

**BACHELOR OF SCIENCE  
IN  
CHEMISTRY**

**CURRICULUM AND SYLLABUS**

(For students admitted from academic year 2018-2019 onwards)

**UNDER CHOICE BASED CREDIT SYSTEM**



**DEPARTMENT OF CHEMISTRY  
FACULTY OF SCIENCE AND HUMANITIES  
SRM INSTITUTE OF SCIENCE AND TECHNOLOGY  
SRM NAGAR, KATTANKULATHUR – 603 203**



**B.Sc. CHEMISTRY**  
(For students admitted from the academic year 2018-2019 onwards)

**CURRICULUM AND SYLLABUS**

**Objectives:**

1. To provide the students an in-depth understanding of the basic concepts of chemical sciences.
2. To provide a detailed knowledge of the terms, concepts, methodologies, principles and experimental techniques involved in various fields of chemistry.
3. To develop student skill in problems solving, critical thinking and analytical reasoning.
4. To identify and solve chemical problems and explore new areas of research.
5. To prepare the students with a working knowledge of experimental techniques and instrumentation required to work independently in research or in other industrial environments.
6. To prepare the students to pursue higher studies and to develop sustainable innovative solutions for the nation.

**Eligibility:**

The candidates seeking admission to the B.Sc. degree program shall be required to have passed (10+2) higher secondary examination or any other equivalent examination of any authority recognized by this university with physics, chemistry and mathematics subjects.

**Duration:**

3 Years (6 Semesters)

**PROGRAM EDUCATIONAL OBJECTIVES**

1. Graduates will pursue higher studies in related fields including management
2. Graduates will perform as employers in private/government institutions rising

up to top positions

3. Graduates will become entrepreneurs

#### STUDENT OUTCOMES

The curriculum and syllabus for Bachelor degrees (2018) conform to outcome based teaching learning process. In general, FOURTEEN STUDENT OUTCOMES (a-n) have been identified and the curriculum and syllabus have been structured in such a way that each of the courses meets one or more of these outcomes. Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program. Further each course in the program spells out clear instructional objectives which are mapped to the student outcomes.

On successful completion of this Programme, students will have the ability to

- a. Apply knowledge of computing, mathematics, and basic sciences appropriate to the discipline
- b. Acquire knowledge and understanding of essential facts, concepts, principles and theories relating to the subject areas identified.
- c. Develop Skills to evaluate, analyse and interpret the chemical information and data.
- d. Solve problems competently by identifying the essential parts of a problem and formulating a strategy for solving the problem.
- e. Apply such knowledge and understanding to the solution of qualitative and quantitative problems mostly of a familiar nature
- f. Use of computers and available software in data analysis.
- g. Use standard laboratory equipments, modern instrumentation and classical techniques to carry out experiments.
- h. Develop skills to interpret and explain the limits of accuracy of experimental data in terms of significance and underlying theory
- i. Think creatively (divergently and convergent) to propose novel ideas in explaining facts and figures or providing new solution to the problems.
- j. Function effectively on teams to accomplish a common goal

k. Understand the professional, ethical, legal, security and social issues and responsibilities

l. Communicate effectively with a range of audiences

m. Understand the best practices and standards and their application

n. Assist in the creation of an effective project plan.

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CURRICULUM

B.SC. (CHEMISTRY)

TOTAL CREDITS: 146

SEMESTER I							
CAREER STREAM TITLE	COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
Language	ULT18101	Tamil-I	4	1	0	5	4
	ULH18101	Hindi-I					
	ULF18101	French-I					
Language	ULE18101	English –I	4	1	0	5	4
Major Core	UCY18101	Structure and Bonding in Chemistry	4	0	0	4	4
	UCY18102	Basic Concepts of Organic Chemistry	4	0	0	4	4
	UCY18103	Inorganic Qualitative Analysis – I	0	0	4	4	2
Allied	UMA18A01	Allied Mathematics- I	4	1	0	5	4
Value Added Course*	CAC18101	Soft Skills	2	0	0	2	2
TOTAL			22	3	4	29	24

## SEMESTER II

CAREER STREAM TITLE	COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
Language	ULT18201	Tamil-II	4	1	0	5	4
	ULH18201	Hindi-II					
	ULF18201	French-II					
Language	ULE18201	English – II	4	1	0	5	4
Major core	UCY18201	Thermodynamics and Solutions	4	0	0	4	4
	UCY18202	Inorganic Qualitative Analysis – II	0	0	4	4	2
Allied	UMA18A02	Allied Mathematics- II	4	1	0	5	4
Supportive course*	UCA18E57	Basic Computer Skills	2	0	2	4	3
Value added course*	CAC18201	Quantitative Aptitude and Logical Reasoning – I	2	0	0	2	2
Extension activity*	UNS18201	NSS	0	0	0	0	1
	UNC18201	NCC					
	UNO18201	NSO					
	UYG18201	Yoga					
TOTAL			20	3	6	29	24

SEMESTER III							
CAREER	COURSE	COURSE TITLE	L	T	P	TOTAL	C

STREAM TITLE	CODE				L+T+P		
Major Core	UCY18301	Fundamentals of Spectroscopy and Group Theory	4	0	0	4	4
	UCY18302	Analytical Chemistry	4	0	0	4	4
	UCY18303	Inorganic Quantitative Estimation	0	0	4	4	2
Allied	UPY18A01	Allied Physics –I	4	0	0	4	4
	UPY18A02	Allied Physics Laboratory –I	0	0	3	3	2
Skill Based Elective - I *	UCY18S01	Water Chemistry and Analysis	0	1	2	3	2
	UCY18S02	Food Chemistry and Analysis					
	UCY18S03	Molecules of Life					
Non-Major Elective-I		Open Electives I	2	0	0	2	2
Value Added Course*	CAC18301	Quantitative Aptitude and Logical Reasoning – II	2	0	0	2	2
<b>TOTAL</b>			<b>16</b>	<b>1</b>	<b>9</b>	<b>26</b>	<b>22</b>

SEMESTER IV							
CAREER STREAM TITLE	COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
Major Core	UCY18401	Chemistry of Main Group Elements	4	0	0	4	4
	UCY18402	Functional Groups in Organic Chemistry-I	4	0	0	4	4
	UCY18403	Gravimetric Analysis and Preparation of Inorganic Compounds	0	0	5	5	3
Allied	UPY18A03	Allied Physics –II	4	0	0	4	4
	UPY18A04	Allied Physics Laboratory –II	0	0	3	3	2
Core Based Elective - I	UCY18C01	Industrial Chemistry	3	0	0	3	3
	UCY18C02	Polymer Chemistry					
	UCY18C03	Pharmaceutical Chemistry					
Skill Based Elective - II*	UCY18S04	C++ Programming and Its Application to Chemistry	0	1	2	3	2
	UCY18S05	Instrumental Methods of Analysis					
	UCY18S06	Computational Chemistry Practical					
Non-Major Elective – II		Open Electives II	2	0	0	2	2
Minor Project**	UCY18404	My India Project	0	0	0	0	2
Value Added Course*	CAC18401	Verbal Ability and Reasoning	2	0	0	2	2
TOTAL			19	1	10	30	28

SEMESTER V							
CAREER STREAM TITLE	COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
Major Core	UCY18501	Transition Metals, Lanthanides, Actinides and Nuclear Chemistry	4	0	0	4	4
	UCY18502	Functional Groups in Organic Chemistry –II	4	0	0	4	4
	UCY18503	Chemical Kinetics, Surface Chemistry and Photochemistry	4	0	0	4	4
	UCY18504	Organic Qualitative Analysis and Preparation of Organic Compounds	0	0	5	5	3
	UCY18505	Physical Chemistry Practical –I	0	0	5	5	3
Core Based Elective - II	UCY18C04	Green Chemistry	3	0	0	3	3
	UCY18C05	Bioorganic Chemistry					
	UCY18C06	Chemistry of Natural Products					
Supportive Course	UES18501	Environmental Studies	3	0	0	3	3
TOTAL			18	0	10	28	24

SEMESTER VI
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CAREER STREAM TITLE	COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
Major Core	UCY18601	Coordination , Organometallic and Bioinorganic Chemistry	4	0	0	4	4
	UCY18602	Organic Synthesis and Heterocyclic Compounds	4	0	0	4	4
	UCY18603	Electrochemistry, Phase Rule and Colloids	4	0	0	4	4
	UCY18604	Physical Chemistry Practical –II	0	0	5	5	3
	UCY18605	Core Based Project	0	0	8	8	4
Core Based Elective - III	UCY18C07	Material Science and Nanotechnology	3	0	0	3	3
	UCY18C08	Energy and Fuel Cells					
	UCY18C09	Agricultural and Leather Chemistry					
Value Added Course*	CAC18601	Communication Skills	2	0	0	2	2
<b>TOTAL</b>			<b>17</b>	<b>0</b>	<b>13</b>	<b>30</b>	<b>24</b>

Legend:

L- Number of lecture hours per week, T - Number of tutorial hours per week

P - Number of practical hours per week, C - Number of credits for the course

\*Internal Evaluation Only

\*\* Socially Relevant Project – Internal Evaluation Only

SUMMARY							
CAREER STREAM TITLE	NO. OF COURSES (CREDITS IN BRACKET)-SEMESTER WISE						
	I	II	III	IV	V	VI	TOTAL
LANGUAGE– I (English)	1(4)	1(4)	-	-	-	-	2(8)
LANGUAGE– II (Tamil/ Hindi/French)	1(4)	1(4)	-	-	-	-	2(8)
MAJOR CORE THEORY	2(4)	1(4)	2(4)	2(4)	3(4)	3(4)	13(52)
MAJOR CORE LAB	1(2)	1(2)	1(2)	1(3)	2(3)	1(3)	7(18)
ALLIED (THEORY)	1(4)	1(4)	1(4)	1(4)	-	-	4(16)
ALLIED (LAB)	-	-	1(2)	1(2)	-	-	2(4)
SKILL BASED ELECTIVES	-		1(2)	1 (2)	-	-	2(4)
SUPPORTIVE COURSES	-	1 (3)	-	-	1 (3)	-	2(6)
VALUE ADDED COURSE	1(2)	1(2)	1(2)	1(2)	-	1(2)	5(10)
EXTENSION ACTIVITY	-	1(1)	-	-	-		1(1)
CORE BASED ELECTIVES	-	-	-	1(3)	1(3)	1(3)	3(9)
NON-MAJOR ELECTIVES	-	-	1(2)	1(2)	-		2(4)
MINOR PROJECT	-	-	-	1 (2)	-	-	1(2)
PROJECT	-	-	-	-	-	1(4)	1(4)
NUMBER OF CREDITS (SEMESTER WISE)	24	24	22	28	24	24	146
TOTAL NUMBER OF CREDITS	146						

**COURSES OFFERED TO OTHER DEPARTMENTS  
(ALLIED SUBJECTS)**

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
I/III	UCY18A01	Allied Chemistry – I	4	0	0	4	4
	UCY18A02	Allied Chemistry Practicals- I	0	0	3	3	2
II/IV	UCY18A03	Allied Chemistry- II	4	0	0	4	4
	UCY18A04	Allied Chemistry Practicals- II	0	0	3	3	2

**Non-Major Electives (offered to other departments)**

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
III	UCY18E81	Biochemistry	2	0	0	2	2
	UCY18E82	Food Chemistry					
IV	UCY18E83	Basics of Bioinformatics	2	0	0	2	2
	UCY18E84	Molecular Modelling & Drug Design					

**SYLLABUS  
FIRST SEMESTER**



குறியீட்டு எண்	பாடம்	L	T	P	Total L+T+P	C
ULT18101	தமிழ் - I	4	1	0	5	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	இரண்டாயிரம் ஆண்டுகாலத் தமிழின் தொன்மையையும் வரலாற்றையும் அதன் விழுமியங்களையும் பண்பாட்டையும் எடுத்துரைப்பதாக இப்பாடத்திட்டம் அமைக்கப்பட்டுள்ளது.	e	f	h	m	n
2.	காலந்தோறும் தமிழ் இலக்கியம் உள்ளடக்கத்திலும், வடிவத்திலும் பெற்ற மாற்றங்கள், அதன் சிந்தனைகள், அடையாளங்கள் ஆகியவற்றை காலந்தோறும் எழுதப்பட்ட இலக்கியங்களின் வழியாகக் கூறுவதாகவும், மொழியின் கட்டமைப்பைப் புரிந்து கொள்வதாகவும் பாடத்திட்டம் வடிவமைக்கப்பட்டுள்ளது.	e	f	h	n	
3.	வாழ்வியல் சிந்தனைகள், ஒழுக்கவியல் கோட்பாடுகள், சமத்துவம், சூழலியல் எனப் பல கூறுகளை மாணவர்களுக்கு எடுத்துரைக்கும் விதத்தில் இப்பாடத்திட்டம் உருவாக்கப்பட்டுள்ளது.	e	f	d	n	

#### அலகு - 1

##### இக்காலக் கவிதைகள் - 1

1. பாரதியார் - கண்ணன் என் சேவகன்
2. பாரதிதாசன் - தமிழ்ப்பேறு
3. அப்துல் ரகுமான் - அவதாரம்
4. மீரா - கனவுகள் +கற்பனைகள் = காகிதங்கள்
5. து. நரசிம்மன் - மன்னித்துவிடு மகனே

## அலகு - 2

### இக்காலக் கவிதைகள் - 2

1. ராஜா சந்திரசேகர் - கைவிடப்பட்ட குழந்தை
2. அனார் - மேலும் சில இரத்தக் குறிப்புகள்
3. சுகிர்தராணி - அம்மா
4. நா.முத்துக்குமார் - தூர்

## அலகு - 3

### சிற்றிலக்கியம்

1. கலிங்கத்துப் பரணி - பொருதடக்கை வாள் எங்கே... ( பாடல் - 485)
2. அழகர்களினை விடு தூது- இதமாய் மனிதருடனே... (கண்ணி - 45)
3. நந்திக் கலம்பகம் - அம்பொன்று வில்லொடிதல்... ( பாடல் - 77)
4. முக்கூடற் பள்ளு - பாயும் மருதஞ் செழிக்கவே... (பாடல் - 47)
5. குற்றாலக் குறவஞ்சி - ஓடக் காண்பதுமே... (பாடல் - 9)

### காப்பியங்கள்

மணிமேகலை - உலகவறவி புக்க காதை - "மாகூஇல் வால்ஒளி! - இந்நாள் போலும் இளங்கொடி கெடுத்தனை" . (28 அடிகள்)

## அலகு - 4 - தமிழ் இலக்கிய வரலாறு

- 1) சிற்றிலக்கியம் - தோற்றமும் வளர்ச்சியும், 2) புதுக்கவிதை - தோற்றமும் வளர்ச்சியும், 3) சிறுகதை - தோற்றமும் வளர்ச்சியும், 4) புதினம் - தோற்றமும் வளர்ச்சியும், 5) உரைநடை - தோற்றமும் வளர்ச்சியும்

## அலகு -5

### மொழிப்பயிற்சி :

1. கலைச்சொல்லாக்கம், 2. அகரவரிசைப்படுத்துதல், 3. மரபுத்தொடர் / பழமொழி, 4. கலை விமர்சனம், 5. நேர்காணல்

### உரைநடைப் பகுதி :

1. உ.வே.சாமிநாதையர் - சிவதருமோத்திரச் சுவடி பெற்ற வரலாறு,
2. தஞ்சாவூர்க் கவிராயர் -கூஜாவின் கோபம்,
3. இரா.பச்சியப்பன் - மாடல்ல மற்றையவை

**பார்வை நூல்கள்**

1. கைலாபதி, க., தமிழ் நாவல் இலக்கியம் ,குமரன் பதிப்பகம், வடபழனி. 1968.
2. சுந்தராஜன், பெ.கோ ., சிவபாதசுந்தரம், சோ., தமிழில் சிறுகதை வரலாறும் வளர்ச்சியும், க்ரியா, சென்னை, 1989.
3. பரந்தாமனார், அ.கி., நல்ல தமிழ் எழுத வேண்டுமா, பாரி நிலையம், சென்னை, 1998,
4. பாக்யமேரி, வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு, என்.சி.பி. எச். பதிப்பகம், சென்னை, 2011
5. வல்லிக்கண்ணன், புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும், அன்னம், சிவகங்கை, 1992

Course Nature : Theory							
Assessment Method (Max. Marks : 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
ULH 18101	HINDI – I	4	1	0	5	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To express and communicate literature which is part of life	e	f	h	m	n
2.	To incorporate day to day personal and professional life 's need to communicate in the language.	e	f			
3.	To help the students to imagine and express their mind through literature	e	f			

- UNIT - I Prose (35 hours)**
1. Bade Ghar Ki Beti - Premchand
  2. Vaishnav Ki Fislal (Vyangya Katha) - Harishankar Parsai
  3. Benam Rishta - Mridula Garg
  4. Utsah - Ramchandar Shukla (Niband)
  5. Puruskar - Jayshankar Prasad
  6. Hardam.Com - Alka Sinha
- UNIT - II One Act Play (15 hours)**
1. Mahabharat Ki Ek Sanjh- Bharat Bhushan Agrawal
  2. Reed Ki Haddi - Jagdish Chandr Mathur
- UNIT - III Correspondence (10 hours)**
1. Official Letter
  2. Demi-Official Letter
- UNIT - IV Cinema (10 hours)**
1. Panchlight - Phanishwar Nath Renu
  2. Chandi Ka Juta - Bal Shauri Reddi
- UNIT - V Technical Terminology (5 hours)**

**REFERENCES**

1. Prayojan Mulak Hindi – Madhav Sontakke
2. A Practical Guide To English Translation And Composition – K.P. Thakur

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE	COURSE TITLE	L	T	P	TOTAL	C
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CODE					L+T+P	
ULF18101	FRENCH-I	4	1	0	5	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:			Student Outcomes			
1.	To encourage greater written skills through comprehension writing and composition writing	e	f	h	m	n
2.	Improve their oral and written skills through a combination of theory and practice.	e	f			
3.	Extend and expand their savoir-faire through the acquisition of latest skills and techniques by practical training.	e	f			

**Unité - I (15 heures)**

Salut-Saluer- Entrer en contact avec quelqu'un – se présenter – s'excuser- *tu* ou *vous*? Les jours de la semaine – Quelques formules de politesse – L'alphabet – Quelques consignes de classe – Je, tu, vous, il. Elle – Etre – Quelques nationalités – Masculin et féminin –Les nombres de 0 à 10 – Quelques sigles.

**Unité - II (15 heures)**

Enchanté- Demander de se présenter – Présenter quelqu'un – La négation : ne...pas – Les adjectifs possessifs –Etre, avoir+quelques verbes en –er – C'est, il est – L'interrogation par l'intonation – Quelques professions – Les nombres de 11 à 69 – Oui, non, si. J'adore !- Exprimer ses goûts –échanger sur ses projet – Aller – Moi aussi – Nous, ils, elles – La conjugaisons des verbes en –er être et avoir – Faire du, de l', de la +sport – Les nombres après 69 – On=nous – Le futur proche – Quelques indicateurs de temps – Les adjectifs possessifs.

**Unité - III (15 heures)**

Tu veux bien – Demander à quelqu'un de faire quelque chose – Demander poliment – Parler d'actions passées –Il y a – Les articles définis et indéfinis – Les marques du pluriel des noms – Les pronoms après une préposition (avec lui, chez, moi) – Le passé composé – Pouvoir, vouloir, venir, connaître.

**Unité - IV (15 heures)**

On se voit quand ? - Proposer, accepter, refuser une invitation – indiquer la date – Prendre et fixer un rendez-vous –Demandez et indiquer l'heure –Les pronoms compléments directs me, te, nous, vous –Pourquoi ? Parce que – Quel(s), Quelle(s) – L'interrogation avec est-ce que – Finir- Savoir – L'heure et la date – Les mois de l'année – Quelques indicateurs de temps

**Unité - V (15 heures)**

Bonne idée ! – Exprimer son point de vue positif et négatif – s’informer sur le prix – S’informer sur la quantité – Exprimer la quantité – La négation : ne ...pas de – Les articles partitifs – Combien ? –Un peu de, beaucoup de,... –Qu’est-ce que, combien – offrir, croire – Penser à, penser de – Plaire à – Les couleurs – Le masculin et le féminin des adjectifs – Les pronoms compléments directs le, la, les.

#### Référence

1. "Latitudes-1" Méthode de français, REGIME MERIEUX, YVES LOISEAU Les éditions Didier, Paris, 2012.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
ULE18101	ENGLISH-I	4	1	0	5	4
INSTRUCTIONAL OBJECTIVES				Student Outcomes		
At the end of this course the learner is expected:						
1.	To enable the students to think in English	e	f	h	m	n
2.	To become aware of the regional literature and the writers.	e	f	d		
3.	To equip students with the awareness and strategies needed to enable the study of English as a lifelong process.	e	f	d		

#### UNIT - I Poetry (15 Hours)

1. Yayum Nyayum – Kurunthogai 40
2. My Grandmother's House – Kamala Das
3. Transgender – Olivia Kent
4. Obituary – A K Ramanujam

#### UNIT - II Prose (15 Hours)

1. On Marriages – Nirad C Choudhary
2. Response to Welcome addresses ii) Why Do We Disagree – Swami Vivekananda
3. I have a dream – Martin Luther King

#### UNIT - III Short Story (15 Hours)

1. A Nincompoo – Anton Chekhov

2. The Rat – Ashokamitran
3. Quantum of Solace – Ian Flemming
4. Squirrel - Ambai

**UNIT - III Popular Literature (15 Hours)**

1. Shabdo -Kaushik Ganguli
2. TEDX Talks
3. John Lennon - Imagine
4. Bob Marley - No woman no cry

**UNIT - V Language Component (15 Hours)**

1. Spot the Errors
2. Jumbled Sentence
3. Homophones & Homonyms
4. Idioms and Phrases
5. Antonyms and Synonyms
6. Story through Images
7. Hints Development
8. Autobiography of Concrete Objects
9. Advertisements
10. Slogan Writing

**TEXT BOOK**

1. Cambridge University Press, Raymond Murphy, Essential Grammar in Use 3<sup>rd</sup> Edition 2010.

<b>Course Nature : Theory</b>							
<b>Assessment Method (Max. Marks: 100)</b>							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
<b>End Semester</b>							50
<b>Total</b>							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C	
UCY18101	STRUCTURE AND BONDING IN CHEMISTRY	4	0	0	4	4	
<b>INSTRUCTIONAL OBJECTIVES</b> At the end of this course the learner is expected.					<b>Student Outcomes</b>		
1.	To understand about the atomic structure	b					l
2.	To know the arrangement of elements in the periodic table and periodic properties				c	l	
3.	To understand structure and bonding in molecules				d	l	n l

4.	To study the theories of acids and bases	b				
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#### UNIT – I Atomic Structure

Quantum theory of radiation - Bohr's model of atom and atomic spectra - Limitations of Bohr model - Photoelectric effect - Wave particle duality and the de Broglie equation - Wave-mechanical model of the atom and the Schrodinger equation - Heisenberg uncertainty principle - significance of wave functions and atomic orbitals Normalization of wave function - radial and angular wave functions - Pauli's exclusion principle - Hund's rule, Sequence of energy levels (Aufbau principle) and electronic configuration.

#### UNIT – II Periodic Table and Periodic Properties

Modern periodic law - Modern periodic table - Division of elements into s,p,d and f blocks - Atomic properties - Justification for their variation - Factors influencing periodic trends and irregularities - Covalent radius - Ionic radius - Ionization energy - Successive ionization energies - Electron affinity and Electronegativity - Pauling, Mullikan and Alfred – Rochow's definitions - Effective Nuclear charge and Slater's rules - Oxidation states and Variable valency - Isoelectronic relationship - Inert-pair effect - Standard reduction potentials - Electrochemical series.

