

NEW EMPOWERIN								
Programme	B.Sc	Programme Code		U	СН	Regula	tions	2018-2019
Department		Chemistry			Semester			1
			Period	ls	Credit	Maxim	um Marl	ks
Course Code	C	Course Name	per We	ek				
			L T	Р	C	CA	ESE	Total
18U1CHC01		General Chemistry - I	6 0	0	6	25	75	100
COURSE OBJECTIVES	To learn about th To learn about th To critique error	To learn about the fundamentals of chemistry and principles of various topics. To learn about the outline of basic concepts of organic chemistry. To critique errors and titrimetry.						
POs		PRO	GRAMMI	E OU	JTCOME			
PO 1	Capable of dem form a part of an	onstrating comprehensive l undergraduate programme	knowledge of study.	and	understandin	g of one o	or more	disciplines that
PO 2	Ability to expre appropriate medi	ss thoughts and ideas effe a; confidently share ones vi	ctively in ews and ex	writ xpre:	ingand orally; ss herself/hims	; Commun self etc.,	icate wi	ith others using
PO 3	Capability to ap claims, beliefs or	ply analytic thought to a basis of empirical evid	body of killence; iden	now] tify :	ledge;analyse relevant assum	and evaluation evaluation of the second s	ate evido mplicati	ence,arguments, ons etc.,
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply ones learning to real life situations.							
PO 5	Ability to evaluarguments of oth	Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyse and synthesis data from a variety of sources; draw valid conclusions etc.,						
PO 6	A sense of inqu and articulating; etc.,	iry and capability for askir Ability to recognise cause-	ng relevant and-effect	/app relat	propriate quest tionships, defin	ions, prob	lematisir 1s, formu	ng, synthesizing ilate hypotheses
PO 7	Ability to work of on the part of a efficiently as a m	effectively and respectfully group, and act together as a nember of a team.	with diven group or a	rse te a tea	eams; facilitate	e cooperati ests of a c	ve or co ommon	oordinated effort cause and work
PO 8	Ability to analys ideas, evidence a	e, interpret and draw concluind experiences from an ope	usions fror en-minded	n qu and	antitative/qual reasoned persp	itative data pective.	a; and cr	itically evaluate
PO 9	Critical sensibility	ty to lived experiences, with	self awar	enes	s and reflexivit	ty of both s	self and	society.
PO 10	Capability to use variety of relevan	e ICT in a variety of learning in the sources; and	ing situation use approp	ons,c oriate	lemonstrate ab e software for a	oility to ac analysis of	cess, val data.	luate, and use a
PO 11	Ability to work through to comp	independently, identify app letion.	ropriate re	sour	ces required fo	or a projec	et, and m	nanage a project
PO 12	Possess knowled	ge of the values and beliefs	of multipl	e cul	ltures and a glo	bal perspe	ective etc	с.,
PO 13	Ability to embra ethical issue from	nce moral/ethical values in multiple perspectives, and	conductin use ethica	g on 1 pra	es life, formu actices in all w	late a Posi ork etc.,	ition/arg	ument about an
PO 14	Capability for m inspiring vision,	happing out the tasks of a building a team who can he	team or ar lp achieve	the	ganization, and vision, motivat	l setting d ting etc.,	irection,	formulating an
PO 15	Ability to acquire knowledge and skills, including learning how to learn, that are necessary for participating in learning activities throughout life, through self-paced etc.,							

COs	COURSE OUTCOME
CO 1	Students understand the periodic properties and electronic configurations of s p d and f block elements
CO 2	Students gain an insight into basic chemical concepts in organic chemistry
CO 3	Students apply the different chemical concepts to different gaseous system and real time problems
CO 4	Students analyze the various atom models
CO 5	Students evaluate the magnitude of various Possible errors in volumetric analysis
Pre-requisites	NIL

Knowledge Levels															
1.Remen	1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing														
		(2/2	(1 . 1.	1	C	O/PO	) / KL N	Mappin	ng	1.		-1)			
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CO	1				4				PO	5 6			6		
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	0			-					PO 1	0			3		
PSO	1		3				PO 11				3				
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PSO	2				4				PO 1	3			1		
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		(3/2)	1 maic	ates the	streng	ui oi co P		on, 5-si AMME	OUTC		III, 1-we	ак)			
COs						-		(PO	s)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO3	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO4	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO5	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1

CO / PSO Mapping							
	(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)						
Programme Specific Outcome ( <b>POs</b> )							
COS	CO1	CO2	CO3	CO4	CO5		
PSO1	2	2	3	2	1		
PSO2	1	1	2	3	2		
PSO3	2	2	1	1	1		

#### **Course Assessment Methods**

#### Direct

1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

1. Course End Delivery

	Content of the Syllabus							
	Electronic structure and periodic properties	Periods	12					
<ul> <li>Quantum numbers and their significance, Pauli s exclusion principle, Hunds rule, Aufbau principle, Extra stability of half filled and completely filled orbital, Electronic configuration of atoms. Modern periodic law, Long form of periodic table, cause of periodicity, division of elements into s, p, d, and f blocks. Variation of atomic radius, ionic radius, ionization energy, electron affinity and electro negativity along the periods andthe groups Factors affecting ionization energy and electro negativity</li> </ul>								
	Basic concepts in organic chemistry	Periods	12					
Unit - II	Unit - IICovalent bonding Concept of hybridization Structure of organic molecules based on sp <sup>3</sup> , sp <sup>2</sup> and sp hybridization Covalent bond properties of organic molecules bond length, bond angle, bond energy, bond polarity, dipole moment. Electron Displacement effects Inductive, Mesomeric, Electromeric and Hyperconjugative effects. Reactive intermediates carbocations - carbanions - free radicals with examples							
	Gaseous State	Periods	12					
Unit - III	<ul> <li><b>POs</b>tulates of kinetic theory of gases, derivation of kinetic gas equation, ideal gas equation, Boyles law, Charles law, Grahams law of gaseous diffusion and Daltons law of partial pressure. Maxwells distribution of molecular velocities, Root mean square, average and most probable velocity, Collision diameter, collision frequency, collision number and mean free path Deviations of real gases from ideal behavior Derivation of Vander Waals equation for real gases. Critical phenomena PV isotherms of real gases, continuity of states, critical constants, relationship between critical and Vander Waals constants, determination of critical volume, the principle of corresponding states, liquefaction of gases</li> </ul>							
	Basic Quantum Chemistry	Periods	12					
Unit - IV	<ul> <li>CGS and SI units Basic units derived units subsidiary units Quantum theory and atomic spectra Bohrs model of atom Limitations of Bohr model Somerfields model photoelectric effect Compton effect de Broglie equation Davisson and Germer experiment Heisenbergs uncertainty principle Schrodingers wave equation (statement only) Eigen values Eigen function Significance of Radial and angular distribution function Concept and Shapes of orbital Differences between orbit and orbital.</li> </ul>							
	Error Analysis	Periods	12					
Unit - V	Unit - V       Errors and its types Significant figure, Definitions of molarity, molality, normality and mole fraction.         Unit - V       Titration - Back titration Equivalence point indicator Standard solution Primary and secondary standards         Types of titrations Acid base and redox. Analysis of basic radicals Group separation and confirmatory tests for basic radicals							
	Total Periods		60					

Text Books	
1	Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry (33rd edition), Vishal publishing co (2017)
2	Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (47th edition), Vishal publishing co., (2017)
3	Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (22nd edition), New Delhi, S Chand & Co (2016)
References	
1	Morrison R.T. and Boyd R.N., Organic Chemistry (7th Edition), Pearson Education, India (2010)
2	Madan. R. D., Inorganic Chemistry (3rd edition), New Delhi, S. Chand and Co (2012)
3	Mukherji. S. M, Singh. S. P, Kapoor. R.P, Organic Chemistry volume I (4th edition) New age International (p) limited (1998)
E-References	
1	https//chem.libretexts.org/Core/InorganicChemistry/DescriptiveChemistry/Periodic Trends of Elemental_Properties/Periodic_Properties_of_the_Elements
2	unicorn.ps.uci.edu/M3LC/lectures/LectureWeek1.pdf



AT EMPOWER								
Programme	B.Sc	Programme Code		U	СН	Regulations		2018-2019
Department		Chemistry	Semester					2
			Period	ls	Credit	Maxim	um Marl	ks
Course Code	0	Course Name	per We	ek				
			L T	Р	C	CA	ESE	Total
18U2CHC02	GENER	AL CHEMISTRY-II	5 0	0	5	25	75	100
OBJECTIVES	1.To gain knowl 2.Acquire the kn 3.To study about	edge about shapes of inorga owledge about hydrocarbor t liquids and liquid crystals.	nic molecu is.	iles a	and metallurgy	7.		
POs		PRO	GRAMM	E OL	JTCOME			
PO 1	Capable of dem form a part of an	onstrating comprehensive l undergraduate programme	knowledge of study.	and	understandin	g of one o	or more	disciplines that
PO 2	Ability to expre appropriate medi	ess thoughts and ideas effe ia; confidently share ones vi	ctively in ews and ex	writ xpre:	ingand orally; ss herself/hims	; Commun self etc.,	icate wi	ith others using
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PO 5	Ability to evaluarguments of oth	nate the reliability and rel ners; analyse and synthesis d	evance of ata from a	evi vari	idence;identify ety of sources;	v logical f ; draw vali	flaws an d conclu	d holes in the sions etc.,
PO 6	A sense of inqu and articulating; etc.,	iry and capability for askir Ability to recognise cause-	ng relevant and-effect	/app relat	propriate quest tionships, defii	ions, probl ne problem	lematisir ns, formu	ng, synthesizing ilate hypotheses
PO 7	Ability to work on the part of a efficiently as a n	effectively and respectfully group, and act together as a nember of a team.	with diven group or a	rse te a tea	eams; facilitate	e cooperati ests of a c	ve or co ommon	oordinated effort cause and work
PO 8	Ability to analysideas, evidence a	e, interpret and draw conclu- and experiences from an ope	usions from m-minded	n qu and	antitative/qual reasoned persp	itative data pective.	a; and cr	itically evaluate
PO 9	Critical sensibili	ty to lived experiences, with	self awar	enes	s and reflexivit	ty of both s	self and	society.
PO 10	Capability to us variety of releva	e ICT in a variety of learning information sources; and	ing situatio use approp	ons,c oriate	lemonstrate ab e software for a	oility to ac analysis of	cess, val data.	luate, and use a
PO 11	Ability to work through to comp	independently, identify app letion.	ropriate re	sour	ces required for	or a projec	et, and m	nanage a project
PO 12	Possess knowled	lge of the values and beliefs	of multipl	e cu	ltures and a glo	obal perspe	ective etc	2.,
PO 13	Ability to embra ethical issue fror	ace moral/ethical values in multiple perspectives, and	conductin use ethica	g on 1 pra	es life, formu actices in all w	late a Posi ork etc.,	ition/arg	ument about an
PO 14	Capability for m inspiring vision,	happing out the tasks of a building a team who can he	team or ar lp achieve	n org the	ganization, and vision, motivat	l setting d ting etc.,	irection,	formulating an
PO 15	Ability to acquir in learning activi	Ability to acquire knowledge and skills, including learning how to learn, that are necessary for participating n learning activities throughout life, through self-paced etc.,						

COs	COURSE OUTCOME
CO 1	Students evaluate the shapes of simple covalent molecules.
CO 2	Students design the methods of extraction, separation and purification of metals from its corresponding ore.
CO 3	Students identify the methods of preparation and properties of alkanes and alkenes.
CO 4	Students assess the classification and reaction of dienes and alkynes.
CO 5	Students identify the various properties of liquids and liquid crystals.
Pre-requisites	

