environmental Studies			
Course Code : 21UAEV21	**Hrs/ Week : 2**	**Hrs/Sem:30**	**Credits : 2**

Course Outcomes:

Upon completion of this course, the students will be able to

1 Recognize the biotic and abiotic components of ecosystem and how they function.
2 Use natural resources more efficiently and know more sustainable ways of living.
3. Acquire an attitude of concern for the environment.
4. Participate in improvement and protection of environment.
5. Manage unpredictable disasters.
6 Create awareness about environmental issues to the public.

Unit I Environment and Ecosystem

Aim and need for Environmental Awareness - Components of Environment Ecosystem - Components of Ecosystem: Abiotic and biotic factors (Producer, Consumer and Decomposer) – Food Chain, Tropic Levels - Food Web, Energy flow and Ecological pyramids

Unit II Natural Resources:

Renewable and non-renewable resources – Water Resources: Uses and Conservation of Water – Rain Water Harvesting – Forest Resources: Importance of Forests - Major and Minor forest produces - Conservation of Forest Energy Resources: Solar Fossil Fuel – Wind – Role of individuals in the conservation of natural resources

Unit III Environmental Pollution

Pollutants – Types of pollution: Air, Water, Noise and Plastic Pollution – Causes, effects and Control measures – Global warming and Climate Change

Unit IV **Human Population and Environment**

Effect of human population on environment – Population Explosion problems related to population explosion – Involvement of population in conservation of environment – Measures adopted by the Government to control population growth – Environment and human health

Unit V **Disaster Management**

Floods–Drought–Earthquakes– Cyclones – Landslide–Tsunami–Control measures

SEMESTER – III			
Part-I பொதுத்தமிழ் - தாள் 3 காப்பிய இலக்கியங்களும் சிற்றிலக்கியங்களும் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, புதினம்,)			
Course Code: 21ULTA31	**Hrs / Week:6**	**Hrs / Semester: 90**	**Credits: 4**

Objectives:

- மாணவியர் இறை நம்பிக்கையிலும், நற்பண்புகளிலும் வளர்ந்து, இலக்கிய அறிவிலும் மொழித்திறனிலும் சிறந்து விளங்க வழிகாட்டல்.
- காப்பிய மாந்தரின் வாழ்க்கையின் மூலமாக கடவுள் நம்பிக்கை, நல்ல உறவுகள், இயற்கையை நேசித்தல், மொழிஅறிவு போன்றவற்றை வளரச் செய்தல்.

Course Outcome:

CO.No.	இப்பாடத்திட்டம் மாணவியருக்கு	அறிவுசார் மதிப்பீடு
CO-1	பெண்களின் சட்டங்கள் உரிமைகள், வேலைவாய்ப்பு பற்றிய விபரங்களை அறிந்து கொள்ள உதவுகிறது.	நடைமுறைப்படுத்தல்
CO-2	அரசியல் சூழ்ச்சி, இனம், சாதி குறித்த பாகுபாடு இவற்றிலிருந்து விடுதலை பெறும் வழிவகைகளைக் கற்றுக்கொடுக்கிறது.	நடைமுறைப்படுத்தல்
CO-3	இலக்கிய அறிவினை வளர்க்க, காப்பியச் சுவை உணர்ந்து சுவைக்க வாய்ப்பளிக்கிறது.	நடைமுறைப்படுத்தல்
CO-4	சமய நல்லிணக்கம், இறைநம்பிக்கை இவற்றை உருவாக்குகிறது.	உருவாக்கம்
CO-5	மொழியைப் பிழையின்றிப் பேசவும் எழுதவும் உதவுகின்றது. படைப்பாற்றல் திறனை வளர்க்க உதவுகிறது.	புரிந்துகொள்ளுதல், திறன் மேம்பாடு
CO-6	தனிமனித வாழ்க்கைச் சிக்கல்களை எதிர்கொள்ளும் நிலையை உருவாக்குகிறது	நடைமுறைப்படுத்தல்
CO-7	இப்பகுதியில் வாழும் அடித்தட்டு மக்களின் வாழ்வு நிலையை அறிந்து கொள்ள உதவுகிறது. பெண்கள் நீதிக்குப் போராடும் உணர்வை வளர்க்கிறது.	நடைமுறைப்படுத்தல், திறன் மேம்பாடு
CO-8	போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையில் படைப்பாக்கத் திறனை வளர்க்க உதவுகிறது.	படைப்பாற்றல்,திறன் மேம்பாடு

SEMESTER – III			
Part-I பொதுத்தமிழ் - தாள் 3 காப்பிய இலக்கியங்களும் சிற்றிலக்கியங்களும் (செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, புதினம்,)			
Course Code: 21ULTA31	**Hrs / Week:6**	**Hrs / Semester: 90**	**Credits: 4**

அலகு - 1 செய்யுள் - 2 மணி

காப்பியங்கள்

1. சிலப்பதிகாரம் - அடைக்கலக் காதை : 11 – 94 பாடலடிகள்
2. மணிமேகலை – ஆபுத்திரன் திறன் அறிவித்த காதை : 1 முதல் 56 பாடலடிகள்
3. பெரியபுராணம் - கண்ணப்ப நாயனார் புராணம். (பாடல்கள்: 757 - 762, 67, 74, 81, 84,85, 804, 05, 06, 12, 14, 18, 19, 825 – 832, 834.
4. கம்பராமாயணம் - நட்புக்கோட் படலம்.
5. சீறாப்புராணம் - கள்வரை நதி மறித்த படலம்.
6. தேம்பாவணி - வளன் சனித்த படலம்.- 9 முதல் 31 பாடல்கள்.

சிற்றிலக்கியம்

1. திருக்குற்றாலக் குறவஞ்சி. IV குறவஞ்சி நாடகம். 8. எங்கள் மலையே.

அலகு - 2 இலக்கணம் - 1 மணி

பொருள் இலக்கணம்

1. அகப்பொருள் : எழுதிணை விளக்கம் - முதல், கரு, உரிப்பொருள்
2. புறப்பொருள் : வெட்சித்திணை முதல் பாடாண்திணை வரை விளக்கம் மட்டும்

யாப்பு இலக்கணம்

1. யாப்பு உறுப்புகள். (எழுத்து, அசை, சீர், தளை, அடி, தொடை)

அலகு - 3 இலக்கிய வரலாறு - 1 மணி

1. ஐம்பெருங்காப்பிங்கள்
2. ஐஞ்சிறுகாப்பியங்கள்
3. சிற்றிலக்கியத்தின் தோற்றமும் வளர்ச்சியும், பிள்ளைத்தமிழ், கலம்பகம், குறவஞ்சி, பரணி.
4. புதினம் தோற்றமும் வளர்ச்சியும்..

அலகு - 4 உரைநடை - 1மணி

இப்பொழுது இவள் - ப. திருமலை.

அலகு - 5 புதினம் - 1 மணி

தேரியாயணம் (சமூக நாவல்) - கண்ணகுமார விஸ்வரூபன்.

B.A., / B.Sc Part I FRENCH

SEMESTER – III			
PART – I French Paper – III Advanced French Language			
Course Code : 21ULFA31	**Hrs/week : 6**	**Hrs/ Sem : 90**	**Credits : 4**

Objectives

To enhance the acquisition of all the four competencies of language learning.

To create the independent capability of the learner to respond and tackle the various situations

of communication when the learner is in the native country of the target language

Course Outcomes

CO	At the end of this course, the students will be able to	CL
1.	give an explanation	Ap
2.	ask and say height and weight	Ap
3.	understand student exchange programme and professional world	Kn, Un, Ap
4.	express a goal and a skill	Ap
5.	understand a comic	Un
6.	describe a lifestyle	Kn, Ap
7.	talk about plans and difficulties	Ap
8.	enjoy, appreciate and understand the lyrics of the French songs	An
9.	write a CV	Cr
10.	comprehend French literature	Kn

SEMESTER – III			
PART – I French Paper – III Advanced French Language			
Course Code : 21ULFA31	**Hrs/week : 6**	**Hrs/ Sem : 90**	**Credits : 4**

Unit 1 – Pas de chance !

1.1 –Se plaindre / plaindre quelqu'un
1.2 – Donner une explication
1.3 – Exprimer une émotion négative
1.4 – Demander et dire le poids et la taille
1.5 – Chance et malchance

Unit 2 – Beau travail ?

2.1 – Comprendre un programme d'échange universitaire
2.2 – Exprimer le but, le souhait et un projet professionnel
2.3 – Exprimer une capacite, une compétence
2.4 – Comprendre des taches professionnelles
2.5 – Universités 2.0

Unit 3 – Au grand air

3.1 – Comprendre une BD sur un changement de vie
3.2 – Exprimer son insatisfaction
3.3 – Exprimer un choix de vie
3.4 – Décrire son mode de vie
3.5 – Je cultive mon jardin

Unit 4 – C'était bien ?

4.1 – Parler de ses difficultés
4.2 – Encourager, rassurer
4.3 – Parler d'un projet
4.4 – Exprimer son accord, son désaccord et intérêt
4.5 – Les Français en chanson

Unit 5 – Le texte littéraire

5.1 – Demain dès l'aube - Victor Hugo
5.2 – La Laitière Et Le Pot Au Lait - Jean De La Fontaine

PrescribedTextbook :

Céline Braud, Aurélien Calvez, Guillaume Cornuau, Anne Jacob,Sandrine Vidal, Cécile Pinson, Marion Alcaraz. *Edito A1Méthode de français*. Paris : Didier, 2016.

Céline Braud, Aurélien Calvez, Guillaume Cornuau, Anne Jacob,Sandrine Vidal, Cécile Pinson, Marion Alcaraz. *Edito A1 Cahier d'exercises*. Paris : Didier, 2016.

Books, Journals and Learning Resources

- J.Girardet&J.Pécheur avec la collaboration de C.Gibble.*Echo A1*. Paris : CLE International, 2012.
- Carlo Catherine, Causa Mariella.*Civilisation Progressive du Français – I.* Paris : CLEInternational, 2003.
- Cocton Marie-Noëlle.*Génération 1 Niveau A1, Méthode de français et cahier d'exercices*.Paris : Didier, 2016.
- Dintilhac Anneline, De Oliveira Anouchka, Ripaud Delphine, DupleixDorothée, Cocton Marie-Noëlle.*Saison 1 Niveau 1, Méthode de français et cahier d'exercices*. Paris : Didier, 2015
- www.francaisfacile.com/exercices/
- www.bonjourdefrance.com
- https://www.frenchtoday.com/french-poetry-reading/

SEMESTER – III			
Part II English Poetry, Prose, Extensive Reading and Communicative English - III			
Course Code: 21UGEN31	**Hrs/ Week: 6**	**Hrs/ Semester: 90**	**Credits: 4**

Objectives:

- To acquaint students with literary art and writings of universal appeal.
- To strengthen the proficiency of communicative English through literary based study.

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO Addressed	CL
CO-1	understand the language and literary components of texts	2,8	Un
CO-2	gain insight into literary experience and expressions of writers	8	Un, Ev
CO-3	comprehend aspects of grammar and its application	4	Un
CO-4	enrich vocabulary and its regular usage	9	Un, Ap
CO-5	analyse functional English in literary texts	1,8	An
CO-6	evaluate perspectives and human values for life	2,10	Ev
CO-7	adopt appropriate technique to enhance communication and writing	1,7	Ap, Cr
CO-8	develop skills of formal writing and speech	4,7	Cr

SEMESTER – III			
Part II English Poetry, Prose, Extensive Reading and Communicative English - III			
Course Code: 21UGEN31	**Hrs/ Week: 6**	**Hrs/ Semester: 90**	**Credits: 4**

Unit I –Poetry

William Shakespeare – All the World's a Stage

Dylan Thomas – Do not go gentle into that good night

Sri Aurobindo Ghosh – The Divine Worker

Unit II – Prose

Bertrand Russell – How to Avoid Foolish Opinions

Virginia Woolf – Men and Women

M.K. Gandhi – At School

Unit III – Fiction

Charlotte Bronte -*Jane Eyre* (Abridged Version)

Unit IV – Grammar

Active and Passive Voice, Direct and Indirect Speech

Unit V –Communication Skills

Listening Comprehension, Close Reading, Conversational English, Formal Writing

Text Books:

Units I – III – Compiled by the Research Department of English.

Units IV – Joseph, K.V. *A Textbook of English Grammar and Usage*. Chennai: Vijay

Nicole Imprints Private Limited, 2006.

Unit V – CLIL (Content & Language Integrated Learning) – Module IV by TANSCHE.

SEMESTER- III			
Core IIIPhysical Chemistry-I			
Course Code : 21UCHC31	**Hrs/Week : 4**	**Hrs/ Sem : 60**	**Credits : 4**

Objectives:

- To appreciate the surface phenomenon in industry and biological systems.
- To have an overall knowledge about gaseous and liquid states of matter.
- To understand the importance of colloids in day to day life

Course Outcome:

CONo.	Upon completion of this course, students should be able to	PSOaddressed	CL
CO- 1	enumerate the general characteristics of adsorption and have thorough knowledge of the theory behind physisorption and chemisorptions	1,2,5,7,8	Ap
CO- 2	prioritise the phenomenon of catalysis in industry and biological systems and learn the basic concepts of adsorption and its applications in various walks of life	1 ,2,7	Re
CO- 3	Gainextensive knowledge about kinetic theory of gases and its relation with temperature and velocity ofa gas	1,3	Un
CO-4	understand the deviation of gases from ideal behaviour using Van der Waal's equation	1,2 , 3	Re

CONo.	Upon completion of this course, students should be able to	PSOaddressed	CL
CO- 5	classify, compare and discuss the preparation method and properties of colloids and also know the importance of colloids in day to day life,	1,2,5	Un
CO-6	have a thorough learning of miscible andimmiscible liquids and outline the statement of Nernst distribution law, its deviations and applications	2,3,4	Re
CO- 7	compare the vapour pressure of partiallymiscible liquids and mixture of immiscible liquids and understand the theory of fractional distillation and steam distillation and its applications.	2,3	An
CO-8	appreciate the chemistry behind the reversible reactions and nature of chemical equilibrium and apply Lechatelier's principle in various aspects.	1,2,3,4,	Ap

Unit I Surface Chemistry

Adsorption – types- physisorption and chemisorption – adsorption of gases by solids adsorption isotherm – derivation and significance of Freundlich and Langmuir isotherms – BET isotherm (no derivation) – applications of adsorption – adsorption indicator-production of high vacua-gas mask-removal of colouring matter from solutions- chromatographic analysis.

Catalysis - General characteristics of catalytic reactions – acid-base catalysis and enzymecatalysis– Fischer Lock and key theory – characteristics of enzyme catalysis. Mechanism andkinetics of enzyme catalysed reaction (Michaelis-Menton equation). Activation energy andcatalysis – theories of homogeneous and heterogeneous catalysis – mechanism of thehydrogenation of ethene on nickel surface. Acid base catalysis –

mechanism – promoters –promotion action – catalytic poisoning – negative catalysis – mechanisms ofnegative catalysis, autocatalysis and photocatalysis.

Unit II Gaseous State

Kinetic theory of gases – justification of postulates-derivation of kinetic gas equation deduction of gas laws from the kinetic gas equation-Charle's law, Boyle's law, Avogadro's law, ideal gas equation – Dalton's law of partial pressure – Graham's law of diffusion-kinetic theory and temperature – Maxwell's law of distribution of velocities (no derivation) – types of molecular velocities – graphical representation and its significance- collision diameter –collision number – collision frequency – mean free path - deviations from ideal behavior compressibility factor- effect of pressure and temperature on deviation-explanation of deviation-volume correction-pressure correction – Van der Waal's equation—limitations liquefaction of gases-critical phenomenon—Andrew's isotherms of CO_2- Van der Waal'sequation and critical constants-experimental determination- law of corresponding states.