#### UNIT – III Chemical Bonding - I

Lewis theory, the octet rule and its exception, VB Theory- VSEPR Theory Effect of bonding and nonbonding electrons on the structure of molecules, Effect of electronegativity, Isoelectronic principle, Illustration of common structures by VSEPR model like  $\text{BeCl}_2$ ,  $\text{SiCl}_4$ ,  $\text{PCl}_5$ ,  $\text{SF}_6$ ,  $\text{IF}_7$ ,  $\text{NH}_3$ ,  $\text{XeF}_6$ ,  $\text{BF}_3$ ,  $\text{H}_2\text{O}$ ,  $\text{I}_3^-$ ,  $\text{BH}_4^-$  etc.,

#### UNIT – IV Chemical Bonding – II

##### MO theory

LCAO method - Criteria of orbital overlap - Types of molecular orbitals -  $\sigma$  and  $\pi$  - MO energy level diagram for homo and hetero diatomic molecules-  $\text{H}_2$  to  $\text{N}_2$ ,  $\text{CO}$ ,  $\text{NO}$ ,  $\text{HCl}$ . Bond order and stability of molecules - Difference between VB theory and MO theory.

##### Ionic bond

Properties of ionic compounds - Factors favoring the formation of ionic compounds- Lattice Energy - Born – Haber Cycle - Enthalpy of formation of ionic compound and stability. Polarizing power and Polarisability - Partial ionic character- Transitions from ionic to covalent character and vice versa - Fajan's rule - effects of polarization on solubility - Melting points and thermal stability of typical ionic compounds.

#### UNIT – V Acids and Bases

Theories of acids and bases – Arrhenius - Bronsted-Lowry theory - Lewis theory - Solvent system definition. Relative strengths of acids and bases - Dissociation



constant of acids and bases - Levelling effect of water. Hard and soft acids and bases (HSAB). Non-aqueous solvents – classification - Liquid ammonia as solvent.

#### TEXTBOOKS

1. D. F Shriver, P. W Atkins and C. H. Langford, *Inorganic Chemistry*, 3<sup>rd</sup> Ed., Oxford University Press, London, 2001
2. B. Douglas, D. McDaniel, and J. Alexander, *Concepts and Models of Inorganic Chemistry*, 3<sup>rd</sup> ed., John Wiley, 1994.

#### REFERENCES

1. K. F Purcell and J. C.Kotz, *Inorganic Chemistry*, Saunders, Philadelphia, 1976.
2. T. Moeller, *Inorganic Chemistry: A Modern Introduction*, Wiley, New York, 1990.
3. B. R. Puri, L. R. Sharma, K. C. Kalia, *Principles of Inorganic Chemistry*, ShobanLalNagin Chand and Co, 1996.
4. J. E. Huheey, E. A. Keiter, and R. L. Keiter, *Inorganic Chemistry*, 4<sup>th</sup> Ed., Harper and Row, New York, 1983.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18102	BASIC CONCEPTS OF ORGANIC CHEMISTRY	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:					Student Outcomes	
1.	To gain knowledge about the basic concepts in organic chemistry.	b				
2.	To understand the importance of stereochemistry.			i	l	
3.	To gain knowledge about aromaticity.	b			l	
4.	To understand about organic reactions and reaction intermediate.	b	c	i		n

#### UNIT – I Bonding in Organic Molecules

Valence bond theory - concept of hybridization and VSEPR theory applied to organic compounds - sigma and pi-bonds - bond length - bond strength and bond angles in compounds with  $sp^3$ ,  $sp^2$  and  $sp$  hybridized carbon atoms - bond polarity and dipole moment.

Molecular orbitals - basic idea of HOMO and LUMO - orbital pictures of methane – ethane – ethene – ethyne - allene and typical C-N and C-O systems.

Common functional groups in organic chemistry - IUPAC nomenclature of organic molecules.

#### UNIT – II Aromaticity

Kekule structure of benzene - molecular orbital picture of benzene - resonance energy and stability of benzene - Huckel's rule (aromatic, non-aromatic, and anti-aromatic molecules) - aromaticity of benzene and benzenoid compounds - aromaticity of three, four, five, six, seven and eight-membered systems - annulenes.

#### UNIT – III Organic Reactions and Reaction Intermediates

Inductive and field effects - mesomeric and resonance effects – hyperconjugation - steric effects.

Bronsted and Lewis acid-base theory - effect of structure on strength of acids and bases - acid-base equilibria, and tautomerism.

Homolysis and heterolysis - the curly arrow formalism of writing organic reaction mechanisms - reaction intermediates - the formation and stability of carbocations – carbanions - free radicals – carbenes - nitrenes, and arynes. Nucleophiles (lone pair, sigma bond, and pi bond nucleophiles) and electrophiles (Lewis acid, pi-bond, and sigma bond electrophiles) - identifying nucleophilic and electrophilic centres in molecules - basic types of reactions: addition – elimination – substitution and rearrangement.

#### UNIT – IV Stereochemistry -I

Configurational isomers - concept of chirality (asymmetry) - stereogenic centres – enantiomers - diastereomers with multiple chiral centres - Fischer projection - predicting the number of stereoisomers of compounds - absolute configuration, (R-S system of nomenclature) - relative configuration (D-L system of nomenclature) optical activity - racemic mixtures - chirality in molecules without a stereocentre.

#### UNIT – V Stereochemistry -II

Geometrical isomerism: cis -trans isomerism and E,Z nomenclature in alkenes and oximes.

Conformations of ethane – propane and butane – Newmann - Sawhorse and Wedge-Dash representations - Conformational isomerism in cycloalkanes - cyclopropane and cyclobutane - Baeyer strain theory - angle strain - Conformations of cyclohexanes - Monosubstituted, and disubstituted cyclohexanes.

#### TEXT BOOKS

1. R.T. Morrison and R. N. Boyd, *Organic Chemistry*, 6<sup>th</sup> edition, Prentice-Hall of India Ltd, New Delhi, 1992.
2. T. W.Graham Solomons, *Organic Chemistry*, 6<sup>th</sup> edition, John Wiley and Sons, New York, 1996.

#### REFERENCES

1. S.H Pine, *Organic Chemistry*, 5<sup>th</sup> edition, McGraw Hill, New York, 1987.
2. S.N. Ege, *Organic Chemistry Structure and Reactivity*, 3<sup>rd</sup> edition: A.I.T.B.S., New Delhi 1998.
3. F.A .Carey, *Organic Chemistry*, 3<sup>rd</sup> edition, Tata-McGraw Hill Publications, New Delhi, 1999.
4. B.Y. Paula, *Organic Chemistry*, 3<sup>rd</sup> edition, Pearson Education Inc., Singapore, 2002.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18103	INORGANIC QUALITATIVE ANALYSIS – I	0	0	4	4	2
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:					Student Outcomes	

1.	To enable the students to develop analytical skills in inorganic qualitative analysis	c	e	h		
2.	To identify and detect various anions and cations through coloured reactions of metal ions.	c	g			
3.	To develop the skill of semi micro analysis	c		h	m	
4.	To enable the students to identify the interfering radicals	c		h		n

**Semi micro qualitative analysis:**

Qualitative analysis of simple salt containing one anion and one cation.

Semi micro qualitative analysis of inorganic salt mixtures containing one interfering acid radical.

**Anions:** Carbonate, sulphate, halides, nitrate, borate, chromate, fluoride, oxalate, tartrate, and phosphate.

**Cations:** Lead, bismuth, copper, cadmium, antimony, iron, zinc, cobalt, nickel, manganese, calcium, strontium, barium, & ammonium.

**REFERENCES**

1. V.V. Ramanujam, *Inorganic Semi Micro Qualitative Analysis*, 3<sup>rd</sup> edition, The National Publishing Company, Chennai, 1974.
2. Vogel's *Text Book of Inorganic Qualitative Analysis*, 4<sup>th</sup> edition, ELBS, London, 1974.
3. V.Venkateswaran, R.Veerasingam and A.R. Kulandaivelu, *Basic principles of Practical Chemistry*, 2<sup>nd</sup> edition, Sultan Chand & Sons, New Delhi, 1997.
4. J. N. Gurtu and R. Kapoor, *Advanced Experimental Chemistry*, S. Chand and Co. 6<sup>th</sup> edition, 2010.

Course Nature: Practical						
Assessment Method-Practical Component (Marks: 100)						
In-Semester	Assessment tool	Experiments	Observation	Regularity	Model Examination	Total
	Marks	25	10	5	10	50
End Semester Examination Marks (Practical):						50
Total Max Marks						100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UMA18A01	ALLIED MATHEMATICS- I	4	1	0	5	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:					Student Outcomes	
1.	To apply basic concepts for clear understanding of mathematical principles.	a				

2.	To solve practical problems	a				
3.	Improve their ability in solving applications of sets and logics	a				
4.	Learning the numerical techniques by solving the theory of equations	a				

**UNIT – I Sets, Relations and Functions (12 hours)**

Sets: sets, representation of sets, types of sets, operation on sets, Venn diagram.

Relation: types of relation, equivalence relation.

Function: types of functions, composite of two functions, composite of three functions

**UNIT – II Mathematical Connectives Logic (12 hours)**

Statements, connectives, conjunction, disjunction, negation, tautology, contradiction, logical equivalence, tautological implications, arguments, validity of arguments – Normal forms – Principal disjunctive normal form - Principle conjunctive normal form.

**UNIT – III Theory of Equations (12 hours)**

Polynomial equations, irrational roots, complex roots, (up to third order equations only) - Reciprocal equations, Approximation of roots of a polynomial equation by Newton's and Horner's methods.

**UNIT – IV Matrices (12 hours)**

Symmetric, skew symmetric, Hermitian, skew Hermitian, Orthogonal, Unitary matrices – Cayley Hamilton Theorem –Eigenvalues– Eigenvectors – solving the equations using Cramer's rule.

**UNIT – V Differentiation (12 hours)**

Simple problems only – maxima and minima of functions of single variable – Radius of curvature (Cartesian co– ordinate) – partial differentiation – Euler's theorem.

**TEXT BOOKS**

1. T.Veerarajan, *Discrete Mathematics*, 7th Edition, Tata-Mcgraw hill, New Delhi, 2006.
2. A.Singaravelu, *Allied Mathematics*, 6th Revised Edition, Meenakshi Agency, Chennai, 2014.
3. Alan Doerr and Kenneth Levasseur, *Applied Discrete Structures for Computer Science*, Galgotia Publications (P) Ltd, 1992.

**REFERENCES**

1. P.R. Vittal, *Allied Mathematics*, 4th Edition Reprint , Margham Publications, Chennai, 2013.

2. S.G.Venkatachalapathy, *Allied Mathematics*, 1st Edition Reprint, Margham Publications, Chennai, 2007.
3. E. Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons. Singapore, 10<sup>th</sup> edition, 2012.
4. T. Veerajan, *Engineering Mathematics I*, Tata McGraw Hill Publishing Co, New Delhi, 5th edition, 2006.
5. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publications, 42<sup>nd</sup> Edition, 2012.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
CAC18101	SOFT SKILLS	2	0	0	2	2
<b>INSTRUCTIONAL OBJECTIVES</b> At the end of this course the learner is expected:				<b>Student Outcomes</b>		
1.	To acquire inter personal skills and be an effective goal oriented team player	d	e	f	h	m n
2.	To develop professionalism with idealistic, practical and moral values	d	e	f	h	m n
3.	To acquire communication and problem solving skills	d	e	f	h	m n
4.	To re-engineer their attitude and understand its influence on behaviour	d	e	h		

#### COURSE OBJECTIVE

To enhance holistic development of students and improve their employability skills.

#### UNIT – I Attitude (6 hours)

Who am I? SWOT analysis, Importance of self confidence and self esteem, Factors influencing attitude, Challenges and lessons from attitude

#### UNIT – II Communication (6 hours)

Practice activities (JAM, spin a story, diagram description, etc...), Activities for evaluation (Extempore, speaking news, book review)

#### UNIT – III Goal Setting (6 hours)

SMART goals, Blue print for success, Short term, Long term, Life time goals, Value of time, Diagnosing time management, Prioritizing work

#### UNIT – IV Public Speaking (6 hours)

Activities for evaluation (Surveying and reporting, Debate, Group discussion)

#### UNIT – V Creativity (6 hours)

Out of box thinking, lateral thinking

## REFERENCES

1. Covey Sean, Seven habits of highly effective teens, New York, Fireside Publishers, 1998.
2. Carnegie Dale, How to win friends and influence people, New York, Simon and Schuster, 1998.
3. Thomas A Harris, I am ok, you are ok, New York, Harper and Row, 1972.

Course Nature : Theory (Internal)						
Assessment Method (Max.Marks: 100)						
In Semester	Assessment Tools	Class Room Activities	Communication Activities	LMS	Participation	Total
	Marks	20	50	20	10	100



SEMESTER II

குறியீட்டு எண்	பாடம்	L	T	P	Total L+T+P	C
ULT18201	தமிழ் - II	4	1	0	5	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	இரண்டாயிரம் ஆண்டுகாலத் தமிழின் தொன்மையையும் வரலாற்றையும் அதன் விழுமியங்களையும் பண்பாட்டையும் எடுத்துரைப்பதாக இப்பாடத்திட்டம் அமைக்கப்பட்டுள்ளது.	e	f	h	m	n
2.	காலந்தோறும் தமிழ் இலக்கியம் உள்ளடக்கத்திலும், வடிவத்திலும் பெற்ற மாற்றங்கள், அதன் சிந்தனைகள், அடையாளங்கள் ஆகியவற்றை காலந்தோறும் எழுதப்பட்ட இலக்கியங்களின் வழியாகக் கூறுவதாகவும், மொழியின் கட்டமைப்பைப் புரிந்து கொள்வதாகவும் பாடத்திட்டம் வடிவமைக்கப்பட்டுள்ளது.	e	f	d		
3.	வாழ்வியல் சிந்தனைகள், ஒழுக்கவியல் கோட்பாடுகள், சமத்துவம், சூழலியல் எனப் பல கூறுகளை மாணவர்களுக்கு எடுத்துரைக்கும் விதத்தில் இப்பாடத்திட்டம் உருவாக்கப்பட்டுள்ளது.	e	f	n		

**அலகு - 1**

- எட்டுத்தொகை : 1. குறுந்தொகை (பாடல் - 130), 2. நற்றிணை (பாடல் - 27), 3. அகநானூறு (பாடல் - 86)
- பத்துப்பாட்டு - சிறுபாணாற்றுப்படை (அடிகள் - 126-143)
- பதினெண் கீழ்க்கணக்கு : திருக்குறள் - வெகுளாமை (அதிகாரம் 31), காதல் சிறப்புரைத்தல் (அதிகாரம் 113)

**அலகு - 2**

- எட்டுத்தொகை : 1. ஐங்குறுநூறு (பாடல் - 203), 2. கலித்தொகை - பாலைத்திணை (பாடல் - 9), 3. புறநானூறு (பாடல் - 235)
- பத்துப்பாட்டு - முல்லைப்பாட்டு (அடிகள் - 6 - 21)
- பதினெண் கீழ்க்கணக்கு - 1. நாலடியார் - நல்லார் எனத்தான் (221), 2. திரிகடுகம் - கோலஞ்சி வாழும் குடியும் (33),

4. இனியவை நாற்பது - குழவி தளர்நடை (14), கார் நாற்பது - நலமிகு  
கார்த்திகை (26), 5. களவழி நாற்பது - கவளங்கொள் யானை (14)

### அலகு - 3

#### சைவம் - பன்னிரு திருமுறைகள்

1. திருஞானசம்பந்தர் - வேயுறு தோளிபங்கள் (இரண்டாம் திருமுறை)
2. திருநாவுக்கரசர் - மனமெனும் தோணி (நான்காம் திருமுறை)
3. சுந்தரர் - ஏழிசையாய் இசைப்பயனாய் (ஏழாம் திருமுறை)
4. மாணிக்கவாசகர் - ஆதியும் அந்தமும் இல்லா (திருவெம்பாவை)
5. திருமூலர் - அன்பு சிவம் இரண்டு (திருமந்திரம்)

#### வைணவம் - நாலாயிரத் திவ்யப் பிரபந்தம்

1. பேயாழ்வார் - திருக்கண்டேன் பொன்மேனி ...
2. பெரியாழ்வார் - கருங்கண் தோகை மயிற் பீலி...
3. தொண்டரடிப்பொடி ஆழ்வார் - பச்சைமாமலை போல்...
4. ஆண்டாள் - கருப்பூரம் நாறுமோ? கமலப்பூ ...
5. திருமங்கையாழ்வார் - வாடினேன் வாடி வருந்தினேன்

#### இஸ்லாமியம்

சீறாப்புராணம் - மானுக்குப் பிணை நின்ற படலம் - - 5 பாடல்கள் (பாடல்  
எண்கள் : 61 - 65)

#### கிறித்துவம்

இரட்சணிய யாதீகம் - கடைதிறப்புப் படலம் - 5 பாடல்கள் (பாடல் எண்கள்  
: 3,9,10,15,16)

### அலகு - 4

#### தமிழ் இலக்கிய வரலாறு

1. சங்க இலக்கியங்கள், 2. நீதி இலக்கியங்கள், 3.பக்தி இலக்கியங்கள், 4.  
காப்பியங்கள்

## அலகு – 5

### சிறுகதைகள்

1. புதுமைப்பித்தன் – அகலிகை
2. ந.பிச்சமூர்த்தி – வேப்பமரம்
3. அகிலன் – ஒரு வேளைச் சோறு
4. ஜி. நாகராஜன் – பச்சக் குதிரை
5. கி.ராஜநாராயணன் – கதவு
6. சா.கந்தசாமி – தக்கையின் மீது நான்கு கண்கள்
7. ஆண்டாள் பிரியதர்ஷினி – மாத்திரை
8. வண்ணதாசன் – ஒரு உல்லாசப் பயணம்
9. சு. தமிழ்ச்செல்வன் – வெயிலோடு போய்
10. பாரததேவி – மாப்பிள்ளை விருந்து
- 11.

### பார்வை நூல்கள்

1. அரசு, வீ., இருபதாம் நூற்றாண்டுச் சிறுகதைகள் நூறு, அடையாளம் பதிப்பகம், திருச்சி, 2013
2. அருணாசலம், ப., பக்தி இலக்கியங்கள், பாரி நிலையம், சென்னை, 2010
3. தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை, 2000
4. பாக்யமேரி, வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு, என்.சி.பி. எச். பதிப்பகம், சென்னை, 2011
5. பசுபதி, ம.வே. செம்மொழித்தமிழ் இலக்கண இலக்கியங்கள், தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர், 2010.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
ULH 18201	HINDI-II	4	1	0	5	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:					Student Outcomes	
1.	To express and communicate literature which is part of life	e	f	h	m	n
2.	To incorporate day to day personal and professional life's need to communicate in the language.	e	f			
3.	To help the students to imagine and express their mind through literature	e	f			

#### UNIT – I POETRY

(30hours)

- Kabir, Tulsi, Rahim, Bihari
- Kaidi Aur Kokila - Makhan Lal Chaturvedi
- Ab Aur Nahi - Om Prakash Valmiki
- Prem Ka Rog - Kunwar Narayan
- Maa Gaon Me Hai - Divik Ramesh
- Adhik Naya Hota Hun - Liladhar Mandloi

#### UNIT – II STORY

(25 hours)

- Vaishnavi - Yashpal
- Dopahar Ka Bhojan - Amarkant
- Jungle - Chitra Mudgal
- Kinare Se Door - Rakesh Bihari
- Precious Baby - Anita Nair

#### UNIT – III

(10 hours)

- Administrative Words, Anuvad : Anuvad Ki Parisbhasha Evam Bhed

#### UNIT – IV

(10 hours)

- Anuvad : English To Hindi

#### REFERENCE

- Prayojan Mulak Hindi – Madhav Sontakke  
A Practical Guide To English Translation And Composition – K.P. Thakur

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C	
ULF18201	FRENCH-II	4	1	0	5	4	
INSTRUCTIONAL OBJECTIVES					Student Outcomes		
At the end of this course the learner is expected:							
1.	Improve their oral and written skills through a combination of theory and practice.	e	f	h			
2.	Consolidate the knowledge of theoretical aspects of French grammar with examples provided from different angles: from present day literature, day to day conversation.	e	f	m			

**Unité-I** (15 heures)  
 C'est où ? – Demander et indiquer une direction – Localiser (près de, en face de,...)  
 - L'impératif – Quelques prépositions de lieu- Les articles contractés au, à la .... – Le passé composé et l'accord du participe passé avec être –Les nombres ordinaux – Ne...plus, ne ... jamais – Les adjectifs numéraux ordinaux – Faire.

**Unité-II** (15 heures)  
 N'oubliez pas ! - Exprimer l'obligation ou l'interdit – Conseiller – En dans les constructions avec de – Quelque chose, rien – Quelqu'un, personne – Il faut, devoir – Qui, que, où – Les pronoms compléments indirects (me, te, lui, leur...). Belle vue sur la mer ! – Décrire un lieu – Situer – se situer dans le temps – La place des adjectifs – Des, De devant un adjectif – Le genre des noms de pays – Les prépositions et les noms de villes, de pays, de continents – Tout(e) (s), tous – Y, pronoms complément – Les adjectifs démonstratifs.

**Unité-III** (15 heures)  
**Quel beau voyage !-** Raconter – Décrire les étapes d'une action – Exprimer l'intensité et la quantité – Interroger- Les verbes pronominaux – à la pièce, au kilo – un sachet de, un litre de ... -d'abord, puis ... - peu, assez, trop... - En pronom complément – L'interrogation par l'inversion et révision de l'interrogation – Partir.

**Unité-IV** (15 heures)  
**Oh !joli !-** Décrire quelqu'un – comparer – Exprimer l'accord ou le désaccord – Se situer dans le temps –L'imparfait – L'imparfait ou le passé composé – la description d'une personne.

**Unité-V** (15 heures)  
**Et après ? -** Parler de l'avenir- Exprimer des souhaits – Décrire quelqu'un- S'en aller, partir, quitter – Les indicateurs de temps (en, dans) – Le futur simple – Le subjonctif présent- La place des pronoms à l'impératif.

**Référence**

1. "Latitudes-1" Méthode de français, Regime Merieux, Yves Loiseau Les éditions Didier, Paris, 2012.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
ULE18201	ENGLISH - II	4	1	0	5	4
<b>INSTRUCTIONAL OBJECTIVES</b> At the end of this course the learner is expected:					<b>Student Outcomes</b>	
1.	To enable the students to think in English	e	f	h	m	n
2.	To become aware of the world literature and the writers	e	f	d		
3.	To equip students with the awareness and strategies needed to enable the study of English as a lifelong process.	e	f	d		

**UNIT – I Poetry (15 Hours)**

1. The Unknown citizen – Auden
2. Nada Kondro Kada Kondro- Pura Naanooru 187
3. On being Trans- Lee Mokobe
4. Girl Child – Pawani Mathur

**UNIT II - Prose (15 Hours)**

1. Men and Women – Virginia Woolf
2. Farewell Speech of Mark Antony – William Shakespeare
3. The Autobiography of an unknown Indian –Nirad C.Chaudhuri

**UNIT III - Short Stories and Play (15 Hours)**

1. A Wrong Man in Worker's Paradise – Rabindranath Tagore
2. Refund – Karen E.Bender
3. Paper Money – Razia Fasih Ahmad
4. Karukku - Bama

**UNIT IV - Popular Literature (15 Hours)**

1. Paul Simon : The Sound of Silence
2. Tedx Talks – If I had a daughter
3. John Lennon- I have a dream
4. Pink Floyd – Brick in the Wall

**UNIT V - Language Component (15 Hours)**

1. Spot the Errors & Punctuation
2. Antonyms and Synonyms
3. Parts of speech
4. Articles
5. Vowels
6. Road Mapping

7. Movie Review
8. Crossword Puzzles
9. Open ended Stories
10. Quiz

#### TEXT BOOK

1. Cambridge University Press, Raymond Murphy, *Essential Grammar in Use* 3<sup>rd</sup> Edition 2010.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18201	THERMODYNAMICS AND SOLUTIONS	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES				Student Outcomes		
At the end of this course the learner is expected:						
1.	To understand the concepts of thermodynamics and apply it to physical and chemical systems.	a	b		h	n
2.	To study the laws of thermodynamics and their applications			e	l	m
3.	To acquire knowledge about the colligative properties of solutions		b	e	h	l
4.	To gain knowledge about the solutions of non-electrolytes		b		l	

#### UNIT - I Introduction to Thermodynamics

System – surrounding – isolated - closed and open systems - homogeneous and heterogeneous systems. State of the system - intensive and extensive properties. Thermodynamic processes - cyclic process - reversible and irreversible process - isothermal and adiabatic process. State and path functions. Work of expansion at constant pressure and free expansion.