Knowledge Levels															
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing															
				С	O / PO	) / KL I	Mappi	ng							
	(3/2)	/1 indic	ates the	e streng	th of c	orrelati	on, 3-st	trong, 2	-mediu	m, 1-we	eak)				
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		7					PO 13				1				
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					Р	ROGR	AMME (PO)	OUTC	OME						
PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	
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3	2	1	1	1	1	1	1	2	2	2	3	2	1	2	
1	1	2	2	3	1	1	3	1	2	2	1	1	1	2	
2	1	1	1	2	1	2	2	1	3	3	2	1	1	3	
3	2	1	1	1	1	1	1	2	2	2	3	2	1	2	
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CO / PO / KL Mapping         CO / PO / Strong, 2-medium, 1-weak)         PO 1         PO 3         PO 4         PO 6         PO 10         PO 10         PO 10         PO 14         PO 14         PO 14         PO 10         CO / POM PO10         PO 14</td><td>Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synth         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         YOS       KI         YOG 1       CO / PO / KL Mapping         YOS       KI         YOG 2       YOG 2         2       PO 4       2         YOG 7       Z         YOG 7       YOG 7         YOG 1       YOG 2         YOG 7       YOG 2         YOG 7       YOG 2         YOG 7       YOG 2         YOG 7       YOG 7         YOG 7       YOG 7         YOG 10       YOG 7         YOG 10       YOG 7         YOG 10       YOG 10         YOG 10       YOG 10         YOG 10       YOG 10         YOG 10       YOG 10       YOG</td><td>Knowledge Levels         bering, 2.Urderstanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing         CO/PO/KL Mapping         OPO 1       Corport 1         PO 1       2         PO 1       2         PO 3       5         PO 4       5         PO 6       6         PO 6       6         PO 6       6         PO 1       7         PO 1       7         PO 10       7         PO 11       3         PO 11       3         PO 13       1         PO 13       1         PO 14       6</td></td></th></td></td>	Knowledge         bering, 2.Understanding, 3.Applying,         CO/PO/KL R         (3/2/1 indicates the strength of correlation of core	Knowledge Level         bering, 2.Understanding, 3.Applying, 4.And         CO / PO / KL Mappin         (3/2/1 indicates the strength of correlation, 3-st         3         KLs         2         KLs         3         CO / PO / KL Mappin         (3/2/1 indicates the strength of correlation, 3-st         KLs         3         CO / PO Mapping         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-st         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-st         PO PO2       PO3       PO4       PO5       PO6       PO7       PO8         1       CO / PO3         PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8         1       1         1       1         CO / PO3       PO4       PO5       PO6       PO7       PO8         3       2       2	Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzin         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2         (3/2/1 indicates the strength of correlation, 3-strong, 2         (3/2/1 indicates the strength of correlation, 3-strong, 2         2       PO         3       PO         3       PO         3       PO         3       PO         3       PO         4       PO         90       PO <td>Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Ex         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-mediate         KLs       PO 1         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-mediate         PO 1         PO 1         PO 1         PO 3         PO 4         PO 1         PO 3         PO 4         PO 7         2       PO 8         PO 10         3       PO 10         PO 10         3       PO 10         PO 10         3       PO 10         <th colsp<="" td=""><td>Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluat         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         PO 0         PO 3         PO 4         PO 3         PO 4         PO 3         PO 4         PO 3         PO 4         PO 4         PO 1         PO 10         PO 10<td>Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.         CO / PO / KL Mapping         CO / PO / Strong, 2-medium, 1-weak)         PO 1         PO 3         PO 4         PO 6         PO 10         PO 10         PO 10         PO 14         PO 14         PO 14         PO 10         CO / POM PO10         PO 14</td><td>Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synth         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         YOS       KI         YOG 1       CO / PO / KL Mapping         YOS       KI         YOG 2       YOG 2         2       PO 4       2         YOG 7       Z         YOG 7       YOG 7         YOG 1       YOG 2         YOG 7       YOG 2         YOG 7       YOG 2         YOG 7       YOG 2         YOG 7       YOG 7         YOG 7       YOG 7         YOG 10       YOG 7         YOG 10       YOG 7         YOG 10       YOG 10         YOG 10       YOG 10         YOG 10       YOG 10         YOG 10       YOG 10       YOG</td><td>Knowledge Levels         bering, 2.Urderstanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing         CO/PO/KL Mapping         OPO 1       Corport 1         PO 1       2         PO 1       2         PO 3       5         PO 4       5         PO 6       6         PO 6       6         PO 6       6         PO 1       7         PO 1       7         PO 10       7         PO 11       3         PO 11       3         PO 13       1         PO 13       1         PO 14       6</td></td></th></td>	Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Ex         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-mediate         KLs       PO 1         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-mediate         PO 1         PO 1         PO 1         PO 3         PO 4         PO 1         PO 3         PO 4         PO 7         2       PO 8         PO 10         3       PO 10         PO 10         3       PO 10         PO 10         3       PO 10         PO 10 <th colsp<="" td=""><td>Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluat         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         PO 0         PO 3         PO 4         PO 3         PO 4         PO 3         PO 4         PO 3         PO 4         PO 4         PO 1         PO 10         PO 10<td>Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.         CO / PO / KL Mapping         CO / PO / Strong, 2-medium, 1-weak)         PO 1         PO 3         PO 4         PO 6         PO 10         PO 10         PO 10         PO 14         PO 14         PO 14         PO 10         CO / POM PO10         PO 14</td><td>Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synth         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         YOS       KI         YOG 1       CO / PO / KL Mapping         YOS       KI         YOG 2       YOG 2         2       PO 4       2         YOG 7       Z         YOG 7       YOG 7         YOG 1       YOG 2         YOG 7       YOG 2         YOG 7       YOG 2         YOG 7       YOG 2         YOG 7       YOG 7         YOG 7       YOG 7         YOG 10       YOG 7         YOG 10       YOG 7         YOG 10       YOG 10         YOG 10       YOG 10         YOG 10       YOG 10         YOG 10       YOG 10       YOG</td><td>Knowledge Levels         bering, 2.Urderstanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing         CO/PO/KL Mapping         OPO 1       Corport 1         PO 1       2         PO 1       2         PO 3       5         PO 4       5         PO 6       6         PO 6       6         PO 6       6         PO 1       7         PO 1       7         PO 10       7         PO 11       3         PO 11       3         PO 13       1         PO 13       1         PO 14       6</td></td></th>	<td>Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluat         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         PO 0         PO 3         PO 4         PO 3         PO 4         PO 3         PO 4         PO 3         PO 4         PO 4         PO 1         PO 10         PO 10<td>Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.         CO / PO / KL Mapping         CO / PO / Strong, 2-medium, 1-weak)         PO 1         PO 3         PO 4         PO 6         PO 10         PO 10         PO 10         PO 14         PO 14         PO 14         PO 10         CO / POM PO10         PO 14</td><td>Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synth         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         YOS       KI         YOG 1       CO / PO / KL Mapping         YOS       KI         YOG 2       YOG 2         2       PO 4       2         YOG 7       Z         YOG 7       YOG 7         YOG 1       YOG 2         YOG 7       YOG 2         YOG 7       YOG 2         YOG 7       YOG 2         YOG 7       YOG 7         YOG 7       YOG 7         YOG 10       YOG 7         YOG 10       YOG 7         YOG 10       YOG 10         YOG 10       YOG 10         YOG 10       YOG 10         YOG 10       YOG 10       YOG</td><td>Knowledge Levels         bering, 2.Urderstanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing         CO/PO/KL Mapping         OPO 1       Corport 1         PO 1       2         PO 1       2         PO 3       5         PO 4       5         PO 6       6         PO 6       6         PO 6       6         PO 1       7         PO 1       7         PO 10       7         PO 11       3         PO 11       3         PO 13       1         PO 13       1         PO 14       6</td></td>	Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluat         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         PO 0         PO 3         PO 4         PO 3         PO 4         PO 3         PO 4         PO 3         PO 4         PO 4         PO 1         PO 10         PO 10 <td>Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.         CO / PO / KL Mapping         CO / PO / Strong, 2-medium, 1-weak)         PO 1         PO 3         PO 4         PO 6         PO 10         PO 10         PO 10         PO 14         PO 14         PO 14         PO 10         CO / POM PO10         PO 14</td> <td>Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synth         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         YOS       KI         YOG 1       CO / PO / KL Mapping         YOS       KI         YOG 2       YOG 2         2       PO 4       2         YOG 7       Z         YOG 7       YOG 7         YOG 1       YOG 2         YOG 7       YOG 2         YOG 7       YOG 2         YOG 7       YOG 2         YOG 7       YOG 7         YOG 7       YOG 7         YOG 10       YOG 7         YOG 10       YOG 7         YOG 10       YOG 10         YOG 10       YOG 10         YOG 10       YOG 10         YOG 10       YOG 10       YOG</td> <td>Knowledge Levels         bering, 2.Urderstanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing         CO/PO/KL Mapping         OPO 1       Corport 1         PO 1       2         PO 1       2         PO 3       5         PO 4       5         PO 6       6         PO 6       6         PO 6       6         PO 1       7         PO 1       7         PO 10       7         PO 11       3         PO 11       3         PO 13       1         PO 13       1         PO 14       6</td>	Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.         CO / PO / KL Mapping         CO / PO / Strong, 2-medium, 1-weak)         PO 1         PO 3         PO 4         PO 6         PO 10         PO 10         PO 10         PO 14         PO 14         PO 14         PO 10         CO / POM PO10         PO 14	Knowledge Levels         bering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synth         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         YOS       KI         YOG 1       CO / PO / KL Mapping         YOS       KI         YOG 2       YOG 2         2       PO 4       2         YOG 7       Z         YOG 7       YOG 7         YOG 1       YOG 2         YOG 7       YOG 2         YOG 7       YOG 2         YOG 7       YOG 2         YOG 7       YOG 7         YOG 7       YOG 7         YOG 10       YOG 7         YOG 10       YOG 7         YOG 10       YOG 10         YOG 10       YOG 10         YOG 10       YOG 10         YOG 10       YOG 10       YOG	Knowledge Levels         bering, 2.Urderstanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing         CO/PO/KL Mapping         OPO 1       Corport 1         PO 1       2         PO 1       2         PO 3       5         PO 4       5         PO 6       6         PO 6       6         PO 6       6         PO 1       7         PO 1       7         PO 10       7         PO 11       3         PO 11       3         PO 13       1         PO 13       1         PO 14       6

CO / PSO Mapping								
	(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)							
Programme Specific Outcome ( <b>POs</b> )								
COS	CO1	CO2	CO3	CO4	CO5			
PSO1	1	2	2	3	2			
PSO2	2	1	3	2	1			
PSO3	1	2	1	1	2			

Content of the Syllabus									
	Chemical bonding	Periods	12						
<ul> <li>Unit - I</li> <li>Ionic bond- factors influencing the formation of ionic bond- characteristics of ionic compounds- lattice energy and its determination using Born-Haber Cycle. Covalent bond- factors influencing the formation bond- characteristics of covalent compounds -partial ionic character in covalent compounds- polarization ions- Fajan s rule and its applications. VSEPR theory- explanation of shapes of simple covalent molecula such as NH<sub>3</sub>, H<sub>2</sub>O, CH<sub>4</sub>. Molecular orbital theory- molecular orbital configuration of homo nucle diatomic molecules- H<sub>2</sub>, He<sub>2</sub>, F<sub>2</sub>, O<sub>2</sub> and hetero nuclear molecular orbital - CO and NO.</li> </ul>									
	Metallurgy	Periods	12						
Unit - II	Occurrence of metals - various steps involved in the metallurgical proc froth floatation-gravity separation-magnetic separation processes. C. Alumino thermic process. Purification of metals by electrolysis - zone ref U.	cesses. Concentra alcination- Roast ining. Extraction	tion of ore by ing - smelting- of Al, Cu, Fe and						
	Alkanes and Alkenes	Periods	12						
Unit - III	Unit - IIIPetroleum source of alkanes - Methods of preparing alkanes - Chemical properties. Mechanism of fre radical substitution in alkanes by halogenation - Uses - Conformational study of ethane and n-butane Cycloalkanes - nomenclature - methods of formation - chemical reactions, Baeyer s strain theory and it limitations. Alkenes- orbital model of double bond, chemical reactions of alkenes- mechanism of Electrophilic and free radical additions- Markovnikoff s rule, peroxide effect, hydroboration, ozonolysis an allylic substitution by NBS. Diels-alder reaction. Elimination reactions-mechanisms of E1 and E2 reactions Hofmann and saytzeff rule.								
	Alkadiene and Alkynes	Periods	12						
Unit - IV	Dienes- classification of dienes- isolated, conjugated, cumulated dienes, s 1, 2 and 1,4 addition. Orbital model of triple bond- chemical reactions formation of acetylides- mechanism of Electrophilic and nucleophilic hydrogenation, halogenation, hydrohalogenation, hydration, hydroborati Demercuration, metal ammonia reduction, oxidation and polymerization.	structure of allene of alkynes- acid addition reaction on - oxidation, C	and butadiene, ity of alkynes- s of alkynes - xymercuration						
	Liquid State	Periods	12						
Unit - V	Unit - VStructure of liquids-Vapour pressure-Trouton s rule- Determination of Vapour pressure -dynamic and static method -Effect of temperature on vapour pressure -Surface tension-Surface energy surface active reagents- Some effects of surface tension-viscosity-Effect of temperature on viscosity Experimental determination of surface tension and viscosity not necessary. Refractive index - Specific refraction - Molar refraction Optical activity. Liquid crystals The mesomorphic state - classification of liquid crystal smectic-nematic and cholestric liquid crystals.								
	Total Periods	Total Periods 60							

Text Books	
1	Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry 33rd edition, Vishal publishing co.,2017.
2	Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, 47th edition, Vishal publishing co., 2017.
3	Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, 22nd edition, New Delhi, S. Chand & Co., 2016.
References	
1	Morrison R.T. and Boyd R.N., Organic Chemistry 7th Edition, Pearson Education, India 2010.
2	Madan. R. D., Inorganic Chemistry 3rd edition, New Delhi, S. Chand and Co., 2012.
3	Mukherji. S. M, Singh. S. P, Kapoor. R.P, Organic Chemistry volume – I 4th edition New age International pvt limited 1998.
E-References	
1	https://www.khanacademy.org/science/biology/chemistryof-life/chemical-bonds-and-reactions/v/ionic- covalent-and-metallic-bonds
2	https://www.cliffsnotes.com/study-guides/chemistry/organic-chemistry-i/structure-and-properties-of-alka nes/alkanes-physical-properties
3	https://chem.libretexts.org/
4	http://www.chem.tamu.edu/class/fyp/mcquest/mcquest.html
5	http://nptel.ac.in/courses/104103069/15



T EMPONIE									
Programme	B.Sc	Programme Code		U	СН	Regulat	Regulations		2018-2019
Department		Chemistry			Semester				2
			Perio	ls	Credit	Maxim	um Mar	ks	
Course Code	C	Course Name	per We	eek					
			L T	Р	С	CA	ESE	Ξ	Total
18U2CHCP01		Core Practical - I		3	05	25	75		100
COURSE OBJECTIVES	To understand th	e principles of volumetric and	nalysis.To	kno	w about differ	ent types o	f volum	etric	2
ODJECTIVES	utrations. 10 enai					of shiple			
POs PO 1	Canable of dam	PRO	GRAMM	E OU	TCOME	a of one of		dia	ciplines that
	form a part of an	undergraduate programme	of study.	e and	understandin	g of one o	or more	disc	cipilites that
PO 2	Ability to expre appropriate medi	ss thoughts and ideas effect a; confidently share ones vie	ctively in ews and e	writ xpres	ingand orally; ss herself/hims	Commun elf etc.,	icate w	ith (	others using
PO 3	Capability to ap claims, beliefs or	ply analytic thought to a b n the basis of empirical evide	oody of k ence; ider	nowl tify 1	edge;analyse relevant assum	and evalua ptions or i	ate evid mplicati	lence ions	e,arguments, etc.,
PO 4	Capacity to extra non-familiar pro- life situations.	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply ones learning to real life situations.							
PO 5	Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyse and synthesis data from a variety of sources; draw valid conclusions etc.,								
PO 6	A sense of inqui and articulating; etc.,	iry and capability for askin Ability to recognise cause-a	g relevan and-effect	t/app relat	ropriate quest ionships, defii	ions, probl ne problem	lematisin Is, form	ng, s ulate	synthesizing e hypotheses
PO 7	Ability to work a on the part of a efficiently as a m	effectively and respectfully group, and act together as a nember of a team.	with dive group or	rse te a tea	eams; facilitate m in the inter	e cooperati ests of a co	ve or co ommon	oord: caus	inated effort se and work
PO 8	Ability to analys ideas, evidence a	e, interpret and draw concluind experiences from an ope	isions from n-minded	n qu and	antitative/qual reasoned persp	itative data	a; and ci	ritica	ally evaluate
PO 9	Critical sensibilit	ty to lived experiences, with	self awar	eness	s and reflexivit	y of both s	self and	soci	ety.
PO 10	Capability to use variety of relevan	e ICT in a variety of learni nt information sources; and	ng situati use approj	ons,d priate	lemonstrate ab e software for a	ility to aco analysis of	cess, va data.	luate	e, and use a
PO 11	Ability to work through to compl	independently, identify appriletion.	ropriate re	esour	ces required fo	or a projec	t, and n	nana	ege a project
PO 12	Possess knowled	ge of the values and beliefs	of multip	e cul	tures and a glo	bal perspe	ective et	c.,	
PO 13	Ability to embra ethical issue from	ace moral/ethical values in multiple perspectives, and	conductin use ethica	g on al pra	es life, formu	late a Posi ork etc.,	ition/arg	gume	ent about an
PO 14	Capability for m inspiring vision,	happing out the tasks of a t building a team who can he	eam or a	n org	anization, and vision, motivat	l setting d	irection,	, for	mulating an
PO 15	Ability to acquire in learning activi	e knowledge and skills, inclution to the state of the sta	uding lear	ning d etc	how to learn,	that are ne	cessary	for p	participating