Unit III Colloids

Definition-Types of colloidal system –lyophilic and lyophobic colloids-characteristics and comparison- Sols- Preparation-Dispersion method (Bredig's Arc method, peptization) – Aggregation method-(double decomposition, reduction, oxidation, Hydrolysis,Change of solvent)-purification of Sols-Dialysis-Properties – Optical (Tyndall effect) – kinetic (Brownianmovement) Electrical (electrical double layer) – Coagulation of colloids – Hardy Schulze law-Hoffmeister series – protective colloids – gold number.

Emulsion – types and their distinction-Emulsifiers – surfactants– Gels – classification, preparation, properties (imbibition,synerisis and thixotropy). Applications of colloids-food, medicine, thixotropic paints, clarification of municipal water, formation of delta.

Unit IV Solution

Liquids in liquids –Completely miscible liquids- Ideal and non-ideal solution-Raoult's law - distillation of homogenous binary liquid mixtures -Theory of fractional distillation – Azeotropic distillation.

Partially miscible liquids – Phenol-water-Triethylamine-water and Nicotine-water systems– Variation of solubility with temperature – Vapour pressure of partially miscible liquids- Criticalsolutiontemperature-upper, lower,upper and lower - influence of impurityon CST (Crismer Test) and applications.

Immiscible liquid systems- Vapour pressure of mixtures of immiscible liquids- Theory ofsteam distillation and its applications.

Nernst distribution law – Statement–Conditions - Thermodynamic derivation – Deviationsfrom the law(molecular association and dissociation) –Applications-Distribution indicators-solvent extraction.

Unit V Chemical Equlibrium

Reversible reactions- nature of chemical equilibrium- characteristics-law of mass action-explanation of the law of mass action based on the molecular collision theory-equilibrium constant; equilibrium law-relationship between K_c and K_p-Application of law of mass action to the equilibria involving the formation of NH_3 , dissociation of $CaCO_3$ and the dehydration of $CuSO_4.5H_2O$. Lechatelier's principle – statement-application to the formation of NH_3

Text Books:

1. Puri B.R, Sharma L.R, Madan S. Pathania. *Principles of Physical Chemistry.* VishalPublishing Co., 2008.
2. Arun Bahl, Bahl B.S, Tuli G.D. *Essentials of Physical Chemistry*. New Delhi: S. Chand &Company Ltd., 2008.

Books for Reference:

1. Malligarjunan U.M . *Principles of Physical Chemistry*. SreeVinayaga Publications. First Edition, 2020.
1. Soni P.L, Dharmaha O.P. *Text Book of Physical Chemistry (A Modern Approach).*SultanChand and Sons Publishers, Revised Edition 2010.

SEMESTER- III			
Skill Based Elective	**Agricultural Chemistry**		
Course Code : 21UCHS31	**Hrs/Week : 2**	**Hrs/ Sem : 30**	**Credits : 2**

Objectives:

- To facilitate the students to know the basic knowledge about agriculture and soil
- To realize the importance of agriculture
- To understand the chemistry behind fertilizers and pesticides
- To get an idea about vermin composting
- To analyze the quality of drinking water
- To know the various water treatment methods

Course Outcome:

CONo.	**Upon completion of this course, students should be able to**	**PSOaddressed**	**CL**
CO- 1	understand the importance of soil its constituents, fertility and to promote agriculture.	1, 7	Un
CO- 2	have an overview of the macro and micronutrients and their functions	1, 7	Re
CO- 3	know the preparation and importance of fertilizers in agriculture	1, 7	Ap
CO-4	aware of the harmful effects of pollutants Produce vermi compost and gobar gas	2, 3, 8	An,Cr
CO- 5	realize the importance of pesticides and insecticides	1, 7	Ap

CONo.	Upon completion of this course, students should be able to	PSOaddressed	CL
CO-6	rationalise the environmental hazards of pesticides	4, 7	Ap
CO-7	understand the water quality standards and water quality parameters and analyse the case studies of heavy metal pollution like Hg, As, and Cd.	1,4,2, 3, 7	Un
CO-8	understand the processes used for purification of municipal water and treat waste water by using different methods	4,7, 8	Un, Cr

Unit I: Soil Nature and Plant Nutrients

Saline, alkali and acid soils. Buffering capacity of soil - Soil reclamation. Liming of soil – measurement of soil pH - Soil fertility – essential plant nutrients and their functions – deficiency symptoms – macro and micro nutrients& their functions.

Unit II: Fertilisers

Natural and synthetic manures-qualities of a good fertilizer- classification of fertilizers – nitrogeneous fertilizers - Preparation and importance of urea-calcium cyanamide - super phosphate-triple super phosphate- potassium chloride-potassium nitrate - DAP, mixed fertilizers (NPK) and human effluent from gobar gas plant as a manure. Vermiculture -vermi compost.

Unit III: Pesticides

Pesticides, Insecticides, Repellants, Fungicides- Definition-classification – on the basis of their mode of action, target organisms they control, method of application- environmental hazards - preparation and uses ofDDT, BHC, lead arsenate,bordeaux mixture. Biopesticides – definition – examples – applications.

Unit IV: Water Quality Parameters Water quality standard for drinking water (WHO)- Water quality parameters-pH, EC, alkalinity, Total acidity, hardness, DO, BOD, COD,

Methaemoglobinemia) – Eutrophication- Case studies- Hg, As, and Cd. (Minamata, arsenic poison in West Bengal, Itai-itai)

Unit V: Water Treatment Methods

Waste water treatment-methods and equipments used-preliminary treatment (screening, skimming) - primary treatment (sedimentation, coagulation) - secondary treatment (trickling filters, oxidation pond, anaerobic digestion)-tertiary treatment (adsorption, ion-exchange, reverse osmosis, electrodialysis, disinfection)-treatment of water of municipal purposes-domestic sewage treatment-industrial waste water treatment.

Hands on Training:

1. Analysis of carbon, nitrogen, potassium, phosphorous, zinc and calcium in soil using mini lab for soil analysis.

2. Determination of BOD and COD of water samples

3. Determination of pH and conductivity of water from different sources.

4. Determination of DO and hardness of water.

Industrial Visit:

A visit may be made to an industry or a premier institution.

*A report of the industrial visit may be submitted as an assignment.

Text Books:

1. Jayashree Ghosh. *Text Book of Pharmaceutical Chemistry*. NewDelhi:S. Chand and company, 2003.

2. BagavathiSundari K . *Applied Chemistry*. MJP Publishers, 2008.

Books for Reference:

1. Sharma B. K . *Industrial Chemistry*. Goel Publishing House. Fifth Edition, 1993-94.

2. Sindhu P.S. *Environmental Chemistry*. New Age International Publishers, 2010.

3. Dr Joshi. S.R *Biopesticides- A Biotechnological Approach*. New Age International (P)

Ltd., Publishers, 2020.

SEMESTER III			
Part III Skill -based Elective -Dairy Chemistry			
Course Code :21UCHS32	**Hrs/Week : 2**	**Hrs/ Sem : 30**	**Credits : 2**

Objective:

- To know the composition and properties of milk.
- To understand processing techniques of milk.
- To get hand-on experience by preparing some milk products.

Course Outcome:

CONo.	Upon completion of this course, students should be able to	PSOaddressed	CL
CO - 1	have a basic knowledge about milk and its composition	1 , 2 , 3	Re
CO - 2	know the quality parameters of milk	3,7,8	Re
CO - 3	categorize the types of different types of milk processing techniques	1 , 2,4	An
CO - 4	prepare different types of milks.	2, 3,6	Ap
CO - 5	understand the theory behind non fermented milks	1, 2	Un
CO - 6	determine the different constituents in milk	2, 3,6	Ap
CO - 7	estimate fat and solids in milk	3,6	Ap
CO - 8	assess the properties of different milk products	1 ,2 ,4,6,7,8	Ev

Unit I: Milk and its Components

Milk – definition – composition and constituents of milk – factors affecting the composition of milk – properties of milk – physical state – flavour – aroma – acidity – density – viscosity

– boiling point – freezing point – estimation of acid number – saponification number – iodine number – RM number – estimation of fat in milk – Babcock method – Majonnier method – nutritive value of milk.

Unit II: Processing Techniques

Milk processing – clarification – pasteurization – definition – effects of pasteurization – role of phosphate in pasteurization – types of pasteurization – bottle pasteurization – batch pasteurization – High Temperature Short Time (HTST) pasteurization – vacuum pasteurization –Ultra High Temperature (UHT) pasteurization, Homogenization – definition – factors influencing homogenization.

Unit III: Special Milks

Non-Fermented milks – definition and manufacture of special milks – sterilized milk – flavoured milk – irradiated / vitaminised milk – standardised milk – reconstituted milk – recombined milk – toned milk – condensed milk.

Fermented milk – definition and manufacture – manufacture of special milks – cultured butter milk – Acidophilus milk – Yoghurt (Firmbodied milk).

Unit IV: Fermented Milk Products

Cream – definition – classification – types of cream – manufacture of canned cream and frozen cream – separation of cream.

Butter – definition – composition – classification – manufacture – churning operation – overrun – types – estimation of acidity of butter – estimation of moisture content in butter.

Ghee – definition – composition – various adulterants of ghee.

Unit V: Laboratory Work

1. Determination of acid number, saponification number, iodine number and R.M.number of milk.
2. Determination of pH of milk.
3. Estimation of fat and total solids in milk.
4. Separation of milk protein from milk.

Books for Reference:

1. Siva Sankar B. *Food processing and preservation*. New Delhi:Prentice, Hall of India Pvt.Ltd., 2002.
2. BagavathiSundari K . *Applied Chemistry.* MJP Publishers.Chennai: Tamil Nadu Book House, 2019.
3. Morris B. Jacobs. *The Chemical Analysis of Foods and Food products*. Third Edition, CBS Publishers & Distributors,2018 .
4. Jayashree Ghosh. *Fundamental concepts of Applied chemistry.*New Delhi:S. Chand & company Ltd,2006.

SEMESTER-III			
NMEI	**Everyday Chemistry**		
Course Code :21UCHN31	**Hrs/Week:2**	**Hrs/ Sem: 30**	**Credits:2**

Objectives:

- To study the purification process for drinking purpose.
- To classify solid, liquid and gaseous fuels.
- To study the constituents of paints and varnishes.
- To appreciate the manufacture of sugar.
- To know the preparation of candles, toothpowder.

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	understand the biological importance of water.	2	Un
CO -2	aware of the ill effects of water borne diseases and prevention.	2, 5	Ap
CO - 3	know the ignition temperature and flash point of fuels.	1	Re
CO – 4	know the characteristics of solid liquid and gaseous fuels.	1	Re
CO – 5	know the fundamental knowledge about constituents of paints and varnishes and their functions.	2, 5	Re

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-6	aware of fluorescent paints (traffic signal) and fire retardant paints.	2, 5	Ap
CO – 7	understand the recovery of alcohol from molasses and know the chemistry of manufacture of paper.	2, 5	Un, Re
CO – 8	outline the preparation and uses of Candle,ToothPowder,Liquidblues,Blackboard chalk, Moth ballssoap, shampoo, lipstick ..	1, 2,5	Re

UNIT I: Water

Water as universal solvent-Hard and soft water-Purification of water for drinking purpose. Desalination, reverse osmosis, mineral water, pH of water for drinking purpose. Biological importance of water-waterbalance and electrolyte balance in human body. Water borne diseases and prevention.

UNIT II: Fuels

Definition-Classification with examples (solid, liquid and gas)- calorific Value-Ignition temperature-Flash point. Characteristics of solid, liquid, and gaseous fuels and their applications.Nuclear fuels- Rocket fuels- Biofuels.

UNIT III: Surface Coating

Pigments, purpose of surface coating. Constituents of paints and varnishes and their functions. Emulsions.Different kinds of paints-fluorescent paints (traffic signal), fire retardant paints.

UNIT IV: Sugar and Paper Industry

Manufacture of sugar, recovery of alcohol from molasses, fermentation, manufacture of beverages. Bagasse. Paper industry- Manufacture of paper.

UNIT V: Chemicals in Day to Day Use

An Outline of the preparation and uses of the following:

a) Candle b) Tooth Powder c) Liquid blues d) Blackboard chalk e) Moth balls f) Soap

g) Shampoo h) Lipstick i) Phenoyle j) Eyetex k) Cleaning powder l) Face powder

Books for Reference:

1. Jayashree Ghosh. *Fundamental concepts of Applied chemistry*. Edition, New Delhi:S. Chand &company Ltd., 2006.
2. Jain P.C and Monika Jain. *Engineering chemistry.*New Delhi:Dhanpat Rai & Sons, 2020.
3. Prakash Shetty.*Science and Technology of Printing materials.*Chennai: MJP Publishers, 2019.
4. Sharma B.K . *Industrial Chemistry.*Meerut:Goel Publishing House, 2003.

SEMESTER III		
Part IV Self studyCourse	**Informative Chemistry**	
Course Code :21UCHSS1		**Credits : +2**

Objectives:

- To make the students aware of the latest developments in drug design
- To enable the students to use the SI units correctly
- To make the students aware of the latest news in chemistry
- To enable the students to handle the chemicals safely
- To realize the hazardous chemical effects and the need to save our planet

Course Outcome:

CO No.	Upon completion of this course, students will beable to	PSO addressed	CL
CO - 1	recognize role of chemistry in drug design	5	Re
CO - 2	know the software used for drug designing	1,7	Re
CO - 3	facilitate the structure and types of MOOCs	5	Cr
CO - 4	practice flip class rooms	5	Ap
CO - 5	apply the concepts of Reduce, Reuse and Recycle	7	Ap
CO - 6	know the methods of disposal of Chemical waste	7	Re
CO - 7	recognize the impact of chemical reactions on our planet earth	5	Re
CO - 8	identify the Nobel laureates in Chemistry	4	Re

Unit I: Computer aided Drug Design

Introduction – Using data to make some drug molecules- future scope - the need and urgency for drug discovery – Software used - Role of Chemistry in Computer Aided Drug Discovery Design.

Unit II: Chemistry education in modern era

ICT enabled learning- self learning using available e-content - e-learning through MOOC, MOOC platforms - structure and types of MOOCs - Changing face of Chemistry education in India - Flip class rooms.

Unit III: Safety in chemistry laboratory

General precautions – hygiene in chemistry laboratory - some common laboratory practices Need forSafeDisposal – methods of safe disposal of chemical waste - Safe disposal of solids - Safe disposal of liquids/Solutions - Reduce,ReuseandRecycle.

Unit IV: Chem applications

Chemical reactions – impact on our planet earth – forensic chemistry – methods of finger print detection - 3D bio printing - hydrocarbons in fossil fuels - combustion reaction of hydrocarbons - need to change our dependence on fossil Fuels – green house effect - ocean Acidification- green fuels

Unit V: SI Units & their Correct usage

Introduction-How base units are defined?- Redefinition of four base units- Common Errors in usage of SI units- Rules for representing SI Units-Rules followed while using Prefixes-Error Percentage.

Reference:

*Course Material is available in the Department of Chemistry

Semester – III			
Women's Synergy			
Code : 21UAWS31	**Hrs/ Week : 2**	**Hrs/Sem:30**	**Credits : 2**

Unit I - Physical Health

Woman's Structural Organisation – Levels of organisation – Body image - Reproductive health – Hormonal Cycle and its Psycho-somatic implications – Child birth – lactation – Nutritional status of women.

Unit II – Psychological Health

Examining factors determining psychological conditions of women – Depression, anxiety, stress, hysteria – Socio – cultural and familial conditioning of women's minds – Self Image, Discrimination against women.

Unit III – Women and Legal Awareness

Women specific – centered legislations – legal issues – laws to prevent gender based violence National / State Pro-women schemes – educational and Employment schemes. Laws for protection of Women – Women's rights to property – Women's Rights in the Indian Constitution – Maternity benefit act.

Unit IV – Women and Finance

Manager of domestic finance – Budgeting basics – Create a family budget - Set financial goals – Plan for financial emergencies – Budget for travel – Saving strategies – Investment options

Unit V – Women's Empowerment in Various Domain

Introduction - Women created history in sports and music – P. T. Usha, M. S. Subbulakshmi - Women who crossed hurdles in Social Service – Mother Theresa, Muthulakshmi Reddy, Medha Patkar - Role of Women in Indian independence movement and Politics – Indira Gandhi, Aruna Asaf Ali.