## UNIT – II First and Second Law of Thermodynamics

First law of thermodynamics – Statement - Definition of internal energy (U) - Enthalpy (H) and heat capacity -U and H as thermodynamic properties. Relationship between  $C_p$  and  $C_v$ . Limitations of first law and the need for the second law - heat engine - Carnot's cycle and its efficiency -Thermodynamic principle of the working of refrigerator - Thermodynamic scale of temperature. Entropy as a state function - entropy as a function of P, V and T- Entropy change in phase change - Entropy of mixing - Entropy as a criterion of spontaneous and equilibrium processes in isolated systems.

## UNIT- III Chemical Equilibrium, Zeroth and Third Law of Thermodynamics

Law of mass action - Thermodynamic treatment of the law of mass action - Van't Hoff reaction isotherm, Temperature dependence of the equilibrium constant - Relationship between  $K_p$  and  $K_c$ , homogeneous equilibria, dissociation of  $PCl_5$ . Factors affecting chemical equilibrium – Le Chatlier principle - Zeroth law of thermodynamics - Absolute temperature scale. Statement of third law - Nernst heat theorem.

## UNIT – IV Colligative Properties of Dilute Solutions

Solution - dilute solutions - definition - Raoult's law for vapour pressure lowering (equation only) - Van'tHoff equation (no derivation) - Determination of molar mass from osmotic pressure measurement -Reverse osmosis. Boiling point elevation - Derivation of molal elevation constant ( $K_b$ ) - Determination of molar mass from boiling point elevation. Freezing point depression - Determination of molar mass from freezing point depression.

## UNIT- V Solutions of Non Electrolytes

Solution of liquids in liquids - Raoult's law - Chemical potentials of ideal and non-ideal solutions - Gibbs–Duhem – Margules equation. Fractional distillation of binary liquid systems - azeotropic mixture - steam distillation of immiscible liquids. Solubility of partially miscible liquids - phenol-water system - Effect of impurities on critical solution temperature. Henry's law - Applications of Henry's law.

## TEXT BOOKS

1. B.R. Puri and L.R. Sharma, *Principles of Physical Chemistry*, ShobanLalNagin Chand and Co. 33<sup>rd</sup> edition, 1992.
2. P.W. Atkins, *Physical Chemistry*, 7<sup>th</sup> edition, Oxford University Press, 2001.

## REFERENCES

1. S.Glasstone and D.Lewis, *Elements of Physical Chemistry*, Mac Milan& Co. Ltd, London, 1960.
2. Rajaram and Kuriacose, *Thermodynamics for students of chemistry*, ShobanLalNagin Chand, 1986.
3. D.V.S Jain and S.P.Jainhar, *Physical chemistry - Principles and problems*,
4. Tata McGraw Hill, New Delhi, 1988.
5. S.H Maron and J.B. Lando ,*Fundamentals of Physical Chemistry*, Macmillan, New York, 1974.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18202	INORGANIC QUALITATIVE ANALYSIS – II	0	0	4	4	2
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To enable the students to develop analytical skills in identification and detection of inorganic ions in the mixture by semimicro analysis.	a	b			
2.	To appreciate the various coloured chemical reactions of metal ions.		b	c		
3.	To learn the elimination of the interfering radicals		b		e	
4.	To understand the analysis of various inorganic mixture			e	h	l

#### Semi Micro Qualitative Analysis:

Qualitative analysis of a mixture containing two anions and two cations.

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

Anions: Carbonate, sulphate, chloride, nitrate, borate, chromate, oxalate, tartrate, and phosphate.

Cations: Lead, bismuth, copper, cadmium, antimony, iron, zinc, cobalt, nickel, manganese, calcium, strontium, barium, & ammonium.

#### REFERENCES

1. V.Venkateswaran, R.Veerasingam and A.R. Kulandaivelu, *Basic principles of Practical Chemistry*, 2<sup>nd</sup> edition, New Delhi, Sultan Chand & sons, 1997.
2. V.V Ramanujam, *Inorganic Semi Micro Qualitative Analysis*, 3<sup>rd</sup> edition, The National Publishing Company, Chennai, 1974.
3. Vogel's *Text Book of Inorganic Qualitative Analysis*, 4<sup>th</sup> edition, ELBS, London, 1974.
4. J. N. Gurtu and R. Kapoor, *Advanced experimental Chemistry*, S. Chand and Co. 6<sup>th</sup> edition, 2010

Course Nature: Practical						
Assessment Method-Practical Component (Marks: 100)						
In-Semester	Assessment tool	Experiments	Observation	Regularity	Model Examination	Total
	Marks	25	10	5	10	50
End Semester Examination Marks (Practical):						50
Total Max Marks						100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UMA18A02	ALLIED MATHEMATICS- II	4	1	0	5	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected		Student Outcomes				
1.	To apply basic concepts for clear understanding of mathematical principles.	a				
2.	To understand integral calculus	a				
3.	To solve practical problems.	a				
4.	Improve the Students knowledge for solving integration problems and their applications.	a				
5.	Improve student ability to solving Laplace transforms and applying Engineering and Science.	a				

#### UNIT – I Integral Calculus

Integral calculus- polynomial and irrational function – Partial fraction (Simple algebraic functions only) - Bernoulli's formula – Reduction formula-

$$\int \sin^n x dx - \int \cos^n x dx - \int_0^{\pi/2} \sin^n x dx - \int_0^{\pi/2} \cos^n x dx$$

#### UNIT – II Trigonometry

Trigonometry – Expansion of  $\sin n\theta$ ,  $\cos n\theta$  and  $\tan n\theta$  – Expansion of  $\sin^n \theta$  and  $\cos^n \theta$  in terms of multiples of  $\sin \theta$  and  $\cos \theta$  .

#### UNIT – III Differential Equation

Differential Equations - Second order differential equations with constant coefficients.

Problem based on R.H.S: 0,  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ ,  $x$  .

#### UNIT – IV Laplace Transformation

Laplace Transformation – Basic properties and simple problems –

$$L[e^{at} f(t)] - L[tf(t)] - L[e^{at} tf(t)] - L[f(t)/t] .$$

#### UNIT – V Inverse Laplace Transformation

Inverse Laplace transformation – Simple Problems based on Inverse Laplace Transformation - Multiplied by 's'- Multiplied by '1/s'- 'Partial Fraction Method'.

#### TEXT BOOK

1. Singaravelu. A, Allied Mathematics, 6<sup>th</sup> Revised Edition, Meenakshi Agency,

- 2014.
2. Vittal. P.R, Allied Mathematics, 4th Edition Reprint, Margham Publications, 2013.

#### REFERENCES

1. Venkatachalapathy, S.G, Allied Mathematics, 1st Edition Reprint, Margham Publications, 2007.
2. T.K. Manickavasagam Pillai and S. Narayanan, Ancillary Mathematics, Reprint, S. Viswanathan Printers and Publishers Pvt. Ltd., Chennai.
3. E. Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons. Singapore, 10<sup>th</sup> edition, 2012.
4. T. Veerajan, "*Engineering Mathematics I*", Tata McGraw Hill Publishing Co, New Delhi, 5th edition, 2006.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publications, 42<sup>nd</sup> Edition, 2012.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C	
UCA18E57	BASIC COMPUTER SKILLS	2	0	2	4	3	
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes			
1.	To have an insight in to the basic computer concepts	a	b				
2.	To acquire knowledge on the storage devices	a	b				
3.	To develop skills to handle HTML	a	b	h			
4.	To perform fundamentals exercises in computer programming			i	j	k	

#### UNIT – I Introduction to Computer

History of development of computers - Computer system concepts - Characteristics - Capabilities and limitations - Generations of computers. - Basic components of a

computer system – Control Unit, ALU, I/ O Devices, memory – RAM, ROM, EPROM, PROM, Flash Memory and other types of memory.

#### **UNIT – II Storage Devices**

Storage fundamentals – Primary Vs Secondary - Data Storage and Retrieval methods – Sequential, Direct and Index Sequential. - Various Storage Devices – Magnetic Tape, Magnetic Disks, Cartridge Tape, Data Drives, Hard Disk Drives, Floppy (Winchester Disk), Disks, Optical Disks, CD, VCD, CD-R, CD-RW, Zip Drive, DVD, SVCD.

#### **UNIT – III Computer Software**

Types of Software – System software, Application software, Utility Software, Demoware, Shareware, Freeware, Firmware, Free Software. - Operating Systems – Functions, Types – Batch Processing, Single User, Multi User, Multiprogramming, Multi-Tasking. -Programming languages – Machine, Assembly, High Level, 4 GL.

#### **UNIT – IV HTML**

HTML Introduction: History of HTML – HTML Document – Anchor Tags – Hyper Links-Sample HTML Documents. HEAD AND BODY SECTIONS: Header Section – Title – Prologue – Links – Comment – Heading – Horizontal Rule – Paragraph – Images and Pictures .

#### **UNIT – V Tables and Frames**

Ordered and Unordered List - TABLES: Table Creation – ColSpan, RowSpan – Cell Spacing, Cell Padding – Nested Tables. FRAMES: Frameset Definition – Frame Definition – Nested Frames.FORMS: Action Attribute – Method Attribute – Drop Down List – Sample Forms.

#### **LIST OF EXPERIMENTS**

1. Create a web page with necessary formats, images and marquees.
2. Create a web page with lists (Ordered, Unordered and Definition Lists).
3. Create a web page with table content.
4. Create a web page site using links for text and images.
5. Using frames, create web page for a travel agency.
6. Create a web-page using forms for our college students admission process
7. Create a web page which displays the wage of style attributes and event function with demo.
8. Create a web page which displays the mouse co-ordinates and image co-ordinates.
9. Create a web page which receives suggestions from customers for a software development and consultancy agency using necessary functions.

### TEXT BOOKS

1. V.Rajaraman, , *Fundamental of Computers*, New Delhi: Prentice Hall India Pvt. Limited, 2014.
2. C. Xavier., *World Wide Web design with HTML*, Tata McGraw Hill Publishing Limited, New Delhi.

Course Nature : Theory and Practical								
Assessment Method (Max. Marks: 100) (Fully internal)								
In Semester	Assessment Tool	Cycle Test I (Theory)	Cycle Test II (Theory)	Model Examination (Theory)	Evaluation of Experiments	Model Examination - Practical	Attendance	Total
	Marks	15	15	20	20	25	5	100
<b>Total</b>								<b>100</b>

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C		
CAC18201	QUANTITATIVE APTITUDE AND LOGICAL REASONING – I	2	0	0	2	2		
<b>INSTRUCTIONAL OBJECTIVES</b> At the end of this course the learner is expected					<b>Student Outcomes</b>			
1.	To improve aptitude, problem solving skills and reasoning ability of the students	a	b	i	j	m	n	
2.	To help them qualify the written test of competitive exams, campus placements and PSUs	a	b	i	j	m	n	
3.	To collectively solve problems in teams and groups	a	b	d	i	j	m	n
4.	To adopt new techniques in solving problem	a	b	h	i	j	m	n

#### COURSE OBJECTIVE

To enhance holistic development of students and improve their employability skills

#### UNIT – I

(6 Hours)

Numbers: Classification of numbers – Test of divisibility – Unit digit – HCF and LCM – Remainder theorem – Progression – Simplification – Averages – Combined mean (simple problems)

#### UNIT – II

(6 Hours)

Simple interest and compound interest – Word problems

**UNIT – III** (6 Hours)  
Problems related to permutation and combination – Probability (simple problems)

**UNIT – IV** (6 Hours)  
Reasoning (Analytical and logical): Odd man out – Word series – Number series – Direction test – Blood relationship – Coding and decoding – Seating arrangements

**UNIT – V**  
Problems related to clocks and calendar

#### REFERENCES

1. Dinesh Khattar-The Pearson guide to quantitative aptitude for competitive examinations.
2. Dr. R.S. Agarwal.– Quantitative Aptitude for Competitive Examinations, S.Chand and Company Limited
3. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata Mcgraw Hill, 3<sup>rd</sup> Edition
4. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata Mcgraw Hill, 4<sup>th</sup> Edition
5. <http://fw.freshersworld.com/placementweek/papers.asp>

Course Nature : Theory (Internal only)							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tools	Assignment 1	Assignment 2	Surprise Test 1	Surprise Test 2	Attendance	Total
	Marks	20	20	25	25	10	100



UNC18201/ UNS18201/ UNO18201/ UYG18201	NATIONAL CADET CORPS (NCC)/ NATIONAL SERVICE SCHEME (NSS)/ NATIONAL SPORTS ORGANIZATION (NSO) / YOGA	L	T	P	C
		0	0	0	1

**PURPOSE**  
To imbibe in the minds of students the concepts and benefits of NCC/NSS/NSO/YOGA and make them practice the same

INSTRUCTIONAL OBJECTIVES		Student Outcomes			
At the end of this course the learner is expected					
1.	To enable the students to gain knowledge about NCC/NSS/NSO/YOGA and put the same into practice	j	k	l	

Course Nature : Practical (Fully internal)		
Assessment Method (Max.Marks: 100)		
In Semester	Activity	Total
	Participation, involvement and contribution of the students activities scheduled	100

## SEMESTER III

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18301	FUNDAMENTALS OF SPECTROSCOPY AND GROUP THEORY	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To know the basics of group theory			b		k
2.	To educate the students about the fundamentals of various spectroscopic techniques			b	i j	k
3.	To understand the concepts and principles of UV, IR, NMR and Mass Spectroscopy			b	c h	
4.	To employ the spectroscopic techniques for the structural identity of organic molecules		a	c	e g	n

**UNIT – I Group Theory**

Symmetry elements and symmetry operations - Group postulates and types of groups - Abelian and non Abelian. Illustration of symmetry operation for H<sub>2</sub>O molecule - Construction of multiplication table for H<sub>2</sub>O molecule - Point group – Definition - Elements of symmetry operations of the following point groups: C<sub>n</sub> (C<sub>2</sub>, C<sub>3</sub>), C<sub>v</sub> (C<sub>2v</sub>, C<sub>3v</sub>) and C<sub>h</sub> (C<sub>2h</sub>, C<sub>3h</sub>).

**UNIT – II Introduction to Spectroscopy**

Interaction of low energy radiation with matter - Electromagnetic radiation- Quantisation of energies in molecules (translational, rotational, vibrational and electronic)- Transitions between energy levels in atoms and molecules - Absorption and emission spectra. Boltzman distribution (formula only) - Relative population of translational, rotational, vibrational and electronic energy levels.

**Electronic Spectroscopy**

Absorption laws, calculations involving Beer – Lambert's law - Verification and its limitations. Instrumentation of photocolorimeter and spectrophotometer - Block diagram. Types of electronic transitions - Chromophores and Auxochromes - Absorption bands and intensity - Factors governing absorption maximum and intensity.

### UNIT – III Infrared and Raman Spectroscopy

Principle- Types of stretching and bending vibrations - Vibrational frequencies - Instrumentation- Block diagram- Identification of organic molecules from characteristic absorption bands.-

Raman spectroscopy - Raleigh and Raman scattering – Stoke and antiStoke's line, Instrumentation - block diagram - Differences between IR and Raman spectroscopy - Mutual exclusion principle – Applications - Structural diagnosis.

### UNIT – IV NMR Spectroscopy

Principle of nuclear magnetic resonance - Basic instrumentation - Block diagram. Shielding mechanism - Chemical shift and number of signals - splitting of signals - coupling constants - Applications of NMR to simple organic compounds – ethanol, ethyl acetate – Benzyl alcohol.

### UNIT – V Mass Spectroscopy

Basic principles of mass spectroscopy - molecular peak - base peak - isotopic peak - metastable peak and their uses – Fragmentation - Nitrogen rule. Instrumentation - Block diagram - Mass spectrum of simple organic compounds – Alkanes - Mc Lafferty rearrangement.

### TEXT BOOKS

1. Y. R. Sharma, *Elementary Organic Spectroscopy*, 1<sup>st</sup> edition, Sultan Chand and Sons, 1980.
2. C. N.Banwell and E. M.Mccash, *Fundamentals of Molecular Spectroscopy*, 4<sup>th</sup> edition. Tata McGraw-Hill Pvt. Ltd., 2007.

### REFERENCES

1. B.R.Puri, L.R. Sharma and Madan S. Pathania, *Principles of Physical chemistry*, 43<sup>rd</sup> edition, Vishal Publishing Co., 2006.
2. D.V.S.Jain and S.P. Jainhar, *Physical chemistry, Principles and problems*, Tata McGraw Hill, New Delhi, 1988
3. D.A. Skoog, D.M. West and F.J. Holler, *Analytical Chemistry: An Introduction*, 5<sup>th</sup> edition, Saunders college publishing, Philadelphia, 1990.
4. S.H. Maron and J.B. Lando, *Fundamentals of Physical Chemistry*, Macmillan, New York, 1974.

Course Nature : Theory								
Assessment Method (Max. Marks: 100)								
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total	
	Marks	10	10	20	5	5	50	
End Semester							50	
Total							100	
COURSE CODE	COURSE TITLE			L	T	P	TOTAL L+T+P	C

UCY18302	ANALYTICAL CHEMISTRY	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected				Student Outcomes		
1.	To use modern instruments and classic techniques to analyse and record the results scientifically	c	e	g	m	
2.	To understand the various purification techniques available and the need for purity of compounds	b	e	g	m	n
3.	To help the student develop the habit of accurate manipulation and attitude of critical thinking	c	e	g	l	
4.	To understand the theoretical principles of chromatography techniques and its applications.	b	c		l	n

#### UNIT – I Introduction to Analytical Chemistry and Safety Methods

Analytical Chemistry- Its role - Classification of analytical methods - advantages of instrumental methods - good lab habits - common lab operations - Safety in the analytical lab- First aid in the case of burns and cuts.

#### UNIT – II Data Analysis

The Mean- The Median- Precision-Accuracy-Confidence limits-Standard Deviation-Errors- Rules for improving Accuracy-Rejection of Data- Significant figures- Reporting of Data- Presentation of Tabulated Data-Scatter Diagrams- Method of Least Squares- S.I. Units.

#### UNIT – III Purification Techniques

Dessicant: Types of dessicant- Relative efficiencies of dessicant- Drying powder and temperature- Regeneration of dessicant- choice of dessicant-technique of drying: drying of solids- Distillation: Theory of distillation- Technique: Fractional-Steam, Azeotropic- Vacuum – Recrystallization- Sublimation Criteria and Tests for purity: Melting point, boiling point- Refractive index and density.

#### UNIT – IV Separation Techniques

Precipitation- Solvent Extraction- Chromatography: Types- Column - Thin layer, - Paper, Ion exchange - Gas-Liquid Chromatography- HPLC and Electrophoresis (Introduction)

#### UNIT – V Principles of Gravimetric Analysis

Methods of obtaining the precipitate- Conditions for precipitation- Choice of precipitants- Advantages of using Organic Precipitants- Specific and Selective Precipitants- Sequestering Agents- Solubility Products and Precipitation- Factors which affect Solubility of Precipitates- Theories of Precipitation- Co-precipitation – post precipitation- procedures to minimize occlusion- procedures to minimize surface adsorption- Effect of digestion- General rules for precipitation- precipitation from homogeneous medium- washing of precipitates- Drying of precipitates- Types, care and use of crucibles.

#### TEXT BOOKS

1. R.Gopalan., *Elements of Analytical Chemistry*, 3<sup>rd</sup> edition, Sultan Chand and Co, New Delhi, 2004.
2. D.A.Skoog, D.M. West, *Fundamentals of Analytical Chemistry*, Saunders College Publishing, New York, 1988

#### REFERENCES

1. B.K.Sharma, *Principles of Instrumental Analytical Chemistry*, Krishna Prakashan Media, Meerut, 2004.
2. Willard, Merrit, Dean, Settle, *Instrumental Methods of Analysis*, CBS Publishers, Delhi, 1986.
3. Sivasankar, *Instrumental methods of analysis*, Oxford University Press, 2012.
4. A.I.Vogel, *A Textbook of Practical Organic Chemistry*, Longman, London, 1957.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
		Marks	10	10	20	5	5
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18303	INORGANIC QUANTITATIVE ESTIMATION	0	0	4	4	2
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To make the students acquire quantitative skills in volumetric analysis	c	e	g	h	m
2.	To gain knowledge about the neutralisation, redox and complexometric titrations	c	e		h	
3.	To educate the students on the various terminologies used for expressing the concentration of the solutions	b		g	l	
4.	To enable the students to plan their experimental projects accordingly and execute them skillfully	a	d		j	n

Volumetric Practical: Calibration of volumetric kits: burette, pipette and standard flask.

#### ESTIMATION OF THE FOLLOWING

- Oxalic acid (Link  $\text{KMnO}_4$ )
- Mohr salt (Link  $\text{KMnO}_4$ )
- Sodium Hydroxide (Link Standard acid)
- Sodium Carbonate (Link  $\text{H}_2\text{SO}_4$ )
- Potassium dichromate (Link  $\text{Fe}^{2+}$ )
- Potassium permanganate (Link  $\text{Fe}^{2+}$ )
- Estimation of Copper sulphate pentahydrate using  $\text{K}_2\text{Cr}_2\text{O}_7$  (Link thio)
- Estimation of  $\text{Zn}^{2+}$  (Link EDTA)
- Total and permanent hardness of water sample (Link EDTA)

#### REFERENCES

- Sundaram, Krishnan, Raghavan, *Practical Chemistry (Part II)*, S. Viswanathan Co. Pvt., 1996.
- V.Venkateswaran, R.Veerasingam, A.R. Kulandaivelu, *Basic principles of Practical Chemistry*, 2<sup>nd</sup> edition, New Delhi, Sultan Chand & sons, 1997.
- J. N. Gurtu and R. Kapoor, *Advanced Experimental Chemistry*, S. Chand and Co. 6<sup>th</sup> edition, 2010.
- Vogel, *Textbook of Quantitative Inorganic Analysis*, Longmann, 12<sup>th</sup> edition, 2011.

Course Nature: Practical
Assessment Method-Practical Component (Marks: 100)

In-Semester	Assessment tool	Experiments	Observation	Regularity	Model Examination	Total
	Marks	25	10	5	10	50
End Semester Examination Marks (Practical):						50
Total Max Marks						100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UPY18A01	ALLIED PHYSICS – I	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES: At the end of this course the learner is expected:				Students Outcomes		
1	To understand the fundamentals of physics	a	b	c		
2	To give the basic understanding of material properties	b	c	e		
3	To educate and motivate the students in the field of science	b	c	e	f	
4	To acquire knowledge on magnetism and dielectrics	b	e	f	f	

#### UNIT – I Simple Harmonic Motion and Circular Motion

Time period – Amplitude – Phase – Spring mass system – Simple pendulum – Composition of two simple harmonic motions of equal periods in a straight line and at right angles – Lissajous figures – Damping force – Damped harmonic oscillator – Uniform circular motion – Acceleration of a particle in a circle – Centripetal and centrifugal forces – Banking on curved roads.

#### UNIT – II Properties of Matter

Elasticity and plasticity – Elastic constants – Bending of beams – Young's modulus by non – Uniform bending – Torsion in a wire – Determination of rigidity modulus of torsion pendulum – Viscosity – Coefficient of viscosity – Stoke's law – terminal velocity – Surface tension – Molecular theory of surface tension – Excess pressure inside a drop and bubble.