COs	COURSE OUTCOME
CO 1	Students will learn how to make solutions and do the titrations with different kinds
CO 2	Students will understand reactions taking place during the experiment
CO 3	The students will be able to apply the knowledge about nature, significance, and influence of errors and to
	be avoided or minimized during quantitative examination of experiment
CO 4	Students will analyze the given samples volumetrically
CO 5	To evaluate the known techniques to prepare, recrystallize and finding melting point of simple inorganic
	compound
Pre-requisites	

					]	Know	ledge	Level	S							
1.Remen	nberi	ng, 2.	Under	stand	ling, 3	B.App	lying,	4.Ana	alyzin	g, 5.E <sup>.</sup>	valuat	ing, 6.	Synth	esizinį	5	
					C	O / PO	) / KL I	Марріі	ng							
		(3/2	/1 indic	ates the	e streng	gth of co	orrelati	on, 3-st	trong, 2	l-mediu	m, 1-we	eak)				
COs	5			]	KLs				PO	S			K	Ls		
CO	1				2				PO	1			2	2		
									PO	2			1			
CO2	2				2				PO	3			5	5		
<u> </u>	2				2				PO	4			5	i		
	3				3				PO	5			4	ļ		
CO 4	4				4				PO	6			6	5		
CO '	5				5				PO	7			2	2		
	5				5				PO	8			4			
PSO	s			]	KLs				PO	9			1			
<b>D</b> 20									PO 1	0				5		
PSO	1				3				PO 1	0 11			3	;		
									PO 1	2			2	2		
PSO	2				4				PO 1	3			1			
PSO	3				2				PO 1	4			6	ō		
150	5				2				PO 1	5			3	5		
		(2)	/1 : 1'	- 4- × 1		CO/]	PO Ma	pping			1	- <b>1</b> -)				
		(3/2)	/1 1nd1c	ates the	e streng	gth of Co		on, $3-st$	$\frac{1}{2}$	-mediu	m, 1-we	eak)				
COs						r	KUGK	AWIWE (PO:	5)	OME						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2	
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2	
CO3	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3	
CO4	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2	
CO5	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1	

CO / PSO Mapping							
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)							
Programme Specific Outcome ( <b>POs</b> )							
COs	CO1	CO2	CO3	CO4	CO5		
PSO1	2	2	3	2	1		
PSO2	1	1	2	3	2		
PSO3	3	3	2	1	1		

1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

1. Course End Delivery

Content of the Syllabus									
	Acidimetry	Periods	9						
Unit - I	1. Estimation of sodium hydroxide-standard sodium carbonate.								
	2. Estimation of hydrochloric acid- standard oxalic acid.								
	3. Estimation of Oxalic acid -standard-oxalic acid								
	Permanganometry Periods 9								
Unit - II	1. Estimation of oxalic acid-std-Mohr s salt or ferrous sulphate.								
	2. Estimation of sodium nitrite-standard oxalic acid.								
	3. Estimation of ferrous ion.								
	Iodometry	Periods	6						
Unit - III	1. Estimation of copper-standard Potassium dichromate.								
	2. Estimation of Potassium dichromate-standard potassium dichromate								
	Dichrometry	Periods	3						
Unit - IV	1. Estimation of ferric ion using diphenyl amine/N-Phenylanthranilic acid	as indicator							
Unit - V	INORGANIC PREPARATIONS	Periods	15						
	1. Micro-Cosmic salt.								
	2. Potassium trioxalatochromate(III)								
	3. Ferrous Ammonium sulphate.								
	4.Tetramminecopper sulphate(II)								
	5. Tris thiourea copper chloride(I)								
	Total Periods		42						

1	V. Venkateswaran, R. Veeraswamy and A.R.Kulandaivelu, Basic Principles of Practical Chemistry, New Delhi, S.Chand & Co, (1995).
References	
1	Pandey O. P, Bajpai D. N., Giri S., Practical Chemistry, New Delhi, S.Chand & Co, (2012)
<b>E-References</b>	
1	https://byjus.com/chemistry/volumetric-analysis/
2	https://chem.libretexts.org

ROUGH ENDOVERIUN	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.								TÜVRheinland CERTIFIED Www.tu-com 10 195976407
Programme	B.Sc	Programme Code			U	СН	Regulat	tions	2018-2019
Department		Chemistry	Semester						3
		Pe	eriod	s	Credit	Maxim	um Mar	ks	
Course Code	Course Name			We	ek				
					Р	С	CA	ESE	E Total
18U3CHC03	GENER	AL CHEMISTRY-III	6	6 0 0 5 25		75	100		
COURSE	1.To acquire know	wledge about the fundamen	tals ar	d pr	incip	ples of chemist	try.2.To ed	lucate th	e students about
OBJECTIVES	the functional group	oups of organic compounds.	3.To ı	inde	rstar	nd the concept	of thermod	lynamic	e terms.
POs		PRO	GRAN	AME	E OU	TCOME			
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.								
PO 2	Ability to expre appropriate medi	ss thoughts and ideas effect a; confidently share ones vie	ctively ews ar	in ind ex	writ pres	ingand orally; ss herself/hims	Commun elf etc.,	icate w	ith others using

PO 3	Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications etc.,
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply ones learning to real life situations.
PO 5	Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyse and synthesis data from a variety of sources; draw valid conclusions etc.,
PO 6	A sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesizing and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses etc.,
PO 7	Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.
PO 8	Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.
PO 9	Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.
PO 10	Capability to use ICT in a variety of learning situations, demonstrate ability to access, valuate, and use a variety of relevant information sources; and use appropriate software for analysis of data.
PO 11	Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective etc.,
PO 13	Ability to embrace moral/ethical values in conducting ones life, formulate a Position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work etc.,
PO 14	Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating etc.,
PO 15	Ability to acquire knowledge and skills, including learning how to learn, that are necessary for participating in learning activities throughout life, through self-paced etc.,

COs	COURSE OUTCOME
CO 1	Students gain the knowledge of preparation, properties and uses of some important d-block metal
	compounds
CO 2	Students know different types of hydrides, preparation, properties and its uses.
CO 3	Students study about preparation, properties and uses of alcohols, phenols and aromatic hydrocarbons
CO 4	Students learn about preparation, properties of aldehydes, ketones and some naming reactions
CO 5	Students able to study about the thermodynamic terms and laws.
Pre-requisites	

# **Knowledge Levels**

# 1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing

		(3/2	/1 indic	ates the	C streng	O / PO	) / KL I orrelati	Mappin	ng trong 2	-mediu	m 1-we	ak)			
COs	S	(3/2	1 mare	]	KLs	,		011, 5 5	PO:	8		uk)	K	Ls	
00	1				2				РО	1			2	2	
	1				2				PO	2			1		
CO	2				1				PO	3			5	5	
	2				2				PO	4			5	i	
	3				3				PO	5			4	ļ	
CO	4				6				PO	6			6	5	
	-				-				PO	7			2	2	
	5				5				PO	8			4	Ļ	
PSO	S			1	KLs			PO 9				1			
								PO 10			3				
PSO	PSO 1			3				PO 11					3	;	
									PO 1	2		2			
PSO	2		4					PO 13				1			
								PO 14				6			
PSO	3				I				PO 1	5			3	;	
						<b>CO</b> /	PO Ma	pping							
		(3/2	/1 indic	ates the	e streng	gth of c	orrelati	on, 3-st	trong, 2	-mediu	m, 1-we	eak)			
COs						Р	ROGR	AMME (POs	OUTC s)	OME					
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	2	3	1	1	1	1	2	1	3	1	1	2	3	1	1
CO3	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO4	1	1	2	2	1	3	1	1	1	1	1	1	1	3	1
CO5	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)							
Programme Specific Outcome ( <b>POs</b> )							
COs	CO1	CO2	CO3	CO4	CO5		
PSO1	2	1	3	1	1		
PSO2	1	1	2	1	2		
PSO3	2	3	1	1	1		

Direct	Course Assessment Methods								
1 Continuou	s Assessment Test I. II & Model								
2. Assignmer	nt								
3. End Seme	ster Examinations								
Indirect									
1. Course En	d Delivery								
Content of the Syllabus									
	Transition elementsPeriods12								
Unit - I	The d - block elements - Position in the periodic table - Electronic configuration- General characteristics of d - block elements. Occurrence - extraction, properties and uses of Mo and Pt. Important compounds of transition metals: preparation, properties and uses of Ziegler - Natta catalyst, Prussian blue, Sodium nitro prusside, Turnbullâ€ <sup>TM</sup> s blue, Nickel DMG complex, Wilkinsonâ€ <sup>TM</sup> s Catalyst, KMnO4, ammonium molybdate and K2Cr2O7.								
	Hydrides	Periods	12						
Unit - II	Hydrides - Classification of hydrides - Ionic Hydrides: LiH, NaH - preparation, properties, uses. Covalent Hydrides: Silanes - Chemistry of Mono and Disilanes - Boron hydrides - preparation, properties and structure of Diborane. Complex Hydrides: NaBH4, LiAlH4 - structure, preparation, properties and uses.								
	Alcohols, Phenols and aromatic hydrocarbons	Periods	12						
Unit - III	Unit - IIIAliphatic alcohols: Introduction - Nomenclature - preparation, properties and distinction between 1°, 2° at 3° alcohols - Aromatic alcohols: Introduction - preparation and properties of benzyl alcohol.Phenol and it types: Introduction - acidity - preparation, properties and uses of phenol. Dihydric phenols: Introduction preparation of catechol, resorcinol and quinol. Trihydric phenols: Introduction - preparation of pyrogallo hydroxyquinol, phloroglucinol. Aromatic hydrocarbons: Aromaticity – Huckel's rule - Electrophil substitution reactions in aromatic compounds (general mechanism only).								
	Carbonyl compounds	Periods	12						
Unit - IV	Introduction - structure of carbonyl compounds - Nomenclature - Preparation and properties of aldehyde and ketones. Chemical properties: Addition reactions, Reactions involving alkyl groups, reduction an oxidation reactions and some important name reactions - Haloform, Reformatsky reaction, Alder condensation, pinacol-pinacolone rearrangement, Wittig Reaction - Chemistry of acetone and acetaldehyde								
	Thermodynamics - I	Periods	12						
<ul> <li>Thermodynamic terms - system, surrounding and boundary - homogenous and heterogeneous system - types of thermodynamic system - state of system - equilibrium and non equilibrium state - nature of work and heat - law of conservation of energy - First law of thermodynamics - Enthalpy of a system - Heat capacity of a system - work done in reversible isothermal compression - work done in reversible adiabatic expansion - Joule Thomson effect, Joule Thomson coefficient, inversion temperature - zeroth law of thermodynamics - absolute temperature scale .</li> </ul>									
	Total Periods		60						

Text Books							
1	Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry (33rd edition), Vishal publishing co., (2017).						
2	Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (47th edition) Vishal publishing co., (2017).						
3	Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (22nd edition), New Delhi, S. Chand & Co., (2016).						
References	•						
1	Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1992).						
2	Madan.R.D., Inorganic Chemistry (3rd edition), New Delhi, S. Chand and Co., (2012).						
3	Mukherji.S.M, Singh.S.P, Kapoor.R.P, Organic Chemistry volume – I (4th edition) New Age International (p) limited (1998).						
E-References							
1	https://www.askiitians.com/iit-jee-chemistry/inorganic-chemistry/hydrogen /hydrides .html						
2	nsdl.niscair.res.in/jspui/bitstream/123456789/778/1/Revised%20 thermodynamics.pdf						
3	https://www.askiitians.com/iit-jee-chemistry/organic-chemistry/carbonyl-compounds/aldehydes-and-ketone s/chemical-properties-of-aldehydes-and-ketones.html						



Programme	B.Sc	Programme Code	U	2018-2019					
Department		Chemistry		Semester			4		
			Periods	Credit	Maxim	um Mar	ks		
Course Code	C	course Name	per Week						
	Como		L T P	C 5	CA 25	ESE 75	Total		
18U4CHC04	Gener	al Chemistry - Iv	0 0 0	5	23	75	100		
COURSE OBJECTIVES	<ol> <li>To study about the fundamentals and applications of nuclear chemistry.</li> <li>To acquire the knowledge about carboxylic acids, its derivatives, Aliphatic and Aromatic amines.</li> <li>To understand the principle and significance of thermodynamics.</li> </ol>								
POs		PRO	GRAMME OU	JTCOME					
PO 1	Capable of demo form a part of an	onstrating comprehensive k undergraduate programme	mowledge and of study.	understanding	g of one o	or more	disciplines that		
PO 2	Ability to expre appropriate medi	ss thoughts and ideas effect a; confidently share ones vie	ctively in writ ews and expres	ingand orally; ss herself/hims	Commun elf etc.,	icate w	ith others using		
PO 3	Capability to ap claims, beliefs or	ply analytic thought to a b the basis of empirical evident	oody of knowl ence; identify	edge;analyse relevant assum	and evaluation or in	ate evid mplicati	ence,arguments, ons etc.,		
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply ones learning to real life situations.								
PO 5	Ability to evaluarguments of oth	ate the reliability and rel ers; analyse and synthesis d	evance of evi ata from a vari	dence;identify ety of sources;	logical f draw valie	laws an d conclu	nd holes in the usions etc.,		
PO 6	A sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesizing and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses etc.,								
PO 7	Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.								
PO 8	Ability to analys ideas, evidence a	e, interpret and draw concluind experiences from an ope	isions from qu n-minded and	antitative/qual reasoned persp	itative data pective.	a; and cr	ritically evaluate		
PO 9	Critical sensibilit	ty to lived experiences, with	self awareness	s and reflexivit	ty of both s	self and	society.		
PO 10	Capability to use ICT in a variety of learning situations, demonstrate ability to access, valuate, and use a variety of relevant information sources; and use appropriate software for analysis of data.								
PO 11	Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.								
PO 12	Possess knowled	ge of the values and beliefs	of multiple cul	tures and a glo	bal perspe	ctive etc	2.,		
PO 13	Ability to embra ethical issue from	the moral/ethical values in multiple perspectives, and	conducting on use ethical pra	es life, formu	late a Posi ork etc.,	tion/arg	ument about an		
PO 14	Capability for m inspiring vision,	happing out the tasks of a t building a team who can he	eam or an org	ganization, and vision, motivat	l setting di ting etc.,	irection,	formulating an		
PO 15	Ability to acquire knowledge and skills, including learning how to learn, that are necessary for participating in learning activities throughout life, through self-paced etc.,								

COs	COURSE OUTCOME
CO 1	Students identify the fundamentals and applications of nuclear chemistry.
CO 2	Students demonstrate the preparations and properties of mono and dicarboxylic acids.
CO 3	Students understand about the Nomenclature, preparations and properties of some aliphatic and aromatic amines.
CO 4	Students learn about the concepts and significance of various thermodynamic functions
CO 5	Students analyze about the bond energy, free energy, exothermic and endothermic reactions.
Pre-requisites	