SEMESTER – IV			
Part-1 பொதுத்தமிழ் - தாள் 4 சங்க இலக்கியம் **(செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, நாடகம்)**			
Course Code: 21ULTA41	**Hrs / Week:6**	**Hrs / Semester: 90**	**Credits: 4**

Objectives:

- மாணவியருக்கு நல்ல மதிப்பீடுகளைக் கற்பித்து, வாழ்வில் அவற்றைப் பின்பற்ற வழிவகுத்தல்.
- இலக்கியமாந்தரின் மூலம் நல்ல வாழ்க்கை அனுபவங்களைப் பெறச்செய்து தன்னம்பிக்கை, ஆளுமைத் திறம், மொழி அறிவு இவற்றை உருவாக்குதல்.

Course Outcome:

CO.No.	இப்பாடத்திட்டம் மாணவியருக்கு	அறிவுசார் மதிப்பீடு
CO-1	அனுபவ அறிவை வளர்க்கிறது.	நடைமுறைப்படுத்தல்
CO-2	பழந்தமிழர் வாழ்வியல் முறைகளை கற்று பயனடைய உதவுகிறது.	நடைமுறைப்படுத்தல்
CO-3	ஆய்வு நோக்கினை வளர்க்கவும் வாழ்வின் வளர்ச்சி நிலையை மேம்படுத்திக் கொள்ளவும் உதவுகிறது.	நடைமுறைப்படுத்தல், உருவாக்கம்
CO-4	மனிதநேயம், இறைநம்பிக்கை இவற்றை உருவாக்குகிறது.	உருவாக்கம்
CO-5	மொழியைப் பிழையின்றி பேசவும் எழுதவும் உதவுகின்றது.	திறன் மேம்பாடு
CO-6	தனிமனித வாழ்க்கைச் சிக்கல்களை எதிர்கொள்ளும் நிலையை உருவாக்குகிறது	நடைமுறைப்படுத்தல், உருவாக்கம்
CO-7	சமுதாய பிரச்சினைகளை எதிர்கொள்ளும் திறம் கிடைக்கிறது.	நடைமுறைப்படுத்தல், திறன் மேம்பாடு
CO-8	போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையில் படைப்பாக்கத் திறனை வளர்க்க உதவுகிறது.	படைப்பாற்றல், திறன் மேம்பாடு

SEMESTER – IV			
Part-1 பொதுத்தமிழ் - தாள் 4 சங்க இலக்கியம் **(செய்யுள், இலக்கணம், இலக்கிய வரலாறு, உரைநடை, நாடகம்)**			
Course Code: 21ULTA41	**Hrs / Week:6**	**Hrs / Semester: 90**	**Credits: 4**

அலகு - 1 செய்யுள் - 2 மணி
எட்டுத்தொகை

1. நற்றிணை - பாடல்கள் : 64, 318
2. குறுந்தொகை - பாடல்கள் : 3, 20, 75
3. ஐங்குநுறூறு - செலவு அழுங்குவித்தப் பத்து - பாடல்கள் : 304, 307, 308, 309
4. பதிற்றுப்பத்து - பாடல் : 25
5. பரிபாடல் - பாடல் 6 (1-10 அடிகள்)
5. கலித்தொகை - பாடல் : 51
6. அகநானூறு - பாடல்கள் : 20, 194
7. புறநானூறு - பாடல்கள் : 191, 204

பத்துப்பாட்டு
மதுரைக்காஞ்சி - 63 வரிகள்

அலகு -2 இலக்கணம் - 1 மணி
1. **பாவகைகள்** - வெண்பா, ஆசிரியப்பா பொது இலக்கணம்
2. **அணி இலக்கணம்** -
   உவமை, உருவகம், வேற்றுமை, வஞ்சப்புகழ்ச்சி, சிலேடை, தற்குறிப்பேற்றம்
3. வாக்கிய வகைகள்
4. பிறமொழிச் சொற்களை நீக்கி எழுதுதல்

   அ. ஆங்கிலச் சொற்கள்

   ஆ. வடமொழிச் சொற்கள்

   இ. தெலுங்குச் சொற்கள்

அலகு 3 இலக்கியவரலாறு - 1 மணி
1. எட்டுத்தொகை நூல்கள்
2. பத்துப்பாட்டு நூல்கள்
3. சங்க இலக்கியத்தின் தனிச்சிறப்புகள்
4. நாடகம் - தோற்றமும் வளர்ச்சியும்

அலகு - 4 உரைநடை - 1மணி
இலக்கியத் தென்றல் - தமிழ்த்துறை - கட்டுரைத் தொகுப்பு,
தூய மரியன்னைகல்லூரி (தன்னாட்சி), தூத்துக்குடி

அலகு -5 நாடகம் - 1 மணி
ஆயிரம் பூக்கள் மலரட்டும் - கீழ்க்குளம் வில்லவன்

II B.A., / B.Sc Part I FRENCH

SEMESTER – IV			
PART – I French Paper – IV French Course and Literature			
Course Code : 21ULFA41	**Hrs/week : 6**	**Hrs/ Sem : 90**	**Credits : 4**

Objectives

To create and develop the taste for literary readings in the target language.

To motivate students to appreciate the French literature.

Course Outcomes

CO	At the end of this course, the students will be able to	CL
1.	comprehend the French literary background	Un, An
2.	imbibe the basic grammatical structures of the language	Un, An
3.	inculcate the values imparted through the literary texts	Un, An
4.	appreciate simple literary texts	An, Ap
5.	acquire literary knowledge and enhance aesthetic perception	An, Ap
6.	explore a literary text, with the perspective of analyzing the content and manner of writing	An, Ap
7.	reflect upon the author's ideas and transform her own personality	Ap, Cr
8.	discover, interrogate and reflect on the humanistic value	Cr
9.	understand the history of France	Un

SEMESTER – IV			
PART – I French Paper – IV French Course and Literature			
Course Code : 21ULFA41	**Hrs/week : 6**	**Hrs/ Sem : 90**	**Credits : 4**

Unit 1 – XVII^{e}siècle

1.1 – Le Corbeau et le Renard - Jean de la Fontaine
1.2 – Le Petit Chaperon Rouge - Charles Perrault
1.3 – Le Passe Composé

Unit 2 – XVIII^{e}siècle

2.1 – Zadig : La danse - Voltaire
2.2 – La Révolution française
2.3 – L'imparfait

Unit 3 – IX^{e}siècle

3.1 – Chansons d'automne - Paul Verlaine
3.2 – Le Père Goriot *(extrait)* - Honoré de Balzac
3.3 – Les Pronoms relatifs

Unit 4 – XX^{e}siècle

4.1 – Le Pont Mirabeau - Guillaume Apollinaire
4.2 – L'Etranger *(extrait)* - Albert Camus
4.3 – Les Indicateurs temporels

Unit 5 – La littérature francophone

5.1 – Le Grand Cahier*(extrait)* - Agota Kristof
5.2 – Le fils à la recherche de sa mère- Pape Faye
5.3 – Le Futur proche et le futur simple

Books, Journals and Learning Resources

- K. Madanagobalane, N.C.Mirakamal.*Le Francais par les Textes*. Chennai :Samhita Publications, 2019.
- Blondeau Nicole, Allouache Ferroud jà, Ne Marie-Françoise.*Littérature Progressive du Français*.Paris : CLE International,2004.
- Carlo Catherine, Causa Mariella.*Civilisation Progressive du Français – I*. Paris : CLE International, 2003.
- Akyuz Anne,Bazelle-Shahmaei Bernadette, Bonenfant Joelle, GliemannMarie-Francoise.*Les 500 exercices de grammaire*. Paris : Hachette livre,2005
- Grégoire Maria.*Grammaire Progressive du français*. Paris :CLE International,2002.
- Sirejols Evelyne, TempestaGiovanna,Grammaire. *Le Nouvel Entrainez-vous avec 450 Nouveaux Exercices.* Paris : CLE International, 2002
- www.francaisfacile.com/exercices/
- www.bonjourdefrance.com
- https://www.conte-moi.net/node/120

SEMESTER – IV			
Part II English Poetry, Prose, Extensive Reading and Communicative English - IV			
Course Code 21UGEN41	**Hrs/ Week: 6**	**Hrs/ Semester: 90**	**Credits: 4**

Objectives:

- To advance students' understanding of literary art and writings of universal appeal.
- To further the proficiency of communicative English through literary studies.

Course Outcome:

CO.No.	**Upon completion of this course, students will be able to**	**PSO Addressed**	**CL**
CO-1	understand better the language and literary components of texts	2,8	Un
CO-2	gain deeper insight into literary experience and expressions of writers	8	Un
CO-3	comprehend sentence types and its application	5	Un
CO-4	be competent in conversational and functional English	1	Ap
CO-5	rightly employ verbal and non-verbal communication skills	2,4,10	Ap
CO-6	adopt right perspectives of human values for life	10	Ap
CO-7	develop skills of creative/ formal writing and speech	3,7	Cr
CO-8	face interviews and competitive exams with confidence	6,10	Ap

SEMESTER - IV			
Part II English Poetry, Prose, Extensive Reading and Communicative English - IV			
Course Code :21UGEN41	**Hrs/ Week: 6**	**Hrs/ Semester: 90**	**Credits: 4**

Unit I –Poetry

John Keats – Bright star, would I were steadfast

E.E. Cummings – I carry your heart with me

Jayanta Mahapatra – Relationship

Unit II – Prose

Helen Keller – Three Days to See

Jerzy Kosinski – TV as a Baby Sitter

Bhabani Bhattacharya – Names are not Labels

Unit III – Fiction

Thomas Hardy – *Tess of the d' Urbervilles* (Abridged Version)

Unit IV – Grammar

Types of Sentences, Transformation of Sentences

Unit V – Communication Skills

Verbal and Non-Verbal Communication, Interview, CV- Resume, Presentation Skills

Text Books:

Units I – III – Compiled by the Research Department of English.

Units IV – Joseph, K.V. *A Textbookof English Grammar and Usage*. Chennai: Vijay Nicole Imprints Private Limited, 2006.

Unit V – CLIL (Content& Language Integrated Learning) – Module IV by TANSCHE.

SEMESTER- IV			
CoreIV	**OrganicChemistry-I**		
Course Code :21UCHC41	**Hrs/Week:4**	**Hrs/ Sem: 60**	**Credits:4**

Objectives:

- To gain knowledge about the importance of nitro and amino compounds
- To study the synthetic importance of active methylene compounds and know the conformational analysis
- To appreciate the applications of organometallic compounds in synthesis
- To know the laboratory and industrial importance of Carbohydrates
- To understand the concepts of tautomerism &molecular rearrangements

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	compare alcohols, nitroalkanes and alkyl nitrites,Differentiate1°, 2°&3° amines by reactions.	1,3	An
CO - 2	justify the effect of substituent on the basicity of aromaticamines.	1,3	Cr
CO - 3	synthesize and Characterize acetoacetic ester and malonic ester.	5,7	Cr
CO- 4	define Sachse Mohr theory – Newman projection ,Sawhorse & Fischer formulaeKnow about the	1	Re

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
	conformational analysis.		
CO - 5	recall the synthetic importance of organometalliccompounds, RecogniseFrankland reagent and its significance.	1,6,7	Re
CO - 6	know the preparation and properties of Thioalcohols and Mustard gas.	1	Re
CO- 7	classify carbohydrates and compare and contrast the reactions and structure of glucose andfructoseIllustrate the structure and reactions of carbohydrate and discuss epimerization and mutarotation.	5,6,1	Un
CO - 8	illustrate the theory of resonance and tautomerism and identify the product of rearrangement reactions such as pinacol-pinacolone, Benzil-Benzilic acid, Curtius,Lossen,Favorskiiand Friesrearrangement.	1,3	Un, An

Unit I : Nitro compounds and Amino compounds

Preparation and reaction of nitrile and isonitrile – distinction between nitroalkane and alkyl nitrites – reduction reaction of nitroalkane – NEFreaction. Preparation of o, p,m-dinitrobenzene- trinitrobenzene.

Aliphatic amine – separation of mixture of amine –(Hoffmann, Heisenberg method)- Comparison of 1º, 2º&3º amines- Mustard oil reaction- Mannich reaction – ascending and descending of amines.

Aromatic amines – effect of substitutents on the basicity of aromatic amines- preparation and properties ofphenylenediamine

Diazonium compounds- Preparation of diazonium chloride and its synthetic applications.

Unit II: Reactive Methylene compounds and Conformational Analysis

Active methylene compounds –preparation, synthetic applications of acetoacetic ester and malonic ester.

Conformational Analysis Definition – Bayer's strain theory – Sachse Mohr theory – Newman projection - Sawhorse & Fischer formulae –examples- butane, 1,2-diol, - difference between conformation and configurations. Conformation analysis of ethane, 1,2 – dichloro ethane andcyclohexane (boat form, Chair form)—dihedral angle (torsional angle) – factors affecting stability of conformation – Dipole - Dipole interaction, bond opposite strain- factors affecting conformational stability

Unit III: Organometallic compounds and Organosulphur Compounds

Definition – examples- Organomagnesium compound (Alkyl magnesium halides) – preparation, general characteristics and synthetic applications (Nucleophilic substitution reactions,additionreactionandmiscellaneousreactions.)Organozinccompounds(Diethyl Zinc-Frankland reagent)- preparation, properties and synthetic applications (Nucleophilic substitution and addition reactions). Preparation and uses ofTEL.

Preparation and properties of thioalcohols and thioethers – sulphonal-mustard gas and sulphones.

Unit IV: Carbohydrates

Introduction and classification – laboratory and industrial preparation of glucose and fructose – reactions of glucose and fructose – structure of glucose and fructose – open chain and ring structure – epimerisation – mutarotation – interconversion of glucose and fructose and vice versa – ascending and descending the series – (Kiliyani& Wohl's synthesis). Manufacture of sucrose – Structure of maltose, lactose and sucrose (elucidation not included) – Starch and cellulose – reactions –uses – differences between starch and cellulose.

Unit V: Tautomerism and Molecular Rearrangement

Resonance – definition – resonance energy – resonance theory. Tautomerism – Definition – Types of tautomerism – Keto-enol, Nitro -acinitro, Lactam - lactim, p-Nitrosophenol-Quinone monoxime and amido-imidotautomerism.

Molecular Rearrangement

a) Rearrangement involving migration to electron deficient carbon- Pinacol-pinacolone rearrangement, Benzil-benzilicacidrearrangement

b)Rearrangement involving migration to electro deficient nitrogen-Curtiusrearrangement, Lossen rearrangement

c) Rearrangement involving carbanion intermediate –Favorskiirearrangement

Rearrangement involving migration from oxygen to aromatic ring-Friesrearrangement.

Text Books:

1. Tewari K.S, Vishnoi N.K . *A Text Book of Organic Chemistry*. 2nd Revised Edition, 2017.

2.Arun Bahl and Bahl. B.S. *Advanced Organic Chemistry*.S.Chand and Company Ltd., Reprint, 2017.

Books for Reference:

1. Ernest l. Eliel. *Stereochemistry of Organic compounds*.New Delhi:Tata McGRAW–Hill Publication company Ltd., 1975.
2. Nasipuri D. *Stereochemistry of Organic Compounds - Principles and Applications*. New Age International Publishers,1994.
3. Kalsi S. *Stereochemistry-Conformation and Mechanism*. New Age International Publishers, 2008.
4. Anup Pathak, AnupaSaha.*Organic Chemistry*. Kolkata: Books and Allied Pvt Limited, Volume I, 2015.
5. Jain M.K and Sharma S.C. *Modern Organic chemistry*. Vishal Publishing Company,

2017.

6. Jerry March. *Advanced Organic Chemistry Reactions Mechanisms and Structure*. 4th Edition 2013.

7. Tewari N. .*Advance Organic Reaction mechanism*.Kolkata:Books and allied (P) Ltd.

Second revised edition, 2017.