#### UNIT – III Heat and Thermodynamics

Kinetic theory of gases – Basic postulates – Ideal gas laws – Van Der Waal's equation of states – Pressure of an ideal gas – Laws of thermodynamics – Entropy – change of entropy in reversible and irreversible processes – Low temperature – Joule – Kelvin effect – Theory and applications – Liquefaction of gases – Linde's process – Adiabatic demagnetization.

#### UNIT – IV Electricity and Magnetism

Electric charge – Conservation of charge – Permittivity – Coulomb's law – Electric field – Electric potential – Gauss's law and its applications – Conductors – Dielectrics – Electric Current – Ohm's law – Magnetic induction – Permeability – Susceptibility – Magnetic field due to a current carrying conductor – Biot Savart's law – Field along the axis of a coil – Force on a conductor carrying current in a magnetic field – Ampere's circuital law – Faraday's law – Gradient – Curl and Divergence – EM waves.

#### UNIT – V Geometrical Optics

Light and Optics – Fermat's principle – Laws of reflection and refraction – Total internal reflection and its illustrations – Mirrors and lenses – Lens formula – Refraction through a prism – Combination of two prisms to produce dispersion without deviation and deviation without dispersion – Defects of images – Coma distortion – Spherical and chromatic aberration in lenses.

#### TEXT BOOKS

1. R. Resnick and D.Halliday, *Fundamentals of Physics*, Wiley Publication, 8<sup>th</sup> Edition, 2011.
2. A.Sundaravelusamy, *Allied Physics I*, Priya Publications, 2009.

#### REFERENCES

1. P.V.Naik, *Principles of Physics*, PHI Learning Pvt. Ltd, 2006.
2. John Thiruvadigal D., Ponnusamy S., Sudha L. and M. Krishnamohan, *Physics for Technologists*, Vibrant Publication, 2013.
3. J. B.Rajam, *Physics for Technologists*, S. Chand, 1981.
4. Brijilal and Subramanian, *Elements of Properties of Matter*, S. Chand Limited, 2014 (Reprint).

Course Nature : Theory								
Assessment Method (Max.Marks: 100)								
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total	
	Marks	10	10	20	5	5	50	
End Semester							50	
Total							100	
COURSE CODE	COURSE TITLE			L	T	P	TOTAL L+T+P	C
UPY18A02	ALLIED PHYSICS LABORATORY-I			0	0	3	3	2
INSTRUCTIONAL OBJECTIVES: At the end of this course the learner is expected:						Students Outcomes		



1	To acquire basic understanding of laboratory techniques	a	d	h	i	
2	To educate the basics of instrumentation, data acquisition and interpretation of results	a		h	i	
3	To educate and motivate the students in the field of science	a		h	i	
4	To allow the students to acquire knowledge of fundamentals of optics	a		h	i	n

#### List of Experiments:

1. Determination of Young's Modulus– Uniform bending Method
2. Determination of Young's Modulus– Non Uniform bending Method
3. Determination of Rigidity Modulus of a wire – Torsional pendulum
4. Determination of thermal conductivity of a bad conductor using Lee's disc method
5. Calibration of Voltmeter using potentiometer
6. Calibration of Ammeter using potentiometer
7. Determination of magnetic susceptibility using Quincke's Method
8. Determination of dispersive power of a prism using spectrometer
9. Determination of Cauchy's constant using spectrometer

#### TEXT BOOKS

1. C.H. Bernard and C.D. Epp, John, *Laboratory Experiments in College Physics*, Wiley and Sons, Inc., 1995.
2. F.A. Jenkins and H.E. White, *Fundamentals of Optics*, 4<sup>th</sup> Ed., McGraw–Hill Book Co., 1981.

#### REFERENCES

1. G. L. Squires, *Practical Physics*, Fourth edition, Cambridge University Press, 2001.
2. D. Halliday, R. Resnick and J. Walker, *Fundamentals of Physics*, 6<sup>th</sup> Ed., John Wiley and Sons, Inc., 2001.
3. F.A. Jenkins and H.E. White, *Fundamentals of Optics*, 4<sup>th</sup> Ed., Reprint McGraw–Hill Book Co., 2007.
4. GeetaSanon, B. Sc., *Practical Physics*, 1<sup>st</sup> Edition. R. Chand & Co, 2007.

Course Nature: Practical						
Assessment Method-Practical Component (Marks: 100)						
In-Semester	Assessment Tool	Experiments	Observation	Regularity	Model Examination	Total
	Marks	25	10	5	10	50
End Semester Examination Marks (Practical):						50
Total Max Marks						100

### SKILL BASED ELECTIVES

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18S01	WATER CHEMISTRY AND ANALYSIS	0	1	2	3	2
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To get a basic idea about the qualities of water	b		i	k	m
2.	To improve the skills of analysis of water quality parameters	c	d	e	g	
3.	To understand and apply the spectrophotometric techniques for chemical analysis	a	c		g	n
4.	To extend the skills in studying flame photometric methods for chemical analysis	b	c	e	g	

#### LIST OF EXPERIMENTS

1. Determination of pH of Water Sample
2. Determination of Turbidity of Water Sample
3. Determination of Hardness of water sample
4. Determination of Dissolved oxygen (DO) by winkler's method
5. Determination of Chemical Oxygen Demand(COD) in water
6. Determination of Biological Oxygen Demand(COD) in water
7. Determination of Nitrate and Nitrite in water by UV-Visible spectrometry
8. Detection of Iron and Manganese in Water
9. Determination of hexavalent and trivalent chromium ( $Cr_6^+$  and  $Cr_3^+$ ) in water by visible spectrometry.
10. Determination of total alkalinity and acidity of a water sample.
11. Determination of Na / K in water sample by Flame photometry.

#### REFERENCES

1. B.K. Sharma, *Industrial Chemistry: including chemical - engineering*, 16<sup>th</sup> edition, Goel publishing house, Meerut, 2011.
2. S.P. Mahajan, *Pollution control in process industries*, Tata McGraw-Hill Education Pvt. Ltd., NewDelhi, 2004.
3. C.K. Varshney, *Water pollution and management*, Wiley Eastern Ltd., Chennai, 1988.
4. S.S. Dara, *A Text Book of Engineering Chemistry*, S.Chand & Co. New Delhi, First Edition, 1985.

Course Nature: Practical				
Assessment Method-Practical Component (Marks: 100)				
In-Semester	Assessment Tool	Experiments	Model Examination	Viva-Voce
	MARKS	70	20	10
Total Max Marks				100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18S02	FOOD CHEMISTRY AND ANALYSIS	0	1	2	3	2
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To get a basic idea about the food chemistry	b			h	
2.	To provide the practical knowledge and training to students in characterising the properties of food	c	e	h	j	l
3.	To familiarize the students on food chemistry and food poisons.	b	c	i	k	m
4.	To acquire knowledge on food additives	b	c			n

#### LIST OF EXPERIMENTS

1. Estimation of Nitrogen (protein) by Kjeldhal method.
2. Estimation of iodine value, acid value and RM value of edible oil.
3. Estimation of food colours (by colorimetric method).
4. Estimation of available carbon dioxide in baking powder.
5. Isolation of caesein and lactose from milk.
6. Estimation of glycine.
7. Isolation of natural food colours – Soxhelet extraction of chlorophyll.
8. Isolation of caffeine from tea dust.
9. Detection of adulterants in food stuffs.
10. Estimation of ascorbic acid.
11. Estimation of glucose.

#### REFERENCES

1. N. S. Gnanapragasam, G. Ramamurthy, *Organic Chemistry Lab Manual*, S.Viswanathan printers and publishers Ltd., 2002.
2. H.K. Chopra, P.S.Panesar, *Food Chemistry*, Narosa Publishing House, 2010.
3. Thanlamma Jacob, *Textbook of applied chemistry for home science and allied Science*, MacMillan, 1976.

4. Lilian Hoagland Meyer, *Food Chemistry*, CBS Publishers & Distributors, 2004

Course Nature: Practical				
Assessment Method-Practical Component (Marks: 100)				
In-Semester	Assessment Tool	Experiments	Model Examination	Viva-Voce
	Marks	70	20	10
Total Max Marks				100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18S03	MOLECULES OF LIFE	0	1	2	3	2
INSTRUCTIONAL OBJECTIVES				Student Outcomes		
At the end of this course the learner is expected:						
1.	To study the properties of lipids			c	g	
2.	To study the structure and properties of carbohydrates			b	c	i
3.	To study the synthesis of a drug molecule			b		i m n
4.	To study the structure –activity relationships of drug molecule.				c	g i n

#### LIST OF EXPERIMENTS

- To determine the saponification value of an oil/fat.
- To determine the iodine value of an oil/fat
- Differentiate between a reducing/ nonreducing sugar.
- To synthesise aspirin by acetylation of salicylic acid
- Preparation of glucosazone from glucose (Osazone formation)
- Determination of cholesterol using Liebermann – Burchard reaction
- Determination of protein by Biuret reaction
- Carbohydrates – qualitative and quantitative determination.

#### REFERENCES

- B.S.Furniss,A.J. Hannaford, V.Rogers, P.W.G Smith, Tatchell, A.R. Vogel's *Textbook of Practical Organic Chemistry*, ELBS, 5<sup>th</sup> edition, 1989.
- V.K. Ahluwalia&R. Aggarwal, *Comprehensive Practical Organic Chemistry*, Universities Press, 2004.
- R. T.Morrison&R. N.Boyd, *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 6<sup>th</sup> edition, 1992.
- I. L. Finar, *Organic Chemistry* , Volume 2, Dorling Kindersley (India) Pvt. Ltd. 6<sup>th</sup> edition, Pearson Education, 2007.

Course Nature: Practical				
Assessment Method-Practical Component (Marks: 100)				
In-Semester	Assessment Tool	Experiments	Model Examination	Viva-Voce
	Marks	70	20	10
Total Max Marks				100

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C		
CAC18301	QUANTITATIVE APTITUDE AND LOGICAL REASONING – II	2	0	0	2	2		
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes				
1.	To improve aptitude, problem solving skills and reasoning ability of the student	a	b	i	j	m	n	
2.	To help them qualify the written test of competitive exams, campus placements and PSUs	a	b	i	j	m	n	
3.	To collectively solve problems in teams and group	a	b	d	i	j	m	n
4.	To adopt new techniques in solving problem	a	b	h	i	j	m	n

## COURSE OBJECTIVE

To enhance holistic development of students and improve their employability skills

### UNIT – I

Percentage - Profit or loss - Discount

### UNIT – II

Ratio, proportion - Mixtures and solutions

### UNIT – III

Time and work - Time, Speed and distance; Problems related to pipes and cisterns, Problems related to train, Problems related to boats and streams, Problems related to races

### UNIT – IV

Set theory - Geometry and mensuration - Cubes

### UNIT – V

Data sufficiency - Data interpretation

## REFERENCES

1. Dinesh Khattar-The Pearson Guide to QUANTITATIVE APTITUDE for competitive examinations.
2. Dr. R.S Agarwal.– Quantitative Aptitude for Competitive Examinations, S.Chand and Company Limited
3. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Tata Mcgraw Hill, 3<sup>rd</sup> Edition
4. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata Mcgraw Hill, 4<sup>th</sup> Edition
5. <http://fw.freshersworld.com/placementweek/papers.asp>

Course Nature : Theory (Internal only)							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tools	Assignment 1	Assignment 2	Surprise Test 1	Surprise Test 2	Attendance	Total
	Marks	20	20	25	25	10	100

## SEMESTER IV

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18401	CHEMISTRY OF MAIN GROUP ELEMENTS	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To impart knowledge about the chemistry of boron, carbon, nitrogen and halogen groups.	b	c			
2.	To know the nature of compounds formed by s and p block elements.	b	c			
3.	To know the various reagents of main group elements used in synthetic chemistry.		c		m	
4.	To understand the crystal structure of solids		c		m	

**UNIT – I Chemistry of Groups 1 & 2 Elements**

Introduction- group properties- comparative study of group I A and group II A elements- anomalous behaviour of lithium and beryllium- extraction of beryllium - diagonal relationship - preparation- properties and uses of lithium hydride- sodium peroxide, potassium iodide- calcium – carbide- super phosphate of lime- Plaster of Paris and lithopone.

**UNIT – II Chemistry of Groups 13 & 14 Elements**

Chemistry of boron – Borane, higher boranes- carboranes- borazines and boron nitrides. Aluminium-amphoteric behavior- aluminates. Group 14 (carbon group)- catenation and heterocatenation- allotropy of carbon- carbides salt-like carbides- interstitial carbides- covalent carbides. Chemistry of silicon – silanes- higher silanes- multiple bonded systems- disilanes- silicon nitrides- siloxanes and silicates. P-N compounds- cyclophosphazenes and cyclophosphazanes. S-N compounds –S<sub>4</sub>N<sub>4</sub>, (SN)<sub>x</sub>.

**UNIT – III Chemistry of Groups 15 & 16 Elements**

General characteristics- unique features of nitrogen- a comparative study of hydrides- preparations- properties and uses of N<sub>2</sub>H<sub>4</sub>- NH<sub>2</sub>OH- HN<sub>3</sub> - oxo acids of nitrogen - nitric acid- oxidising properties - structures of oxides and oxoacids of phosphorus and nitrogen -halides of phosphorus - phosphazines.

Gradient in properties, oxidation state- differences between oxygen and other elements- chemistry of ozone and H<sub>2</sub>O<sub>2</sub>- oxides of sulphur thionyl and sulphuryl chlorides-oxoacids of sulphur- sulphuric- permono- perdisulphuric acid–SF<sub>6</sub>- SCl<sub>2</sub>- S<sub>2</sub>Cl<sub>2</sub>- preparation- properties and structures.

#### UNIT – IV Chemistry of Groups 17 & 18 Elements

General characteristics of halogen with reference to electronegativity- electron affinity- oxidation states and oxidising power. Peculiarities of fluorine. Hydrides-oxides and oxo acids of halogens. Inter halogen compounds and pseudo halogens-Basic nature of iodine.

Noble gases- Position in the periodic table-Isolation from atmosphere. General Characteristics – Structure and shape of Xenon compounds – XeF<sub>2</sub>- XeF<sub>4</sub>- XeF<sub>6</sub>- XeOF<sub>4</sub> - uses of noble gases.

#### UNIT – V Structure of Solids

Classification- Amorphous and crystalline solids- types of solids-metals- ionic crystals- Vander Waals crystals- covalent crystals. Weiss and Miller indices- drawing various planes in a cubic lattice. Crystal systems and Bravais lattices. Crystal defects- Schottky and Frenkel defects.

X-ray diffraction- Bragg's equation- principle of X-ray diffraction. Structure of ionic solids- Packing of ions in solids- radius ratio-coordination number in ionic crystals-crystal structures- sodium chloride- zinc blende- wurtzite- rutile- cesium chloride-fluorite- antiferite (unit cell diagrams)- identification of simple cubic- bcc- fcc- lattices and indexing of X-ray lines.

#### TEXTBOOKS

1. D. F. Shriver and P. W. Atkins, *Inorganic Chemistry*, 3<sup>rd</sup> ed., W. H. Freeman and Co, London, 1999.
2. J. E. Huheey, E. A. Keiter and R. L. Keiter, *Inorganic Chemistry*, 4<sup>th</sup> ed., Harper Collins, New York, 1993.

#### REFERENCES

1. R.D. Madan, *Modern Inorganic Chemistry*, S. Chand & Company Ltd., New Delhi, 2004.
2. B. R.Puri, L. R. Sharma and K. C. Kalia, *Principles of Inorganic Chemistry*, Shoban Lal Nagin Chand and Co., Delhi, 1996.
3. F. A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, *Advanced Inorganic Chemistry*, 6<sup>th</sup> ed., John Wiley, New York, 1999.
4. F. A. Cotton, G. Wilkinson and P.L. Gaus, *Basic Inorganic Chemistry*, 3<sup>rd</sup> ed., John Wiley, New York, 2008.

Course Nature : Theory									
Assessment Method (Max.Marks: 100)									
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total		
	Marks	10	10	20	5	5	50		
End Semester							50		
Total							100		
COURSE	COURSE TITLE				L	T	P	TOTAL	C



CODE					L+T+P	
UCY18402	FUNCTIONAL GROUPS IN ORGANIC CHEMISTRY - I	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:					Student Outcomes	
1.	To gain knowledge about the basic concepts in organic chemistry			b	c	
2.	To understand how structure affects the reactivity of organic molecules				c	d
3.	To understand the physical and chemical properties of the functionalized organic compounds.				c	d
4.	To know the chemistry of aromatic compounds					d e

#### UNIT – I Alkanes and Cycloalkanes

Methods of synthesis of alkanes- Wurtz reaction, hydrogenation of alkenes- Corey-House synthesis.

Reactions- Free radical halogenations of alkanes with mechanism- sulphonation-nitration- oxidation- cracking and aromatization.

Cycloalkanes- Preparation using Wurtz reaction- Dieckmann's ring closure reaction and reduction of aromatic hydrocarbons. Reactions - mechanism of substitution and ring-opening reactions.

#### UNIT –II Alkenes: Elimination And Addition Reactions

Structure and stability of alkenes- General methods of preparation- E2 and E1 elimination reactions and their stereochemistry- Zaitsev's rule- dehydrogenation-dehydrohalogenation- dehydration reactions- Hoffmann elimination- cis and trans eliminations.

Reactions- Addition of hydrogen-halogen (Mechanism of electrophilic and free radical addition)- hydrogen halide (regioselectivity of electrophilic additions and Markownikoff's rule)- hydrogen bromide (peroxide effect), ozonolysis- hydroboration-oxidation- dihydroxylation with  $\text{KMnO}_4$  and allylic bromination by NBS.

#### UNIT – III Dienes and Alkynes

Dienes- General methods of preparation: mechanism of dehydrohalogenation.

Stability of dienes (conjugated, isolated, allenes and cumulenes)- Diels-Alder reaction - mechanism of 1,2- and 1,4-additions- Polymerization - Addition polymerization- Ziegler Natta catalysed polymerization.

Alkynes- Preparation- mechanism of dehydrohalogenation and dehydrogenation.

Acidity of alkynes- formation of acetylides and their utility in synthesis- Electrophilic addition reactions of alkynes- mechanism of addition of water- hydrogen halides and halogens- Lindlar's catalyst- oxidation- ozonolysis and hydroboration-oxidation.

#### UNIT – IV Alkyl Halides : Nucleophilic Substitution Reactions

General methods of preparation of haloalkanes.

Reactions- Nucleophilic substitution reaction mechanisms ( $S_N1$ ,  $S_N2$ , and  $S_Ni$ ) - stereochemical aspects of nucleophilic substitution reactions- competition between substitution and elimination- effect of solvent- substrate structure- leaving group- nucleophiles including ambident nucleophiles- substitution involving neighbouring group participation- carbocation rearrangements.

#### UNIT –V Chemistry of Aromatic Compounds

General methods of preparation of benzene-Reactions- Mechanism of electrophilic aromatic substitutions- examples of electrophilic aromatic substitution reactions – nitration- sulphonation- halogenation- Friedel-Crafts alkylation and acylation- alkylation of benzene by acylation-reduction- orientation and reactivity of substituted benzenes- ortho/para ratio- synthesis of substituted benzenes using arene diazonium salts- nucleophilic aromatic substitutions and their mechanisms- benzyne.

Polynuclear aromatic hydrocarbons – preparation- properties and uses of naphthalene- anthracene and phenanthrene.

#### TEXT BOOKS

1. R.T. Morrison and R. N.Boyd, *Organic Chemistry*, 6<sup>th</sup> edition, Prentice-Hall of India Ltd, New Delhi, 1992.
2. T. W. Graham Solomons, *Organic Chemistry*, 6<sup>th</sup> edition, John Wiley and Sons, New York, 1996.

#### REFERENCES

1. S.H. Pine, *Organic Chemistry*, 5<sup>th</sup> edition, McGraw Hill, New York, 1987
2. S.N. Ege, *Organic Chemistry Structure and Reactivity*, 3<sup>rd</sup> edition: A.I.T.B.S., New Delhi, 1998.
3. F.A.Carey, *Organic Chemistry*, 3<sup>rd</sup> edition, Tata-McGraw Hill Publications, New Delhi, 1999.
4. B.Y.Paula, *Organic Chemistry*, 3<sup>rd</sup> edition, Pearson Education Inc, Singapore, 2002.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
		Marks	10	10	20	5	5
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18403	GRAVIMETRIC ANALYSIS AND PREPARATION OF INORGANIC COMPOUNDS	0	0	5	5	3
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To enable the students acquire the quantitative skills in gravimetric analysis	b	c			
2.	To develop preparative skills in inorganic preparations.		c	d	e	
3.	To enable the students to understand the basics of complex formation of inorganic compounds	b	c			m
4.	To enable the students to plan experimental projects accordingly and to execute them skillfully	c	f	g		n

#### GRAVIMETRIC ANALYSIS

1. Estimation of Lead as lead chromate.
2. Estimation of Barium as barium chromate.
3. Estimation of Nickel as Nickel - DMG complex.
4. Estimation of Copper as copper (I) thiocyanate.
5. Estimation of Magnesium as magnesium oxinate.
6. Estimation of Barium as barium sulphate.

#### PREPARATION OF INORGANIC COMPOUNDS

1. Preparation of Prussian Blue
2. Preparation of Tetrammine Copper(II) sulphate tetrahydrate
3. Preparation of Trithiourea copper (II) sulphate dihydrate
4. Preparation of Potassium trioxalato ferrate (II)
5. Preparation of  $\text{CuCl}_2$

#### REFERENCES

1. V.Venkateswaran, R.Veerasingam, A.R.Kulandaivelu, *Basic principles of Practical Chemistry*, 2<sup>nd</sup> edition, New Delhi, Sultan Chand & sons, 1997.
2. Sundaram, Krishnan, Raghavan, *Practical Chemistry*, (Part III) S.Viswanathan Co. Pvt, 1996
3. Vogel's, *Text Book of Quantitative Chemical Analysis*. 5<sup>th</sup> edition, ELBS/Longman England, 1989.
4. N.S. Gnanaprasadam and G. Ramamurthy, *Organic Chemistry – Lab manual*, S. Viswanathan Co. Pvt., 1998.

Course Nature: Practical
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Assessment Method-Practical Component (Marks: 100)						
In-Semester	Assessment tool	Experiments	Observation	Regularity	Model Examination	Total
		Marks	25	10	5	10
End semester examination marks (practical):						50
Total max marks						100

SEMESTER IV

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UPY18A03	ALLIED PHYSICS – II	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES: At the end of this course the learner is expected:				Students Outcomes		
1	To understand the fundamentals of physics		a	b	c	
2	To emphasize the significance of Green technology and its applications		b	c	e	
3	To understand the structural, optical, nuclear and electronic properties of solids		b	c	e	f
4	To acquire knowledge on elementary ideas of integrated circuits		b	e	f	f

**UNIT - I Renewable Energy Physics**

Sources of conventional energy – Need for non – Conventional energy – Resources – Solar energy – Solar cells and its applications – Wind energy – Generation and applications – Bio mass energy – Generation and applications – Geothermal energy – Generation – Applications – Tidal energy – Generation and applications.

**UNIT - II Modern Physics**

Atomic structure – Alpha, beta and gamma radiation – Law of radioactive decay – Decay constant – Half life – Mean life – Nuclear energy – Mass defect – Binding energy – Fission and fusion – Biological effects of radiation – Black body radiation – Planck's quantum hypothesis – Photoelectric effect – Compton effect – De Broglie equation – Uncertainty principle.

**UNIT - III Wave and Fibre Optics**

Wave nature of light – Huygens's principle – Interference – Young's double slit experiment – Coherence – Interference from thin films – Michelson's interferometer. Diffraction – Wave theory of light – Single slit experiment – Diffraction grating – Polarization – Fiber optics – Propagation of light in optical fiber – Acceptance angle – Numerical aperture – Attenuation – Types of optical fibers and its Applications.