1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluation	ing, 6.	.Synth									
		•	1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing								
CO / PO / KL Mapping											
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)											
COs KLs POs		K									
CO 1 4 PO 1			2								
CO 2 6 PO 2			1								
PO 3			5								
CO 3 2 PO 4			5								
PO 5			+								
PO 7			2								
CO 5 4 PO 8			4								
PSO <sub>2</sub> KL <sub>2</sub> PO 9			1								
PSOS KLS PO 10			3								
PSO 1 3 PO 11	3										
PO 12	2										
PSO 2 4 PO 13	1										
PO 14	6										
PSO 3 1 PO 15			3								
CO / PO Mapping											
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)											
COs PROGRAMME OUTCOME (POs)	PROGRAMME OUTCOME (POs)										
PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11	PO12	PO13	PO14	PO15							
CO1         1         1         2         2         3         1         1         3         1         2         2	1	1	1	2							
CO2         1         1         2         2         1         3         1         1         1         1         1	1	1	3	1							
CO3         3         2         1         1         1         1         2         2         2	3	2	1	2							
CO4         2         3         1         1         1         2         1         3         1         1	2	3	1	1							
CO5         1         1         2         2         3         1         1         3         1         2         2	1	1	1	2							

CO / PSO Mapping									
	(3/2/1 indica	ates the strength of con	relation, 3-strong, 2-n	nedium, 1-weak)					
COs	Programme Specific Outcome ( <b>POs</b> )								
COS	CO1	CO2	CO3	CO4	CO5				
PSO1	2	1	2	1	2				
PSO2	3	1	1	1	3				
PSO3	1	1	2	3	1				

Direct	Course Assessment Methods						
1 Continuou	s Assessment Test I. II & Model						
2 Assignmer	at						
3 End Semester Examinations							
Indirect							
1. Course En	d Delivery						
	Content of the Syllabus						
	Nuclear Chemistry	Periods	12				
Unit - I	Constitution of the nuclei - stable and unstable nuclei and their relationsh Natural radioactivity - modes of decay - Radioactive decay series - Radioactive equilibrium - Mass defect and binding energy - Numerical pr and artificial radioactivity. Nuclear fission - atom Bomb and nuclear re reaction in the sun, Hydrogen bomb. Application of radioactive isoto Isotopesas tracers - Medicinal Applications.	hip to (n/p) ratio. I Nuttal rule and roblems - Artificia eactors - Nuclear pes - C14 dating	Vuclear forces - average life - Il transmutation fusion - fusion , rock dating -				
	Carboxylic acids and derivatives	Periods	12				
Unit - II	General preparation and reactions of Monocarboxylic acids - Prep Dicarboxylic acids: Succinic, Maleic and Fumaric acid. Hydroxy acids: and Citric acid. Aromatic dicarboxylic acid: Phthalic acid.Acid de chlorides, Anhydrides, Esters and amides. Reactions involving acid Lossen and Schmidt rearrangements.	aration, propertie Lactic acid, Mali rivatives: prepara derivatives - Hof	s and uses of c acid, Tartaric utions of Acid mann, Curtius,				
	Organic Nitrogen Compounds	Periods	12				
Unit - IIIAliphatic Amines: Nomenclature - Separation of amines by Hinsberg's and Hoffmann methods - General methods of preparation and properties of primary amines. Distinction between 10, 20 and 30 amines .Aromatic Amines: Basicity of Aromatic amines - Derivatives of aniline - Acetanilide -preparation and properties. Diazonium compounds - Diazotization mechanism, preparation and properties of diazoaceticester.							
	Thermodynamics - II	Periods	12				
Unit - IV	Limitations of first law - Need for second law - Spontaneous process efficiency - Carnot theorem - thermodynamic scale of temperature. Conc - entropy a state function - entropy change in isothermal expansion of an changes of an ideal gas with changes in P, V & T. Entropy of mi significance of entropy. Work & free energy functions - partial molar free - Gibbs-Helmholtz equation - Clapeyron - Clausius equation. Third law of	- cyclic process - ept of Entropy - U ideal gas - Calcula axture of ideal ga e energy - Gibbs I f thermodynamics	Carnot cycle - Inits of Entropy ation of entropy ases - physical Duhem equation				
	Thermochemistry	Periods	12				
Unit - V	Introduction - Enthalpy change in a chemical reaction - Exothermic and between heats of reaction at constant volume and pressure - Standa enthalpies - Kirchoffs equation - Hessâ€ <sup>TM</sup> s Law and its applications - renergy and its applications - Nernst Heat theorem -Flame temperature and	endothermic reac rd Enthalpy - Do measurement of e d Explosion tempo	tions - Relation etermination of nthalpy – Bond erature.				
	Total Periods		60				

Text Books	
1	Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry (33rd edition), Vishal publishing co., (2017).
2	Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (47th edition) Vishal publishing co., (2017).
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1	Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1992).
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3	Mukherji.S.M, Singh.S.P, Kapoor.R.P, Organic Chemistry volume – I (4th edition) New Age International (p) limited (1998).
E-References	
1	http://www.ltcconline.net/stevenson/2008CHM101Fall/CHM101Lecture Notes20081201a. htm
2	https://www.askiitians.com/iit-jee-amines-and-nitrogen-containing-compounds/amines-and-its-preparation-methods/
3	nptel.ac.in/courses/101104063/25



ENIPOWE.									
Programme	B.Sc	tions	2018-2019						
Department		Chemistry		Semester			4		
			Periods	Credit	Maxim	um Mark	.S		
Course Code	C	ourse Name	per Week			1			
			L T P	С	CA	ESE	Total		
18U4CHCP02	Co	re Practical II	6 0 0	4	25	75	100		
COURSE OBJECTIVES	1.To understand 2.To expose the s 3.To enable the s	the principles of qualitative students to separate anions a students to understand the te	analysis. and cations. chniques to rer	nove interferir	ng from no	n interfer	ring radicals.		
POs		PRO	GRAMME OU	TCOME					
PO 1	Capable of demo	onstrating comprehensive k undergraduate programme	knowledge and of study.	understandin	g of one o	or more	disciplines that		
PO 2	Ability to expre appropriate medi	ss thoughts and ideas effect a; confidently share ones vi	ctively in writ ews and expres	ingand orally; ss herself/hims	; Commun self etc.,	nicate wit	th others using		
PO 3	Capability to ap claims, beliefs or	ply analytic thought to a l the basis of empirical evid	oody of knowl ence; identify	edge;analyse relevant assum	and evaluation evaluation of the second s	ate evide mplicatio	ence,arguments, ons etc.,		
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply ones learning to real life situations.								
PO 5	Ability to evalu arguments of oth	ate the reliability and rel ers; analyse and synthesis d	evance of evi ata from a vari	dence;identify ety of sources;	v logical f ; draw vali	flaws and d conclus	d holes in the sions etc.,		
PO 6	A sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesizing and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses etc.,								
PO 7	Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.								
PO 8	Ability to analys ideas, evidence a	e, interpret and draw conclu nd experiences from an ope	usions from quantum n-minded and	antitative/qual reasoned persp	itative data pective.	a; and cri	tically evaluate		
PO 9	Critical sensibilit	y to lived experiences, with	self awareness	s and reflexivit	ty of both s	self and s	ociety.		
PO 10	Capability to use ICT in a variety of learning situations, demonstrate ability to access, valuate, and use a variety of relevant information sources; and use appropriate software for analysis of data.								
PO 11	Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.								
PO 12	Possess knowled	Possess knowledge of the values and beliefs of multiple cultures and a global perspective etc.,							
PO 13	Ability to embra ethical issue from	ace moral/ethical values in multiple perspectives, and	conducting on use ethical pra	es life, formu actices in all w	late a Pos ork etc.,	ition/argu	ament about an		
PO 14	Capability for m inspiring vision,	apping out the tasks of a t building a team who can he	team or an org	anization, and	l setting d ting etc.,	irection,	formulating an		
PO 15	Ability to acquire knowledge and skills, including learning how to learn, that are necessary for participating in learning activities throughout life, through self-paced etc.,								

COs	COURSE OUTCOME
CO 1	Students learn how to separate the cations and anions systematically.
CO 2	Students gain the knowledge about group separation of various cations.
CO 3	Students enable to acquire knowledge about interfering and non interfering ions.
CO 4	Students learn how to analyze the cations and anions using preliminary tests.
CO 5	Students find some cations using flame test.
Pre-requisites	

I.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         CO / PO / KL Mapping         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         CO 1       2         CO / CO 3       KLs       PO 1       2         CO 4       PO 3       5         CO 3       1         PO 4       5         CO 3       1         PO 4       5         CO 3       5         CO 4       4       PO 4       5         CO 4       PO 5       4         PO 6       6         CO 4       PO 10       3         PO 10       3         PO 11       3         PO 12       2         P	Knowledge Levels															
CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         COs       KLs       POs       KLs         CO 1       2       PO 1       2         CO 2       4       PO 3       5         CO 3       1       PO 4       5         CO 4       4       PO 6       6         CO 5       5       PO 7       2         CO 5       5       PO 8       4         PO 0       1       PO 9       1       1         PO 0       7       2       1 </th <th colspan="9">1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing</th>	1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing															
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)           CO 8         KLs         PO 8         KLs           CO 1         2         PO 1         2           CO 2         4         PO 3         5           CO 3         1         PO 4         5           CO 4         4         PO 6         6           CO 4         4         PO 7         2           CO 5         5         PO 9         1           PSO 8         KLs         PO 9         1           PSO 1         3         PO 1         3           PSO 2         4         PO 1         3           PSO 3         3         PO 11         3           PSO 4         3         PO 13         1           PSO 3         1         PO 13         1           PSO 4         PO 13         1         PO 15         3           PSO 5         PO 13         1         PO 15         3           PSO 4         PO 13         1         PO 15         3           PSO 5         PO 14         6         PO 15         3           PO 10         PO 10         PO 10						С	O / PO	) / KL I	Mappi	ng						
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $										PO	2			1		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	CO	2				4				PO	3			5	i	
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	DEO	1				2				PO I	0			3	i	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	P30	1				3				PO 1	1			3		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	DEO	2				4				PO 1	2			2		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	P50	Ζ				4				PO 1	3			1		
PO 15         3           CO / PO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)           PROGRAMME OUTCOME (POs)           COs         PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11         PO12         PO13         PO14         PO15           CO1         3         2         1         1         1         1         2         2         3         2         1         2         2         1         1         1         2         2         1         1         1         2         2         1         1         1         2         2         1         1         1         2         2         1         1         1         2         2         1         1         1         2         2         1         1         1         2         2         1         1         1         2         2         1         1         1         2         2         1         1         1         2         2         1         1         1         2         2         1         1         1         2         2<	PSO	3				1				PO 1	4			6	)	
CO / PO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         PROGRAMME OUTCOME (POs)         COs       PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PO13 PO14 PO15         CO1       3       2       1       1       1       1       2       2       3       2       1       2       2       3       1       1       3       1       2       2       1       1       1       2         CO2       1       1       2       3       1       1       3       1       2       2       1       1       1       2         CO2       1       1       2       2       3       1       1       3       1       2       2       1       1       1       2         CO2       1       1       2       3       1       1       3       1       2       2       1       1       1       2         CO2       1       1       1       1       1       1	150	5				1	<u> </u>			PO 1	5			3		
Indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         PROGRAMME OUTCOME (POs)         PO1       PO2       PO3       PO4       PO5       PO6       PO7       PO8       PO9       PO10       PO11       PO12       PO13       PO14       PO15         CO1       3       2       1       1       1       1       2       2       2       3       2       1       2         CO2       1       1       2       2       3       1       1       2       2       1       1       1       2         CO2       1       1       2       3       1       1       3       1       2       2       1       1       1       2	CO / PO Mapping															
COs         PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11         PO12         PO13         PO14         PO15           CO1         3         2         1         1         1         1         2         2         2         3         2         1         2           CO2         1         1         2         3         1         1         3         1         2         2         1         1         1         2		PDOCDAMME OUTCOME														
PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11         PO12         PO13         PO14         PO15           CO1         3         2         1         1         1         1         2         2         2         3         2         1         2           CO2         1         1         2         3         1         1         3         1         2         2         1         1         1         2	COs			(POs)												
CO1         3         2         1         1         1         1         2         2         2         3         2         1         2           CO2         1         1         2         2         3         1         1         2         2         2         3         2         1         2           CO2         1         1         2         2         3         1         1         3         1         2         2         1         1         1         2		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO2         1         1         2         2         3         1         1         3         1         2         2         1         1         1         2	CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
	CO2	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO3         2         3         1         1         1         2         1         3         1         1         2         3         1         1	CO3	2	3	1	1	1	1	2	1	3	1	1	2	3	1	1
CO4         1         1         2         2         3         1         1         3         1         2         2         1         1         1         2	CO4	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO5         1         1         3         3         2         2         1         2         1         1         1         1         2         1	CO5	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1

CO / PSO Mapping								
	(3/2/1 indica	ates the strength of con	relation, 3-strong, 2-n	nedium, 1-weak)				
COs	Programme Specific Outcome ( <b>POs</b> )							
COS	CO1	CO2	CO3	CO4	CO5			
PSO1	2	2	1	2	1			
PSO2	1	3	1	3	2			
PSO3	2	1	3	1	1			

Course Assessment Methods					
Direct					
1. Continuous Assessment Test I, II & Model					
2. Assignment					
3. End Semester Examinations					
Indirect					
1. Course End Delivery					

Content of the Syllabus								
	Semimicro Qualitative Analysis of Inorganic Mixtures Periods							
	ANIONS TO BE ANALYSED: Carbonate, Sulphate, Nitrate, Chloride, Fluoride, Borate, Oxalate,							
Unit - I	Phosphate radicals.							
	CATIONS TO BE ANALYSED: Lead, Bismuth, Copper, Cadmium, Aluminium, Cobalt, Nickel,							
	Zinc, Barium, Strontium, Calcium, Magnesium, Ammonium radicals.							
	Total Periods		45					

Text Books	
1	1.V. Venkateswaran, R. Veeraswamy and A.R.Kulandaivelu, Basic Principles of Practical Chemistry, New
	Delhi, S.Chand & Co, (1995).
References	
1	1. Pandey O. P, Bajpai D. N., Giri S., Practical Chemistry, New Delhi, S.Chand & Co, (2012)
<b>E-References</b>	
1	1. http://amrita.olabs.edu.in/?sub=73&brch=7∼=180&cnt=1
2	2. http://www.federica.unina.it/agraria/analytical-chemistry/inorganic-qualitative- analysis/