SEMESTER- IV			
Skill Based Elective I	**Medicinal Chemistry**		
Course Code : 21UCHS41	**Hrs/Week : 2**	**Hrs/ Sem : 30**	**Credits : 2**

Objectives:

- To inculcate the basic knowledge about classification drugs and their mode of action.
- To rationalize the causes and curative measures of common diseases.
- To know about the first aid to be done during emergency.
- To create an awareness about hypertension and cardiovascular drugs.
- To get an idea about diabetes and hypoglycaemic agents.

Course Outcome:

CONo.	**Upon completion of this course, students should be able to**	**PSOaddressed**	**CL**
CO- 1	have an understanding of the classification drugs.	1,3,4	Un
CO- 2	know the importance of drugs and their mode of action.	4	Un
CO- 3	know the causes of common insect borne, air borne and water borne diseases.	3, 4, 7	Re
CO-4	get an idea about the treatment for common diseases.	3, 4, 7	Re
CO- 5	estimate the sugar and cholesterol levels in blood.	4, 5, 7	Ev
CO-6	aware about first aid rules and first aid box.	4, 7	Ap

CO-7	know the types of blood pressure and treatment methods anddescribe about the cardiovascular drugs.	1,2,4	Un
CO-8	know about diabetics and its treatment andget an idea about some anti-convulsant agents.	4, 7	Re

Unit I: Classification and mechanism of drug action

The nature and sources of drugs-Classification of drugs – biological Classification –(drugs acting on central nervous system and peripheral nervous system, Chemotherapeutic drugs, pharamcodynamic agent, metabolic diseases and endocrine function) and chemical classification.

Mechanism of action-actions at extracellular and cellular site-Drug receptors and biological responses-Chemistry of drug receptor binding-covalent bond- hydrogen bond- Van der Waals forces.

Unit II: Causes of common diseases and their treatment by drugs

Common diseases and their treatment: Insect borne diseases-malaria, filariasis, plague, Air borne diseases-diphtheria, whooping cough, influenza, measles, mumps, common cold, tuberculosis (T.B)

Water borne diseases-cholera, typhoid, dysentery, Disorder of digestive system-Jaundice

Unit III: Clinical chemistry cum Hands on Training

Determination of sugar (glucose) in serum-Folin and Wu' s method — -determination of serum cholesterol -Sackett' s method for total cholesterol --tests for cholesterol — estimation of glucose in urine -Benedict's test

Important rules of First aid- First aid for cuts, abrasions and bruises-bleeding-fractures-fainting composition of first aid box — some common poisons and their antidotes

Unit IV: Blood pressure and cardio vascular drugs

Blood pressure-types and treatment -Hypertension-primary and secondary hyper tension treatment, hypo tension.

Functions and uses of the following drugs

Cardiovascular drugs-antiarrhythmic drugs-quinidine-antihypertensive agents- (hypotensive drugs) — clonidine and reserpine.

Definition forAngiogram andAngioplast.

Unit V: Diabetes and hypoglycemic agents

Diabetes types – Diabetes insipidus and diabetes mellitus – control of Diabetes –oral hypoglycemic agents –sulphonyl urease -tolubutamide, chlorpropamide, biguanides-phenformin and metformin.

Text Books:

1. Jayashree Ghosh.*Text Book of Pharmaceutical Chemistry.*New Delhi:S.Chand and company, 2003.

2. BhagavathiSundari. *Applied Chemistry*. MJP Publishers, 2008.

Books for Reference:

1. Jayashree Ghosh.*Fundamental Concepts of Applied chemistry*.New Delhi:S.Chand and Company, 2006.

2. Dr. Abhishek Tiwari, Dr.Biswa Mohan Sahoo, Dr. Rajesh Shukla.*Pharmaceutical Chemistry.*NiraliPrakashan,2021.

3. Ashutosh Kar.*Medicinal Chemistry*.New Delhi: New age International (P) Limited, 2004.

SEMESTER IV			
Core Skill Based	**Forensic Chemistry**		
Course Code :21UCHS42	**Hrs./Week:2**	**Hrs/ Sem 30**	**Credits:2**

Objectives:

- To know the origin of forensic science.
- To understand the methods of finger print detection.
- To study different ways in blood stain analysis.
- To understand the drug test methods.
- To learn the nature of investigations in arson sites.

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	understand the origin of forensic science.	4	Un
CO - 2	know the scope of forensic chemistry.	3, 4, 7	Re
CO - 3	understand the forms of finger printing.	4	Un
CO - 4	aware about the methods used in the detection of finger prints.	4, 7	Ap
CO - 5	know the different types of blood stains	3, 4, 7	Re
CO - 6	estimate the level of alcohol.	4, 5, 7	Ev
CO - 7	describe about investigations in arson sites.	3, 4, 7	Un
CO - 8	know about explosive investigations.	4, 7	Re

SEMESTER IV			
Core Skill Based	**Forensic Chemistry**		
Course Code :21UCHS42	**Hrs./Week:2**	**Hrs/ Sem 30**	**Credits:2**

Unit I: Origin of forensic science

Introduction – Early years of forensic science – - sampling in crime sites - detecting nicotine in human body- Stas –Otto test - Advances in nineteenth century- guaiac test – hydrogen peroxide test - Marsh test- detecting arsenic in human body –- rifling- finger printing of bullets - scope of forensic science – criminalistics

Unit II: Finger printing

Introduction- History of finger printing - General principles of finger printing – forms of finger prints - Finger printing systems- Henry system- Integrated automated fingerprint identification system-finger printing detection - Chemicals found in eccrine secretions – powder test – chemical test- silver nitrate test - light test

Unit III: Forensic serology

Introduction- Blood types – research by Landsteiner – properties of four blood groups – rules for blood transfusions – testing for blood types -polymorphic proteins and isoenzymes-proteins and enzymes in blood stain analysis – calculation of frequencies based on blood specimen-characterization of blood stains – blood stain patterns – Adlers' test – luminol test – testing for semen and saliva

Unit IV: Toxicology and drug testing

Introduction - Alcohol and the human body – metabolism of alcohol – behavioral effects of varying levels of blood alcohol concentrations– Testing for blood alcohol concentration-drunkometer – intoximeter – breath analyzer- saliva test – Testing for drugs- marquis test – testing for poisons – confirmatory tests.

Unit V: Arson and explosives investigations

Arson as an economic and social problem – Arson investigations – heat of combustion of some fuels – conditions for combustion – ignition temperature – flash points – flammable

range of common fluids- onsite investigation of accelerant residues – Explosive investigations- classifications of explosives – colour tests for some common explosives.

Text book:

1. David E. Newton.*Forensic Chemistry*. Library of congress, 2007.

Reference book:

1. Jay A. Siegel.*Forensic chemistry- Fundamentals and applications*. Wiley Blackwell, 2015.

SEMESTER- IV			
NME II Industrial Chemistry			
Course Code :21UCHN41	**Hrs/Week:2**	**Hrs/ Sem: 30**	**Credits:2**

Objectives:

- To know the constituents of petrochemicals.
- To study the importance of reclaimed rubber.
- To know the analysis of fats and oils.
- To identify the nature of artificial and natural food colorants.
- To know the specification and standards in quality control.

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSOaddressed	CL
CO-1	know the composition of petroleum and refining of petroleum.	1	Un
CO-2	define and explain the octane number and cetane number.	1	Re, Un
CO-3	employ the manufacture of rubber and Gutta-percha.	1	An
CO-4	know the importance of reclaimed rubber and foam rubber.	1	Un
CO-5	analyze fats and oils.	8	An
CO-6	acquire the knowledge about saponification value and RM value.	5	Un
CO-7	understand the characteristics of food colorants and examine the artificial and natural food colorants.	6, 5, 8	Un,An
CO-8	attain the knowledge of PFA, FPO, FDA, drug licence and aware of essential commodities act, consumer protection act, AGMARK.	2,5	Un Ap

SEMESTER- IV			
NME II	**Industrial Chemistry**		
Course Code :21UCHN41	**Hrs/Week:2**	**Hrs/ Sem: 30**	**Credits:2**

Unit I: Petro Chemicals

Occurrence – composition of petroleum – Refining of petroleum – purification –cracking – types of cracking – catalytic cracking – thermal cracking – knocking andantiknocking properties – octane number – activation. Gasoline – cetane number – flash point –synthetic petrol

Unit II: Rubber Industry and Fibres

Manufacture of rubber, Gutta-percha –properties of rubber – compounding of rubber – vulcanization – properties of vulcanized rubber– synthetic rubber – SBR rubber and Neoprene rubber – Reclaimed rubber and foam rubber –uses.

Fibres – Difference between natural and synthetic fibres

Unit III: Fats, Oils and Waxes

Fats and oils – definition – physical and chemical properties – Analysis of fats and oils–

Saponification value, iodine value, acid value, Reichert-Meissel value– manufacture of vanaspathi or vegetable ghee. Waxes – definition and classification.

Unit IV: Food Additives

Baking soda – food color natural and artificial – intentional food additives – acid base and their salts – antioxidants – stabilizers– bleaching – maturing agents – leavening agents – humectants and preservatives.

Unit V: Quality control

Quality control – Specification and standards : PFA, FPO, FDA, drug licence, WHO standards, IS specification packing and label requirements, essential commodities act, consumer protection act, AGMARK

Books for Reference:

1. Siva Sankar B. *Food processing and preservation*.New Delhi:Prentice — Hall of India Pvt.Ltd., 2002.

2. BagavathiSundari K. .*Applied Chemistry.*Chennai:MJP Publishers, TamilNadu Book House, 2006.

3. Agarwal. *Natural Products Volume II (Organic)*.Meerut: Krishna Prakashan Media P. Ltd 2015.

SEMESTER IV	
Part IV Self Study	**Applied Chemistry**
Course Code :21UCHSS2 (Optional)	**Credit : +2**

Objectives

- To distinguish different types of water
- To develop a knowledge about the manufacture of soaps and detergents
- To differentiate different types of special milks
- To know the chemical nature of perfumes and pigments
- To understand the nature and composition of paints and varnishes

Course Outcome

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	differentiate between hand and soft water in terms of origin and content	2	Ap
CO - 2	analyse samples of water to assess their suitability for drinking	5	An
CO - 3	describe the process of manufacture of soaps	1,7	Re
CO - 4	aware of comparison of soaps and detergents.	5	Ap
CO - 5	list out the characteristics of good paint	1,7	Re
CO - 6	understand the constituents of varnishes and their functions	2,7	Un
CO - 7	know the different composition of milk	1	Re
CO-8	identify the different types special milks	2	Ap

Unit I: Water Softening Techniques

Water– water quality parameters - Hardness of water – temporary and permanent hardness, disadvantages of hard water – softening of hard water – zeolite process, demineralization process and reverse osmosis – sterilization of water for domestic use by chlorine, ozone and UV light

Unit II: Soaps and Detergents

Soap – definition and types – manufacture of different types of soaps (toilet soaps, transparent soaps and liquid soaps) and their uses – cleansing action of soaps. Detergents – classification of detergents (cationic, anionic and non-ionic) – comparison of soaps and detergents.

Unit III: Paint and Varnishes

Purpose of surface coating – Paint – characteristics of good paint – constituents of paints – classification of paints – fluorescent paints (traffic signal), fire retardant paints – Varnishes – constituents and their functions. Emulsion paints.

Unit IV: Pigments and Perfumes

Pigments – Definition – Examples – colours imparted by the pigments and their uses(lithopone, titanium dioxide, ultramarine blue, Red lead, chrome green) Perfumes – Ingredients of perfumes- Isolation of essential oils – Artificial flavours – apple, grape, banana, pineapple, jackfruit (Naming of a few compounds only structure not needed)

Unit V: Dairy Chemistry

Milk – composition of milk - Types of milk - Special milks – sterilized milk – flavoured milk – irradiated / vitaminised milk – toned milk – condensed milk. Fermented milks – Cultured butter milk – Acidophilus milk – Yoghurt (Firm-bodied milk).

References:

1 Jayashree Ghosh. *Fundamental concepts of Applied chemistry*.New Delhi:S. Chand & company Ltd, 2006.

2. Jain P.C. and Monika Jain. *Engineering chemistry*.New Delhi: Dhanpat Rai & Sons, 2012.

4. Sharma B.K . *Industrial Chemistry*.Meerut:Goel Publishing House,2020.

SEMESTER III & IV			
Core Practical II	**Semi-micro Inorganic Qualitative Analysis**		
Course Code :21UCHCR2	**Hrs/Week : 2**	**Hrs/ Sem : 30**	**Credits : 2**

Systematic qualitative analysis of a mixture containing two anions and two cations. One of the anions should be an interfering radical which should be eliminated. The two cations should be of different groups.

Principles of flame testing – concept of solubility and solubility product – concept of pH and Buffer action – common ion effect - theory of testing anions (Simple and interfering) – Principle of grouping of cations –Theory of testing cations.

The combination of mixture containing two halides,(sulphates along with lead, barium, strontium and calcium), (oxalate and carbonate) & (one oxidizing and one reducing group), should be avoided.

Anions:

(i) Carbonate (ii) Sulphide (iii) Sulphate (iv) Chloride (v) Bromide (vi) Iodide.

(vii) Nitrate (viii) Borate (ix) Oxalate (x) Fluoride (xi) Chromate (xii) Phosphate

Cations:

(i) Lead (ii) Copper (iii) Bismuth (iv) Cadmium (v)Antimony (vi) Nickel (vii) Manganese (ix) Zinc (x) Barium (xi) Strontium (xii) Calcium (xiii) Magnesium (xiv) Ammonium.

Course Work:

Detection of sodium and potassium ions by flame photometer

Books for Reference:

1. J. N. Gurtu and R. Kapoor.*Advanced Experimental ChemistryVolume II*. S. Chand & Company Ltd,1980.
2. A.O. Thomas.*Practical Chemistry for B. Sc. Main students*. Scientific Book Centre, Cannanore,1992.

SEMESTER- IV			
Ability Enhancement Course: Yoga and Meditation			
Code: 21UAYM41	**Hrs/Week : 2**	**Hrs/Semester : 30**	**Credits: 2**

Course Outcome:

- To learn and practice various meditation, yoga methods to transform the ordinary life into a healthy, harmonious life leading to holistic wellbeing,
- To create an eco-friendly, loving and compassionate world.
- Acquire knowledge and skill in yoga for youth empowerment.
- Increase their power of concentration
- Learn the causes and ways to overcome fear and sadness.
- Create a ecofriendly, loving and compassionate world.

Unit I: Meditation (6 Hrs)

Meditation – Purposes of meditation– Major types of meditations: Zazen, Mindfulness, Vipasana, Yoga, Self-inquiry, Listening, Qi Gong, Taoist, Tantra– Health benefits of meditation: physical, psychological, spiritual–Meditation and Silence:Silence of the body, mind, heart,and beyond – General methodology of meditation – Tips for better meditation

Exercises: Practicing Zazen meditation – Self-enquiry meditation exercises

Unit II: Self-Awareness (6 Hrs)

Awareness – Self-awareness – Importance of self-awareness – Shades of self-awareness – Difference between Awareness and Concentration – Power of concentration – Levels of concentration – How to increase concentration? – Beauty of living here and now – Ways to develop your presence – Self-awareness and Ecology: interconnectedness

Exercises: Body Scan exercise – Self-Witnessing exercise – Eating Raisin with full awareness

Unit III: Yoga (6 Hrs)

Meaning and importance of yoga – Yoga and human physical system – Principles of Yoga – Different types of yoga – Yoga and balanced diet – Yoga and energy balance – Pranayama – Surya namaskaram– Basic asanas for healthy life – Therapeutic benefits of simple yogasanas – Naturopathy for common ailments.