**UNIT - IV Crystal Physics**

Space lattice – Basis – Unit Cell – Lattice parameters – Two dimensional and three dimensional Bravais lattices and Crystal systems – Cubic crystal system – Crystal symmetry – Reciprocal lattice and its importance – Density and atomic packing fraction – Directions – Planes and Miller indices – Interplanar distance – Hexagonal Closely Packed (HCP) structure – Crystal imperfections – X ray diffraction – Laue method – Single crystal and powder diffraction.

#### UNIT V Electronics

Basic Electronics – P and N type semiconductors – Junction Diode and their characteristics – Half wave – Full wave rectifiers – Voltage regulations – Zener diode – Junction transistor – PNP – Digital electronics – AND, OR, NOT gates – NAND and NOR as universal building Blocks – Boolean algebra – Laws of Boolean algebra – De Morgan's theorem, basics of integrated circuit (IC)

#### TEXT BOOKS

1. Kittel C., *Introduction to Solid State Physics*, 8<sup>th</sup> Edition, Wiley Eastern Ltd, 2005.
2. Malvino and Leach, *Digital Principles & their Applications*, Tata McGraw Hill, 2010.

#### REFERENCES

1. Jha A.K., *Textbook of Applied Physics*, International Publishing House Pvt. Ltd, 2011.
2. Mansi Karkare and RajniBahuguna, *Applied Physics*, Volume – II International Publishing House Pvt. Ltd, 2010.
3. Tasneem Abbasi, Abbasi S. A, *Renewable Energy Sources: Their Impact on Global Warming and Pollution*, PHI Learning Pvt. Ltd. 2013.
4. Thyagarajan K. and Ajay Ghatak, *Introduction to Fiber Optics*, Cambridge, University Press, 1998.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UPY18A04	ALLIED PHYSICS LABORATORY-II	0	0	3	3	2
INSTRUCTIONAL OBJECTIVES: At the end of this course the learner is expected:				Students Outcomes		
1	To familiarized with the concept of material properties	a	d	h	i	
2	To educate the basics of instrumentation, data acquisition and analysis	a		h	i	
3	To understand the optical and electronic properties of solids through experimentations	a		h	i	
4	To understand the instrumentation of electronics experiments	a		h	i	n

List of Experiments:

1. Study the I-V Characteristic of a Solar Cell
2. Determination of wire thickness using air wedge experiment.
3. Study of attenuation and propagation characteristics of optical fiber cable
4. Band gap determination using Post Office Box – Specific resistance
5. Band gap determination using Four Probe Method.
6. Dielectric constant Measurement
7. Hall effect– Hall coefficient determination
8. Determination of regulation properties of a given power supply using a integrated circuit (IC)
9. Construction of AND, OR, NOT gates using diodes, resistors and Transistors

TEXT BOOKS

1. S.O. Kasap, *Principles of Electronic Materials and Devices*, Tata McGraw Hill Edition, 2002
2. Thiruvadigal, J. D., Ponnusamy, S. and C.P.Kala and Krishna Mohan.M., *Materials Science*, Vibrant Publications, 2012.

REFERENCES

1. C.Ouseph, K.Rangarajan, *A Text Book of Practical Physics*, Volume I,II,S.Viswanathan Publishers,1997.
2. Chauhan and Singh, *Advanced Practical Physics*, Revised Edition, Pragati Prakashan, 1985.
3. Van Vlack, L.H., *Material Science for Engineers*, 6<sup>th</sup> Edition, .Addison Wesley, 1985.
4. Callister, Jr. W.D., *Materials Science and Engineering: An Introduction*, Seventh Edition, Wiley, 2007.

Course Nature: Practical
Assessment Method-Practical Component (Marks: 100)

In-Semester	Assessment Tool	Experiments	Observation	Regularity	Model Examination	Total
	Marks	25	10	5	10	50
End semester examination marks (practical):						50
Total max marks						100

#### CORE BASED ELECTIVES

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18C01	INDUSTRIAL CHEMISTRY	3	0	0	3	3
INSTRUCTIONAL OBJECTIVES				Student Outcomes		
At the end of this course the learner is expected:						
1.	To gain knowledge in various industrial fuels			b	c	
2.	To study in depth about the use of various fertilizers in agriculture			d	e	i m
3.	To learn the basic concepts in water treatment and about pollution control				c	e g
4.	To gain knowledge about the manufacture of cement and glass			d	e	m

#### UNIT - I Industrial Fuels

Energy sources- Classification of fuels –solid- liquid and gaseous. Calorific value of fuels and its determination. Solid fuels – coal- lignite- sub-bituminous coal- bituminous coal and anthracite. Coking and non-coking coal. Liquid fuels – petroleum refining and uses. Hydrodesulphurisation and cracking (thermal and catalytic - fixed bed and fluidised bed). Octane number. Production and uses of tetraethyl lead- ETBE and MTBE. Gaseous fuels - natural gas and gobar gas –production- composition and uses-gobar electric cell.

#### UNIT – II Chemistry in Agriculture

Fertilizers- NPK- superphosphate- triple superphosphate- uses of mixed fertilizers. Micronutrients and their role, biofertilizers- plant growth hormones. Pesticides- classification of pesticides with examples. Insecticides - stomach poisons- contact insecticides- fumigants. Manufacture and uses of insecticides. DDT- BHC (gamma-xane: Conformation of gamma isomer) pyrethrin, banned pesticides. Herbicides -manufacture of 2,4-D and 2,4,5-T. Fungicides -preparation of Bordeaux mixture-lime-sulphur creosote oil (formula only). Sugar industry - double sulphitation process. Refining and grading of sugar. Saccharin - use as a sugar substitute-aspartame.



### UNIT – III Water Treatment

Introduction-sources of water. Hardness of water- temporary and permanent hardness - units of hardness- disadvantages of hard water. Effect of iron and manganese in water. Estimation of hardness – EDTA method and alkali titration method. Water softening methods - Zeolite process- ion-exchange demineralisation- mixed – bed deionisation. Domestic waste water treatment. Purification methods – chlorination- break point chlorination. Reverse osmosis - Desalination.

### UNIT – IV Pollution and Chemical Toxicology

Pollution: Air pollution –causes and effects. Acid rain- Greenhouse effect (global warming)-ozone layer depletion-photochemical oxidants. Control measures of air pollution. Water pollution – organic pollutants- chemical oxygen demand (COD)-biological oxygen demand (BOD) - total organic carbon and carbondioxide capture and sequestration.

Chemical toxicology: Effect of toxic chemicals on enzymes. Lead- mercury and cyanide pollution and their biochemical effects. Carbon monoxide, sulfur dioxide-oxides of nitrogen- ozone - biochemical effects.

### UNIT –V Cement, Glass and Ceramics

Cement: Manufacturing – Wet Process and Dry process- types- analysis of major constituents- setting of cement- reinforced concrete. Cement industries in India. Glass: Composition and manufacture of glass. Types of glasses- optical glass- coloured glasses and lead glass. Ceramics: Types- raw materials-white wares- manufacture and uses.

### TEXT BOOKS

1. R.Norris Shreve and Joseph A. Brink, Jr., *Chemical process industries*, 4<sup>th</sup> edition, Mc Graw – Hill, Kogakusha, Ltd, New York, 1977.
2. T. George Austin, *Shreve's Chemical Process industries*, 5<sup>th</sup> edition, Mc Graw – Hill, New York, 1984.

## REFERENCES

1. P. C. Jain and M.C. Jain, *Engineering Chemistry*, 10<sup>th</sup> edition, Dhanpat Rai and Sons, New Delhi, 1993.
2. A. K.De, *Environmental Chemistry*, 2<sup>nd</sup> edition, Wiley Eastern Ltd., Delhi, 1986.
3. E. S Manahan, *Fundamentals of Environmental Chemistry*, 2<sup>nd</sup> edition, CRC Press, Florida, 2000.
4. N. S. Subba Rao, *Biofertilizers in Agriculture*, Oxford and IBH Publishing Co Pvt Ltd, New Delhi, 1982.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18C02	POLYMER CHEMISTRY	3	0	0	3	3
INSTRUCTIONAL OBJECTIVES				Student Outcomes		
At the end of this course the learner is expected:						
1.	To learn the basic concepts and synthesis of polymers			b	c	
2.	To learn the characterization techniques employed in polymers				d	f g
3.	To understand the properties and techniques involved in the polymerization of polymers				d	g m
4.	To study the various applications of polymers				c	m

### UNIT – I Introduction to Polymer and its Synthesis

Definition – Monomer- polymer- polymerization and degree of polymerization. Classification of polymers based on architecture- structure- thermal behaviour- synthesis and tacticity. Synthesis of high polymers- step growth polymerization- chain growth polymerization - free radical- ionic- coordination polymerization. Special Topics in polymer synthesis – metathesis- group transfer polymerization and macromers in polymer synthesis.

### UNIT – II Structure and Properties of Polymers

Molecular weight- structure- properties- physical properties- solubility- viscosity- density, crystallinity. Chemical properties, thermal properties- glass transition

temperature, heat distortion temperature. Electrical properties- optical properties- mechanical properties- rheological properties and magnetic properties.

#### UNIT – III Polymerization Techniques and Processing

Techniques of Polymerization – Bulk, solution, suspension, emulsion techniques. Other techniques – Interfacial polymerization technique and plasma polymerization technique. Processing of Polymers – principles of processing-melt- rubbery stage- solution- emulsion and suspension. Techniques for polymer processing- compression, extrusion-spinning- casting- transfer and injection.

#### UNIT – IV Characterization of Polymers

Techniques for determination of molecular weight – Gel Permeation Chromatography. Techniques for determination of Morphology -X-Ray diffractometer- electron microscope- atomic force microscopy and scanning tunneling microscopy- scanning electron microscopy and transmission electron microscope. Techniques for determination of thermal behavior of polymers – thermo gravimetric analysis- differential thermal analysis- differential scanning calorimetry- dynamic mechanical analysis and thermo mechanical analysis.

#### UNIT – V Advances in Polymers

Biopolymers and biodegradable polymers in medical field- high temperature and fire resistant polymers- silicones. Application of polymers in solar cells- conducting polymers and composites (basic idea only).

#### TEXT BOOKS

1. Fred. W. Billmeyer, *Textbook of Polymer Science*, 3<sup>rd</sup> edition, Wiley India, Delhi, 2008.
2. Jeol R. Fried, *Polymer Science and Technology*, Prentice Hall of India Private Limited, New Delhi, 1999.

#### REFERENCES

1. Premamoy Ghosh, *Polymer Science and Technology: Plastics, Rubbers, Blends and Composites*, 3<sup>rd</sup> edition, McGraw Hill Education (India) Private Limited, 2011.
2. Niranjan Karak, *Fundamentals of Polymers Raw Materials to Finish Products*, PHI Learning Private Limited, New Delhi, 2009.
3. M.G. Arora, M. Singh and M.S. Yadav *Polymer Chemistry*, 2<sup>nd</sup> revised edition, Anmol Publications Private Ltd., New Delhi, 1989.
4. V. R. Gowariker, N.V. Viswanathan, Jayadev Sreedhar, *Polymer Science*, New Age International (P) Limited, Publishers, New Delhi, 2009.

Course Nature : Theory
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Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
		Marks	10	10	20	5	5
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18C03	PHARMACEUTICAL CHEMISTRY	3	0	0	0	3
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To learn the fundamentals of drug properties	a	b			
2.	To understand the clinical and biochemical analysis		b	c	g	h
3.	To learn the properties of common drugs.			c		m
4.	To learn the causes and treatment for various critical diseases		g	i	k	m

#### UNIT – I General Pharmaceutical Terms and Common Diseases

Definition of the following terms: Drug- pharmacophore- pharmacology- pharmacopeia- bacteria- virus- chemotherapy and vaccine. First aid for accidents - antidotes for poisoning. Causes- symptoms and drug for jaundice- cholera- malaria and filaria. Causes and treatment of cancer and AIDS.

#### UNIT – II Antibacterials and Antibiotics

Antibacterials: Sulpha drugs-examples and actions-prontosil- sulphathiazole-sulphafurazole. Antibiotics-Definition and action of penicillin- streptomycin-chloramphenicol - SAR of chloramphenicol only. Antiseptics and disinfectants - definition and distinction-phenolic compounds-chloro compounds and cationic surfactant.

### UNIT – III Enzymes

Classification- specificity- cofactor-coenzyme- ATP- mechanism of enzyme action and immobilisation of enzymes.

### UNIT – IV Analgesics and Related Drugs

Analgesics- Antipyretics and anti-inflammatory agents : Definition and actions - narcotic and non-narcotic- morphine and its derivatives- pethidine and methadone- salicylic derivative- paracetamol- ibuprofen - disadvantages and uses.

### UNIT – V Anaesthetics and Related Drugs

Anaesthetics – definition-local and general - volatile nitrous oxide, ether, Chloroform, cyclo propane- trichloroethylene - uses and disadvantages. Drugs affecting CNS - Definition, distinction and examples for tranquilizers, sedatives, hypnotics, psychedelic drugs - LSD Hashish- their effects.

### TEXT BOOKS

1. Jayashree Ghosh, *A Text Book of Pharmaceutical Chemistry*, S.Chand and Co. Ltd, 1999.
2. S.C. Rastogi, *Biochemistry*, Tata McGraw Hill Publishing Co, 1993.

### REFERENCES

1. O.Le.Roy, *Natural and synthetic organic medicinal compounds*, Ealemi, 1976.
2. R.S. Satoskar, *Pharmacology and Pharmatherapeutics*, Popular Prakashan, Vol.I and Vol II, 1973.
3. O.Kleiner and J.Martin, *Bio-Chemistry*, Prentice-Hall of India (P) Ltd, New Delhi, 1974.
4. Ashutosh Kar, *Medicinal Chemistry*, Wiley Eastern Limited, New Delhi, 1993.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

### SKILL BASED ELECTIVES

COURSE	COURSE TITLE	L	T	P	TOTAL	C
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CODE					L+T+P	
UCY18S04	C ++ PROGRAMMING AND ITS APPLICATION TO CHEMISTRY	0	1	2	3	2
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:					Student Outcomes	
1.	To understand the basic fundamentals of C++ programming by learning various operators, arrays and functions.	a	b			
2.	To construct simple programs using C++ programming language			c	d	e
3.	To employ numerical methods in programming language			d	e	f
4.	To solve problems in quantitative chemical analysis using C++ programming language			d	e	f

#### PRACTICAL C++ PROGRAMMING

1. Calculation of pH of a solution
2. Calculation of number of vibrational modes of linear and non-linear molecules
3. Calculation of RMS, Average and Most Probable velocity
4. Conversion of Fahrenheit to Centigrade and vice versa
5. Calculation of Molarity, Molality and Normality of a solution.
6. Calculation of pressure of ideal or Vander Waals gas
7. Calculation of bond energy using Born-Lande equation.

#### TEXT BOOKS

1. E. Balagurusamy, Programming in ANCI C, Tata Mc Graw- Hill, New Delhi, 2004.
2. K.V. Raman, Computers in Chemistry, 1<sup>st</sup> edition, Tata Mc Graw- Hill, New Delhi, 1993.

#### REFERENCES

1. Ramesh Kumari., *Computers and their Applications to Chemistry*, 2<sup>nd</sup> edition, 2014.
2. Venugopal and Prasad, *Programming with C*, 11<sup>th</sup> edition, 1971.
3. J. H. Noggle, *Physical Chemistry on a Microcomputer*. Little Brown & Co. (1985).
4. S.M. Venit, *Programming in BASIC: Problem solving with structure and style*. Jaico Publishing House: Delhi 1996.

Course Nature: Practical				
Assessment Method-Practical Component (Marks: 100)				
In-Semester	Assessment Tool	Experiments	Model Examination	Viva-Voce
	MARKS	70	20	10
Total Max Marks				100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18S05	INSTRUMENTAL METHODS OF ANALYSIS	0	1	2	3	2
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To obtain basic knowledge about the principles of instrumental analysis.	a	b			
2.	To develop skills in analytical methods to solve problems and to obtain precise, accurate and valid information			c	d	e
3.	To learn the basic concepts of determination of organic compounds by UV and IR spectrophotometer		d	e	g	h
4.	To educate students in chromatographic techniques		c	d	k	m

#### LIST OF EXPERIMENTS

1. Determination of Iron/Cobalt by UV-Vis spectrometry.
2. Analyzing the organic compounds using UV spectrophotometer
3. Titration of mixture of halides (Chloride + Iodide) by Potentiometric titrations.
4. Determination of R<sub>f</sub> values of various organic compounds by gas chromatography.
5. Determination of sodium, potassium and calcium by flame photometer.
6. Analysis of pure compounds by Thin Layer Chromatography.
7. Determine the titration curve for an amino acid by pH meter.
8. IR absorption spectra – study of organic compounds.
9. Study of Ferrocyanide/Ferricyanide redox couple by cyclic voltammetry.
10. Determination of the isoelectric pH of a protein.

## REFERENCES

1. D.A. Skoog, F.J. Holler and S R.Crouch, *Principles of Instrumental Analysis*, 6<sup>th</sup> edition, Cengage Learning India Edition, 2006.
2. H.H. Willard, L.L. Merritt, J.Dean, and F.A. Settoe, *Instrumental Methods of Analysis*, 7<sup>th</sup> edition, Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
3. Y.R. Sharma, *Elementary Organic Spectroscopy: Principles and Chemical Applications*, 5<sup>th</sup> edition, S.Chand and company Ltd., Ram Nagar, New Delhi, 2010.
4. D.A. Skoog, D.M. West and F.J. Holler, *Analytical Chemistry: An Introduction*, 5<sup>th</sup> edition, Saunders college publishing, Philadelphia, 1990.

Course nature: Practical				
Assessment Method-Practical Component (Marks: 100)				
In-Semester	Assessment Tool	Experiments	Model Examination	Viva-voce
	Marks	70	20	10
Total Max Marks				100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18S06	COMPUTATIONAL CHEMISTRY PRACTICAL	0	1	2	3	2
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To understand the basic knowledge of molecular modelling techniques	a	b	c	f	
2.	Computational and theoretical approaches to predict structure, stability and spectroscopy of molecular clusters using quantum chemical methods.		c	d	e	f

1. Introduction to operating system. Basics of software's installation and operating system (windows, UNIX, LINUX)
2. Generating molecular structure coordinates using Cartesian and Z-matrix for small molecules
3. Geometry optimizations and bond angle analysis
  - (a) Comparing the optimized bond angles of H<sub>2</sub>O, H<sub>2</sub>S and H<sub>2</sub>Se.
  - (b) T-shaped molecular geometry (ClF<sub>3</sub>, BrF<sub>3</sub>)
  - (c) Linear, Trigonal Planar, Tetrahedral, Trigonal Bipyramidal and Octahedral
4. Geometry optimizations of following functional groups and calculated the dipole moment



- (a) alkyl halide (b) aldehyde (c) ketone (d) amine (e) ether (f) nitrile (g) thiol (h) carboxylic acid (i) ester (j) amide.
5. Compute the atomization energy, ionization potential and proton affinities for small molecules and ions
  6.  $pK_a$  prediction from hydration number for ions and molecules
  7. Calculated the binding energy for small molecular clusters and surface
  8. Reaction mechanism in organic molecule (Prediction of minimum energy pathway and Transition state)
  9. Spectral Analysis: UV, IR, NMR and Aromaticity
  10. Understanding Crystal structure and information from CCDC

#### REFERENCES

1. Software and Books: Gaussian, Molpro, Gauss View, Chemcraft, Material Studio, VMD, Mercury, or any similar software's.
2. Foresman, J. B. Exploring Chemistry with Electronic Structure Methods, Gaussian Inc, 1996.
3. Leach, A.R. *Molecular Modelling Principles and Application*, Longman, 2001.

Course Nature: Practical				
Assessment Method-Practical Component (Marks: 100)				
In-semester	Assessment tool	Experiments	Model Examination	Viva-Voce
	Marks	70	20	10
Total Max Marks				100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18404	MY INDIA PROJECT	0	0	0	0	2

Course Nature : Project				
Assessment method- (fully internal)				
In-Semester	Assessment Tool	Review-1	Review-2	Total
	Marks	30	70	100
Total Max Marks				100

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
CAC18401	VERBAL ABILITY AND REASONING	2	0	0	2	2
<b>INSTRUCTIONAL OBJECTIVES</b> At the end of this course the learner is expected:			<b>Student Outcomes</b>			
1.	To enable the students understand the syntax of English and develop their lexical skills	d	f	h	n	
2.	To develop comprehension and interpretation skills	d	e	f	h	N
3.	To enhance vocabulary skills and improve repertoire of words	d	f	h	m	N
4.	To help the students succeed in competitive exams and placements	j	m	n		

#### COURSE OBJECTIVE

To instill confidence in students and develop skills necessary to face the challenges of competitive exams and placements

#### UNIT - I

Spotting error, Change of speech, Change of voice

#### UNIT - II

Synonyms, Antonyms, Idioms, Phrasal verbs, One word substitution

#### UNIT - III

Sentence improvement, Sentence completion (Grammar based)

#### UNIT - IV

Sentence completion (Vocabulary based), Odd word

#### UNIT - V

Reading comprehension, Word analogy, Para jumble

## REFERENCES

1. Hari Mohan Prasad and Meenakshi Upadhyay, Objective English for Competitive Examinations, McGraw Hill Education.
2. Norman Lewis, Word Power Made Easy New Revised and Expanded Edition, Goyal publication, 2011.
3. Raymond Murphy, Intermediate English Grammar, Cambridge University Press, 2007.

Course Nature : Theory (Internal only)							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tools	Assignment 1	Assignment 2	Surprise Test 1	Surprise Test 2	Attendance	Total
	Marks	20	20	25	25	10	100

SEMESTER V

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18501	TRANSITION METALS, LANTHANIDES, ACTINIDES AND NUCLEAR CHEMISTRY	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:					Student Outcomes	
1.	To know the tendency of transition metals to exhibit variable valencies.	b				
2.	To understand the basic concepts of coordination chemistry and early theory.	b	d	l		
3.	To know the occurrence of lanthanides and actinides in nature and their uses.	b		n		
4.	To know the importance of nuclear reactions in the modern world.	e	g	i	j	n

**UNIT – I Transition Metals (d – block elements)**

First- second and third transition series - general characteristics - metallic character- atomic and ionic radii - oxidation states- color- complex formation- catalytic and magnetic properties- non-stoichiometric compounds- synthesis and reactivity of vanadates- chromates-dichromate- molybdates- tungstates- manganite- permanganate- polycations. Biological importance of transition metals: biological roles of Cr- Mo- Mn- Fe- Co- Cu-Zn.

**UNIT –II Inner Transition Metals (f – block elements)**

Lanthanides: lanthanide series- abundance and natural isotopes- lanthanide contraction- similarity in properties- occurrence- oxidation states- chemical properties of Ln(III) cations- magnetic properties- color and electronic spectra of lanthanide compounds. Separation of lanthanides: solvent extraction- ion exchange- chemical properties of Ln(III) metal ions.

Actinides: actinide series- abundance and natural isotopes- occurrence- preparation of actinides- oxidation states- general properties- the later actinide elements.

Uranium-occurrence- metallurgy- chemical properties of hydrides- oxides and halides.

### UNIT – III Coordination Chemistry

Introduction: ligands-monodentate, bidentate and polydentate ligands- coordination sphere- coordination number- nomenclature of mononuclear and dinuclear complexes- chelate effect. Isomerism: linkage- ionization- hydrate- coordination- coordination position isomerism- geometrical (*cis* and *trans*, and *fac* and *mer*)-optical isomerism. Theories: Sidgwick theory-EAN and stability- formation of metal-metal bond in dimers- valence bond theory hybridization-geometry- magnetism- drawbacks of VBT.

### UNIT – IV The Nucleus and Radiochemistry

The nucleus: subatomic particles- structure of the nucleus-shell model- liquid drop model- forces in the nucleus- mesons- stability of nucleus n/p ratio- binding energy-radioactive elements. Radiochemistry: natural and induced radioactivity- radioactive decay- $\alpha$ -decay-  $\beta$ -decay- $\gamma$ -decay- neutron emission- positron emission- electron capture- unit of radioactivity (Curie)- half-life period- Geiger-Nuttal rule- radioactive displacement law- radioactive series.