Programme	B.Sc	Programme Code	UCH				Regulations		2018-2019	
Department		Chemistry				Semester				1
			I	Period	S	Credit	Maxim	um Mar	ks	
Course Code	C	ourse Name	pe	er We	ek			r		
			L	Т	Р	С	CA	ESE	Ξ	Total
18U1CHA01	Allie	ed Chemistry - I	5	0	0	5	25	75	1	100
OBJECTIVES	prepare students of practical chem	To impart knowledge in formation of molecule from atoms and various organic reaction mechanism, To prepare students for a carrier in chemical industries and To acquire basic knowledge in fundamental aspects of practical chemistry.								
POs		PRO	GRA	AMMI	E OU	JTCOME				
PO 1	Capable of demo form a part of an	onstrating comprehensive k undergraduate programme o	tnow of stu	ledge udy.	and	understandin	g of one o	or more	dis	sciplines that
PO 2	Ability to express appropriate medi	ss thoughts and ideas effect a; confidently share ones vie	ctive ews a	ly in and ex	writ xpres	ingand orally; ss herself/hims	Commun elf etc.,	icate w	rith	others using
PO 3	Capability to ap claims, beliefs or	ply analytic thought to a b the basis of empirical evide	oody ence	of kı ; iden	nowl tify i	ledge;analyse relevant assum	and evalua ptions or i	nte evid mplicati	lenc ions	e,arguments, s etc.,
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply ones learning to real life situations.									
PO 5	Ability to evalu arguments of oth	ate the reliability and releases; analyse and synthesis dates and synthesis dates and synthesis dates are as a second synthesis dates are as a second synthesis are as a secon	evan ata fi	ice of rom a	evi vari	dence;identify ety of sources;	logical f draw valie	laws and conclu	nd usio	holes in the ns etc.,
PO 6	A sense of inqui and articulating; etc.,	iry and capability for askin Ability to recognise cause-a	g rel and-e	levant effect	/app relat	ropriate quest ionships, defii	ions, probl ne problem	ematisi s, form	ng, ulat	synthesizing te hypotheses
PO 7	Ability to work e on the part of a g efficiently as a m	effectively and respectfully group, and act together as a nember of a team.	with grou	diver p or a	se te a tea	eams; facilitate	e cooperati ests of a co	ve or co ommon	cau	linated effort ise and work
PO 8	Ability to analysideas, evidence a	e, interpret and draw conclu nd experiences from an oper	ısion n-mi	s fron	n qu and	antitative/qual reasoned persp	itative data pective.	; and ci	ritic	ally evaluate
PO 9	Critical sensibilit	ty to lived experiences, with	self	aware	eness	s and reflexivit	y of both s	elf and	soc	iety.
PO 10	Capability to use variety of relevan	e ICT in a variety of learning the information sources; and u	ng si use a	ituatio pprop	ons,d oriate	lemonstrate ab e software for a	ility to aco analysis of	cess, va data.	alua	te, and use a
PO 11	Ability to work i through to compl	independently, identify appr letion.	ropri	ate re	sour	ces required fo	or a projec	t, and n	nana	age a project
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective etc.,									
PO 13	Ability to embra ethical issue from	n multiple perspectives, and	cond use	lucting ethica	g on l pra	es life, formu actices in all w	late a Posi ork etc.,	tion/arg	gum	ent about an
PO 14	Capability for m inspiring vision,	apping out the tasks of a t building a team who can hel	eam	or an hieve	org	ganization, and vision, motivat	l setting di ting etc.,	rection	, fo	rmulating an
PO 15	Ability to acquire knowledge and skills, including learning how to learn, that are necessary for participating in learning activities throughout life, through self-paced etc.,									

COs	COURSE OUTCOME
CO 1	Students learn about bonding, anti bonding, non bonding and Interhalogen compounds.
CO 2	Students acquire knowledge about the fundamental concepts of acid and base and to determine the hardness of water.
CO 3	Students able to apply the knowledge to prepare various concentration of solution.
CO 4	Students understand about the various antibiotics and drugs.
CO 5	Students evaluate the characteristics of soil, fertilizers and pesticides.
Pre-requisites	

#### **Knowledge Levels** 1. Remembering, 2. Understanding, 3. Applying, 4. Analyzing, 5. Evaluating, 6. Synthesizing CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak) COs KLs POs KLs PO 1 CO 1 PO 2 CO 2 PO 3 PO 4 CO 3 PO 5 PO 6 CO 4 **PO** 7 CO 5 PO 8 PO 9 **PSOs** KLs PO 10 PSO 1 PO 11 PO 12 PSO 2 PO 13 PO 14 PSO 3 PO 15 CO / PO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak) **PROGRAMME OUTCOME** COs (POs) PO12 PO13 PO14 PO1 **PO2** PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO15 CO1 CO2 CO3 CO4 CO5

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)										
Programme Specific Outcome ( <b>POs</b> )										
COs	CO1	CO2	CO3	CO4	CO5					
PSO1	1	2	3	2	2					
PSO2	2	1	2	3	1					
PSO3	1	2	1	1	2					

Course Assessment Methods					
Direct					
1. Continuous Assessment Test I, II & Model					
2. Assignment					
3. End Semester Examinations					
Indirect					
1. Course End Delivery					

Content of the Syllabus											
	Chemical bonding and Aromaticity	Periods	12								
Unit - I	- I Chemical Bonding Definition types Ionic bond and covalent bond, hydrogen bond -formation and characteristics properties -bond order- magnetic properties. Structure of NaCl, CaF <sub>2</sub> . MO theory-bonding in H <sub>2</sub> , O <sub>2</sub> , N <sub>2</sub> using MO theory -bonding -bond order- magnetic properties. Aromaticity -Huckels rule-types Examples.										
	Acid and Base theoryPeriods12										
Unit - II	Arrhenius concept - Lowry-bronsted theory -Lewis acid and base theory - Conjugated Acid and base Strength of an Acid and base. Principle and Classification of Hard acid and Base -Soft Acid and base HSAB. Acidity of water - Alkalinity-PH -hardness of water- types of hardness - methods RO and Zeolit process.										
	Volumetric analysis	12									
Unit - III	<b>hit - III</b> Law of Volumetric analysis-Definitions of molarity, molality, normality and mole fraction. Titration-Back titration-Equivalence point-Indicator - Standard solution - Primary and secondary standards- Types of titrations- Acid-base and redox.										
	Pharmaceutical Chemistry-I	Periods	12								
Unit - IV	IV Definition of the terms - Drug, Pharmacy, Pharmacophore, Pharmacodynamics and Pharmacopoeia. Antibiotics - Definition, classification - broad and narrow spectrum antibiotics. penicillin, chloramphenical and erythromycin - structure and uses -structure elucidation not needed. Sulpha drugs-preparation of sulphaguanine and sulphathiazole. Mechanism and mode of action of sulpha drugs.										
	AgriculturalChemistry	Periods	12								
Unit - V Soil types-red soil, black soil, alluvial soil, desert soil, red soil; role of humus: Manures and their importance. Chemical fertilizers- Natural and synthetic fertilizers: Classification of NPK fertilizer-Preparation of Urea, Ammonium sulphate, Triple super phosphate potassium nitrate; role of macronutrients and micronutrients. Pesticides- classification-insecticides, herbicides and fungicides- Structure of important pesticides: DDT, BHC.											
	Total Periods		60								

Text Books	
1	Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry (33rd edition), Vishal publishing co., (2017).
2	Jayashree Ghosh .S, Fundamental concepts of Applied Chemistry, New Delhi, S. Chand & Co., (2008).
3	Sharma B.K., Industrial chemistry including chemical engineering (16th), Meerut, Krishnaprakasam media., (2011).
4	Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (22nd edition), New Delhi, S. Chand & Co., (2016).
5	Dr.R.D.Madan, Modern inorganic chemistry,(3rd edition), New Delhi,S. Chand & Co., (2014).
References	
1	Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry , 47th edition, Vishal publishing co., 2017.
2	Jayashree Ghosh, Text Book of Pharmaceutical Chemistry, S. Chand, New Delhi, 1999.
3	Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, 50th edition, New Delhi, S. Chand &Co., 2011.
E-References	
1	www.sparknotes.com/chemistry/bonding/molecularorbital/section1.rhtm
2	www.organic-chemistry.org/namedreactions/nucleophilic-substitution-sn1-sn2.shtm
3	www.soest.hawaii.edu/oceanography/courses/OCN633/Fall%202013/Titrimetry.pdf
4	chem.libretexts.org/



Programme	B.Sc	Programme Code	UCH				Regulations		,	2018-2019
Department		Semester							2	
						Credit	Maxim	um Mar	ks	
Course Code	C	ourse Name	pe	er We	ek					
			L	Т	Р	С	CA	ESE	Ξ	Total
18U2CHA02	Allie	d Chemistry - II	5	0	0	5	25	75		100
COURSE OBJECTIVES	To compile stude research laborato various kinds of	ents with various chromatog ries.To educate about the ch drugs and its uses.	raphy emis	y tech stry of	niqu Ebio	es and its appl -organic and b	ications to io-inorgan	wards in	ndu oour	stries and ids and
POs		PRO	GRA	MMI	E OU	TCOME				
PO 1	Capable of demo form a part of an	onstrating comprehensive k undergraduate programme o	nowl of stu	ledge 1dy.	and	understandin	g of one o	or more	dis	ciplines that
PO 2	Ability to express appropriate medi	ss thoughts and ideas effect a; confidently share ones vie	ctivel ews a	ly in and ex	writ xpres	ingand orally; ss herself/hims	Commun elf etc.,	icate w	rith	others using
PO 3	Capability to ap claims, beliefs or	ply analytic thought to a b the basis of empirical evide	ody ence;	of kı ; iden	nowl tify 1	edge;analyse elevant assum	and evalua ptions or i	nte evid mplicati	lenc ions	e,arguments, s etc.,
PO 4	Capacity to extra non-familiar prol life situations.	polate from what one has leaders, rather than replicate	earne currio	d and culum	app 1 coi	bly their components of the second seco	etencies to ge; and app	solve d	liffe s lea	rent kinds of arning to real
PO 5	Ability to evalu arguments of oth	ate the reliability and releases; analyse and synthesis dates and synthesis dates and synthesis dates are specific to the synthesis dates are specific to the synthesis and synthesis are specific to the synthesynthes	evano ata fr	ce of com a	evi vari	dence;identify ety of sources;	logical f draw valie	laws ar d conclu	nd usio	holes in the ns etc.,
PO 6	A sense of inqui and articulating; etc.,	ry and capability for askin Ability to recognise cause-a	g rel ind-e	evant effect	/app relat	ropriate quest ionships, defii	ions, probl ne problem	ematisi s, form	ng, ulat	synthesizing e hypotheses
PO 7	Ability to work e on the part of a g efficiently as a m	effectively and respectfully group, and act together as a member of a team.	with grou	diver p or a	se te 1 tea	eams; facilitate m in the inter	e cooperati ests of a co	ve or co	cau	linated effort ise and work
PO 8	Ability to analysideas, evidence a	e, interpret and draw conclu nd experiences from an oper	sions n-mii	s fron nded	n qua and 1	antitative/qual reasoned persp	itative data pective.	; and ci	ritic	ally evaluate
PO 9	Critical sensibilit	y to lived experiences, with	self	aware	eness	s and reflexivit	y of both s	elf and	soc	iety.
PO 10	Capability to use variety of relevan	e ICT in a variety of learning to the second s	ng si 1se aj	ituatic pprop	ons,d riate	emonstrate ab software for a	ility to acc analysis of	cess, va data.	luat	te, and use a
PO 11	Ability to work i through to compl	ndependently, identify appr etion.	opria	ate re	sour	ces required fo	or a projec	t, and n	nana	age a project
PO 12	Possess knowled	ge of the values and beliefs	of m	ultiple	e cul	tures and a glo	bal perspe	ctive et	c.,	
PO 13	Ability to embra ethical issue from	ce moral/ethical values in multiple perspectives, and	cond use e	ucting ethica	g on l pra	es life, formu	late a Posi ork etc.,	tion/arg	gum	ent about an
PO 14	Capability for m inspiring vision,	apping out the tasks of a t building a team who can hel	eam p acł	or an hieve	org	anization, and vision, motivat	l setting di	irection	, fo	rmulating an
PO 15	Ability to acquire knowledge and skills, including learning how to learn, that are necessary for participating in learning activities throughout life, through self-paced etc.,									

COs	COURSE OUTCOME
CO 1	Students predict the concept of various chromatographic techniques.
CO 2	Students identify the details of bio organic compounds and bio inorganic compounds.
CO 3	Students utilize knowledge of antipyretics, analgesic, antiseptics, disinfectants and anesthetics
CO 4	Students analyze the structure of different haem proteins.
CO 5	Students evaluate the different pharmaceutically important compounds and their uses in real life.
Pre-requisites	

Knowledge Levels																
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing																
<b>CO / PO / KL Mapping</b> (3/2/1 indicates the strength of correlation 3-strong 2-medium 1-weak)																
CO	COs KLs POs KLs															
	•				NLS					<b>&gt;</b> 1			2 2			
CO	1				4				PO	2			1	, 		
CO	2				2											
									PO	3			5			
CO	3				3				PO	4 5						
CO 4	1				4				PO	6			6	;		
									PO	7			2	2		
CO	5		5					PO 8				4				
PSO	s			]	KLs			PO 9				1				
								- PO 10				3				
PSO	1		3					PO 11				3				
								PO 12				2				
PSO	2				4				PO 1	3			1	1		
DSO	2				1				PO 1	4		6				
130	3			1 PO 15							3					
		(2/2	/1 . 1.			<b>CO</b> /]	PO Ma	pping		1.	. 1	.1)				
		(3/2)		ates the	e streng	th of Co		on, 3-si	rong, $2$	-mediu	m, 1-we	eak)				
COs						1	NUGK	(POs	5)	OME						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	
CO1	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2	
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2	
CO3	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3	
CO4	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2	
CO5	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1	

CO / PSO Mapping										
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)										
Programme Specific Outcome ( <b>POs</b> )										
COs	CO1	CO2	CO3	CO4	CO5					
PSO1	2	2	3	2	1					
PSO2	3	1	2	3	2					
PSO3	1	2	1	1	1					

	Course Assessment Methods		
rect			
1. Continue	us Assessment Test I, II & Model		
2. Assignm	ent		
3. End Sen	ester Examinations		
direct			
1. Course H	nd Delivery		
	Content of the Syllabus		
	Chromatography	Periods	12
Unit - I	Chromatography       -definition-types- column, paper, thin layer -meth         Difference       between paper chromatography and thin layer chromatography-         chromatography-       HPLC-principle-experimental techniques - instrumentat         Amino acids and Carbohydrates	graphy. High p tion and advantage Periods	n application- pressure liquid es. 12
Unit - II	Aminoacids- Preparation- Gabriel method, Strecker synthesis- Isoelect Polypeptide- Proteins- Classification- primary structure and its func Classification Properties and Resetting of gluppes and function.	ric point, Reaction tions. Carbohydra conversion of gluco	ns of glycine. ates-definition,
	and vice versa- sucrose and starch		
	and vice versa- sucrose and starch Bio-inorganic Chemistry	Periods	12
Unit - III	Bio-inorganic Chemistry         Structure of chlorophyll, phorphyrin unit and photosynthesis. Nitrogen fix haem proteins: haemoglobin, myoglobin. Oxygen transport and respirat containing metals.	Periods xation, carbon cyc tion. Metallo enzy	12 ele. structure of mes, vitamins