Exercises:Practicing basic Asanas – Doing Sun Salutation

Unit IV: Mindfulness (6 Hrs)

Definition of mindfulness – Three components of mindfulness– Benefits of mindfulness – Mindfulness and Brainwave patterns – Myths about mindfulness – Scientific Facts about mindfulness – Formal method to practice mindfulness – Qualities of Mindfulness – Obstacles for mindfulness – informal ways of practicing mindfulness – Mindfulness to get rid of addictions

Exercises: Practice Mindful Walking –Practice Mindful Talking

Unit V: Heartfulness (6 Hrs)

Attitude to life – Power of positive attitude – Techniques to develop positive attitude – Positive vs negative people – Forms of negative attitude – Heartfulness – Managing fear: Basic 5 fears, Ways to overcome fear–Handling anger: Anger styles, Tips to tame anger – Coping with sadness: Causes and ways to overcome sadness, dealing with depression – Ultimacy of compassion: Compassion to oneself, towards others: Forgiveness, to nature: Seeing God in all

Exercises: Practice Loving-Kindness meditation– Doing compassionate actions

Text Book:

1) Thamburaj Francis. *Meditation and Yoga for Holistic Wellbeing.* Trichy:Grace Publication. 2019.

Books References:

1) Osho. *Meditation the Only Way.* New Delhi: Full Circle Publication, 2009.
2) Thamburaj Francis. *Journey from Excellence to Godliness: Zen Meditation for Transformation.* Grace Publication, Trichy, 2017.
3) Osho. *Awareness: The Key to Living in Balance.* New York: St.Martin's Griffin Publication, 2001.
4) Tolle Eckart.*The Power of Now: A Guide to Spiritual enlightenment.* New World Library, 2004.
5) Swami Gnaneswarananda. *Yoga for Beginners.* Calcutta: Sri Ramakrishna Math, 2010.
6) HanhThichNhat. *The Miracle of Mindfulness: An Introduction to the Practice of Meditation.* Beacon Press, 2016.
7) Kamlesh D. Patel and Joshua Pollock. *The Heartfulness Way: Heart-Based Meditations for Spiritual Transformation.* Westland Publications, 2018.

SEMESTER- V			
Core V (Common Core)	**Material Science**		
Course Code : 21UPCC51	**Hrs/Week : 6**	**Hrs/ Sem : 90**	**Credits : 5**

Objectives:

- To study the different crystal structures and crystal imperfections.
- To understand the usage of the appropriate materials while designing electronic system.
- To enrich the students about the background theory and properties of different materials.
- To classify different magnetic materials.
- To appreciate different methods of synthesis of nanomaterials.

Course Outcome:

CONo.	**Upon completion of this course, students will be able to**	**PSO addressed**	**CL**
CO – 1	understand the basic symmetry elements and operations of crystals.	1, 2	Un
CO – 2	distinguish the types of crystals and enumerate the various crystal imperfections.	3,4	An
CO – 3	get a clear knowledge about metallic glasses shape memory alloys and biomaterials.	1, 3, 5,7, 8	Re
CO – 4	justify the wave nature of matter and its experimental study.	1,3	Ev
CO – 5	apply Bragg's law for x-ray study.	2	Ap

CO – 6	distinguish magnetic materials based on susceptibility.	2	An
CO – 7	usage of magnetic materials in various field.	2	Ap
CO – 8	discuss the synthesis methods of nano materials.	2	Un

SEMESTER- V			
Core V (Common Core)	Material Science		
Course Code : 21UPCC51	Hrs/Week : 6	Hrs/ Sem : 90	Credits : 5

Unit I: Crystal structure and crystal imperfections

Types of solids- Explanation of isotropy-anisotropy. Symmetry of crystals-Plane of symmetry,axis of symmetry,centre of symmetry. Miller indices and determination. Crystal structure-crystal lattice, space lattice .unit cells-Types of crystal systems-Classification of crystals on the basis of bonds-ionic crystal,crystal lattice of NaCl and CsCl. Lattice energy of ionic crystal- (Born-Haber cycle). Molecular crystal-dry CO_2-Covalent crystal- Structure of diamond. Metallic crystal-crystal defect-(vacancy, interstitial, impurity).Semiconductors-solar cell.Liquid crystals-types and its applications.

Unit II: New materials

Shape memory alloys-Phases of shape memory alloys-Types-Characteristics-Applications

Metallic glasses- Glass transition temperature-Preparation-types-properties-applications

Intermetallic compounds-properties-classification-preparation-applications

High temperature materials-properties-types-applications

Biomaterials- Classification-types of dental cement and its applications.

Smart material-Properties-Components-Classification-application

Unit III: X-rays

X rays-Production-Properties-X ray spectra-continuous and characteristic spectrum-Mosley's Law-(Statement, explanation and importance)-Compton effect-Expression for change of wavelength

Diffraction of X-rays-Bragg's law – Derivation of Bragg's equation - Experimental methods of X-ray study– Laue, rotating crystal and powder methods.

Unit IV: Magnetic and dielectric materials

Classification of magnetic materials – Langvein theory of diamagnetism – theory of paramagnetism– Domain theory of ferromagnetism – Antiferro magnetic materials – Application of Different magnetic materials.

Dielectric materials – Types of dielectric materials – different types of electric polarization –- Internal field – Clausius-Mossotti equation – Frequency and temperature dependence of dielectric constant.

Unit V: Nanomaterials

Nanomaterials- Synthesis- Techniques for Synthesis-Plasma arcing, Chemical vapour deposition, Sol gels, Electro deposition, Ball milling –Properties of nano particles and applications-Carbon nanotubes-Structure-Fabrication: Arc method, Pulsed laser deposition-Chemical vapour deposition- Structure- Properties- Applications.

Text Books:

1. Arumugam M. *Material Science*. Anuradha Publication, 2008.
2. Sri Vasta C M & Srinivasan C. *Science of Engineering materials*. New Age International (P) Ltd, Second Edition, 1999.
3. Palanisamy P. K. *Solid state Physics Copyright* (2003).Chennai:Scitech Publication (India) Pvt Ltd, 3rd reprint 2008.
4. Mureghesan R, Kiruthiga Sivaprasath. *Modern Physics*. S.Chand& Co Ltd. 17th Edition, 2013.
5. Dr.Mani. P. *A Text Book of Engineering Physics*.Chennai:Dhanam Publications. Revised Edition, 2008.
6. Marikani A.*Materials Science*. Delhi:PHI Learning Pvt.Ltd. Eastern Economy Edition, 2017.

Books for Reference:

1. Charles Kittel. *Introduction to solid state Physics*. John Wiley and Sons, 2010.

2. Palanisamy P. K. *Material Science*, Chennai: Scitech Publication (India) Pvt Ltd, 2005.
3. Fulekar M.H *Nano Technology Importance and applications*. I.K International Publishing House Pvt Ltd, 2010.

SEMESTER- V			
Core VI	**Inorganic Chemistry-I**		
Course Code :21UCHC51	**Hrs./Week:4**	**Hrs/ Sem: 60**	**Credits:4**

Objectives:

- To provide the knowledge of d block elements.
- To have a profound understanding of theories of chemical bonding.
- To know the chemistry behind d and f block elements.
- To acquire knowledge about the reactions in non- aqueous solvents.
- To understand the nature of different types of inorganic materials.

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	provide knowledge about non-aqueous solvents.	1	Un
CO - 2	helps to learn the positions of the zero, d– and f block elements in the periodic table.	1	Ev
CO - 3	explain the general characteristics of non-aqueous solvents d– and f–block elements and the general horizontal and group trends in them.	1	Ap
CO - 4	recall relevant oxidation states for halogens, d and f block elements.	1	Re
CO - 5	appreciate the relative stability of various oxidation states in terms of electrode potential values.	1, 7	Ev

CO - 6	derive equations for reactions of compounds of halogens, d and f block elements.	1, 2, 8	Cr
CO - 7	describe the synthesis of halogens, d and f block elements.	3, 5, 6	Ap
CO - 8	recall the structures, the properties, applications of silicones and silicates.	1, 2	Re

SEMESTER- V			
Core VI	**Inorganic Chemistry-I**		
Course Code :21UCHC51	**Hrs./Week:4**	**Hrs/ Sem: 60**	**Credits:4**

Unit I Reactions in non-aqueous solvents

Solvent- definition- water as a universal solvent - classification of solvents – factors affecting the solvating ability– liquid range-dielectric constant – dipole moment and viscosity.

Liquid NH_3 as non aqueous solvent-reason –auto ionisation – ammono acid and bases. Reactions - neutralization, precipitation, solvolysis, complex formation and redox reactions.

Advantages and disadvantages of liquid NH_3 as a solvent.

Liquid SO_2 as non aqueous solvent – reason. Reactions- precipitation, neutralization, solvolysis, complex formation and redox reactions. Advantages and disadvantages of liquid SO_2 as a solvent.

Unit II Theories of Chemical Bonding

Valence bond theory – postulates.

VSEPR Theory Postulates – Geometry of molecules containing only Bond pairs of electrons BeF_2, BF_3, CCl_4, PF_5, SF_6, IF_7. Geometry of molecules containing Bond pairs as well as Lone pairs of electrons. $SnCl_2$, H_3O^+, SF_4, ClF_3, XeF_2, XeF_4, IF_5.

Geometry of Ions – Carbonate ion, Nitrate ion, Sulphate ion, Perchlorate ion, chlorate ion.

Molecular Orbital Theory - The basic principles of molecular orbital theory – Linear combination of atomic orbitals (LCAO). Molecular orbital treatment of Hydrogen molecule H_2, Hydrogen molecule ion H_2^+ , H_2^-, O_2^+, O_2^-, O_2^{2-}. Carbon monoxide molecule & Nitric oxide molecule. Term symbols for Diatomic molecules. Molecular orbital's of polyatomic species H_3^+ ion. Walsh Diagram – BeH_2 molecule.

Unit III d- Block Elements

General characteristics of d-block elements – comparative study of Ti, Zr, Hf extraction, properties and uses of titanium-preparation and uses of titanium dioxide and titanium tetrachloride. polyvalency of vanadium. Comparative study of Cr, Mo, W – polyvalency of chromium-extraction, properties and uses of molybdenum and tungsten. Platinum-Extraction, properties and uses. Platinum sponge, Platinum black, platinized asbestos and colloidal Platinum, potassium chloroplatinate. Comparative study of

Cu, Ag, Au.(similarities and dissimilarities)

Unit IV f- Block Elements

General characteristics of lanthanides – separation of lanthanides – precipitation – thermal reaction – fractional crystallization – complex formation – solvent extraction – valency change method – ion exchange method. Extraction of a mixture of lanthanides from monazite sand – applications of lanthanides and their compounds – lanthanide contraction – causes and consequences. General characteristics of actinides – comparison between lanthanides and actinides- extraction of Th and U. Preparation and uses of UF_6 and uranyl acetate.

Unit V Inorganic Polymers

Inorganic polymers – general properties - Classification of inorganic polymers - polymer containing phosphorous – preparation, properties and structure of polyphosphonitrilic chloride - polymer containing sulphur - preparation, properties and structure of polymeric sulphur nitride - polymer containing boron – preparation, properties, structure of borazine, substituted borazine – boron nitride and polycarbonates – polymer containing silicon - preparation, properties, structure and uses of silicone fluids, silicone rubbers and silicon resins. Silicates – classification and structure of silicates.

Text books:

1. Puri B.R, Sharma L.R, Kalia K.C. *Principles of Inorganic Chemistry*.Delhi:Milestone publishers and distributors, 2019 – 2020.

2. Sathya Prakash and Madan R.D. *Advance Inorganic Chemistry*. S Chand and Co, 2019.

Books for Reference:

1. Wahid U Malik, Tuli G.D, Madan R.D. *Selected Topics in Inorganic Chemistry*.S.Chand& Co. Ltd., 2018.

2. Albert Cotton F, Geoffrey Wilkinson, Carlos A. Murillo, Manfred Bochmann. *Advanced Inorganic Chemistry*, John Wiley & Sons. sixth edition, 2016.

3. James E.Huheey, Ellen Keiter, Richard L.Keiter, Okhil K.Medhi. *Inorganic Chemistry-Principles of Structure and Reactivity*. Pearson India Education Services Pvt. Limited, 2020.

SEMESTER- V			
CoreVII	**Organic ChemistryII**		
Course Code :21UCHC52	**Hrs./Week:5**	**Hrs/ Sem: 75**	**Credits:5**

Objectives:

- To know the importance of effect of substituent in phenol.
- To study the importance of carboxylic acid and their derivatives.
- To understand the different applications of Photochemistry in Organiccompounds.
- To know the importance of Heterocyclic compounds.
- To Study importance of Synthetic reagents and Specific namereactions.

Course Outcome:

CONo.	**Upon completion of this course, students will be able to**	**PSOaddressed**	**CL**
CO- 1	reframe the alcohol series, justify the effect of substituent on the acidity of phenols.	1,2,3,6	Cr,Re
CO - 2	explain the mechanism of Claisen, Benzoin, Perkin, Knovenegal reaction- Wittig reaction-iodoform reaction.	2	Un
CO - 3	generalize the properties of carbonyl and carboxylcompounds and explain the factors influencing strength of acid -effect of substituent in benzene ring	1, 2, 6	Cr Un
CO -4	identify the type of the photochemical and thermalreactions.	1,7	Re
CO – 5	understand the important applications ofphotochemistry in organic compounds.	1	Un
CO – 6	know about the importance of heterocyclic compounds, alkaloids and terpenes	1, 4	Re
CO-7	identify the nature of compounds in heterocyclic compounds compare quinoline and isoquinoline	5	Ap

CO - 8	recall the preparation of NBS and wilkinsons catalyst Prepare reagents in organic synthesis like Lithium Aluminium hydride, Periodic acid and illustrate the mechanisms of Reformatsky reaction- Cope elimination- Bayer-villiger oxidation	1,3,4	Re Cr Ap

Unit I: Hydroxy Compounds and Carbonyl compounds

Alcohols – distinction between primary, secondary and tertiary alcohols – (Lucas test, catalytic dehydrogenation, oxidation, Victor - Meyer's test)-Interconversion of primary, secondary and tertiary alcohols. Ascent and descent in the series of alcohols-trihydric alcohol-Glycerol- Preparation, properties – derivatives of glycerol- nitroglycerine-blasting gelatin- Cordite and dynamite-Phenols – classification with example – effect of substitutent on the acidity of phenols

Aliphatic aldehyde& ketones-Reactivity of carbonyl groups-general reactions of aldehydes and ketones-mechanism of addition and condensation reaction- Cannizzaro reaction-Aldol condensation-Reduction reaction- MPV reduction-Wolf-kishner- Clemmenson reduction

Aromatic aldehydes and ketones- Mechanism of Claisen, Benzoin, Perkin, Knovenegal reaction- Wittig reaction-iodoform reaction

Unit II: Carboxylic Acid and their derivative

Aliphatic monocarboxylic acid- general methods of preparation and reactions- acidic nature-factors influencing strength- dicarboxylic acid- Blanc's rule-Aromatic monocarboxylic acid-effect of substituent in benzene ring- Aromatic dicarboxylic acid- Reactions of phthalic acid –Test for Carboxylic acid – Aliphatic hydroxy acids – Preparation reactions of maleic acid and citric acid – Action of heat on hydroxy acid – aliphatic acid derivative- reaction of ester, acid halide and acidamide

Unit III: Photochemistry

Introduction – Photochemical vs thermal reactions – singlet and triplet states – allowed and forbidden transitions – Jablonski diagram – photosensitization – photochemical reaction – elimination reaction – Norrish type I and Type II – photolysis of cyclic ketone – photolysis of aldehyde – photolysis of compounds containing Nitrogen – Barton reaction –

photocycloaddition– Paterno-Buchi reaction – photo induced reaction of α,β-unsaturated ketone.

Unit IV: Heterocyclic compounds

Introduction – preparation and reactions of furan, pyrrole and thiophene. Aromatic character and basic nature – comparative reactivity. Preparation and reactions of pyridine – preparation and reactions of quinoline, isoquinoline and indole. Structural elucidation of pyridine, quinoline andisoquinoline

Unit V: Reagents of Synthetic Importance and Name Reactions

Preparation and synthetic applications of the following reagents in organic synthesis – Aluminium isopropoxide, N-Bromo succinimide (NBS), Lithium Aluminium hydride, Periodic acid,Osmiumtetraoxide- Wilkinson'scatalyst.