Measurement of radioactivity: ionization chamber- Geiger counters- scintillation counters.

### UNIT – V Nuclear Reactions

Nuclear reactions: types of nuclear reactions- nuclear cross section- spallation, nuclear fission-theory of nuclear fission- chain reaction- critical mass- nuclear reactors-fast breeder reactors- fuels used in nuclear reactors-separation of isotopes-moderators- coolants- nuclear fusion- nuclear reactors in India.

Applications: energy tapping- dating of objects- neutron activation analysis- isotopic labeling studies- nuclear medicine- $^{99m}\text{Tc}$  radiopharmaceuticals.

### TEXTBOOKS

1. J. D. Lee, *Concise Inorganic Chemistry*, 5<sup>th</sup> ed., Blackwell Science, London, 1996.
2. D. F. Shriver and P. W. Atkins., *Inorganic Chemistry*, 3<sup>rd</sup> ed., W. H. Freeman and Co, London, 1999.

### REFERENCES

1. J. E. Huheey, E. A. Keiter and R. L. Keiter, *Inorganic Chemistry*, 4<sup>th</sup> ed., Harper Collins, New York, 1993.
2. F. A. Cotton, G. Wilkinson, C. Murillo and M. Bochman., *Advanced Inorganic Chemistry*, 6<sup>th</sup> ed., John Wiley, New York, 1999.
3. T. Moeller, *Inorganic Chemistry: A Modern Introduction*, Wiley, New York, 1990.
4. H. J. Arnikar, *Essentials of Nuclear Chemistry*, 4<sup>th</sup> ed., New Age International, New Delhi, 1995.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In	Assessment	Cycle	Cycle	Model	Assignment	Attendance	Total

Semester	Tool	Test I	Test II	Examination			
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C	
UCY18502	FUNCTIONAL GROUPS IN ORGANIC CHEMISTRY-II	4	0	0	4	4	
INSTRUCTIONAL OBJECTIVES				Student Outcomes			
At the end of this course the learner is expected:							
1.	To gain knowledge about the basic concepts in organic chemistry	b					
2.	To understand how structure affects the reactivity of organic molecules	b	c	i			
3.	To understand the chemistry of aldehydes and ketones	b	c		l	n	
4.	To study in depth the chemistry of nitrogen compounds		c		l	n	

#### UNIT – I Chemistry of Alcohols, Phenols and Ethers

General methods of synthesis of alcohols-phenols and ethers- Williamson ether synthesis.

Reactions of alcohols with hydrogen halides- thionyl chloride and phosphorous halides- intramolecular reactions of alkoxide anions and the synthesis of cyclic ethers- Oxidations of alcohols with sodium dichromate and pyridinium chloro chromate.

Ring opening reactions of epoxides with nucleophiles- formation of trans diols from epoxides

Chemistry of glycols and glycerols-preparation, properties and uses. Mono- di and tri hydric phenols: Preparation- properties and uses.

## UNIT – II Aldehydes and Ketones- 1: Addition Reactions at Electrophilic Carbons

Relative reactivities of carbonyl groups, mechanism of nucleophilic additions to the carbonyl group- addition of the nucleophile hydride ion- Cannizzaro reaction- canohydrin formation- addition of oxygen nucleophiles- formation of acetals and ketals and their hydrolysis- addition of carbon nucleophiles to the carbonyl group- Grignard reagents- organolithium compounds- addition reactions of nitrogen nucleophiles- imines and enamines- mechanism of the Wittig reaction- oxidations and reductions of aldehydes and ketones- mechanism of reductions with  $\text{NaBH}_4$ -  $\text{LiAlH}_4$ - Clemmenson- Wolf-Kishner and Meerwein-Ponndorf-Verley reductions.

## UNIT – III Aldehydes and Ketones-2: Enols and Enolate Anions

Acidity of alpha-hydrogens- keto-enol tautomerism, enolates-regioselectivity of enolisation. thermodynamic and kinetic enolates- halogenation at the alpha carbon of carbonyl compounds- Hell-Volhard-Zelinski reaction- Alkylation at the alpha carbon of carbonyls- alkylation at the beta-carbon- the Michael addition- 1,4 vs 1,2 addition, mechanisms of the Aldol condensation- mixed aldol reactions- Claisen and the mixed Claisen condensation- Perkin reaction- Knoevenagel condensation- Dieckmann condensation- alkylation of active methylene compounds- malonic ester synthesis and acetoacetic ester synthesis.

## UNIT – IV Carboxylic Acids and their Functional Derivatives

Nomenclature and classification of aliphatic and aromatic carboxylic acids. Preparation, acidity (effect of substituents on acidity) and reactions: Nucleophilic substitution reactions at the carbonyl group- reduction and oxidation. Preparation and properties of dicarboxylic acids such as oxalic- malonic- succinic. Preparation and reactions of acid chlorides- acid anhydrides- amides and esters- mechanism of the esterification reaction.

## UNIT –V Chemistry of Nitrogen Containing Compounds

Nitro compounds: aliphatic and aromatic nitro compounds- Classification- general properties - Preparation by nitration. Reduction reactions. Di- and tri-substitution of aromatic nitro compounds: synthesis of o-, m-, p- dinitrobenzenes and trinitrobenzene.

Aliphatic and aromatic amines - preparation of primary- secondary and tertiary amines - reactions and basicity of amines- effect of substituents on basicity of aromatic amines.

**TEXT BOOKS**

1. R.T. Morrison and R. N. Boyd, *Organic Chemistry*, 6<sup>th</sup> edition, Prentice-Hall of India Ltd, New Delhi, 1992.
2. T. W. Graham Solomons, *Organic Chemistry*, 6<sup>th</sup> edition, John Wiley and Sons, New York, 1996.

**REFERENCES**

1. S.H. Pine, *Organic Chemistry*, 5<sup>th</sup> edition, McGraw Hill, New York, 1987.
2. S.N. Ege, *Organic Chemistry Structure and Reactivity*, 3<sup>rd</sup> edition: A.I.T.B.S., New Delhi, 1998.
3. F.A. Carey, *Organic Chemistry*, 3<sup>rd</sup> edition, Tata-McGraw Hill Publications, New Delhi, 1999.
4. B.Y. Paula, *Organic Chemistry*, 3<sup>rd</sup> edition, Pearson Education Inc, Singapore, 2002.

<b>Course Nature : Theory</b>							
<b>Assessment Method (Max.Marks: 100)</b>							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
<b>End Semester</b>							<b>50</b>
<b>Total</b>							<b>100</b>

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C	
UCY18503	CHEMICAL KINETICS, SURFACE CHEMISTRY AND PHOTOCHEMISTRY	4	0	0	4	4	
<b>INSTRUCTIONAL OBJECTIVES</b> At the end of this course the learner is expected:				<b>Student Outcomes</b>			
1.	To understand the principles of gaseous state	b	e				
2.	To understand the concepts of chemical kinetics	b	e		g	n	
3.	To educate the basic ideas of surface phenomena			g	i	n	
4.	To learn the principles of photochemistry	b			i	n	



#### UNIT – I Gaseous State

Gaseous state - laws of gaseous state- gas constant R in different units - deviation from ideal behaviour- Van der waals equation for real gases - critical phenomenon - PV isotherm of real gases- critical temperature - critical volume. Molecular velocities - root mean square-average and most probable velocities. Maxwell distribution law- collision number and mean free path - collision diameter.

#### UNIT – II Basics of Chemical Kinetics

Rate of a reaction -order and molecularity - derivation of rate constant for first and second order reactions - zero order reaction - pseudo order reaction. Hydrolysis of ethyl acetate- saponification of esters - methods of determining order of a reaction - half-life time method. Effect of temperature on reaction rates

#### UNIT – III Theories of Chemical Kinetics

Concept of activation energy - Arrhenius equation - collision theory- absolute reaction rate theory (ARRT)- application of ARRT to simple bimolecular process- theory of unimolecular reactions- Lindemann- Hinshelwood- RRKM and Slater treatment.

#### UNIT – IV Surface Phenomena

Catalysis: General characteristics - types of catalysis - acid base catalysis - enzyme catalysis- explanation with suitable examples- Michaelis–Menten equation.

Adsorption: Definition- difference between adsorption and absorption - factors influencing adsorption - Freundlich adsorption isotherm- Langmuir adsorption isotherm - applications.

#### UNIT – V Photochemistry

Consequences of light absorption - Jablonski diagram-radioactive and non-radioactive transitions. Laws of photo chemistry: Lambert – Beer- Grothus - Draper and Stark – Einstein. Quantum efficiency. Rate law and kinetics of photo chemical reactions:  $H_2-Cl_2$  reaction. Comparison of thermal and photochemical reactions. Photo sensitization and quenching. Fluorescence- phosphorescence and chemiluminescence. Laser and uses of lasers.

**TEXT BOOKS**

1. B.R.Puri, L.R.Sharma and M.S.Pathania, *Principles of Physical Chemistry*, 23<sup>rd</sup> edition, New Delhi, Shoban Lal Nagin Chand & Co,1993.
2. P.W. Atkins, J.D.Paula, *Physical chemistry*, 9<sup>th</sup> Oxford university press, 2009.

**REFERENCES**

1. P.L.Soni, and O.P. Dharmara, *Text of Physical Chemistry*, 11<sup>th</sup> edition, Sultan Chand & Sons Educational Publishers , New Delhi, 1979.
2. Gilbert .W. Castellan, *Physical Chemistry*, 3<sup>rd</sup> edition, Narosa Publishing House, 1985.
3. S.Glasstone, D.Lewis, *Elements of Physical Chemistry*, 2<sup>nd</sup> edition, London, Mac Millan & Co. Ltd,1948.
4. K. L. Kapoor, *A Textbook of Physical chemistry*, (volume-2 and 3) Macmillan, India Ltd, 1994.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18504	ORGANIC QUALITATIVE ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS	0	0	5	5	3
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To enable the students to develop analytical skills in organic qualitative analysis	c	e	g		
2.	To develop preparative skills in organic preparations	c		h	i	n
3.	To enable the students to check the purity of organic compounds by determining the melting or boiling points	c	d	g		
4.	To analyze and characterize simple organic functional groups	c	e	g	i	n

**SYSTEMATIC ANALYSIS OF MONOFUNCTIONAL ORGANIC COMPOUNDS**

Analysis of Simple Organic compounds

(a) Characterization of functional groups

(b) Confirmation by preparation of solid derivatives / characteristic color reactions.  
 Note: Mono –functional compounds are given for analysis. In case of bi-functional compounds, students are required to report any one of the functional groups.

(c) Identification of functional groups:

i) Carboxylic acids ii) Phenols iii) Aldehydes iv) Ketones v) Esters vi) Carbohydrates  
 vii) Amines viii) Amidesix) Halogen compounds

#### Organic Preparation

Preparation of Organic Compounds involving the following chemical transformations

1.Oxidation 2. Reduction 3.Hydrolysis 4.Nitration 5.Bromination 6.Diazotization

Determination of boiling /melting points by semimicro method.

#### REFERENCES

1. V.Venkateswaran, R.Veerasingam, A.R.Kulandaivelu, *Basic principles of Practical Chemistry*, 2<sup>nd</sup> edition, New Delhi, Sultan Chand & sons, 1997.
2. Sundaram, Krishnan, Raghavan, *Practical Chemistry*, (Part III) S.Viswanathan Co. Pvt, 1996.
3. Vogel's, *Text Book of Quantitative Chemical Analysis*. 5<sup>th</sup> edition, ELBS/Longman England, 1989.
4. N.S. Gnanaprasadam and G. Ramamurthy, *Organic Chemistry – Lab manual*, S. Viswanathan Co. Pvt., 1998.

Course Nature: Practical						
Assessment Method-Practical Component (Marks: 100)						
In-semester	Assessment tool	Experiments	Observation	Regularity	Model Examination	Total
	Marks	25	10	5	10	50
End Semester Examination Marks (Practical):						50
Total Max Marks						100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18505	PHYSICAL CHEMISTRY PRACTICAL – I	0	0	5	5	3
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To understand the principles of kinetic reaction			b		i
2.	To impart knowledge with respect to the phase transformation of different systems.	a		b		i
3.	To enable the students to acquire analytical and psychomotor skills.			c	d	g i
4.	To understand the basic concepts of critical solution temperature			b		

#### LIST OF EXPERIMENTS

1. Determination of Transition Temperature of the hydrated salt
2. Determination of Critical Solution Temperature of phenol water system.
3. Effect of impurity on Critical Solution Temperature
4. Phase Diagram (Simple eutectic system)
5. Kinetics of Iodination of Acetone
6. Determination of Rate constant of Acid –catalysed Hydrolysis of an Ester
7. Determination of partition coefficient of iodine between water and carbon tetrachloride
8. Determination of relative avidity of two acids.

#### REFERENCES

1. V. Venkateswaran, R.Veerasingam, A.R.Kulandaivelu, *Basic principles of Practical Chemistry*, 2<sup>nd</sup> edition, New Delhi, Sultan Chand & sons, 1997. .
2. Sundaram, Krishnan, Raghavan, *Practical Chemistry*, (Part III) S.Viswanathan Co. Pvt, 1996.
3. Vogel's, *Text Book of Quantitative Chemical Analysis*. 5<sup>th</sup> edition, ELBS/Longman England, 1989.
4. David P. Shoemaker, Carl W. Garland, Joseph W. Nibler, *Experiments in Physical Chemistry*, 5<sup>th</sup> edition, McGraw- Hill Book Company, 1989.

Course nature: practical						
Assessment Method-Practical Component (Marks: 100)						
In-semester	Assessment tool	Experiments	Observation	Regularity	Model Examination	Total
	Marks	25	10	5	10	50
End Semester Examination Marks (Practical):						50
Total Max Marks						100

#### CORE BASED ELECTIVES

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18C04	GREEN CHEMISTRY	3	0	0	3	3
INSTRUCTIONAL OBJECTIVES					Student Outcomes	
At the end of this course the learner is expected:						
1.	To learn the principles of green chemistry	b			i	n
2.	To understand the microwave mediated organic synthesis			c	g	i
3.	To gain knowledge about ionic liquids and phase transfer catalysts	b		d	g	i
4.	To acquire knowledge on green solvents and green catalysts	b			g	n

#### UNIT - I Introduction to Green Chemistry

Green chemistry - Anastas' twelve principles of green chemistry -Principle of atom economy. Examples of reactions following the principles of green chemistry and atom economy.

- A. Green Preparation of propene
- B. Green synthesis of Ibuprofen

#### UNIT - II Green Reactions

Acetylation of primary amine, base catalyzed aldol condensation (synthesis of dibenzalpropanone)- halogen addition to C=C bond (bromination of trans-stilbene)- [4+2] cycloaddition reaction (Diels-Alder reaction between furan and maleic acid). Rearrangement reaction (benzyl-benzilic acid rearrangement)- coenzyme catalyzed benzoin condensation (thiamine hydrochloride catalyzed synthesis of benzoin).

#### UNIT - III Green Solvents

Introduction –classification of ionic liquids- synthesis of ionic liquids – Ionic liquids: simple preparation – types – properties and application – ionic liquids in organic reactions (Heck reaction, Suzuki reactions and epoxidation)- Analytical chemistry -

gas chromatography stationary phases – advantages and disadvantages. Reactions in water and supercritical water and carbon dioxide.

#### UNIT - IV Green Catalyst

Supported metal catalysts – mesoporous silica. Phase transfer catalyst - Synthesis – applications. Magnetically recoverable catalysts.

#### UNIT – V Alternative Synthesis, Reagents and Reaction Conditions

Photo reduction of benzophenone to benzopinacol using sunlight. Photochemical alternative to Friedel-Crafts reaction and use of dimethyl carbonate as a methylating agent. Reaction in water - furan and maleic acid. Supercritical liquids – water and CO<sub>2</sub>. Extraction of D-limonene from orange peel. Green chemistry examples based on sonochemistry and mechanochemistry and photochemical principles in green chemistry.

#### TEXT BOOKS

1. V.K. Ahluwalia, *Green Chemistry – Environmentally benign reactions*. Ane Books, India, 2006.
2. Paul T. Anastas & Tracy C., Williamson, *Green Chemistry – Designing Chemistry for the Environment*, 2<sup>nd</sup> edition, 1998.

#### REFERENCES

1. Paul T. Anastas & Tracy C., Williamson *Green Chemistry – Frontiers in benign chemical synthesis and processes*, Oxford University Press, New York, 1998.
2. Rashmi Sanghi, & M. M. Srivastava, *Green Chemistry – Environment friendly alternatives*, Narosa Publishing House, 2003.
3. M.C. Cann & M. E Connelly, *Real world cases in Green Chemistry*, American Chemical Society, 2008.
4. P. Tundo, A. Perosa and F. Zechini, *Methods and Reagents for Green Chemistry*, John Wiley & Sons Inc. New Jersey, 2007.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18C05	BIOORGANIC CHEMISTRY	3	0	0	3	3
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To understand the organic chemistry of biomolecules.			b	i	
2.	To learn about how enzymes work in the biological system				i	n
3.	To gain knowledge about peptide and protein chemistry			b		i
4.	To understand the structure of nuclei acids			b	d	i

#### UNIT- I Amino Acids

Classification and nomenclature of amino acids- configuration of amino acids- acid base properties- isoelectric point- separation- resolution of racemic mixtures of amino acids.

#### UNIT- II Peptides and Proteins

Peptide bonds- disulfide bonds- peptide secondary structures and their stabilization- strategies for peptide synthesis: N-protection and C-activation- automated peptide synthesis.

Proteins: primary- secondary- tertiary and quaternary structures- protein denaturation.

#### UNIT- III Enzymes

Classification of enzymes- enzyme catalysis and kinetics- nucleophilic- acid-base and metal-ion catalysis- the catalytic triad- mechanisms of carboxypeptidase A- serine proteases and lysozyme- enzyme inhibition and drug design- enzymes in organic synthesis- catalytic antibodies.

#### UNIT- IV Carbohydrates

Configurations of aldoses and ketoses- osazone formation- Kiliani-Fischer synthesis- Ruff degradation- stereochemistry of glucose and the Fischer proof- hemiacetal formation and the cyclic structure of monosaccharides- glycosidic linkages- anomeric effect- reducing and non-reducing sugars-- examples of disaccharides and polysaccharides.

#### UNIT- V Nucleic Acids

Sugars and bases- nucleosides and nucleotides- conformation of sugar-phosphate backbone- hydrogen bonding by bases- the double helix- A-B and Z double helices- stability of double helix- determining the base sequence in DNA- structure and role of RNA.

### TEXT BOOKS

1. R.T. Morrison and R. N. Boyd, *Organic Chemistry*, 6<sup>th</sup> edition, Prentice-Hall of India Ltd, New Delhi, 1992.
2. T. W. Graham Solomons, *Organic Chemistry*, 6<sup>th</sup> edition, John Wiley and Sons, New York, 1996.

### REFERENCES

1. S.H. Pine, *Organic Chemistry*, 5<sup>th</sup> edition, McGraw Hill, New York, 1987.
2. S.N. Ege, *Organic Chemistry Structure and Reactivity*, 3<sup>rd</sup> edition: A.I.T.B.S., New Delhi, 1998.
3. F.A. Carey, *Organic Chemistry*, 3<sup>rd</sup> edition, Tata-McGraw Hill Publications, New Delhi, 1999.
4. B.Y.Paula, *Organic Chemistry*, 3<sup>rd</sup> edition, Pearson Education Inc, Singapore, 2002.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P			C
UCY18C06	CHEMISTRY OF NATURAL PRODUCTS	3	0	0	3			3
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:						Student Outcomes		
1.	To know the Introduction to chemistry of natural products like alkaloids, terpenoids, etc.	b					l	
2.	Understanding of the methods of isolation, purification and structural elucidation of natural products.	c	d	g	m			
3.	An introduction to synthesis of important natural products.	c	d				i	
4.	An appreciation of bio-activity of natural products	c		g			n	



#### UNIT – I Alkaloids

Natural occurrence-General structural features-Isolation and their physiological action.Hoffmann's exhaustive methylation, Emde's modification.Structural elucidation and synthesis of coniine, piperine, nicotine and papaverine.

#### UNIT – II Terpenoids and Carotenoids

Terpenoids: Introduction, occurrence, isolation, classification, general characteristics of Terpenoids. Isoprene rule, heme terpenoids, terpenes. Structural determination and synthesis of Acyclic monoterpenoids (citral and Geraniol), Monocyclic mono terpenoids (menthol) and Bicyclic monoterpenoids (camphor).

Carotenoids: Introduction, geometrical isomerism, structure determination and synthesis of b-carotene and vitamin-A

#### UNIT – III Anthocyanins and Flavones

Anthocyanins: Introduction to anthocyanins. Structure and general methods of synthesis of anthocyanins- Cyanidine chloride: structure and determination.

Flavones: Structure and determination of flavone and flavonoids, Quercetin: Structure determination and importance.

#### UNIT – IV Purines and Steroids

Purines: Introduction, occurrence, isolation and biological importance. Synthesis and structural elucidation of Uric acid, Xanthine and Caffeine. Biological importance of cholesterol and oestrone (no structural determination and synthesis).

#### UNIT – V Natural Dyes and Indian Medicinal plants

General introduction and classification with special reference to textile and edible dyes and fabric brighteners. Occurrence, isolation, purification, colour and constitution. Structural determination and synthesis of indigoitin and alizarin.

Origin, Evolution and Cultivation methods of medicinal plants (Aloe vera, Ashwagandha, Brahmi, Kalmegh, Shankpushpi Tulsi and turmeric)-storage and protection . Export of medicinally important plants (General aspects).

#### TEXT BOOKS

1. O. P. Agarwal, *Chemistry of Natural Products*, Vol 1, Goel Publishing House, Meerut, 1997.
2. Gurdeep Chatwal and S.K. Anand, *Chemistry of Natural Products*, Himalaya Publishing Co, New Delhi, 2001.

#### REFERENCES

1. L.Finar ,*Organic Chemistry*, Vol 2, 5<sup>th</sup> edition, Pearson education, 1975.
2. A.A. Farooqi and B.S. Sreeramu, *Cultivation of Medicinal and Aromatic Crops*.

University Press (India) Pvt. Ltd., Hyderabad, 2004.

3. S.S. Gokhale, C.K.Kokate and A.P. Purohit, *Pharmacognosy*. Nirali Prakashan. Pune, 1994.
4. N.C. Kumar, *An Introduction to Medical botany and Pharmacognosy*. Emkay Publications, New Delhi, 1993.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

SUPPORTIVE COURSE

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UES18501	ENVIRONMENTAL STUDIES	3	0	0	3	3
<b>INSTRUCTIONAL OBJECTIVES</b>				<b>Student Outcomes</b>		
At the end of this course the learner is expected:						
1.	To gain knowledge on the importance of natural resources and energy		a		g	
2.	To understand the structure and function of an ecosystem			b	h	
3.	To imbibe an aesthetic value with respect to biodiversity, understand the threats and its conservation and appreciate the concept of interdependence				f	
4.	To understand the causes of types of pollution and disaster management			e		j
5.	To observe and discover the surrounding environment through field work				m	n

**UNIT – I Introduction to Natural Resources/Energy (9 Hours)**  
 Natural Resources – Definition – Scope and Importance – Need for Public Awareness – Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources and over-exploitation – Water resources and over-utilization – Mineral resource extraction and its effects - Food resources - food problems and Modern agriculture - Energy resources and its future.

**UNIT – II Ecosystems (9 Hours)**  
 Concept of an ecosystem-structure and function of an ecosystem-producers, consumers and decomposers- ecological succession- food chains(any 2 Examples)- food webs(any 2 Examples)-ecological pyramids.