	Pharmaceutical Chemistry-II	Periods	12							
Unit - IV	Structure and mode of action: Analgesics and Antipyretics-salicylic acid derivatives-aspirin, p-aminophenol derivatives- para acetamol and ibuprofen. Antiseptic and disinfectants-definition and distinction, crystal violet, acridine. Anaesthetics-definition, classification- local and general, preparation, properties and uses of cocaine and benzo cocaine.									
	Organic Analysis	Periods	12							
Unit - V	Qualitative analysis of organic substances: test for saturation and unsaturation; aliphatic & aromatic; acidi and basic nature of organic compound; elements test for N, S and halogens: functional groups like acid phenol, aldehyde, ketone, carbohydrate, amine, ester, amide and diamide.									
	Total Periods		60							

Text Books	
1	Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry,50th edition, New Delhi, S. Chand & Co., (2011). R., Sharma L.R., Kalia K.K., Principles of
2	Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry 23rdedition. New Delhi, S. Chand & Co., 2004. Applied Chemistry, New Delhi, S. Chand & Co., 2008.
3	V. Venkateswaran, R. Veeraswamy and A.R.Kulandaivelu, Basic Principles of Practical Chemistry, New Delhi, S.Chand & Co, 1995.
4	Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, 22nd edition, New Delhi, S. Chand & Co., 2016.
5	Pandey.O.P, Bajpai.D.N., Giri.S., Practical Chemistry, New Delhi, S.Chand & Co, 2012.
References	
1	1. Jayashree Ghosh .S, Fundamental concepts of Applied Chemistry, New Delhi, S. Chand & Co., 2008.
2	2. Sharma.B.K., Industrial chemistry including chemical engineering -16th- Meerut, Krishnaprakasam media. 2011.
<b>E-References</b>	
1	https://www.khanacademy.org/test-prep/mcat/chemical-processes/separations- purifications/a/principles-of-chromatography
2	https://en.wikipedia.org/wiki/Carbohydrate.
3	https://chem.libretexts.org/



EMPOWE														
Programme	B.Sc	Programme Code		UCH Regulations										
Department		Chemistry			2									
			Perio	ds	Credit	Maxim	um Mark	CS						
Course Code	C	Course Name	per W	eek										
			L T	Р	С	CA	ESE	Total						
18U2CHAP01	Allied	l Chemistry Practicals	3 0	0	5	25	75	100						
COURSE OBJECTIVES	To understand th qualitative analys	qualitative analysis of organic												
POs		PROGRAMME OUTCOME												
PO 1	Capable of demotors form a part of an	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that orm a part of an undergraduate programme of study.												
PO 2	Ability to expre appropriate medi	ss thoughts and ideas effe a; confidently share ones vi	ctively in ews and e	writ expres	ingand orally; ss herself/hims	Commun elf etc.,	icate wi	th others using						
PO 3	Capability to ap claims, beliefs or	ply analytic thought to a l n the basis of empirical evid	oody of k ence; idei	knowl ntify 1	edge;analyse relevant assum	and evaluation ptions or i	ate evide mplicatio	ence,arguments, ons etc.,						
PO 4	Capacity to extra non-familiar pro life situations.	polate from what one has lebens, rather than replicate	earned an curriculu	d app m coi	bly their components of the second seco	etencies to ge; and apj	solve di ply ones	fferent kinds of learning to real						
PO 5	Ability to evalu arguments of oth	ate the reliability and rel ers; analyse and synthesis d	evance o ata from a	of evi a vari	dence;identify ety of sources;	logical f draw valie	laws and d conclus	d holes in the sions etc.,						
PO 6	A sense of inqui and articulating; etc.,	iry and capability for askin Ability to recognise cause-a	g relevan and-effect	nt/app t relat	ropriate quest ionships, defin	ions, probl ne problem	lematisin Is, formu	ng, synthesizing late hypotheses						
PO 7	Ability to work a on the part of a efficiently as a m	effectively and respectfully group, and act together as a nember of a team.	with dive group or	erse te a tea	eams; facilitate m in the inter	e cooperati ests of a co	ve or co ommon o	ordinated effort cause and work						
PO 8	Ability to analys ideas, evidence a	e, interpret and draw conclu nd experiences from an ope	isions fro n-minded	m qu l and	antitative/qual reasoned persp	itative data pective.	a; and cri	itically evaluate						
PO 9	Critical sensibilit	ty to lived experiences, with	self awar	renes	s and reflexivit	ty of both s	self and s	society.						
PO 10	Capability to use variety of relevan	e ICT in a variety of learning information sources; and	ng situati use appro	ions,c priate	lemonstrate ab e software for a	ility to aco analysis of	cess, val data.	uate, and use a						
PO 11	Ability to work through to compl	independently, identify appriletion.	ropriate r	esour	ces required for	or a projec	et, and m	anage a project						
PO 12	Possess knowled	ge of the values and beliefs	of multip	le cul	tures and a glo	bal perspe	ective etc	.,						
PO 13	Ability to embra ethical issue from	ce moral/ethical values in multiple perspectives, and	conductir use ethic	ng on al pra	es life, formu	late a Posi ork etc.,	ition/argu	ument about an						
PO 14	Capability for minspiring vision,	apping out the tasks of a t building a team who can he	eam or a	n org	anization, and	l setting d	irection,	formulating an						
PO 15	Ability to acquire in learning activi	e knowledge and skills, incl ties throughout life, through	uding lean	rning ed etc	how to learn,	that are ne	cessary f	for participating						

COs	COURSE OUTCOME
CO 1	Students will learn how to conduct a volumetric estimation process precisely
CO 2	Students will understand reactions taking place during the experiment.
CO 3	Students will plan, conduct, review and report the experiment
CO 4	The students will learn the nature, significance, and influence of errors and how they may best be avoided
	or minimized during quantitative examination of a chemical compound. Students will gain knowledge about
	analysis of organic compounds.
CO 5	Students will evaluate the reactivity of various functional groups.
Pre-requisites	

					l	Know	ledge	Level	s						
1.Remer	1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing														
					C	O / PC	) / KL 1	Марріі	ng						
		(3/2	/1 indic	ates the	e streng	gth of c	orrelati	on, 3-st	rong, 2	2-mediu	m, 1-we	eak)			
CO	<b>S</b>			]	KLs				PO	s			K	Ls	
CO	1				2				PO	1			2		
CO	2				2				PO	2			1		
CO	Ζ				Ζ				PO	3			5	i	
00	3				5				PO	4			5	j –	
0	5				5				PO	5			4		
CO	4				2				PO	6			6	5	
CO	5		5					PO 7				2			
	-				-				PO	8		4			
PSO	s			]	KLs				PO	9			1	1	
BEO	1		2					PO 10				3			
P30	1		3					PO 11				3			
DCO	2				4			PO 12					2	2	
PSO	2				4				PO 1	13		1			
PSO	3				1			PO 14				6			
150	5				1	~ ~ .		PO 15				3	\$		
		(2)	/11:	ofoc 41		CO/	PO Ma	pping		)	m 1	alt)			
		(3/2		ates the	e streng	gin of c		on, 5-si	rong, $2$		m, 1-we	eak)			
COs						Г	NUGN	(POs	5)	UNIE					
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO3	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1
CO4	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO5	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1

	CO / PSO Mapping												
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)													
Programme Specific Outcome (POs)													
COs	CO1	CO2	CO3	CO4	CO5								
PSO1	2	2	1	2	1								
PSO2	1	1	2	1	2								
PSO3	2	2	1	2	1								

Direct

1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

1. Course End Delivery

	Content of the Syllabus											
	Volumetric Estimations-Acidimetry	Periods	9									
Unit - I	1. Estimation of sodium hydroxide-standard sodium carbonate											
	2. Estimation of Oxalic acid -standard-oxalic acid.											
	3. Estimation of Hydrochloric acid - standard oxalic acid											
Unit - II	Permanganometry	Periods	9									
	1.Estimation of oxalic acid-std-Mohrs salt or ferrous sulphate.											
	2.Estimation of sodium nitrite-standard oxalic acid.											
	3.Estimation of ferrous ion.											
	Qualitative Organic Analysis	Periods	9									
Unit - III	Systematic analysis of organic compounds:Characterization of Organic co groups and confirmation by preparation of derivative.Functional groups th Ketones, carboxylic acids.	ompounds by their nat may be studied	functional l:Aldehydes,									
	Qualitative Organic Analysis	Periods	9									
Unit - IV	Systematic analysis of organic compounds:Characterization of Organic co groups and confirmation by preparation of derivative.Functional groups th primary amines, phenol,amide, diamide.	ompounds by their nat may be studied	functional l: aromatic									
	Qualitative Organic Analysis	Periods	9									
Unit - V	Systematic analysis of organic compounds:Characterization of Organic compound confirmation by preparation of derivative.Functional groups that may be studied: monosaccharides.	ds by their functiona Nitro compounds a	al groups and nd									
	Total Periods		45									

Text Books	
1	1. V. Venkateswaran, R. Veeraswamy and A.R.Kulandaivelu, Basic Principles of Practical Chemistry, New Delhi, S. Chand & Co, (1995).
4	
References	
1	.Pandey O. P, Bajpai D. N., Giri S., Practical Chemistry, New Delhi, S.Chand & Co, (2012).
<b>E-References</b>	
1	1. http://www.chem.uwimona.edu.jm/lab_manuals/c10expt25.html
2	2. http://vlab.amrita.edu/?sub=2&brch=191∼=345&cnt=1
3	3. http://amrita.olabs.edu.in/?sub=73&brch=8∼=116&cnt=1



Shipowe													
Programme	B.Sc	Programme Code	U	CH	Regulat	tions	2018-2019						
Department		Chemistry		Semester			3						
			Credit	Maximum Marks									
Course Code	C	Course Name	per Week										
			L T P	С	CA	ESE	Total						
18U3CHA03		Allied Chemistry - I	5 0 0	5	25	75	100						
COURSE OBJECTIVES	To provide a bro with a molecular To expose the stu	with a molecular perspective. To expose the students to a breadth of experimental techniques using instrumentation.											
POs	PROGRAMME OUTCOME												
PO 1	Capable of demo form a part of an	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.											
PO 2	Ability to expre appropriate medi	ss thoughts and ideas effect a; confidently share ones vi-	ctively in writ ews and expres	ingand orally; ss herself/hims	; Commun self etc.,	icate wit	h others using						
PO 3	Capability to ap claims, beliefs or	ply analytic thought to a b the basis of empirical evid	oody of knowl ence; identify	ledge;analyse relevant assum	and evaluation or i	ate evide mplicatio	nce,arguments,						
PO 4	Capacity to extra non-familiar prol life situations.	polate from what one has lobelens, rather than replicate	earned and app curriculum con	bly their component of the second sec	etencies to ge; and apj	solve dif ply ones l	ferent kinds of learning to real						
PO 5	Ability to evaluarguments of oth	ate the reliability and rel ers; analyse and synthesis d	evance of evi ata from a vari	dence;identify ety of sources	v logical f ; draw valie	laws and d conclus	l holes in the ions etc.,						
PO 6	A sense of inqui and articulating; etc.,	iry and capability for askin Ability to recognise cause-a	g relevant/app and-effect relat	ropriate quest ionships, defin	ions, probl ne problem	lematising ns, formul	g, synthesizing late hypotheses						
PO 7	Ability to work e on the part of a efficiently as a m	effectively and respectfully group, and act together as a nember of a team.	with diverse to group or a tea	eams; facilitate m in the inter	e cooperati ests of a co	ve or coo ommon c	ordinated effort ause and work						
PO 8	Ability to analys ideas, evidence a	e, interpret and draw conclund experiences from an ope	isions from qu n-minded and	antitative/qual reasoned persp	itative data pective.	a; and crit	tically evaluate						
PO 9	Critical sensibilit	ty to lived experiences, with	self awareness	s and reflexivit	ty of both s	self and s	ociety.						
PO 10	Capability to use variety of relevan	e ICT in a variety of learni nt information sources; and	ng situations,d use appropriate	lemonstrate ab e software for a	oility to aco analysis of	cess, valı data.	ate, and use a						
PO 11	Ability to work it through to compl	independently, identify appril	ropriate resour	ces required for	or a projec	et, and ma	anage a project						
PO 12	Possess knowled	ge of the values and beliefs	of multiple cul	tures and a glo	obal perspe	ective etc.	,						
PO 13	Ability to embra ethical issue from	nce moral/ethical values in multiple perspectives, and	conducting on use ethical pra	es life, formu actices in all w	late a Posi	ition/argu	ment about an						
PO 14	Capability for m inspiring vision,	happing out the tasks of a t building a team who can he	eam or an org	ganization, and vision, motiva	l setting d ting etc.,	irection,	formulating an						
PO 15	Ability to acquire in learning activi	Ability to acquire knowledge and skills, including learning how to learn, that are necessary for participating in learning activities throughout life, through self-paced etc.,											

COs	COURSE OUTCOME
CO 1	Students will be known molecular orbital theory and types of interhalogens.
CO 2	Students can understand organic reactions and types of hybridization
CO 3	Students will be enhanced their knowledge towards electrolysis, conductance and buffer solutions.
CO 4	Students will learn the basics of pharmaceutical chemistry.
CO 5	Students will gain knowledge about corrosion and its preventive methods.
Pre-requisites	

					]	Know	ledge	Level	s						
1.Remer	nberi	ng, 2.	Under	stand	ling, 3	B.App	lying,	4.Ana	alyzin	g, 5.E	valuat	ing, 6.	Synth	esizinį	g
		(2)/2	(1 . 1.		C	0 / PO	) / KL I	Mappin	ıg	1.		.1)			
00		(3/2)		ates the	e streng	th of co	orrelati	on, 3-si	rong, 2	-meatu	m, 1-we	eak)	1/1	r	
CO	8				KLS				PO	5 1					
CO	1				4					1 ว					
CO	2				2				r0.	2			1		
									PO	3			5	5	
CO	3				5				PO	4			5	5	
00	4				6				PO :	ა 6			4	+	
0.	4				6				PO	7			2	)	
CO	5		3					PO 8							
								PO 9				1			
P\$0	S				KLS				PO 1	.0		3			
PSO	1		3					DO 11				2			
									PO 1	2			2 0	)	
PSO	2				4			PO 13				1			
								PO 13				6			
PSO	3				1			PO 14 PO 15				3			
						<b>CO</b> /]	PO Ma	pping							
		(3/2)	1 indic	ates the	e streng	th of c	orrelati	on, 3-st	rong, 2	-mediu	m, 1-we	eak)			
COs						Р	ROGR	AMME (POs	OUTC 5)	OME					
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO3	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1
CO4	1	1	2	2	1	3	1	1	1	1	1	1	1	3	1
CO5	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
	1														