Reformatsky reaction- Cope elimination- Bayer-villiger oxidation-Ritter reaction-Hell-Volhard –Zelinsky reaction and Dakin reaction.

Text Books:

1. Tewari K.S, Vishnoi N.K. *A Text Book of Organic Chemistry*.Vishal Publishing.2nd Revised Editions 2017.
2. Arun Bahl and B. S. Bahl. *Advanced Organic chemistry*. S. Chand and Company Ltd., Reprint, 2017.

Books for Reference:

1. Bhupinder Mehta, Manju Mehta. *Organic chemistry*. PHI Learning pvt. Ltd, 2006.
2. Finar I.L .*Organic chemistr, The Fundamental Principles.* Volume I, 6th edition 2014.
3. Tewari N. *Advance Organic Reaction mechanism*. Kolkatta:Books and allied (P) Ltd.Second revised edition, 2017.
4. Jain M.K and Sharma S.C . *Modern organic chemistry*. Vishal publishing co, 4th edition 2012.

SEMESTER- V			
Core VIII	**Physical Chemistry-II**		
Course Code : 21UCHC53	**Hrs/Week : 5**	**Hrs/ Sem : 75**	**Credits : 5**

Objectives:

- To study the various thermodynamic parameters and its applications in different physical states of the systems.
- To sustain a deep knowledge about the importance of electrochemistry and its applications.

CONo.	Upon completion of this course, students should be able to	PSOaddressed	CL
CO- 1	study various thermodynamic parameters and its applications in different physical states of the systems and have a study about the first law of thermodynamics.	1 ,2 , 3	Re
CO- 2	know the basics of molar heat capacities Joule Thomson effect – Joule Thomson coefficient – inversion temperature.	1 ,2,7	Re
CO- 3	learn the concept of entropy and Second law of thermodynamics.	1,3	Un
CO-4	have an idea about work function, free energy function and partial molar properties	1,2 , 3	Re
CO- 5	know the significance and application of Claussius-Claypeyron equation.	1,2,5	Un

CO-6	understand the concept of fugacity, Nernst heat theorem and third law of thermodynamics.	1, 3,4	Re
CO- 7	understand about EMF, electrochemical series and its significance , concentration cells and applications of e.m.f.	2,3	An
CO-8	probe into the importance of electrochemistry and its industrial application.	1,3	An

SEMESTER- V			
Core VIII	**Physical Chemistry-II**		
Course Code : 21UCHC53	**Hrs/Week : 5**	**Hrs/ Sem : 75**	**Credits : 5**

Unit I: Thermodynamics I

Scope of thermodynamics-Thermodynamic terms and basic concepts-thermodynamic equilibrium – types of thermodynamic system –Intensive and extensive properties-State function-Path function-Thermodynamic processes – (Isothermal, adiabatic, isobaric, isochoric)– Reversible and irreversible process-sign conventions of work and heat – Pressure-Volume Work-Internal Energy-First law of thermodynamics – Various statements-enthalpy of a system – relationbetween ΔH and ΔE – molar heat capacities – definition – molar heat capacity at constantvolume – molar heat capacity at constant pressure – relation between Cp and C_v- JouleThomson effect – Joule Thomson coefficient – inversion temperature.

Unit II: Thermodynamics II

Limitations of first law of thermodynamics-Spontaneous process-Examples and criteria of spontaneity-Entropy-Second law of thermodynamics –Different statements — Entropy changes in isothermal expansion of anideal gas – Entropy changes in reversible and irreversible processes –-Work function and freeenergy function – Variation of free energy with temperature and pressure – Gibbs Helmholtzequation – Derivation and significance – Partial molar properties – Chemical potential –Gibb's Duhem equation – Derivation and significance .

Unit III: Thermodynamics III

Claussius-Claypeyron equation – derivation (integral anddifferential forms) - significances - application in ice skating — derivation of Van't Hoff isotherm and isochore-Concept of fugacity– fugacity of a gas in a gaseous mixture –physical significance offugacity-Nernst heat theorem – third law of thermodynamics – statement -determination ofabsolute entropy of solids, liquids and gases– entropy change in chemical reactions – derivation of the

Boltzmannentropy equation – residual entropy – Thermodynamic equilibrium-Zeroth law of thermodynamics.

Unit IV: Electrochemistry I

Strong and weak electrolyte-Effect of equivalent conductance on dilution- Elementary treatment of Debye-Huckel theory of strong electrolytes – Significance of Debye-Huckel Onsagar equation (Derivation not required) – Transport Number – Determination by Hittorff's and moving boundary methods – Abnormal transport numbers – Absolute velocity of an ion and its determination – Kohlrausch's law and its applications — Conductometric titrations – Different types – Advantages.

Electrochemical cells-Types-Chemical cell and concentration cell-Reversible and irreversible cell – Cell representation-Cell reaction-Single electrode potential -Standard electrode potential- Types of electrodes- Primary and secondary reference electrode-metal – metal ion-gas electrode- metal insoluble metal salt electrode (calomel), membrane and redox electrodes.

Unit V: Electrochemistry II

EMF –Definition- Electrochemical series and significance- – Nernst equation (Relation between EMF and equilibrium constant)–Derivation-Application of Nernst equation to calomel electrode- glass electrode -quinhydrone electrode.

Concentration cells – Types-Electrode concentration cells –Electrolyte concentration cells with and without transference- liquid junction potential –Elimination of Liquid Junction Potential-Applications of EMF-Potentiometric titration (acid-base, redox and precipitation).

Industrial applications of electrolysis-Electroplating-Principle-Process-Electroplating of Cu, Ni and Cd-Power sources-Primary cells-selection of anode and cathode-Alkaline-

MnO_2 cell-Secondary cells-Characteristics- Lithium battery and Ni-Cd battery-Fuel cells-Principle-Hydrogen-Oxygen fuel cells-alkaline fuel cells.

Corrosion-Principle-Stability ofmetals-active and noble metals-Anode and cathode process-Protective coating-Types of coating-Protection of structures and pipe lines-Protection of ships in sea.

Text Books:

1. Puri B.R, Sharma L.R, Madan S. Pathania. *Principles of Physical Chemistry*. VishalPublishing Co., 2008.
2. Arun Bahl, Bahl B.S, Tuli G.D. *Essentials of Physical Chemistry*.New Delhi:S. Chand & Company Ltd , 2008.

Books for Reference:

1. Samuel Glasstone.*Thermodynamics for chemists*.New Delhi: Affiliated East-West Press (Pvt.) Ltd., III printing, 2010.
2. Samuel Glasstone. *An introduction to electrochemistry*.New Delhi: Affiliated East-West Press (P) Ltd., 2006.

SEMESTER V			
Core Practical III Physical Chemistry Practicals			
Course Code : 18UCHCR3	**Hrs/Week : 5**	**Hrs/ Sem : 75**	**Credits : 3**

Objective:

Enable the student to get analytical skills and help them to plan and execute experimental projects.

List of Experiments:

1. Critical solution temperature of phenol - water system and effect of impurities on CST.
2. Transition Temperature of a salt hydrate – determination of molecular weight
3. Kinetics of Ester Hydrolysis
4. Conductometric Acid base Titration
5. Conductometric precipitation Titration
6. Potentiometric Redox Titration
7. Molecular weight determination by Rast Method
8. Phase Diagram – Simple eutectic
9. Phase Diagram – Compound formation
10. Heat of solution by solubility method ($K_2Cr_2O_7$/ oxalic acid)
11. Adsorption kinetics of oxalic acids/acetic acid on charcoal. Determination of concentration of the given acid.

Course Work:

1. Verification of Beer's Law using spectrophotometer.

Books for Reference:

1. Gurtu J.N and Kapoor R. *Advanced experimental chemistry*. S.Chand and Co, 1987.
2. Dr. Sundaram S, Dr.Krishnan and Dr. Raghavan P.S, Viswanathan S. *Practical chemistry*. (Printers & Publishers), Pvt. Ltd., 2007.
3. Mukhopadhyay R, Chatterjee P. *Advanced practical chemistry*.Kolkata:Books and allied (p) Ltd.Third Edition, 2007.

SEMESTER V	
Self Study **Chemistry for Competitive Examination**	
Course Code :21UCHSS3 (Compulsory)	**Credits : 2**

Unit I: Purification and Analysis of Organic Compounds

Organic chemistry- Sources of organic compounds. Purification - of organic compounds- Chemical methods of purification- Criteria of purity-Qualitative analysis - detection of elements-Detection of and nitrogen, sulphur, halogens phosphorus - Test for nitrogen - Test for Sulphur - Test for halogens – Beilsteintest for halogen - Test for phosphorus- Quantitative analysis - Estimation of carbonand hydrogen - Estimation of nitrogen - Detection of metals- Separation of mixtureinto components.

Unit II: Structure of Atoms

Atoms – Definition – Dalton's atomic theory - sub atomic particles - charges of sub - atomic particles discoveries of subatomic particles - atomic and mass number - isotopes - symbols for elements - principles governing filling up of electrons in the orbitals - Electronic configurations of first twenty elements. Rutherford; J.J Thomson and Bohr's atomic models - valency; formula and naming of compounds - Molecular mass and mole concept.

Unit III: Classification of Elements and Periodicity of Properties

Classification of elements Doberiner, Newlands, Mendeleev and modern Periodic tables - Groups & Periods - classifications of elements into s, p, d and f block with examples periodicity of properties - metallic character, atomic - ionic radii,. ionization potential energy, electron affinity and electronegativity.

Unit IV: Chemical Bonding and Non - Metals

Need for the Chemical bond formation - introduction to ionic bond, covalent bond, coordinate bond and metallic bond - ionic bond formation - definition, and explanation using

NaCl, - covalent bond - definition and explanation using H_2, O_2, N_2, CH_4, Properties of ionic and covalent compounds Noble gases and their applications - Halogens and their applications preparation and uses of hydrogen, phosphorus and sulphur, Differences between diamond and graphite.- Fullerenes.

Unit V: Biochemistry

Amino acids – Classification – Properties - Zwitter ion structure- Isoelectric point - Chemical properties - Synthesis of amino acids – Proteins - Importance of proteins - Composition of proteins - Classification of proteins - Tests for proteins - Properties of proteins – Drugs - Therapeutic index - Sulpha drugs – Arsenicals - Antipyretics and analgesics – Antimalarials –Antibiotics - Vitamins – Definition – Classification – Provitamins - Physiological action - Vitamin A, Vitamin. A2,Vitamin D, Vitamin E, Vitamin B-complex, Vitamin C - Hormones - Enzymes - Nucleic acids - Viruses - Metal ions in biological systems.

References:

1. Arun Bahl and Bahl B.S. *Advanced Organic Chemistry*.S.Chand and Company Ltd., Reprint, 2017.
2. Puri B.R, Sharma L.R, Kalia. K.C. *Principles of Inorganic Chemistry* Paperback – 7.Vishal Publishing Co. 33rd edition, December 2020.
3. Sathyanarayana U and Chakrapani U. *Essentials of Biochemistry*. Elsevier,2021.

Semester - V			
Common Skill Based Core	**Computer for Digital Era and Soft Skills**		
Code : 21UCSB51	**Hrs / Week : 2**	**Hrs / Sem : 30**	**Credits : 2**

Course Outcome

- Identify different types of computer systems.
- Classify various types of software being used.
- Compare various digital payments and use them in day to day life.
- Recognise the innovative technologies IoT and integrate it in various fields.
- Analyze various social networking platforms and use them efficiently.
- Distinguish various cyber attacks and apply preventive measures.
- Understand the various soft skills needed to become successful.
- Analyze self and adapt oneself to work in a team.

Unit I: Fundamentals of Computers:

Introduction to computers- Components of computers-Working principle-Types of computers-Tablet-Notebook-Smart phone-PDA-Impact of computers on society-Types of software.

Unit II: Recent Trends in Computer Science and e-Governance:

IoT - applications- Mobile applications - E-Learning- E-Commerce - digital payments

Unit III: Social Media:

Face book-Twitter-Linked In-Instagram-Advantages of Social Networking-Issues/Risks of Social Networking-Protecting ourselves from social Networking problems-Cybercrimes-Hacking-Phishing- Cyber Security

Unit IV: Introduction to Soft Skills:

Learning objectives – What are soft skills?-Categories of Soft Skills-Integral Parts of Soft Skills.

Unit V: Understanding Self and Team Building:

Transactional Analysis (TA) - Structural analysis of Ego states- The functional model of Ego states - Egogram-Storkes - Life Position - Egogram and Life Positions Questionnaire-Team and Team Building- Features of effective creative teams

Books for Reference:

1. Peter Norton, Introduction to Computers 6th Edition
2. Charles P Pfleeger, Shari Lawrence Pfleeger, Security in Computing, I Edition, Pearson Education, 2003.
3. E.Balagurusamy, Fundamentals of Computers, McGraw Hill
4. Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang , E-Commerce fundamentals and applications, Wiley Student edition
5. Benita Bhatia Dua, DeepaJeyaraman, Profit with Social Media, CNBC
6. Dr.K.Alex, Soft Skills, S.Chand & Co
7. http://www.digitalindia.gov.in/content/social-media-analytics
8. https://www.researchgate.net/publication/307878962_Introduction_to_E-Governance
9. http://www.ijqr.net/journal/v10
10. https://www.researchgate.net/publication/258339295_FUNDAMENTALS_OF_COMPUTER _STUDIES

SEMESTER- VI			
Core IX	**Inorganic Chemistry - II**		
Course Code :21UCHC61	**Hrs./Week:4**	**Hrs/ Sem: 60**	**Credits:4**

Objectives:

- To study the formation and bonding in coordination compounds
- To know the theories behind the formation of coordination complexes.
- To study the reaction mechanism in complexes
- To know the importance of metals in biological systems and the application of metal chelates in various fields.
- To understand the nature of metal carbonyls and their applications

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	acquire knowledge in the chemistry of coordination compounds and their properties.	1	Un
CO - 2	characterize and synthesize of coordination compounds and explain the definition of coordination compounds, naming them and decide isomerism.	1, 5,6	Ap, Re
CO - 3	describe the formation and bonding in coordination compounds.	1, 6	An
CO - 4	grasp the knowledge of bonding and identify the structure and bonding in metal carbonyls of mono, bi nuclear and	1, 3, 6	Re, Ap

	poly nuclear carbonyls.		
CO - 5	know the reaction mechanism of coordination compounds.	1	Re
CO – 6	understand the formation of metal clusters.		
CO-7	formulate independent research ideas in the field of bioinorganic chemistry.	1	Un
CO-8	recall the importance of metals in biological systems and the application of metal chelates in various fields.	1, 4, 8	Re

SEMESTER- VI			
Core IX	**Inorganic Chemistry - II**		
Course Code :21UCHC61	**Hrs./Week:4**	**Hrs/ Sem: 60**	**Credits:4**

Unit I: Co-ordination Compounds I

Limitations of VB theory,Co-ordination compounds –definition –addition (or) molecular compounds double salts-complex salts. Terminology – complex ions (central metal ion) coordination number- ligands - types of ligands (monodentate– bidentate – polydentate - bridging ligands) –Chelating ligands – Oxidation number, co-ordination sphere, effective atomic number (EAN). Nomenclature of coordination compounds – isomerism in co-ordination compound – structural and stereo isomerism. Hydrate isomerism – ligand isomerism – linkage isomerism – coordination isomerism – coordination position isomerism – polymerisation isomerism. Stability of complex ions – Irving William series.