**UNIT – III Environmental Pollution /Disaster Management (9 Hours)**  
 Definition-causes, effects and control measures of : Air, Water and Soil pollution- e-waste management- Disaster management: Natural and man made-food/earthquake/cyclone, tsunami and landslides.

**UNIT – IV Social Issues and The Environment (9 Hours)**

Sustainable development- Climate change: global warming, acid rain, ozone layer depletion and nuclear radiation- Environment Protection Act (any 2) air, water, wildlife and forest.

**UNIT – V Human Population and The Environment (9 Hours)**

Population growth, variation among nations - Population explosion—Family Welfare Programme - Environment and human health - Human rights - Value education - HIV/AIDS - Women and Child Welfare - Role of Information Technology in environment and human health.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

## SEMESTER VI

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P			C
UCY18601	COORDINATION, ORGANOMETALLIC AND BIOINORGANIC CHEMISTRY	4	0	0	4			4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes				
1.	To understand the nature of bonding in coordination compounds	b	c					
2.	To acquire knowledge on the stability of complexes		c	d				
3.	To understand the reactivity of coordination compounds		c	d	i			
4.	To understand the active roles played by metal ions and coordination compounds in biological systems.			d	e	m		

**UNIT – I Theory of Coordination Compounds**

Crystal field theory: crystal field effects, assumptions of crystal field theory-crystal field splitting in octahedral and tetrahedral geometries-qualitative crystal field splitting diagrams- high-spin and low-spin complexes- CFSP and factors affecting it-computation of CFS- evidences of crystal field splitting- spectrochemical series. Crystal field splitting of transition metal ions in tetrahedral and octahedral fields. Jahn Teller theorem- crystal field splitting in tetragonally distorted octahedral geometry and in square planar geometry. Covalency in transition metal complexes- evidences for covalency-intensity of d-d transitions-spin-spin splitting- hyperfine splitting- adjusted crystal field theory . MO Theory: Metal orbitals and LGOs suitable for  $\sigma$ - and  $\pi$ -bonding in octahedral geometry-construction of qualitative MO energy level diagram for s-bonding in octahedral geometry.

**UNIT – II Stability of Coordination Complexes**

Stability of Complexes – Factors affecting the stability of complexes - Unimolecular and bimolecular nucleophilic Substitution reactions in octahedral and square planar complexes – Trans effect – Magnetic properties of transition metal complexes – Elementary idea of electronic spectra of transition metal – complexes.

### UNIT – III Reactions and Mechanism of Coordination Compounds.

Lability and inertness - interpretation in terms of VBT- acid hydrolysis of octahedral complexes -  $S_N1$  and  $S_N2$  mechanism - factors influencing: base hydrolysis of octahedral complexes -  $S_N1CB$  mechanism- evidences - stereochemistry of intermediate of base hydrolysis - trans effect -  $\pi$ -bond theory- applications - transition metal complexes as catalyst - Wilkinson's catalyst - Ziegler-Natta catalyst and their catalytic cycles.

### UNIT – IV Organometallic Chemistry

Organometallic ligands - types of organometallic compounds - organometallic compounds of group 12 – 15 elements - metal complexes with pi – acceptor ligands -  $\pi$  acidity - Metal carbonyls : types - EAN rule , theoretical basis - synthetic methods- reactivities- structure and bonding in  $Ni(CO)_4$ ,  $Fe(CO)_5$ ,  $Cr(CO)_6$ ,  $Co_2(CO)_8$  and  $Mn_2(CO)_{10}$  - synergism- vibrational spectra - mixed carbonyls - compounds with multinuclear centres- alkene complexes - carbocyclic systems - ferrocene - preparation- properties- structure and bonding -(VB explanation).

### UNIT – V Bioinorganic Chemistry

Essential and non – essential metals - oxygen carriers - haemoglobin- myoglobin, hemocyanin - metalloenzymes- cyanocobalamine - carbonic anhydrase - cytochrome P-450 - role of alkali metals - sodium ion pump - alkaline earth metals - toxicity of Hg, Pb, Cr - metals in medicine and diagnosis - chelate therapy- in vivo fixation of nitrogen.

### TEXTBOOKS

1. F. Shriver, P. W. Atkins and C. H. Langford, *Inorganic Chemistry*, 3<sup>rd</sup> ed., Oxford University Press, 2000.
2. J. E. Huheey, E. A. Keiter and R. L. Keiter, *Inorganic Chemistry, Principles of Structure and Reactivity*, 4<sup>th</sup> ed., Harper Collins, 1993.

### REFERENCES

1. F. Basalo and Pearson, *Inorganic Reaction Mechanisms*, 2<sup>nd</sup> edition, Wiley Interscience, 1969.
2. F. A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, *Advanced Inorganic Chemistry*, 6<sup>th</sup> ed., John Wiley, New York, 1999.
3. T. Moeller, *Inorganic Chemistry: A Modern Introduction*, Wiley, New York, 1994.
4. K. F. Purcell and J. C. Kotz, *Inorganic Chemistry*, Saunders, Philadelphia, 1976.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50

End Semester	50
Total	100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C	
UCY18602	ORGANIC SYNTHESIS AND HETEROCYCLIC COMPOUNDS	4	0	0	4	4	
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:					Student Outcomes		
1.	To gain knowledge about the basic concepts in organic chemistry				b	c	
2.	To acquire knowledge on the basic principles of photochemistry				b	c	
3.	To study the mechanisms of transition metal catalysed reactions				b	c	d
4.	To understand the basics of heterocyclic chemistry.				c	e	m

#### UNIT – I Oxidation and Reduction Reactions

Methods for alcohol oxidation- Jones reagent- Swern oxidation- Dess-Martin periodinane (DMP) oxidation- Pyridinium chlorochromate (PCC)- Pyridinium dichromate (PDC)- TEMPO- oxidation of aldehydes to carboxylic acids- allylic oxidation of alkenes using selenium dioxide.

Reduction of carbonyl groups using nucleophilic reducing agents-  $\text{LiAlH}_4$ ,  $\text{NaBH}_4$ ,  $\text{NaBH}_3\text{CN}$ - electrophilic reducing agents- DIBAL-H,  $\text{BH}_3\cdot\text{THF}$ , dissolving metal reductions-  $\text{Na}/\text{NH}_3$ - Birch reduction- Lindlar's catalyst- transfer hydrogenation- Wilkinson's catalyst.

#### UNIT – II Molecular Rearrangements

Wagner-Meerwein-, pinacol-pinacolone and benzilic acid rearrangements migrating aptitude and their stereochemical outcome- Wolff rearrangement- Demjanov rearrangement- Wittig rearrangements- Favorskii rearrangement in acyclic and cyclic  $\alpha$ -halo ketones- Fries rearrangement- Hoffman- Curtius- Schmidt and Lossen rearrangements and its key reaction intermediates- Beckmann rearrangement and its stereochemistry and Baeyer-Villiger rearrangement.

#### UNIT – III Photochemistry and Pericyclic Reactions

Basic principles of photochemistry- Jablonskii diagram- photochemical reactions of carbonyl compounds: Norrish type I and II reactions.

Pericyclic reactions- molecular orbitals and orbital symmetry- Woodward-Hoffman rules- electrocyclic reactions- interconversion of cyclobutenes and conjugated dienes- interconversion of cyclohexadienes and trienes-cycloadditions- photochemical dimerization of alkenes- Diels-Alder reaction- sigmatropic rearrangements- hydrogen shifts- Cope rearrangement and Claisen rearrangement.

#### UNIT – IV Transition Metal Catalyzed Reactions

A basic discussion on the mechanism of the following transition metal catalyzed cross coupling reactions: Suzuki, Negishi- Stille -Heck and Ullman coupling reactions. Basic ideas on C-H activation.

#### UNIT – V Heterocyclic Compounds

Nomenclature of heterocyclic compounds- aromatic heterocyclic compounds- synthesis and reactions of furan- pyrrole- thiophene and pyridine.

#### TEXT BOOKS

1. R.T. Morrison and R. N.Boyd, Organic Chemistry, 6<sup>th</sup> edition, Prentice-Hall of India Ltd, New Delhi, 1992.
2. T. W. Graham Solomons, Organic Chemistry, 6<sup>th</sup> edition, John Wiley and Sons, New York, 1996.

#### REFERENCES

1. S.H. Pine, *Organic Chemistry*, 5<sup>th</sup> edition, McGraw Hill, New York, 1987.
2. S.N. Ege, *Organic Chemistry Structure and Reactivity*, 3<sup>rd</sup> edition: A.I.T.B.S., New Delhi, 1998.
3. F.A. Carey, *Organic Chemistry*, 3<sup>rd</sup> edition, Tata-McGraw Hill Publications, New Delhi, 1999.
4. B.Y.Paula, *Organic Chemistry*, 3<sup>rd</sup> edition, Pearson Education Inc, Singapore, 2002.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
		Marks	10	10	20	5	5
End Semester							50
Total							100



COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18603	ELECTROCHEMISTRY, PHASE RULE AND COLLOIDS	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES				Student Outcomes		
At the end of this course the learner is expected:						
1.	To learn about the principles and applications of electrochemistry			b	c	
2.	To understand basics of phase equilibrium				c	d
3.	To enable the students to understand the effect of pressure and temperature on phase equilibrium.			c	d	e g
4.	To learn about the properties and applications of colloids			b	c	d

#### UNIT – I Electrochemistry-I

Faraday's laws of electrolysis- properties of electrolytes- ionic strength of solutions - van't Hoff factor. Electrical transport and conductance in metal and in electrolytic solution- specific conductance and equivalent conductance- variation of conductance with concentration - equivalent conductance at infinite dilution - Kohlrausch's law and its applications. Arrhenius theory of electrolytic dissociation and its limitation - weak and strong electrolyte according to Arrhenius theory- ostwald's dilution law - applications and limitation.

#### UNIT – II Electrochemistry-II

Single and standard electrode potentials. Reference electrodes: (i) Primary reference electrode: Standard hydrogen electrode (ii) Secondary reference electrode: Saturated calomel electrode. Determination of standard electrode potentials of zinc and copper electrodes. Calculation of cell EMF from single electrode potentials. Definition and applications of electromotive series.

#### UNIT – III Electrochemistry-III

Electrolytic & galvanic cells - reversible and irreversible cells. Types of reversible electrodes-gas/metal ion – metal/metal ion-metal/insoluble salt/ anion and redox electrodes - electrode reactions - conventional representation of electrochemical cells. Electromotive force of a cell and its measurement- computation of E.M.F-derivation of Nernst equation and its application.

#### UNIT – IV Phase Rule

Phase rule- meaning of the terms – phase- component- degrees of freedom - derivation of Gibbs phase rule - application of Clapeyron-Clausius equation in phase transitions. Phase diagrams of one component systems (water and sulphur systems) -Phase diagrams of two component systems: (i) Simple eutectic - Lead-silver system

(ii) Formation of compound with congruent melting point- freezing mixtures ,  $\text{CuSO}_4$ -water system - efflorescence- deliquescence.

#### UNIT – V Colloids

Types of colloids - characteristics of true solutions- colloidal solutions and suspensions- preparation of colloids- purification of colloids - electro dialysis and ultrafiltration- properties of colloids - the origin of charge on colloidal particles- the electrical double layer- Zeta potential, electro-osmosis - electrophoresis - coagulation of colloids- Hardy- Schulze rule and its exception - gold number - protective colloids- applications of colloids.

#### TEXT BOOKS

1. B.R.Puri, L.R.Sharma and M.S.Pathania, *Principles of Physical Chemistry*, 23<sup>rd</sup> edition, New Delhi, Shoban Lal Nagin Chand & Co,1993.
2. P.W. Atkins, J.D. Paula, *Physical chemistry*, 9<sup>th</sup> Oxford university press, 2009.

#### REFERENCES

1. P.L.Soni, and O.P. Dharmara, *Text of Physical Chemistry*, 11<sup>th</sup> edition, Sultan Chand & Sons Educational Publishers, New Delhi, 1979.
2. Gilbert .W. Castellan, *Physical Chemistry*, 3<sup>rd</sup> edition, Narosa Publishing House, 1985.
3. S.Glasstone, D.Lewis, *Elements of Physical Chemistry*, 2<sup>nd</sup> edition, London, Mac Millan & Co. Ltd,1948.
4. K. L. Kapoor, *A Textbook of Physical chemistry*, (volume-2 and 3) Macmillan, India Ltd, 1994.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P			C
UCY18604	PHYSICAL CHEMISTRY PRACTICAL-II	0	0	5	5			3
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:					Student Outcomes			
1.	To understand the principles potentiometric and conductometric titration.				b	c		
2.	To acquire knowledge on the determination of molecular weight of polymer				b	c	d	
3.	To understand the principles of kinetic reaction				b	c	d	
4.	To enable the students to acquire analytical and psychomotor skills			b	c	d	e	f

#### LIST OF EXPERIMENTS

1. Precipitation Titration (KCl vs. AgNO<sub>3</sub>)
2. Conductometric Acid-Base Titration (HCl vs NaOH)
3. Potentiometric Redox Titration (FAS vs K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>)
4. Determination of pH of a buffer solution potentiometrically using quinhydrone electrode
5. Determination of Freundlich adsorption Isotherm
6. Determination of Molecular Weight of Polymer
7. Conductometry - Determination of limiting molar conductance of a strong electrolyte (KCl)
8. Kinetics of Persulphate - Iodide reaction: Determination of pseudo first order rate constant.

## REFERENCES

1. V. Venkateswaran, R.Veerasingam, A.R.Kulandaivelu, *Basic principles of Practical Chemistry*, 2<sup>nd</sup> edition, NewDelhi, Sultan Chand & sons, 1997.
2. Sundaram, Krishnan, Raghavan, *Practical Chemistry*, (Part III) S.Viswanathan Co. Pvt, 1996.
3. Vogel's, *Text Book of Quantitative Chemical Analysis*. 5<sup>th</sup> edition, ELBS/Longman England, 1989.
4. David P. Shoemaker, Carl W. Garland, Joseph W. Nibler, *Experiments in Physical Chemistry*, 5<sup>th</sup> edition, McGraw- Hill Book company, 1989.

Course Nature: Practical						
Assessment Method-Practical Component (Marks: 100)						
In-Semester	Assessment Tool	Experiments	Observation	Regularity	Model Examination	Total
	Marks	25	10	5	10	50
End Semester Examination Marks (Practical):						50
Total Max Marks						100

SEMESTER VI

COURSE CODE	COURSE TITLE	L	T	P	Total L+T+P	C
UCY18605	CORE BASED PROJECT	0	0	8	8	4

Project Work Evaluation

Internal Assessment: 50 Marks

Assessment Tool	Marks
First Review (Abstract)	10
Second Review	10
Final Review	20
Attendance	10

External Examination: 50 Marks

Assessment Tool	Marks
Report and Presentation	10
Analysis	10
Findings and Conclusion	20
Viva-Voce	10

CORE BASED ELECTIVES

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18C07	MATERIAL SCIENCE AND NANOTECHNOLOGY	3	0	0	3	3
INSTRUCTIONAL OBJECTIVES					Student Outcomes	
At the end of this course the learner is expected:						
1.	To educate the students on the basic concepts of solid state chemistry				b	c
2.	To understand the theory and properties of magnetic and dielectric materials.				f	g h
3.	To study the employability of the materials in various industries				b	c d
4.	To understand and study the synthesis , properties and applications of nanomaterials				b	c d

### UNIT – I Materials

Solids – crystalline and amorphous materials, Concepts - Unit cell, Bravais lattices. Radius ratio rules – coordination number, different structure types in solids – few examples. Preparation techniques - Solid state reactions, sol-gel, hydrothermal, solvothermal, high pressure, zone refining, CVD, Czochralski methods. Characterisation techniques – XRD, thermogravimetric and differential thermal analysis and scanning electron microscopy (only introduction and selected application aspects).

### UNIT – II Properties of materials

Optical, Electrical and Magnetic Properties - Introduction – types of magnetic materials – diamagnetism – paramagnetism - ferromagnetism. Ferrites: preparation and their applications Metals, Semiconductors and Insulators – variation of conductivity with temperature – p and n types, p-n junction Piezoelectric, pyro-electric and ferroelectric materials - Overview and applications

### UNIT – III Industry Relevant Materials

Refractories (Introduction, classification, properties, manufacturing and applications), Abrasives (Introduction, classification, properties, hardness, manufacturing (Silicon carbide, Norbide and Tungsten carbide) and applications), Composites (Definition, Types, Focus on FRP, Applications), Paints (Introduction, chemistry of paints - Constituents of oil and emulsion paints and their role), Explosives and Propellants

### UNIT – IV Modern Engineering Materials

Shape memory alloys: introduction – examples – application – advantages - disadvantages. Biomaterials: Introduction – metals and alloys in biomaterials – ceramic biomaterials, composite biomaterials - polymeric biomaterials.

### UNIT – V Nano Materials and nanotechnology

Introduction – techniques for synthesis of nanophase materials: chemical reduction techniques, sol-gel synthesis, electrodeposition, inert gas condensation, vapour deposition and mechanical alloying (Elementary level) – properties (optical, magnetic and chemical properties) - applications of nanomaterials in catalysis, medicines and electronics (selected examples) .

### TEXT BOOKS

1. Anthony R. West, *Solid state chemistry and its applications*, John Wiley & Sons, 1989.
2. V.R. Raghavan, *Materials Science and Engineering*, Prentice Hall (India) Ltd, 2001.

### REFERENCES

1. Kenneth J. Klabunde, *Nanoscale Materials In Chemistry*, John Wiley and Sons

- Inc. Publication, 2002.
- Lesley Smart and Elaine Moore, *Solid State Chemistry-An Introduction*, Chapman Hall, London, 1992.
  - M. G. Arora, *Solid State Chemistry*, Anmol Publications, New Delhi, 2001.
  - H. P. Meyers, *Introductory Solid State Physics*, Viva Books Private Limited, 1998.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P			C
UCY18C08	ENERGY AND FUEL CELLS	3	0	0	3			3
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:						Student Outcomes		
1.	To know about the chemistry of fuels	b	c	d				
2.	To educate students on the present indian energy scenario		d	e				
3.	To learn about the environmental impact on climatic change		j	k				
4.	To gain knowledge about solar energy	b	c					

#### UNIT – I Introduction to Energy

Definition and units of energy- power- forms of energy- conservation of energy- second law of thermodynamics- energy flow diagram to the earth. Origin of non renewable energy source-fossil fuels- time scale of fossil fuels- renewable energy resources- role of energy in economic development and social transformation.

#### UNIT – II Indian Energy Scenario

Commercial and non-commercial forms of energy- energy consumption pattern and its variation as a function of time- energy resources available in India- urban and rural energy consumption- nuclear energy - promise and future- energy as a factor limiting growth-need for use of new and renewable energy sources.

#### UNIT – III Environmental Impact on Climate Change

Status of nuclear and renewable energy: Present status and future promise energy policy issues- fossil fuels- renewable energy- power sector reforms- restructuring of energy supply sector.

#### UNIT – IV Solar Energy

Definition- energy available from sun- solar radiation data- solar energy conversion into heat and electricity- principle of natural and forced convection- photo voltaics- p-n junctions. Solar cells- types of solar cells. Basic ideas of electro and photo catalytic water splitting.

#### UNIT – V Fuel Cell Technology

Introduction and overview of fuel cell technology-difference between batteries and fuel cells- fuel cell principle- components of fuel cells- classification by operating temperature / electrolyte types-mechanism and applications of solid oxide fuel cells- molten carbonate fuel cells- alkaline fuel cells- polymer electrolyte membrane fuel cells- direct methanol fuel cells.

#### TEXT BOOKS

1. Jose Goldenberg, Thomas B. Johansson, Amulya K.N. Reddy and Robert H. Williams, *Energy for Development*, Washington D.C., World Resource Institute, 1985.
2. B.G. .Desai, *Energy policy for India*, Wiley Eastern, 1978.
3. Charles E. Brown, *World Energy Resources*, Springer, 2002.

#### REFERENCES

1. R. Foster, M. Ghassemi, A. Cota, *Solar Energy*, CRC Press, 2010.
2. J.A. Duffie, W.A. Beckman, *Solar Engineering of Thermal Processes*, 3<sup>rd</sup> edition, Wiley, 2006.
3. H. Liu, *Principles of Fuel Cells*, Taylor & Francis, N.Y, 2006.
4. Hoogers, *Fuel cell technology*, Handbook, CRC Press, 2003.

Course Nature : Theory
Assessment Method (Max. Marks: 100)



In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18C09	AGRICULTURAL AND LEATHER CHEMISTRY	3	0	0	3	3
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To understand the basic concepts and importance of soil chemistry	b	c			
2.	To gain a knowledge for analysing, cultivate and promote agricultural methods			d	e	
3.	To understand the various aspects of leather chemistry		b	c		
4.	To acquire knowledge about different types of pollution, control and treatment methods.	b	c	d	e	

#### UNIT – I Soil Chemistry

Introduction - formation of soil. Classification of soil and properties of soil - soil acidity - causes of acidity -soil alkalinity - determination of soil pH - buffering of soils - amending the soil - reclamation of acid soil - liming agents.

#### UNIT – II Soil Fertility and Productivity

Organic Manures - farmyard manure - compost - oil cakes - bone meal - meat meal - fish meal - blood meal and green manures - fertilizers - classification of fertilizers - requisites of a good fertilizers - nitrogenous fertilizers- Phosphatic fertilizers - super phosphate of lime - triple super phosphate - NPK fertilizers - ill effects of fertilizers- effect of mixed fertilizers on soil pH- micronutrients - role of micronutrients sources - need for nutrient balance- soil management and micronutrients needs.

### UNIT – III Pesticides

Classification of insecticides - stomach poisons - contact poisons and fumigants - insecticides- organic insecticides- DDT - gammexane - malathion - parathion - fungicides- herbicides- rodenticides - pesticides in India - adverse environmental effects of pesticides.

### UNIT – IV Leather Chemistry

Introduction - constituents of animal skin - preparing skins and hides -cleaning and soaking - liming and degreasing- manufacture of leather - leather tanning - vegetable tanning - chrome tanning and mineral tanning - dyeing and fat liquoring - leather finishing - oil tanning - by products.

### UNIT – V Pollution

Tannery effluents - pollution and its control - water pollution and air pollution - waste management - primary-secondary -tertiary treatment - pollution prevention.

### TEXT BOOKS

1. B.K. Sharma, Industrial Chemistry, Goel Publishing House, Meerut, 2014.
2. K.Bagavathi – Sundari, Applied Chemistry, MJP Publishers, 2006.

### REFERENCES

1. Louis M.Thompson and Frederick. R.Troch, Soils and Soil Fertility, 4<sup>th</sup> edition, Tata Mc Graw hill, 1993.
2. T.D. Biswas and S.K. Mukherjee, Text book of Soil Science, 2<sup>nd</sup> edition, 2017.
3. B.A. Yagodin, Agricultural Chemistry Vol I & Vol II, New Century books (P) Ltd., 1987.
4. Jayashree Ghosh, Fundamental concept of Applied Chemistry, S. Chand & Company Ltd, 2012.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	Total	C
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					L+T+P		
CAC18601	COMMUNICATION SKILLS	2	0	0	2	2	
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:		Student Outcomes					
1.	To actively participate in formal discussions and manifest professional skills such as working in team, empathy, communicating appropriately and assertiveness	d	e	f	h	m	n
2.	To foster problem solving and decision making skills through case studies on work ethics, decision making, organizational behavior etc.,	d	e	f	h	m	n
3.	To build confidence to face audience and overcome stage fear with necessary training in public speaking and presentation skills	d	e	f	h	m	n
4.	To develop written business communication skills	d	e	f	h	m	n

#### COURSE OBJECTIVE

To inculcate professional ethics and improve employability skills

#### UNIT - I (6 Hours)

Etiquettes- social, professional, communication, dining and grooming etiquettes

#### UNIT - II (6 Hours)

Interpersonal skills- Empathy, Managing conflicts, Effective decision making

#### UNIT - III (6 Hours)

Team work- Role of leader and effective leadership, Role of team members and team ethics, Case study analysis (in teams) to understand team dynamics

#### UNIT - IV (6 Hours)

Professional writing- Report, Letter, Summary and e-mail

#### UNIT - V (6 Hours)

Presentation skills- Importance of verbal and non-verbal communication, Body language, Use of appropriate language

## REFERENCES

1. 'How to deliver a presentation' By Paul Newton; e-book
2. 'A-Z of Presentation' By Eric Garner; e-book
3. 'Emotional Intelligence' By Daniel Coleman.