CO / PSO Mapping								
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)								
COs								
COs	CO1	CO2	CO3	CO4	CO5			
PSO1	2	2	1	1	3			
PSO2	3	1	2	1	2			
PSO3	1	2	1	1	1			

Course Assessment Methods			
Direct			
1. Continuous Assessment Test I, II & Model			
2. Assignment			
3. End Semester Examinations			
Indirect			
1. Course End Delivery			

Content of the Syllabus								
	Covalent bonding	Periods	12					
Unit - I	Covalent bond-Hybridization-Definition -Salient features-VSEPR theory - Shapes of inorganic molecules such as BF <sub>3</sub> , H <sub>2</sub> O, NH <sub>3</sub> ,ClF <sub>3</sub> and XeF <sub>2</sub> . Molecular orbital theory - Postulates-bonding,anti bonding an non-bonding molecular orbital-Bond order-MO diagram for H <sub>2</sub> , He <sub>2</sub> ,N <sub>2</sub> ,O <sub>2</sub> ,F <sub>2</sub> ,NO and CO							
	Organic ReactionsPeriods12							
Unit - II	Classification of reactions-substitution, addition, elimination reactions-explanation. Isomerization, polymerization and condensation definition with examples. Hybridization in methane, ethylene, acetylene. Aromaticit Huckels rule. Electrophilic substitution reactions in benzene - Mechanism of nitration, sulphonation, halogenation and alkylation							
	Electrochemistry-I	Periods	12					
Unit - III	Electrolytic conduction-Faradays law of electrolysis-Conductance of electrolytes-Specific conductance, equivalent conductance, molar conductance-variation of molar conductance with dilution - Kohlrausch law and its application-Conductometric titrations-Ostwald dilution law-pH definition Common ion Effec-Buffer solutions - Definition -Henderson equation -Derivation-Indicators-Acid-base Indicators							
	Pharmaceutical Chemistry-I	Periods	12					
Unit - IV	Antibiotics-Definition, classification - broad and narrow spectrum antibiotics. penicillin, chloramphenical and erythromycin-structure and mode of action structure elucidation not needed. Sulpha drugs - preparationof sulphaguanidine, sulphapyridine and sulphathiazole. Mechanism and mode of action of sulpha drugs							
	Applied Chemistry-I	Periods	12					
Unit - V	Unit - V Corrosion-Types of corrosion - Dry and Wet corrosion definition only-Prevention of corrosion by electroplating. Paints - Requirements of good paint- constituents of paints and their functions- manufacture of paints -special paints: luminescent fire retardant and heat resistant paints. Varnishes -Constituents, characteristics of good varnish, types and uses.							
	Total Periods 30							

Text Books	
1	Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry 33rd edition, Vishal publishing co., 2017.
2	Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, 22nd edition, New Delhi S. Chand & Co., 2016.
3	Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry , 47th edition, Vishal publishing co., 2017.
References	
1	Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry 50th edition, New Delhi, S. Chand &Co.,2011.
2	Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry 23rd edition, New Delhi, S. Chand &Co., 2004.
E-References	
1	https://chem.libretexts.org/Core/Physical_and_Theoretical_Chemistry/Chemical_Bonding/Molecular_Or bital_Theory/MO_bonding_in_F2_and_O2.
2	https://www.cliffsnotes.com/study-guides/chemistry/organic-chemistry-ii/reactions-of-aromatic-compou ds/electrophilic-aromatic-substitution-reactions



Programme	B.Sc	Programme Code	U	Regulations		2018-2019			
Department		Chemistry		Semester			4		
			Periods	Credit	Maxim	um Mar	ks		
Course Code	C	ourse Name	per Week			1			
			L T P	С	CA	ESE	Total		
18U4CHA04	Allie	d Chemistry - II	5 0 0	5	25	75	100		
COURSE OBJECTIVES	To gain knowled carbohydrates.Ac	ge about coordination comp equire the knowledge about	ounds and nati medicinal drug	ural products s gs and dyes	uch as ami	no acids	s and		
POs		PRO	GRAMME OU	JTCOME					
PO 1	Capable of demo form a part of an	onstrating comprehensive k undergraduate programme o	nowledge and of study.	understandin	g of one o	or more	disciplines that		
PO 2	Ability to expre appropriate medi	ss thoughts and ideas effect a; confidently share ones vie	ctively in write ws and express	ingand orally; ss herself/hims	Commun elf etc.,	icate w	ith others using		
PO 3	Capability to ap claims, beliefs or	ply analytic thought to a b the basis of empirical evide	oody of know	ledge;analyse relevant assum	and evalua ptions or i	ate evid mplicati	ence, arguments,		
PO 4	Capacity to extra non-familiar prol life situations.	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply ones learning to real life situations.							
PO 5	Ability to evaluarguments of oth	ate the reliability and releases; analyse and synthesis d	evance of evi ata from a vari	dence;identify ety of sources;	logical f draw valio	laws ar d conclu	nd holes in the usions etc.,		
PO 6	A sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesizing and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses etc.,								
PO 7	Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.								
PO 8	Ability to analys ideas, evidence a	e, interpret and draw conclu nd experiences from an oper	sions from qu n-minded and	antitative/qual reasoned persp	itative data pective.	i; and ci	ritically evaluate		
PO 9	Critical sensibilit	ty to lived experiences, with	self awarenes	s and reflexivit	y of both s	self and	society.		
PO 10	Capability to use variety of relevan	Capability to use ICT in a variety of learning situations, demonstrate ability to access, valuate, and use a variety of relevant information sources; and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.								
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective etc.,								
PO 13	Ability to embra ethical issue from	Ability to embrace moral/ethical values in conducting ones life, formulate a Position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work etc.,							
PO 14	Capability for minspiring vision,	apping out the tasks of a t building a team who can hel	eam or an org	ganization, and vision, motivat	l setting di	irection,	formulating an		
PO 15	Ability to acquire in learning activi	e knowledge and skills, inclution ties throughout life, through	uding learning self-paced etc	how to learn,	that are nee	cessary	for participating		

COs	COURSE OUTCOME
CO 1	Students will learn the basic concepts of coordination compounds and its applications.
CO 2	Students will know about the aminoacids, proteins and carbohydrates.
CO 3	Students will gain knowledge regarding electrode potential and batteries.
CO 4	Students will enhance their knowledge towards pharamaceutical and industrial chemistry.
CO 5	Students will dyes and its importance.
Pre-requisites	

					]	Know	ledge	Level	S						
1.Reme	1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing														
		(3/2	/1 indic	ates the	C e streng	O/PC	) / KL I	Mappin	ng trong 2	-mediu	m 1-we	vak)			
C0	COs KL s POs KL s														
	1				2				PO	1			2	2.5	
CO	1				2				PO	2			1		
CO	2				2				DO	<b>ว</b>					
									PO	5 4				) ;	
CO	3				3				PO	5			4	, 	
СО	4				4				PO	6			e	õ	
60	5				4				PO	7			2	2	
CO	2		4			PO 8				4					
PSC	Ds			]	KLs			PO 9				1			
						PO 10				3					
PSO	) 1		3				PO 11				3				
									PO 1	2			2	2	
PSO	02				4				PO 1	3			1	-	
PSO	3				1			PO 14 6							
150	5				1	<u> </u>		<u> </u>	PO 1	5			3	5	
		(3/7	/1 indic	atas th	astrono	CO/.	PO Ma	ipping	trong	mediu	m = 1 w	ak)			
		(3/2	1 mult	aus ult	Sucily	<u>е поте</u>	ROGR	AMME	OUTC	OME	111, 1-wt	.ακ)			
COs		r	r			-		(PO	s)		n	n	T		n
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO3	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO4	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO5	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2

CO / PSO Mapping								
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)								
Programme Specific Outcome (POs)								
COs	CO1	CO2	CO3	CO4	CO5			
PSO1	2	2	3	2	2			
PSO2	1	1	2	3	3			
PSO3	2	2	1	1	1			

D	Course Assessment Methods								
Direct	a Assessment Test I. H. & Model								
2 Assignment									
3. End Seme	2. Assignment 3. End Semester Examinations								
Indirect									
1. Course En	d Delivery								
	Content of the Syllabus								
	Coordination compoundsPeriods12								
Unit - I	Unit - IAddition compounds-double salts and complexes. Complexes Mononuclear complexes only) General aspects-central metal atom,Ligand-types of ligands.Coordination number and oxidation state of central metal atom-Nomenclature-Theories of Complexes- Werners theory,Sidgwick theory,EAN rule,VBT-its applications to $[Cu(NH_3)_4]^{2^+}$ , $[Ni(CO)_4]$ , $[Co(NH_3)_6]^{3^+}$ and $[CoCl_6]^{3^-}$ Chelation-Meaning examples – 								
	Amino acids and Carbohydrates	Periods	12						
Unit - II	Unit - IIAminoacids - Preparation - Gabriel method, Strecker synthesis-Isoelectric point, Reactions of glycine.Polypeptide-Proteins - Classification-primary structure and its functions.Carbohydrates - definition, Classification, Preparation and Reactions of glucose and fructose-Inter conversion of glucose to fructose and vice versa-sucrose and starch								
	Electrochemistry-II	Periods	12						
Unit - III	Cells-Galvanic cell with examples.Electrode potential-single electrode potential- Standard electrode potential-Nernt equation-derivation-electrochemical series and its applications- EMF-Applications of EMF measurements:Determination of pH by using hydrogen electrode- Reference electrodes:hydrogen electrode and calomel electrode-Reversible and irreversible cell-Batteries-definitio - lead acid battery								
	Pharmaceutical Chemistry-II	Periods	12						
Unit - IV	Unit - IV Structure and mode of action: Analgesics and Antipyretics-salicylic acid derivatives-aspirin, p- aminophenol derivatives- paracetamol and ibuprofen. Antiseptic and disinfectants-definition and distinction, crystal violet, acridine. Anaesthetics - definition, classification-local and general, preparation, properties and uses of cocaine and benzo cocaine								
	Applied Chemistry-II     Periods								
Unit - V	Dyes-definition-requisites of a true dye, classification of dyes - based on structure and mode of application, colours and chemical constitution-Witts theory, Bayer theory. Dyeing forces-ionic interactions, hydrogen bonds, vander-waals interaction, covalent bonds with examples, cross dyeing - principle only. Basic operations in dyeing process-preparation of fiber and dye bath, applications of dye and finishing								
	Total Periods	30							

Text Books	
1	Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry 33rd edition, Vishal publishing co.,2017.
2	Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry 33rd edition, Vishal publishing co. 2017.
References	
1	Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry 33rd edition, Vishal publishing co., 2017.
2	Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry 33rd edition Vishal publishing co.,2017.
E-References	
1	https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/carbhyd.htm
2	http://dyes-pigments.standardcon.com/what-is-dye.html



Programme	B.Sc	Programme Code	U	CH	Regulat	tions	2018-2019		
Department		Chemistry			2				
			Periods	Credit	Maxim	um Mark	S		
Course Code	C	Course Name	per Week			1			
			L T P	C	CA	ESE	Total		
18U4CHAP01	Allied	l Chemistry Practicals	3 0 0	5	25	75	100		
COURSE OBJECTIVES	To understand th qualitative analys	e principles of volumetric a sis of organic	nalysis. To ena	ble the studen	ts to have h	nands-on	training on		
POs		PROGRAMME OUTCOME							
PO 1	Capable of demo form a part of an	onstrating comprehensive k undergraduate programme	cnowledge and of study.	understandin	g of one o	or more of	disciplines that		
PO 2	Ability to expre appropriate medi	ss thoughts and ideas effective in the second state of the second	ctively in writ ews and expres	ingand orally; ss herself/hims	Commun elf etc.,	icate wit	th others using		
PO 3	Capability to ap claims, beliefs or	ply analytic thought to a beam of the basis of empirical evid	oody of knowl ence; identify	ledge;analyse relevant assum	and evaluation or i	ate evide mplicatio	ence,arguments, ons etc.,		
PO 4	Capacity to extra non-familiar prob life situations.	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply ones learning to real life situations.							
PO 5	Ability to evalu arguments of oth	nate the reliability and rel ers; analyse and synthesis d	evance of evi ata from a vari	dence; identify ety of sources;	logical f draw valio	laws and d conclus	d holes in the sions etc.,		
PO 6	A sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesizing and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses etc.,								
PO 7	Ability to work e on the part of a efficiently as a m	Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.							
PO 8	Ability to analys ideas, evidence a	e, interpret and draw concluind experiences from an ope	usions from qu n-minded and	antitative/qual reasoned persp	itative data	i; and cri	tically evaluate		
PO 9	Critical sensibilit	ty to lived experiences, with	self awarenes	s and reflexivit	ty of both s	self and s	ociety.		
PO 10	Capability to use variety of relevan	Capability to use ICT in a variety of learning situations, demonstrate ability to access, valuate, and use a variety of relevant information sources; and use appropriate software for analysis of data.							
PO 11	Ability to work i through to compl	Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.							
PO 12	Possess knowled	ge of the values and beliefs	of multiple cul	tures and a glo	bal perspe	ective etc.	••		
PO 13	Ability to embra ethical issue from	nce moral/ethical values in multiple perspectives, and	conducting on use ethical pra	es life, formu	late a Posi ork etc.,	ition/argu	iment about an		
PO 14	Capability for m inspiring vision,	happing out the tasks of a t building a team who can he	eam or an org	ganization, and	l setting d	irection,	formulating an		
PO 15	Ability to acquire in learning activi	e knowledge and skills, incl ties throughout life, through	uding learning self-paced etc	how to learn,	that are neg	cessary f	or participating		

COs	COURSE OUTCOME
CO 1	Students will learn how to conduct a volumetric estimation process precisely
CO 2	Students will understand reactions taking place during the experiment.
CO 3	Students will plan, conduct, review and report the experiment
CO 4	The students will learn the nature, significance, and influence of errors and how they may best be avoided
	or minimized during quantitative examination of a chemical compound. Students will gain knowledge about
	analysis of organic compounds.
CO 5	Students will evaluate the reactivity of various functional groups.
Pre-requisites	