Unit II: Co-ordination Compounds II

Crystal field theory –postulates of Crystal field theory- CF splitting in tetrahedral, Relation between Δ_t, Δ_0 and 10 Dq. Distribution of d^x (x=0 to 10) electrons in t_{2g} and $e_g$orbitals in tetrahedral complexes - and CF splitting in octahedral complexes - Distribution of d^x (x=0 to 10) electrons in t_{2g} and $e_g$orbitals in octahedral complexes-. Spiltting of d orbitals in square planar complexes – calculating the value of crystal field splitting parameter in square planar complexes - Strong and weak field ligands, Crystal field stabilization energy (CFSE) – factors influencing the magnitude of CF splitting — applications of crystal field theory - magnetic properties, colour of transition metal complexes – Ligand field theory- Jahn Teller theorem Consequences of Jahn- Teller distortion.

Unit III: Reaction Mechanism in Co-ordination Compounds

Substitution reaction in octahedral complexes – dissociative (S_N1), associative(S_N2) mechanism. Lability and inertness of transition metal complexes- Interpretation - Lability of non-transition metal complexes- Substitution reactions in octahedral complexes (acid and base hydrolysis) and substitution reactions in square planar complexes S_N1 and S_N2. Trans effect- pi bonding theory of trans effect – uses of trans effect. Electron transfer reactions – Outer sphere and inner sphere mechanism, MO diagram for sigma system$[Co(NH_3)_6]^{3+}$, $[Ti(H_2O)_6]^{3+}$.

Unit IV: Organometallic compounds and Metal clusters

Eighteen electron rule – Nomenclature of organometallic compounds- classification of carbonyls- based on the number of metal atoms present in carbonyl- based on the structure of carbonyls. General methods of preparation, properties of transition metal carbonyls.

Nature of M-CO bonding in metal carbonyls - Structure and bonding in metal carbonyls of mono, bi nuclear and poly nuclear carbonyls of Ni, V, Cr, Fe, Co and Mn. [$(Ni(CO)_4$.) $V(CO)_6$, $Fe(CO)_5$, $Cr(CO)_6$, $Co_2(CO)_8$, $Fe_2(CO)_9$, $Mn_2(CO)_{10}$, and $Fe_3(CO)_{12}$]. Carbonyl clusters – Wade's rules. Bonding in ferrocene – Aromatic character of ferrocene.

Unit V: Bio-Inorganic Chemistry

Role of metal ion in living systems (excess and deficiency of trace metals) – metalloproteins, metallo-enzymes – characteristics of metallo-enzymes – characteristics of metal activated enzymes – functions of metal in enzymes – elementary idea of metallo-porphyrins. Structure and function of haemoglobin, myoglobin and chlorophyll .Function of Na/K pump. Biological functions and toxicity of some elements. Applications of co-ordination compounds in medicine, industry, biological systems and analytical chemistry.

Text book:

1. Puri B.R. Sharma L.R. Kalia. *Principles of Inorganic Chemistry*.Delhi:K.K. Milestone Publishers & Distributors, 2019 – 2020.

Books for Reference:

1. Lee J.D. *Concise Inorganic Chemistry*. Blackwell ScienceWiley.fifth edition, 2008.
2. Gopalan R, Ramalingam V.*Concise co-ordination Chemistry*. Vikas Publishing House Pvt Ltd, 2008.
3. Wahid U Malik, Tuli G.D, Madan R.D. *Selected Topics in Inorganic Chemistry*. S. Chand & Co. Ltd, 2018.
4. Albert Cotton F, Geoffrey Wilkinson, Carlos A. Murillo, Manfred Bochmann. *Advanced Inorganic Chemistry*, John Wiley & Sons.sixth edition 2016.

SEMESTER- VI			
CoreX	**OrganicChemistry-III**		
Course Code :21UCHC62	**Hrs./Week: 4**	**Hrs/ Sem: 60**	**Credits: 4**

Objectives:

- To have an idea on GreenChemistry and crown ethers
- To Know the classification of dyes and importance of poly nuclear hydrocarbons
- To understand retrosynthesis and its relay approach tosynthesis
- To know the extraction of oil using Clevenger apparatus
- To interpret the chemical structure of molecules using spectroscopy

Course Outcome:

CONo.	**Upon completion of this course, students will be able to**	**PSOaddressed**	**CL**
CO - 1	apply green chemistry in day-to-day life, drycleaning, versatile bleaching agent.	4,7	Ap
CO - 2	implement an awareness about green chemistry andthe methods of microwave assisted synthesis.	3,8	Ap
CO - 3	demonstrate various Theories of colour and constitution,know the applications of dyes .	1	Ap,Re
CO - 4	classify the polynuclear hydrocarbonsStructure Elucidation of alizarin.	1.5	Ap Cr
CO - 5	state synthons and synthetic equivalent- Protectionand deprotection of different groups and explain retrosynthesis of 5-hexanoic acid.	1,3,6	Re Un
CO-6	apply the methods of extraction of Alkaloids and Terpenoids	6	Ap
CO - 7	apply Woodward-Fieser rule for calculation of absorptionmaxima of dienes and α, β unsaturated ketones and enumerate the applications of UV spectroscopy in	1, 2,6	Ap

	coordinationcomplexes.		
CO - 8	generalise the theoretical principle, selection rules and instrumentation of IR spectroscopy and categorise IR absorption frequencies and applications of IR	1, 2,4,6	Cr, An

SEMESTER- VI			
CoreX	**OrganicChemistry-III**		
Course Code :21UCHC62	**Hrs./Week: 4**	**Hrs/ Sem: 60**	**Credits: 4**

Unit I: Green Chemistry

Introduction – need for green chemistry – twelve principles of green chemistry – greenchemistryinday-to-daylife–drycleaning,versatilebleachingagent–atomeconomy-green solvents – supercritical fluid CO_2, ionic liquids andwater

Microwave assisted organic synthesis – introduction – microwave assisted reactions in water – Hofmann elimination and hydrolysis of benzyl chloride – microwave assisted reactions in organic solvents – esterification and Fries rearrangement – microwave assisted reactions in solid state – deacylation, oxidation of alcohols usingclayfen.

Unit II: Dyes and Polynuclear hydrocarbons

Dyes-Witt's theory of colour and constitution – chromophore – Auxochrome –classification of dyes according to chemical structure – preparation and uses of Nitrodyes – Martius yellow. Azo dyes – Aniline yellow, Methyl orange, Congo red, Bismarkbrown, Diphenylmethane dyes- Auramine O. Xanthene dyes – Fluorescein, Eosin and Rhodamine B. Phthalein dyes – Phenolphthalein. Indigo and Thioindigoid dyes – Indigo and Thioindigo. Anthraquinoid dyes – Alizarin. Classification of dyes according to method of application- Direct dyes, Mordant dyes, Vat dyes, Ingrain dyes and Disperse dyes.

Polynuclear hydrocarbons -Synthesis, reactions and structure of naphthalene and anthracene.

Unit III: Retrosynthetic Analysisand Crown ethers

Synthons and synthetic equivalent (electrophilic and nucleophilic). Carbon-carbon bond forming reactions involving Michael and Dieckmann reaction-Protection of functional groups and removal of protecting groups-disconnection approach-Application of Protection

and deprotection to alcohols, aldehydes, ketones, acids, phenols and amines. Retrosynthetic analysis of 5- hexanoicacid.

Crown ethers- Synthesis and applications.

Unit IV: Alkaloid and Terpenoids

Alkaloids – definition – classification – occurrence – extraction using soxhelet apparatus pigment analysis using flame photometer-extraction of oil from plants using Clevenger-general characteristics. General methods of identification –functional nature of oxygen, nitrogen. Oxidation, Hofmann's exhaustive methylation – structure and synthesis of coniine, piperineandnicotine.Methods of extraction –Qualitative analysis of phytochemicals – Quantitative estimation of tannin, phenoliccompounds.

Terpenoids – introduction – classification – isolation of terpenoids – isoprene rule – general properties of terpenoids. General procedure for determining structure of terpenoids – synthesis and structure of geraniol, Citral, dipentene and menthol.

Unit V: Organic Spectroscopy

UV Spectroscopy – Chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic and hypochromic effect – instrumentation- types of electronic transitions – forbidden and allowed transitions. Woodward-Fieser rule for calculation of absorption maxima of dienes and α, β unsaturated ketones .

IR Spectroscopy – number of fundamental vibrations. Finger print region, characteristics of IR absorption frequencies, intermolecular and intramolecular hydrogen bonding.

NMR Spectroscopy – introduction – number of signals – internal standard(TMS) – chemical shift – factors influencing chemical shift – splitting of the signals, spin-spin coupling, coupling constant. NMR spectrum of ethanol, benzyl alcohol, propionic acid, anisole, benzaldehyde, 2,3-dibromopropene, ethyl methyl ketone and mesitylene. C^{13} NMR.

Text Books:

1. Tewari K.S, Vishnoi N.K. *.A Text Book of Organic Chemistry*. Vishal Publishing 2nd Revised Editions, 2017.
2. Arun Bahl and Bahl B. S. *Advanced Organic chemistry*. S. Chand and Company Ltd, Reprint, 2017.

Books for Reference:

1. Kumar V. *An introduction to green chemistry*. Delhi:Vishal Publishing Company, Jabudhar, May2007.
2. Ahluwalia V. K .*Green Chemistry* . Ane Books Pvt. Ltd. Second edition, 2013.
3. Rashmi Sanghi. *Green Chemistry Environmental Friendly Alternatives* .Editors M.M. SrivatsavaNarosa Publishing House Reprint, 2008.
4. Finar I.L. *Organic chemistry -The Fundamental Principles*, Volume I. 6th edition, 2014.
5. Tewari N. *Advance Organic Reaction mechanism.* Kolkata:*Books* and allied (P) Ltd. Second revised edition, 2017.
6. Jain M.K and Sharma S.C. *Modern organic chemistry*. Vishal publishing co., 4th edition 2012.
7. Kalsi P.S .*Spectroscopy of Organic compounds*. New Delhi: New Age International(P) Ltd. IV Edition., 2007.
8. Sharma B.K. *Spectroscopy*.Goel Publishing House. Fourteenth Edition,2000.
9. Jag Mohan.*Organic Spectroscopy - Principles and Application.*, U.K: Alpha Science International Limited. Second Edition,2004.
10. Robert M. Silverstein, Francis X. Webster, David J. Kiemle. *Spectroscopic Identification of Organic Compounds.*Newyork:JohnWileyandSons, Inc., 2014.
11. Bhupinder Mehta, Manju Mehta.*Organic chemistry*. PHI Learning pvt. Ltd., 2006.

SEMESTER- VI			
Core XI	**Physical Chemistry-III**		
Course Code : 21UCHC63	**Hrs/Week : 5**	**Hrs/ Sem : 75**	**Credits : 5**

Objectives:

- To know the concepts of chemistry behind light and sound
- To study the symmetry elements and apply group theory to various molecules.
- To apply phase rule to different physical states of system.
- Inculcate a wide understanding about reaction kinetics and its applications
- To have a basic knowledge about various types of spectra and their applications.

Course Outcome:

CO No.	Upon completion of this course, studentsshould be able to	PSOaddressed	CL
CO - 1	know the terminologies used in phase diagram	1,3,4	Ev
CO - 2	interpret phase rule as applied to one component system and two component system	1,3	Un
CO - 3	apply reaction kinetics to determine the rate of chemical reactions; understand the factors that influence rates of reaction.	1,2, 3,5	Ap
CO-4	understand the kinetics of the reaction and to determine the reaction mechanism	1,2,4	Re
CO - 5	summarize the chemical reactions under light and sound	3	Un

CO No.	Upon completion of this course, studentsshould be able to	PSOaddressed	CL
CO - 6	apply the concept of group theory to various molecules	1	Ap
CO-7	get awareness about different symmetry elements, symmetry operations and point groups	1, 2	Re
CO-8	understand the theory and applications of rotational spectroscopy, IR, UV and NMR	1,2	Un

SEMESTER- VI			
Core XI	**Physical Chemistry-III**		
Course Code : 21UCHC63	**Hrs/Week : 5**	**Hrs/ Sem : 75**	**Credits : 5**

Unit I: Phase Rule

Statement – definitions of terms used – thermodynamic derivation of phase rule –phase

diagrams- areas- curves- triple point- meta stable equilibrium- polymorphism-enantiotropy-monotropy-experimental determination of transition point –colour change-density change-solubility change, and cooling curve methods.

One component system-water system, Sulphur system -two component system – condensedsystem and reduced phase rule – simple eutectic system – Ag-Pb system – Pattinson's process or the desilverisation of argentoferrous Lead –Zn-Cd system -principles of freezing mixture –KI-H_2O -system forming compounds with congruent and incongruent melting points – (Zn –Mg system, $FeCl_3$ – H_2O system)

Unit II: Chemical Kinetics

Reaction rate –units of rates –order and molecularity of a reaction–Pseudo unimolecular reactions –examples- Differential and integratedforms of rate expressions for first, second and zero reactions – first order reaction –examples- Experimental determination of rate constant of decomposition of N_2O_5 in CCl_4 -second order reaction—examples-experimental determination of alkaline hydrolysis of ester-Time for half change for first, second order reactions – determination of order of thereactions (integrated rate equation method ,differential method, graphical method ,half lifemethod, Van't Hoff method)- Effect of temperature on reaction rate – Arrhenius equation – Activation energy and itssignificance. Collision theory and derivation of rate constant of a bimolecular reaction –Limitations of collision theory – unimolecular reactions and Lindemann's theory –Transitionstate theory – potential energy diagram for activation energy as applied to endothermicand exothermic reaction.

Unit III: Photochemistry and Sonochemistry

Photochemistry – photochemical reaction – Beer-Lambert law(derivation)— Grotthus-Draper law, Starck-Einsteins law of photochemicalequivalence – quantum yield – validity of Einstein's law – reason for low and high quantumyield – determination of quantum yield using actinometer – flash photolysis. Photolysis ofNH_3 and chlorination of methane. Kinetics of decomposition of HI – combination of H_2 andCl_2 reaction – kinetics of the H_2 and Br_2 reaction. Photophysical processes – Photosensitisation-Jablonski diagrams-explanation offluorescence and phosphorescence and its applications– luminescence– chemiluminescence– bioluminescence-thermoluminescence .

Sonochemistry – definition, principle -Cavitation-Sonoluminescence- applications-in the field of industry and medicine.

Unit IV: Group Theory

Symmetry elements and symmetry operations –centre of symmetry –axis ofsymmetry- plane of symmetry -proper axis of rotation- improper axis of rotation– Inversionand identity operations – symmetry elements in water, ammonia, boron trifluoride, benzene,allene and 1,2-dichloro ethylene. Group postulates and types of groups - abelian and non-abeliangroups-order of a group-Point group-Assignment of point group to water and ammonia – Rearrangement theorem-Group multiplication table forC_{2v} – molecular point groups.

Unit V: Spectroscopy

Electromagnetic Spectrum-Regions- interaction of radiation with matter – Differenttypes of energy levels in molecules – rotation, vibration and electronic levels.

Microwave spectroscopy - theory -applications in the determination of bond distances in diatomic molecules –microwaveoven

IR Spectroscopy-Vibrational (IR) spectra – theoretical principle – harmonic oscillator and unharmonicity – modes of vibrations – selection rules – Number of fundamental vibrations –

–Hook's Law -Force constant – Fermi resonance – Overtones- characteristics of IR absorption frequencies, – Applications in the determination of bond strength.

UV Spectroscopy-Theory – types of electronic transitions - selection rules – forbidden and allowedtransitions - Chromophore, auxochrome, bathochromic shift, hypsochromic shift-hyperchromic and hypochromic effect – Woodward - Fieser rule forcalculation of absorption maxima of dienes and α, β unsaturated ketones (simple problemscan be asked using Woodward-Fieser rule)

NMR-Introduction – spin moment-theory – number of signals –internalstandard (TMS) – chemical shift – factors influencing chemical shift – splitting of the signals,spin-spin coupling, coupling constant. NMR spectrum of ethanol-Magnetic Resonance Imaging.