Course Nature : Theory (Internal only)							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tools	E mail drafting	Case study analysis	Presentation	Professional writing	Participation	Total
	Marks	20	25	25	20	10	100

SEMESTER III

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18A01	ALLIED CHEMISTRY-I	4	0	0	4	4
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:					Student Outcomes	
1.	To gain knowledge on the importance of basic organic chemistry.			b	c	
2.	To acquire knowledge about hydrocarbon and their reactions.				c	d e
3.	To promote the importance of silicon and metals.				c	g h
4.	To acquire knowledge in chemical kinetics and photochemistry.				c	d e

**UNIT – I Introduction of Hybridisation and Isomerism**

Hybridisation - sp, sp<sup>2</sup> and sp<sup>3</sup>-Bond length- bond angle- dipole moment- inductive effect- mesomeric effect and hyperconjugation - Isomerism- geometrical and optical isomerism- optical activity- asymmetry- dissymmetry, elements of symmetry- R, S notations.

**UNIT – II Hydrocarbons**

Methods of preparation of alkanes, properties - Reactions. Free radical mechanism of halogenation of alkanes, Methods of preparation of alkenes -Stereochemistry of dehydrohalogenation (E1, E2, E1CB mechanism). Properties of alkenes -Electrophilic and nucleophilic addition mechanisms.

**UNIT – III Chemistry of Hydrogen, Silicon and Metals**

Occurrence- extraction and chemical properties of iron- cobalt- nickel and copper. Position of hydrogen in periodic table- atomic hydrogen and isotopes of hydrogen. Preparation and structure of borazole - SiO<sub>2</sub>, SiC and SiCl<sub>4</sub>.

**UNIT – IV Chemical Kinetics**

Rate of reaction, order- molecularity, first order rate law and simple problems- Half-life period of first order reaction- pseudo first order reaction- zero and second order reactions. Arrhenius and collision theories.

## UNIT – V Industrial Chemistry

Industrial Chemistry: Fuel gases–Water gas- producer gas- LPG gas- Gobar gas and natural gas. Fertilizers –NPK and mixed Fertilizers-soaps and detergents.

Pesticides: Dichloromethane- chloroform- carbon tetrachloride- DDT and BHC.

Types of solvents: - Polar, Non polar.

### TEXT BOOKS

1. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, Shobulal Nagin Chand and Co, 2001.
2. P. L. Soni, A Textbook of Inorganic Chemistry, Sultan Chand and Co., 1977.

### REFERENCES

1. R. Gopalan, Text Book of Inorganic Chemistry, 2<sup>nd</sup> edition, Hyderabad, Universities Press, (India), 2012.
2. R.T. Morrison and R.N. Boyd, S. K. Bhattacharjee, Organic Chemistry, 7<sup>th</sup> edition, Pearson India, 2011.
3. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, 35<sup>th</sup> edition, New Delhi ShobanLal Nagin Chand and Co, 2013.

Course Nature : Theory							
Assessment Method (Max.Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P			C
UCY18A02	ALLIED CHEMISTRY PRACTICAL-I	0	0	3	3			2
INSTRUCTIONAL OBJECTIVES					Student Outcomes			
At the end of this course the learner is expected:								
1.	To gain knowledge on the importance of basic acidimetry.	b	c					
2.	To acquire knowledge about permanganometry.			e	g	h		
3.	To understand the importance of dichrometry.			g	h	m		
4.	To acquire knowledge in iodimetry.			c	d	e	g	

### VOLUMETRIC ANALYSIS

Acidimetry and Alkalimetry

- 1) Estimation of HCl using standard oxalic acid
- 2) Estimation of NaOH using standard sodium carbonate

#### Permanganometry

- 1) Estimation of FAS using standard oxalic acid
- 2) Estimation of  $\text{KMnO}_4$  using standard potassium dichromate

#### Dichrometry

- 1) Estimation of  $\text{FeSO}_4$  using standard FAS.

#### Complexometric or EDTA titration

- 1) Estimation of Zn/Mg

#### Iodimetry

- 1) Estimation of ascorbic acid
- 2) Estimation of phenol / aniline

#### TEXT BOOKS

1. V.Venkateswaran, R.Veerawamy, A.R.Kulandaivelu, *Basic Principles of Practical Chemistry*, 2<sup>nd</sup> edition, Sultan Chand and Sons, 1997.
2. B.S. Furniss, A.J. Hannaford, P.W. G. Smith, A.R. Tatchell, *Vogel's Text Book of Practical Organic Chemistry*, 5<sup>th</sup> edition, Pearson Education, 2005.

#### REFERENCES

1. Sundaram, Krishnan, Raghavan, *Practical Chemistry (Part II)*, S. Viswanathan Co. Pvt., 1996.
2. N.S. Gnanapragasam and G.Ramamurthy, *Organic Chemistry – Lab Manual*, S. Viswanathan and Co., 1998.
3. J.N. Gurtu and R. Kapoor, *Experimental Chemistry*, S.Chand and Co, 1987.
4. Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.

Course Nature: Practical						
Assessment Method-Practical Component (Marks: 100)						
In-Semester	Assessment Tool	Experiments	Observation	Regularity	Model Examination	Total
	Marks	25	10	5	10	50
End semester examination marks (practical):						50
Total max marks						100

**SEMESTER IV**

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18A03	ALLIED CHEMISTRY-II	4	0	0	4	4
<b>INSTRUCTIONAL OBJECTIVES</b>				<b>Student Outcomes</b>		
At the end of this course the learner is expected:						
1.	To gain knowledge on the importance of basic organic chemistry			b	c	
2.	To acquire knowledge about coordination compounds				c	d e
3.	To promote the importance of industrial chemistry				c	g h
4.	To acquire knowledge in phase rule, adsorption and fundamentals in electrochemistry				c	d e

**UNIT – I Carbohydrates, Benzene and Heterocyclic Compounds**

Classification of carbohydrates–Properties and uses of glucose and fructose mutarotation - Chemistry of benzene - Preparation, mechanism of electrophilic substitution reactions. Heterocyclic compounds– Preparation and properties of pyrrole and pyridine.

**UNIT – II Coordination Chemistry**

Nomenclature and isomerism of coordination compounds. EAN rule - VB and Crystal field theories of octahedral, tetrahedral and square planar complexes. Chelation and its industrial applications.

**UNIT – III Industrial Chemistry**

Hardness of water – Temporary and permanent hardness, disadvantages of hard water Boiler scales and sludges - Softening of hard water – Zeolite process - demineralization process and reverse osmosis – Purification of water for domestic use: use of chlorine, Ozone and UV light.

**UNIT- IV Phase Rule and Adsorption**

Phase rule- Definition of terms involved. phase diagram of H<sub>2</sub>O, Pb-Ag . Adsorption - Langmuir adsorption isotherms - Principles of chromatography (Paper, TLC and column).

**UNIT –V Electrochemistry**

Faradays laws of electrolysis - Specific conductance, equivalent conductance - Cell constant - Arrhenius theory Ostwald's dilution law and Kohlrausch law - Nernst equation - Applications of EMF- Measurements.



### TEXT BOOKS

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, Shobulal Nagin Chand and Co, 2001.
2. R. Gopalan, S. Sundaram, Allied Chemistry, Sultan Chand and Sons, 1995.

### REFERENCES

1. B.S. Bahl and Arun Bahl, *A Text book of Organic Chemistry*, 21<sup>st</sup> edition, Sultan Chand and Co., 2012.
2. I.L. Finar, *Organic Chemistry*, Vol 1&2, 6<sup>th</sup> edition England, Addison Wesley, Longman Ltd, 1996.
3. P.W. Atkins, *Physical Chemistry*, 5<sup>th</sup> edition, Oxford University press, 1994.
4. M.J.Sienko and R.A.Plane, *Chemistry: Principles and properties*, International Student Edition, 1995

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

## SEMESTER IV

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18A04	ALLIED CHEMISTRY PRACTICAL-II	0	0	3	3	2
INSTRUCTIONAL OBJECTIVES At the end of this course the learner is expected:				Student Outcomes		
1.	To get a good exposure to the basic concepts of chemistry.			b	c	
2.	To enable the students to acquire quantitative skills in volumetric analysis.				e	g h
3.	To learn the fundamentals of conductometric and potentiometric titrations.				g	h m
4.	To understand the method of determination of molecular weight by viscosity average method.			c	d	e g

## LIST OF EXPERIMENTS

1. Estimation of  $\text{KMnO}_4$  using standard Oxalic Acid
2. Estimation of  $\text{K}_2\text{Cr}_2\text{O}_7$  using decinormal solution of Sodium thiosulphate solution
3. Estimation of Copper using decinormal solution of Potassium dichromate solution
4. Estimation of Nickel using decinormal solution of EDTA
5. Determination of Molecular Weight of a Polymer
6. Conductometric Titrations –I ( HCl vs NaOH)
7. Conductometric Titrations- II ( KCl vs  $\text{AgNO}_3$ )
8. Potentiometric Titration (Redox Titrations)

## TEXT BOOKS

1. V.Venkateswaran, R. Veeraswamy, A.R.Kulandaivelu, *Basic Principles of Practical Chemistry*, 2<sup>nd</sup> Edition Sultan Chand and Sons, 1997.
2. Daniels et al., *Experimental Physical Chemistry*, 7<sup>th</sup> edition, New York, McGraw Hill, 1970.

## REFERENCES

1. N.S. Gnanapragasam and G.Ramamurthy, *Organic Chemistry – Lab Manual*, S. Viswanathan and Co., 1998.
2. A.Findlay, *Practical Physical Chemistry*, 7<sup>th</sup> Edition, London, Longman , 1959.
3. V.K.Ahluwalia, S.Dingra, and A.Gulati, *College Practical Chemistry*, Orient Longman Pvt. Ltd., Hyderabad, 2005.
4. K.K. Sharma and D.S. Sharma, *Introduction to Practical Chemistry*, Vikas Publishing House, New Delhi, 2005.

Course Nature: Practical						
Assessment Method-Practical Component (Marks: 100)						
In-semester	Assessment tool	Experiments	Observation	Regularity	Model Examination	Total
		Marks	25	10	5	10
End Semester Examination Marks (Practical):						50
Total Max Marks						100

NON-MAJOR ELECTIVES  
SEMESTER III

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18E81	BIOCHEMISTRY	2	0	0	2	2
<b>INSTRUCTIONAL OBJECTIVES</b> At the end of this course the learner is expected:		<b>Student Outcomes</b>				
1.	To develop a sound knowledge of the fundamental concepts in biochemistry.	a	b			
2.	To enumerate the molecular motif of a living cell, structural and functional hierarchy of biomolecules			c		
3.	To emphasis on the various aspects of metabolism and interrelationship of metabolic events.		b	c		
4.	To gain knowledge about amino acids and proteins and their structural features	a	b			
5.	To gain knowledge about enzymes, enzymatic reactions and inhibition	a	b			

**UNIT – I Amino Acids and Proteins**

Living Cell – Plant and Animal cell. Cell membrane - organelles - functions of major and sub cellular components- anabolism and catabolism and their relation to metabolism. Amino acids – classification- synthesis of amino acids and their identification. Peptide bond- stereochemistry- synthesis of peptides by solution and solid phase techniques. Proteins -classification -properties- 3D structure. Determination of amino acid sequence. Denaturation and renaturation of protein molecules. Separation and purification of proteins - dialysis - gel filtration - electrophoresis. Catabolism of amino acids- transamination- oxidative deamination- decarboxylation. The urea cycle and other possibilities of detoxification of ammonia.

**UNIT – II Enzymes**

Nomenclature- classification and properties-specificity- factors influencing enzyme action. Mechanism of enzyme action - Lock and Key model and induced fit models. Coenzymes - cofactors - prosthetic groups of enzymes (TPP, NAD, NADP, FAD, ATP). Their importance in enzyme action. Mechanism of inhibition (competitive, non and uncompetitive and allosteric). Immobilization of enzymes. Enzyme specificity.

### UNIT – III Lipids

Classification - neutral lipids- phospho lipids (lecithines, cephalins, plasmalogens) and glycolipids – importance- synthesis and degradation. Fatty acids, saturated, unsaturated fatty acids- EFA. Properties- hydrolysis - acid number, saponification number. Auto-oxidation (Rancidity)- addition reactions - iodine value- polenske number- Reichert-Meissl number and acetyl number. Hydrogenation of Cholesterol - biosynthesis. Bile salts derived from cholesterol. Metabolism -oxidation of glycerol - oxidation of fatty acids. Biosynthesis of lipids - synthesis of fatty acids and synthesis of triglycerides.

### UNIT– IV Carbohydrates

Classification - reducing and non-reducing sugars. Glucose – structure- conformation and stability. Carbohydrates of the cell membrane – starch- cellulose and glycogen.(Structure and utility). Metabolism - glycolysis and its reversal. TCA cycle - relation between glycolysis and respiration. Principles of bioenergetics- electron transport- chain and oxidative phosphorylation.

### UNIT – V Nucleic Acids

Nucleosides and nucleotides - purine and pyrimidine bases. Nucleic acids - difference between DNA and RNA, classification of RNA. Biosynthesis of DNA- replication. Biosynthesis of mRNA- Transcription. Genetic code- mutations and mutants. DNA repair. Biosynthesis of proteins. DNA sequencing and PCR- recombinant DNA technology- DNA polymorphism.

### TEXT BOOKS

1. David L. Nelson and Michael M. Cox Lehninger, *Principles of Biochemistry*, 4<sup>th</sup> edition, Worth Publishers, New York, 2005.
2. L. Veerakumari, *Biochemistry*, MJP publishers, Chennai, 2004.

### REFERENCES

1. Lubert Stryer, *Biochemistry*, W. H. Freeman and Company, New York, 1975.
2. Robert L.Caret, Katherine J. Denniston, Joseph J. Topping, *Principles and Applications of Organic and Biological Chemistry*, WBB publishers, USA, 1993.
3. J. L. Jain, *Biochemistry*, Sultan Chand and Co, 1999.
4. Mazur and B. Harrow, *Text book of Biochemistry*, 10<sup>th</sup> edition, W.B. Saunders Co., Philadelphia, 1971.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In	Assessment	Cycle	Cycle	Model	Assignment	Attendance	Total

Semester	Tool	Test I	Test II	Examination			
	Marks	10	10	20	5	5	50
End Semester							50
Total							100

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C	
UCY18E82	FOOD CHEMISTRY	2	0	0	2	2	
INSTRUCTIONAL OBJECTIVES				Student Outcomes			
At the end of this course the learner is expected:							
1.	To familiarize the students on food chemistry	a	b				
2.	To gain necessary details and information related with the properties and composition of food		b	c			
3.	To know chemistry of carbohydrates, proteins and amino acids	a	b				
4.	To understand the properties and structure of vitamins		b	c	d		
5.	To provide practical training to the students in the food analysis		d	e	g	m	

#### UNIT – I Food Science

Food requirements - consumer safety - Objectives of food science - Constituents of food - Food as a source of energy- energy requirement in human body - Food health and disease. Water - role of water in food- dietary requirements and sources - important physical properties of water - concept of water activity - water binding in foods - Water activity and activity of microorganisms - controlling of water activity in foods - experimental determination of water activity in foods.

#### UNIT – II Carbohydrates

Chemistry of carbohydrates - Composition and structure - Definition- classification- importance, monosaccharides- structure and properties- Disaccharides – maltose- lactose, sucrose. Oligosaccharides- raffinose. Polysaccharides- starch- cellulose- pectins - seed gum- sea weed and algal polysaccharides (application only). Dietary sources -functional properties of dietary carbohydrates- biological role of dietary fibre- nutrition- flavor and colour development sweetness - texturing characteristics of carbohydrates - plasticizing action and humectancy of carbohydrates.

#### UNIT – III Fats and Oils

Definition and classification of fat - biological role and uses of lipids proximate composition of cereals- pulses- tubers- oil seeds- fruits and vegetables - Fat group

classification - dietary sources - fatty acids in foods nomenclature - triglycerides - composition and structure - physical properties of triglycerides - polymorphism of triglycerides- plasticizing properties of fats- enrobing fats - emulsifying properties of fats - rancidity and reversion of fats and activity.

#### UNIT – IV Proteins and Enzymes

Classification - Structure and functions of amino acids and proteins- role of proteins and requirements- functions of proteins in foods- physical and chemical properties of proteins important protein sources- milk- meat- fish- egg and cereal proteins. Enzymes- endogenous enzymes in foods and activity of endogenous enzymes.

#### UNIT – V Vitamins and Minerals

Definition of vitamins - Classification- general sources-structure- properties- functions and dietary requirements- deficiency symptoms of vitamins A,D,E,K,C thiamine-riboflavin- niacin and biotin- Role of minerals - food colours and flavors- Food additives - classification and purpose - Role of thickeners- sweeteners- stabilizers- emulsifiers- leaveners- colours- flavoring agents-preservatives and examples.

#### TEXT BOOKS

1. B. Sivasankar, *Food processing and preservation*, Prentice – Hall of India Pvt. Ltd. New Delhi, 2002.
2. SrinivasanDamodaran, Kirk L. Parkin, and Owen R. Fennema, *Food Chemistry*, 4<sup>th</sup> Edition, CRC Press, New York, 2007

#### REFERENCES

1. H. Charley, *Food Science*, John Wiley and Sons Inc., New York, 1982
2. G.G. Birch, J. G. Brennan and K. J. Parker, *The Sensory Properties of Foods*, Applied Science Publication, London, 1977.
3. S. Robinson, *Food: Biochemistry and Nutritional Value*, Harlow, Essex, England, Longman Scientific & Technical. Chicago, 1987.
4. B. A. Fox and A.G. Cameron, *Food Science- Nutrition and Health*, 5<sup>th</sup> edition, Edward Arnold, London, 2005.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
		Marks	10	10	20	5	5
End Semester							50
Total							100

SEMESTER IV

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18E83	BASICS OF BIOINFORMATICS	2	0	0	2	2
INSTRUCTIONAL OBJECTIVES				Student Outcomes		
At the end of this course the learner is expected:						
1.	To learn the transformation of a chemical structure into a language for computer representation and manipulation	a	b			
2.	To gain knowledge from chemical reactions		b		m	
3.	To teach QSAR model generation and virtual screening			c	l	
4.	To identify drug target molecules and drug designing			c	d	i
5.	To provide applications of computational models	a			e	f

**UNIT – I Representation and Manipulation of Chemical Structures**

2D Chemical Structures- Computer representation of chemical structures, structure and substructure searching, reaction databases. 3D chemical structures: 3D pharmacophore, conformational search and analysis of 3D database, methods to derive 3D pharmacophores.

**UNIT – II Introduction to Protein Modeling**

Amino acids- protein structure and conformational properties- Ramachandran plot and dihedral angles- enzyme mechanisms- Michaelis–Menten kinetics- Introduction of protein data bank (PDB), .file format.

**UNIT – III Computational Models**

Introduction, deriving a quantitative structure activity relationship (QSAR) equation- simple and multiple linear regression, designing a QSAR experiment, selection of descriptors- experimental design- indicator variables- molecular field analysis and partial least squares.

**UNIT – IV Drug Design and Development**

Drug discovery process- Target identification and validation- lead discovery- lead modification- identification of active part- pharmacophore- functional group modification.



#### UNIT – V Application of Computational Chemistry

Prediction of properties of compounds- lead finding and optimization- molecular docking- searching and scoring algorithm- computer assisted synthesis design- design of combinatorial chemistry.

#### TEXT BOOKS

1. Andrew R Leach, Valerie J Gillet, *An Introduction to Chemoinformatics*, Kluwer academic publishers, 2003.
2. N.G. Rick, *Drugs: from Discovery to Approval*, John Wiley & sons, 2004.

#### REFERENCES

1. Johann Gasteiger, Thomas Engel, *Chemoinformatics- A Textbook*, Wiley- VCH, 2003.
2. Jürgen Bajorath, *Chemoinformatics: Concepts, Methods, and Tools for Drug Discovery*, Humana press, 2004.
3. Garland R Marshall, *Chemoinformatics in Drug Discovery*, John Wiley & Sons, 2006.
4. Andrew R Leach, *Molecular Modelling- Principles and Applications*, Prentice Hall, 2<sup>nd</sup> edition, 1996.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
		Marks	10	10	20	5	5
End Semester							50
Total							100

SEMESTER IV

COURSE CODE	COURSE TITLE	L	T	P	TOTAL L+T+P	C
UCY18E84	MOLECULAR MODELLING & DRUG DESIGN	2	0	0	2	2
<b>INSTRUCTIONAL OBJECTIVES</b> At the end of this course the learner is expected:				<b>Student Outcomes</b>		
1.	To understand the basic concepts of molecular structure, the relationship amongst bio molecular structure, function and force field.			b		m
2.	To understand the postulates of quantum mechanics and be able to apply knowledge to electronic structure calculations.	a				m
3.	To explain the implication and the structure of the terms in a force-fields				f	l
4.	To understand the molecular mechanisms, torsional energy and electrostatic interactions.			b		
5.	To identify drug like properties and associated empirical rules and active sites for target based drugs.			d		i n

**UNIT – I Concepts in Molecular Structure**

Basic concepts of molecular structure (bond length, bond angle, torsion angle and non-covalent interactions – Molecular structure and internal energy – Energy minimization of small molecules – Empirical representation of molecular energies – Use of force fields and the molecular mechanics method – Discussion of global energy minimum – Molecular representation in graphics.

**UNIT – II Quantum Mechanics**

Postulates of quantum mechanics- electronic structure calculations- Ab initio, semi-empirical and density functional theory calculations- Molecular size versus accuracy. Approximate molecular orbital theories.

**UNIT – III Empirical Force Field Models**

Molecular Mechanisms- energy calculations- Bond stretch- angle bending- torsional term. Electrostatic interaction- Vander waals interactions. Miscellaneous interaction.

#### UNIT – IV Drug Designing

Physicochemical properties of drugs & Introduction to drug designing- Concept of receptor/target site- Lead identification and structure modification- Concepts in molecular recognition, Drug like properties and associated empirical rules, structure based drug design- Conformational search technique- Target structure based Drug Design (Active site identification).

#### UNIT – V Water and Small Organic Molecules

Non-polarizable and polarizable rigid models. Flexible models and calculation of force constants. Structural and dielectric properties of a polar medium- Continuum models versus molecular models. Calculation of structure, energy and free energy through simulations using molecular models.

#### TEXT BOOKS

1. Andrew R. Leach, *Molecular Modelling: Principles and Applications*, Prentice Hall, 2001.
2. Hans Pieter, Heltje&GerdFolkens, *Molecular Modelling*, Wiley-VCH; 3<sup>rd</sup> edition, 2008.

#### REFERENCES

1. Jonathan M. Goodman, *Chemical Applications of Molecular Modelling*, Royal Society of Chemistry, 2004.
2. Guy H. Grant and W. Graham Richards, *Computational Chemistry*, Oxford University Press, 1995.
3. Alan Hinchliffe, *Molecular Modelling for Beginners*, John-Wiley, 2<sup>nd</sup> edition, 2008.
4. N. Claudcohen, *Guide Book on Molecular Modelling in Drug Design*, Academic Press, San Diego, 1996.
5. Frenkel and B. Smith, *Understanding Molecular Simulations. From Algorithms to Applications*, Academic Press, San Diego, California, 2001.

Course Nature : Theory							
Assessment Method (Max. Marks: 100)							
In Semester	Assessment Tool	Cycle Test I	Cycle Test II	Model Examination	Assignment	Attendance	Total
		Marks	10	10	20	5	5
End Semester							50
Total							100