Text Books:

1. Puri B.R, Sharma L.R, Madan S. Pathania. *Principles of Physical Chemistry*. Vishal Publishing Co., 2008.
2. Arun Bahl, Bahl B.S, Tuli. G.D. *Essentials of Physical Chemistry*.New Delhi: S. Chand & Company Ltd, 2008.
3. Ramakrishnan V and Gopinathan M.S. *Group Theory in Chemistry.* NewDelhi:Vishal Publications,1991.
4. Sharma B.K. *Spectroscopy.*Goel Publishing House. Fourteenth Edition, 2000.

Books for Reference:

1. Samuel Glasstone.*Thermodynamics for chemists*.New Delhi:Affiliated East-West Press (Pvt.) Ltd, III printing, 2010.
2. Soni P.L, Dharmaha O. P. *Text Book of Physical Chemistry* (A Modern Approach). Sultan Chand and Sons Publishers. Revised Edition, 2010.
3. Bhattacharya P.K. *Group Theory and its Chemical Applications*..Mumbai: Himalaya PublishingHouse,1988.
4. Morris Sylvin. *Photochemistry and Sonochemistry*. NewDelhi: Ivy Publishing House, 2003.
5. Albert Cotton F.*Chemical Applications of Group Theory*. John Wiley and Sons.III Edition, 1999.
6. Banwell C.N. *Fundamentals of Molecular Spectroscopy*. Mc. Graw Hill. Fourth Edition 2003.

SEMESTER VI			
Elective	**Polymer Chemistry**		
Course Code :21UCHE61	**Hrs/Week : 4**	**Hrs/ Sem : 60**	**Credits : 4**

Objectives:

- To understand the chemistry and technology of different types of polymers.
- To study their applications in various fields.
- To understand the property of polymers.
- To learn different types of polymerisation techniques.

Course Outcome:

CO No.	Upon completion of this course, students should be able to	PSOaddressed	CL
CO - 1	know the terminologies used in polymers.	1,3,4	Ev
CO - 2	interpretthedegree of polymerization.	1,3	Un
CO - 3	apply mechanism for determining molecular weight.	1,2, 3,5	Ap
CO-4	understand the properties of different polymers.	1,2,4	Re
CO - 5	differentiate the polymerization techniques.	3	Un
CO - 6	outline the principle of polymerization reactions.	3	Re

CO No.	Upon completion of this course, students should be able to	PSOaddressed	CL
CO - 7	apply the concept of inhibitors and retarders andhave a thorough knowledge of kinetics of polymerization.	1,2	ApRe
CO-8	have a basic knowledge of synthetic polymers and understand the biomedical applications of polymers	1 , 2 , 3	ReUn

SEMESTER VI			
Elective	**Polymer Chemistry**		
Course Code :21UCHE61	**Hrs/Week : 4**	**Hrs/ Sem : 60**	**Credits : 4**

Unit I: Introduction to Polymers

Introduction-Classification based on chemical structure,mode of synthesis and composition – Characteristics of the polymers-nomenclature of polymers – Homopolymers and Hetero polymers — Conducting polymers- Tacticity – isotactic, atactic, syndiotactic polymers – Copolymer-types-statistical, random, alternating,block and graft copolymer.Plastics(thermoplast and thermosets)–elastomers –fibres. Degree of polymerization – functionality – linear, branched and cross linked polymers.

Unit II: Properties of Polymers

Glassy stage – glass transition temperature, factors affecting it crystallinity of polymers. Viscosity, solubility, optical, electrical, thermal and mechanical properties of polymers – Degradation of polymers of thermal, oxidative, mechanical and chemical methods.

Molecular mass – Number average, weight average, viscosity average moleculer mass and their determination– practical significance of moleculer mass distribution.

Unit III: Polymerization Techniques

Classification of polymerization reactions-addition polymerization, condensation polymerization-difference between addition and condensation polymerization-ionic polymerization and coordination polymerization.Polymerization.techniques- bulk, suspension, emulsion and solution polymerization.

Unit IV: Polymer Reactions

Initiators-types – azo, free radical, peroxide and redox initiators. Inhibitors and its applications. Retarders-definition and examples. Mechanism of anionic and cationicpolymerization. Kinetics of free radical,anionic and Ziegler- Natta polymerisation.

Unit V: Some Important Synthetic Resins and Polymers

Outline of synthesis and their usesof the following

Resins-Phenol formaldehyde resin, Melamine – formaldehyde resin, Epoxy resins – grades, and curing process.

Synthetic Polymers:Poly olefins – Polyethylene – HDPE, LDPE,LLDPE – Polypropylene – Polyvinyl chloride – grades of PVC – Teflon, Polymethylmethacrylate (pexiglass) polystyrene, polyamide – Nylon6, Nylon6,6, Nylon6,10 Nylon11, - polyester – polyurethanes – polycarbonates

Synthetic rubber – Styrene rubber, Nitrile rubber, Butyl rubber, Polysulphide rubber and Neoprene.

Biomedical Applications of polymers.

Text book:

1. Bagavathi Sundari K. *Applied Chemistry.* Chennai: MJP Publishers, Tamilnadu Book House, 2008.

Books for Reference:

1. Young R.J and Lovell P.A . *Introduction to polymers*. Replika press Pvt.Ltd.India.II Edition, 2011
2. Arora M.G, Singh M. *Polymer chemistry*. New Delhi:Anmol publications Pvt.Ltd. 4374/4B, Ansari Road,Daryaganj,2003.
3. Gowarikar V.R, Viswanathan N. V and Streedhar J. *Polymer science*. 4th edition, 2021.
4. Jain P.C. and Monika Jain. *Engineering chemistry*. Delhi: DhanpatRai & Sons. Eleventh Edition, 2012.

SEMESTER- VI			
Elective	**Essential Topics in Chemistry**		
Course Code :21UCHE62	**Hrs/Week:4**	**Hrs/ Sem: 60**	**Credits: 4**

Objectives:

- To grasp the principles behind milk processing, corrosion and polymer processing
- To employ the separation process effectively for solid and liquids in our daily life
- To recognize the nature and the function of food additives in our food.

Course Outcome:

CONo.	Upon completion of this course, students should be able to	PSOaddressed	CL
CO-1	have a basic knowledge about milk and its composition.	1 , 2 , 3	Re
CO- 2	understand the theory behind fermented milks.	1, 2	Un
CO- 3	know the types of different types of purification techniques.	1,3	Re
CO- 4	apply chromatographic techniques for the recovery of Organic substances.	2, 3,6	Ap
CO- 5	generalize the types of corrosion.	1, 2,4,6	Cr
CO- 6	categorize the constituents of paint and its uses.	1 , 2,4	An
CO- 7	assess the properties of conductive polymers.	1 ,2 ,4,6,7,8	Ev
CO- 8	know the preparation of synthetic polymers.	3,7,8	Re

Unit I: ChromatographyI

Chromatography – classification - principle of adsorption and partition chromatography- Types of chromatography – column chromatography, adsorbents – classification of adsorbents – solvents – preparation of column, adsorption, recovery of substances. Factors affecting column efficiency – Applications – Advantages and limitations - Use of column chromatography in the separation of plant pigments.

Unit II: ChromatographyII

Paper Chromatography – Principle –- choice of papers - development techniques – ascending, descending – radial paper chromatography - Thin layer chromatography – Principle - choice of adsorbent – choice of solvent – R_f value – factors affecting R_f value - separation of amino acids – ion –exchange chromatography –Principle - Types of resins - separation of lanthanides – separation of chloride and bromide using ion exchange chromatography.

Unit III : Corrosion and Protective Coating

Corrosion of metals – definition – disadvantages – types of corrosion-theories of corrosion (Direct Chemical corrosion, electrochemical corrosion) – methods of preventing corrosion-corrosion inhibitors

Types of protective coating (metallic, organic, organic lining and ceramic coating) paint-characteristics of a good paint – constituents of paints and their functions varnish, resins and lacquers, their characteristics – uses – difference between paint, varnish and lacquer

Unit IV: Food Chemistry

Manufacture of sugar from beetroot and sugarcane – molasses – manufacture of alcoholic beverages – manufacture of vinegar food additives – baking soda – food color natural and artificial – intentional food additives – acid base and their salts – antioxidants – stabilizers– bleaching – maturing agents – leavening agents – humectants and preservatives.

Unit V: Textile chemistry

Fibres- Essential and desirable properties of textile fibres – bast and leaf fibres – jute, sisal and hemp - Advantages and disadvantages of natural and manmade fibres- Silk- Varieties of natural silk, rearing of silkworm, properties and uses of various types of silk - Cotton – physical and chemical properties – Organic and Bt cotton. Wool- physical and chemical properties of wool – varietires, sorting and grading of wool.

Text Books:

1. BagavathiSundari K . *Applied Chemistry.*Chennai:MJP Publishers, Tamil Nadu Book House, 2006.
2. Jayashree Ghosh. *Fundamental concepts of Applied chemistry*.New Delhi:S. Chand & company Ltd, 2006.

Books for Reference:

1. Siva Sankar B. *Food processing and preservation*. Prentice, New Delhi: Hall of India Pvt., Ltd, 2002.
2. Arora M.G, Singh M. *Polymer Chemistry*.New Delhi:Anmol Publications Pvt.Ltd,2002.
3. Sharma B. K. .*Industrial Chemistry.*Meerut:Goel Publishing House, 2003.

SEMESTER V & VI			
Core Practical IV Organic Analysis and Organic Preparations			
Course Code : 18UCHCR4	**Hrs/Week : 3**	**Hrs/ Sem : 45**	**Credits : 3**

Objective:

Enable the students to develop analytical skill in organic qualitative and quantitative analysis and to develop skill in preparing organic compounds.

1. Organic Analysis:

   Analysis of simple organic compounds

   a. Nature of the compound- Aromatic / Aliphatic
   b. Test for saturation/ unsaturation.
   c. Detection of element present/ absent
   d. Characterization of functional groups (Acids, amide, amines, phenol, aldehyde, ketone, anilide, ester, carbohydrates , nitro compounds), Confirmation by preparation of a solid derivative.

2. Preparation of Organic compounds involving the following chemical conversions

   1.Oxidation 2. Hydrolysis 3. Nitration 4. Bromination

   5. Diazotization 6.Benzoylation 7.Osazone formation

3. Determination of physical constant(melting point/boiling point)

4. Course work

   i. Extraction of various phytochemicals using soxhelet apparatus and to analyse plant pigmentsusing flame photometer
   ii. Extraction of oil from plants using Clevenger apparatus.

Books for Reference:

1. Raghupati Mukhopadhyay, Pratul Chatterjee. *Advanced Practical Chemistry*. Books andAllied (P) Ltd. Third Edition, 2007.
2. Gurtu J.N. and Kapoor R .*Advanced experimental chemistry*. S.Chand and Co., 1987.
3. Arthur I.Vogel. *A text book of practical organic chemistry* including qualitative analysis. Longman Group Ltd.ELBS edition,1975.
4. Gnanapragasam N.S, Ramamoorthy G.*Organic Chemistry Lab Manual*. S. Viswanathan Printers and Publishers Pvt. Ltd., 2007.

SEMESTER VI			
Core Practical V Gravimetry and Inorganic Preparation			
Course Code : 21UCHCR5	**Hrs./Week:5**	**Hrs/ Sem: 75**	**Credits : 2**

Objective:

Enable the student to get analytical skills and help them to plan and execute experimental projects.

a) Gravimetric Analysis

1. Estimation of Lead as Lead Chromate.
2. Estimation of Barium as Barium Chromate
3. Estimation of Zinc as Zinc Oxinate
4. Estimation of copper as copper (I) thiocyanate
5. Estimation of calcium as calcium oxalate.

b) Inorganic Preparations

1. Preparation of Potash alum
2. Preparation of Hexamminenickel(II)chloride
3. Preparation of Tetramminecopper(II)sulphate
4. Preparation of Prussian blue.
5. Preparation of Potassiumtrioxalatochromate (III) trihydrate
6. Preparation of Potassiumtrisoxalatoferrate(III)
7. Preparation of Tristhioureacopper(I) sulphate

Course work:

1. Estimation of Nickel as Nickel – DMG complex
2. Estimation of Iron/ Nickel by spectrophotometer.

SEMESTER VI			
Part III	**Instrumental methods of analysis**		
Course Code :21UCHC64	**Hrs/Week : 5**	**Hrs/ Sem : 60**	**Credits : 4**

Objectives:

- To study the analytical uses of thermal, electrical and colorimetric methods.
- To study the applications of various spectral measurements in analysis.
- To study different types of chromatography and their application in analysis.
- To have a knowledge about the interpretation of experimental results.

Course Outcome:

CO No.	Upon completion of this course, students should be able to:	PSO addressed	CL
CO- 1	have a basic knowledge of purification techniques	1 , 2 , 3	Re
CO- 2	understand the principles of different types of organic separations	1, 2	Un
CO- 3	know the types of theory and instrumentation of colorimetry and spectrophotometry	1,3	Re
CO- 4	enumerate the applications of nephelometry and turbidimetry	2, 3,6	Ap
CO- 5	generalise the theoretical principle and applications of atomic absorption spectroscopy	1, 2,4,6	Cr
CO- 6	analyze the compounds using TGA, DTA and DSC.	1 , 2,4	An
CO- 7	assessprinciple behind TGA and DTA and know the basic principles in the electrolytic separation of metals	1 ,2 ,4,6,7,8	Ev,Re
CO-8	have a basic knowledge about voltammetric techniquesand apply the concept of amperometry	1 , 2 , 3	Re, Un

SEMESTER VI			
Part III	**Instrumental methods of analysis**		
Course Code :21UCHC64	**Hrs/Week : 5**	**Hrs/ Sem : 60**	**Credits : 4**

Unit I: Separation and Purification Techniques

Purification of solid organic compounds – recrystallization, use of miscible solvents – use of drying agents – sublimation – purification of liquids – distillation- use of immiscible solvents –solvent extraction. Separation of organic mixtures – ether separation, bicarbonate separation, sodium hydroxide separation, hydrochloric acid separation.

Unit II: Spectrophotometry

Fluorometry – principle – instrumentation – applications – advantages and disadvantages of fluorometry - . Flame photometry – principle – instrumentation – applications – errors in flame photometry. Nephelometry and turbidimetry –theory and instrumentation – turbidimetric titrations and applications.

UNIT III: Colorimetry and Atomic Absorption Spectroscopy

Principle, instrumentation- types of colorimetry – visual and photoelectric –advantages of colorimetry - Atomic absorption spectroscopy – principle – instrumentation – interferences – spectral and chemical –Applications- Determination of chromium in steel by Atomic absorption spectroscopy- determination of calcium in blood serum.

UnitIV: Thermoanalytical Methods

Thermoanalytic method – principle of thermogravimetry, differential thermo analysis – instrumentation for TGA, DTA and DSC – characteristics of TGA and DTA curves – factors

affecting TGA and DTA curves – applications – TGA of calcium oxalate monohydrate – DTA of calcium oxalate monohydrate – electrogravimetric analysis – electrolytic separation of metals – principle of separation of copper and nickel

Unit V: Electroanalytical Methods

Coulometry – principle – types – controlled potential coulometry – constant currentcoulometry – chronocoulometry – Voltammetry – principle – types – linear sweep voltammetry – cyclic voltammetry – square wave voltammetry – stripping voltammetry – alternating current voltammetry – pulse –voltametry – Amperometryamperometrictritations– Chronoamperometry.

Books for Reference:

1. Gopalan R, Subramanian P.S and Rengarajan K. *Elements of Analytical Chemistry.* New Delhi:Sultan Chand & Sons Educational Publishers, 2003.
2. Mahinder Singh, *Analytical Chemistry-.Instrumental Techniques – Vol I*, Dominant Publishers and Distributors.II Edition, 2002.
3. Hobart H. Willard, Lynne L, Merritt, J.R, John A. Dean, Frank A. Settle, J.R. *Instrumental Methods of Analysis*. CBS Publishers & Distributors.Sixth Edition, 2004.
4. Douglas A. Skoog, Donald M. West, F. James Holler Harcourt.*Fundamentals of Analytical Chemistry.* College Publishers, Seventh Edition 2020.
5. Aruldhas G. *Molecular Structure and Spectroscopy*.Prentice Hall of India, 2005.