					]	Know	ledge	Level	s						
1.Remer	nberi	ng, 2.	Under	rstand	ling, 3	B.App	lying,	4.Ana	alyzin	g, 5.E	valuat	ing, 6.	Synth	esizinį	g
		(2.12			С	O/PC	) / KL 1	Марріі	ng			•			
		(3/2	1 indic	ates the	e streng	gth of c	orrelati	on, 3-st	rong, 2	2-mediu	m, I-we	eak)	1/1	r	
CO	S				KLS					S 1				LS	
CO	1				2				PO	$\frac{1}{2}$					
CO	2				2				10	2			1	-	
					_				РО	3			5	5	
CO	3				5				PO	4			5	5	
									PO	5			4		
CO	4				2				PO	0				)	
CO	5		5				PO /				Z				
			KLs				PO 8				4				
PSO	s						PO 10				3				
PSO	1		3				1010								
1.00							PO 11					3			
PSO	2		4				PO 12				2				
150	2						PO 13				1				
PSO	3		1				PO 14				6				
				PO 15				3							
		(3/2	/1 indic	ates the	e strend	th of c	orrelati	on 3-st	rong ?	-mediu	m 1-we	ak)			
		(3/2	1 mare	ates in	o strong	<u>,ui oi e</u> P		AMME	OUTC	OME	iii, i we	uix)			
COs						-		(POs	s)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO3	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1
CO4	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO5         1         1         3         3         2         2         1         2         1         1         1         1         1         2								2	1						

CO / PSO Mapping									
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)									
~~	Programme Specific Outcome (POs)								
COs	CO1	CO2	CO3	CO4	CO5				
PSO1	2	2	1	2	1				
PSO2	1	1	2	1	2				
PSO3	2	2	1	2	1				

Direct

## 1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

Indirect

1. Course End Delivery

Content of the Syllabus								
	Volumetric Estimations-Acidimetry	Periods	9					
Unit - I	1. Estimation of sodium hydroxide-standard sodium carbonate							
	2. Estimation of Oxalic acid -standard-oxalic acid.							
	3. Estimation of Hydrochloric acid - standard oxalic acid							
Unit - II	Permanganometry	Periods	9					
	1.Estimation of oxalic acid-std-Mohrs salt or ferrous sulphate.							
	2.Estimation of sodium nitrite-standard oxalic acid.							
	3.Estimation of ferrous ion.							
	Qualitative Organic Analysis	Periods	9					
Unit - III	Systematic analysis of organic compounds:Characterization of Organic co groups and confirmation by preparation of derivative.Functional groups th Ketones, carboxylic acids.	ompounds by their nat may be studied	functional l:Aldehydes,					
	Qualitative Organic Analysis	Periods	9					
Unit - IV Systematic analysis of organic compounds:Characterization of Organic compounds by their f groups and confirmation by preparation of derivative.Functional groups that may be studied: primary amines, phenol,amide, diamide.								
	Qualitative Organic Analysis	Periods	9					
Unit - V	Systematic analysis of organic compounds:Characterization of Organic compounds by their functional groups and confirmation by preparation of derivative.Functional groups that may be studied: Nitro compounds and monosaccharides.							
	Total Periods	45						

Text Books	
1	1. V. Venkateswaran, R. Veeraswamy and A.R.Kulandaivelu, Basic Principles of Practical Chemistry, New
	Delhi, S. Chand & Co, (1995).
4	
References	
1	.Pandey O. P, Bajpai D. N., Giri S., Practical Chemistry, New Delhi, S.Chand & Co, (2012).
E-References	
1	1. http://www.chem.uwimona.edu.jm/lab_manuals/c10expt25.html
2	2. http://vlab.amrita.edu/?sub=2&brch=191∼=345&cnt=1
3	3. http://amrita.olabs.edu.in/?sub=73&brch=8∼=116&cnt=1

HOUEN ENDOWENHEN	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.							N	TÜVRheinland CERTIFIED
Programme	B.Sc	Programme Code			UC	CH	Regulat	tions	2018-2019
Department		Chemistry				Semester			3
Course Code	Course Name			riod We	s ek	Credit	Maximum Marks		
				Т	Р	С	CA	ESE	Total
18U3CHN01		Industrial Chemistry	3	0	0	2	25	75	100
COURSE OBJECTIVES	To learn the impo of different types products	ortance of water chemistryT To enable the students to lea	o unde arn ab	ersta out t	nd th he p	ne manufacturi reparation and	ing of soap importanc	s,deterge e of vari	ents and glass ous industrial
POs		PRO	GRAN	/MI	E OU	ТСОМЕ			
PO 1	Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.								
PO 2	Ability to expre appropriate medi	ss thoughts and ideas effect a; confidently share ones vie	ctively ews ar	in Id ex	writi pres	ingand orally; s herself/hims	Commun elf etc.,	icate wit	th others using

DO 2	Constitute to early early instants the set of a hole of broughdenerships and early to early an early and the set of the s
PO 3	claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications etc.,
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply ones learning to real life situations.
PO 5	Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyse and synthesis data from a variety of sources; draw valid conclusions etc.,
PO 6	A sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesizing and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses etc.,
PO 7	Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.
PO 8	Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.
PO 9	Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.
PO 10	Capability to use ICT in a variety of learning situations, demonstrate ability to access, valuate, and use a variety of relevant information sources; and use appropriate software for analysis of data.
PO 11	Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective etc.,
PO 13	Ability to embrace moral/ethical values in conducting ones life, formulate a Position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work etc.,
PO 14	Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating etc.,
PO 15	Ability to acquire knowledge and skills, including learning how to learn, that are necessary for participating in learning activities throughout life, through self-paced etc.,

COs	COURSE OUTCOME
CO 1	Students will be known the various methods involved in water quality analysis
CO 2	Students canunderstandthe manufacture of soap and detergents.
CO 3	Students will be enhanced their knowledge towards manufacture of glass.
CO 4	Students will learn the basic concepts involved in lubricants.Students will gain knowledge about petroleum products
CO 5	Students will learn how to conduct a volumetric estimation process precisely
Pre-requisites	

#### **Knowledge Levels** 1. Remembering, 2. Understanding, 3. Applying, 4. Analyzing, 5. Evaluating, 6. Synthesizing CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak) COs KLs KLs POs PO 1 CO 1 PO 2 CO 2 PO 3 PO 4 CO 3 PO 5 PO 6 CO 4 PO 7 CO 5 PO 8 PO 9 PSOs KLs PO 10 PSO 1 PO 11 PO 12 PSO 2 PO 13 PO 14 PSO 3 PO 15 CO / PO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak) **PROGRAMME OUTCOME** COs (POs) PO14 PO1 **PO2** PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PO13 PO15 CO1 CO2 CO3 CO4

CO / PSO Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)									
COs	Programme Specific Outcome (POs)								
COs	CO1	CO2	CO3	CO4	CO5				
PSO1	2	2	3	2	2				
PSO2	1	1	2	3	3				
PSO3	2	2	1	1	1				

CO5

Diroct	

#### **Course Assessment Methods**

1. Continuous Assessment Test I, II & Model

2. Assignment

#### 3. End Semester Examinations

Indirect

1. Course End Delivery

Content of the Syllabus									
	Water chemistry- I	Periods	6						
Unit - I	Examination of water quality by chemical and physical examination of water: colour - turbidity - odour-taste-temperature-pH-electrical conductivity-suspended solids - dissolved solids - acidity-total acidity-alkalinity - free CO <sub>2</sub> - dissolved O <sub>2</sub> -free chlorine-chlorine demand - BOD -COD.								
Unit - II	Soaps and detergents	6							
	Soaps:manufacture-toilet and transparent soap -metal soaps,cleansing acti	on of soap.							
	Detergents:Manufacture of synthetic detergents-anionic detergents-cationic detergents and amphoteric detergents								
	Glass industry	Periods	6						
Unit - III	Glass-physical and chemical properties of glass-characteristics-manufactumaterial-melting-shaping-annealing-finishing-special glass:optical,borosi	rre: formation of t licate and coloure	batch d glass						
Unit - IV	Lubricants	Periods	6						
	Definition-functions - properties - viscosity index-pour point - cloud point - classification - additives for lubricants- grease-solid lubrication-emulsions								
Unit - V	Petroleum and Petrochemicals	Periods	6						
	Cracking - mechanism, changes occurring during cracking - types - applic	ations - synthetic	petrol -						
	Hydrogenation of coal Bergius process - Fischer tropsch process - knocking and anti knocking agents - octane number								
	Total Periods 30								

Text Books	
1	Industrial chemistry by B.N.Chakrabarty, Oxford and IBH publishing Co, NewDelhi, 1981.
2	Industrial chemistry by B.K.Sharma, Goel Publishing House, Meerut.
4	
References	
1	College Industrial chemistry by P.P.Singhn, T.M.Joseph, R.G.Dhanvale, Himalaya Publishing house,
	Bombay 4th edition, 1983
2	Applied chemistry by Jayashree Ghosh, S.Chand Publication Reprint 2013
<b>E-References</b>	
1	https://www.scribd.com/document/274281762/Water-Technology-Ppt
2	nptel.ac.in/courses/103107082/module6/lecture5/lecture5.pd



EMPONIE										
Programme	B.Sc	Programme Code		UCH Regulations				,	2018-2019	
Department		Chemistry				Semester	3			
			Periods Credit Maximum Marks							
Course Code	C	Course Name	pe	er We	ek					
	L T P C CA						ESE 75	E	Total	
18U3CHN02	wieu	icinai Chemisti y	5	0	0	2	23	15		100
COURSE	1.To study the sy 2 To learn the im	vstem of Indian medicines	drugs							
OBJECTIVES	3.To prepare and	analyse the drugs.	urugs	•						
POs		PRO	OGRA	MMI	E OU	TCOME				
PO 1	Capable of dem form a part of an	onstrating comprehensive k undergraduate programme	cnowl of stu	ledge ıdy.	and	understanding	g of one o	or more	dis	ciplines that
PO 2	Ability to expre appropriate medi	ss thoughts and ideas effect a; confidently share ones vi	ctivel ews a	y in ind ex	writ pres	ingand orally; ss herself/hims	Commun elf etc.,	icate w	ith	others using
PO 3	Capability to ap claims, beliefs or	ply analytic thought to a l n the basis of empirical evid	oody ence;	of kr ident	nowl tify 1	edge;analyse relevant assum	and evalua ptions or i	te evid mplicati	enc ions	e,arguments, etc.,
PO 4	Capacity to extra non-familiar pro- life situations.	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply ones learning to real life situations.								
PO 5	Ability to evaluarguments of oth	Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyse and synthesis data from a variety of sources; draw valid conclusions etc.,								
PO 6	A sense of inqu and articulating; etc.,	A sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesizing and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses etc.,								
PO 7	Ability to work of on the part of a efficiently as a m	effectively and respectfully group, and act together as a nember of a team.	with group	diver p or a	se te a tea	eams; facilitate m in the intere	e cooperati ests of a co	ve or co ommon	cau	linated effort ase and work
PO 8	Ability to analys ideas, evidence a	e, interpret and draw concluind experiences from an ope	usions en-mir	s fron nded a	n qu and	antitative/qual reasoned persp	itative data pective.	; and cr	ritic	ally evaluate
PO 9	Critical sensibili	ty to lived experiences, with	self a	aware	enes	s and reflexivit	y of both s	elf and	soc	iety.
PO 10	Capability to use variety of relevan	e ICT in a variety of learni nt information sources; and	ng sit use ap	tuatic pprop	ons,d oriate	lemonstrate ab e software for a	ility to acc analysis of	cess, va data.	luat	e, and use a
PO 11	Ability to work through to comp	Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.								
PO 12	Possess knowled	ge of the values and beliefs	of mu	ultiple	e cul	tures and a glo	bal perspe	ctive et	c.,	
PO 13	Ability to embra ethical issue from	nce moral/ethical values in multiple perspectives, and	condu use e	ucting ethica	g on l pra	es life, formulactices in all w	late a Posi ork etc.,	tion/arg	gum	ent about an
PO 14	Capability for m inspiring vision,	happing out the tasks of a t building a team who can he	team lp ach	or an nieve	org	anization, and	I setting di	irection,	, fo	rmulating an
PO 15	Ability to acquir in learning activi	e knowledge and skills, incl ties throughout life, through	uding 1 self-	g learn -paceo	ning 1 etc	how to learn,	that are nee	cessary	for	participating

COs	COURSE OUTCOME
CO 1	Students known the systems of Indian medicines
CO 2	Students able to understand the drugs.
CO 3	Students enhanced their knowledge towards preparation of drugs.
CO 4	Students learn the importance of medicinal plants.
CO 5	Students know to analyse the drug and its quality.
Pre-requisites	

					J	Know	ledge	Level	S						
1.Remen	nberi	ng, 2.	Under	rstand	ling, 3	3.App	lying,	4.An	alyzin	g, 5.E	valuat	ing, 6.	Synth	esizinį	5
		(3/2	/1 indic	ates the	C e streng	O/PC	/ KL I	Mappin on. 3-si	ng trong, 2	-mediu	m. 1-we	eak)			
COs	5	(0) _		]	KLs	,		,	PO	8		)	K	Ĺs	
CO	1				2				РО	1			2	2	
	-				-				PO	2			1		
COZ	2				2				PO	3			5	i	
CO	3				3				PO -	4 7			5	5	
CO	4				4				PO : PO :	5			4	-	
	+				4				PO	7			2	, )	
CO	5		4				PO 8				4				
PSO	s		KLs					PO 9				1			
							PO 10				3				
PSO	1		3						PO 1	1			3	;	
PSO	2		1						PO 1	2			2	2	
150	2		4					PO 13				1			
PSO	3		1					PO 14 PO 15				6			
						<b>CO</b> /	PO Ma	pping	101	.5				,	
		(3/2	/1 indic	ates the	e streng	gth of c	orrelati	on, 3-s	trong, 2	-mediu	m, 1-we	eak)			
COs						Р	ROGR	AMME (PO	OUTC	OME					
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
CO3	2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
CO4	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
CO5	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2

	CO / PSO Mapping							
	(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)							
COs	Programme Specific Outcome (POs)							
COS	CO1	CO2	CO3	CO4	CO5			
PSO1	2	2	3	2	2			
PSO2	1	1	2	3	3			
PSO3	2	2	1	1	1			

Course Assessment Methods
Direct
1. Continuous Assessment Test I, II & Model
2. Assignment
3. End Semester Examinations
Indirect
1 Course End Delivery

1. Course End Delivery

	Content of the Syllabus						
	Introduction to Pharmacognosy	Periods	6				
Unit - I	History, Definition and scope of pharmacognosy; Systems of Indian Medi	icines - Siddha, U	nani, Ayurveda,				
	Homeopathy; Terminologies.						
Unit - II	Classification of drugs	Periods	6				
	Classification of Crude drugs - Taxonomical, Morphological, Pharmacological	gical and chemica	al classifications;				
	Chemistry of drugs and its evaluation.						
	Preparation and Application of Drugs	Periods	6				
Unit - III	Preparation of crude and commercial drugs. Making infusion, decoction, lotion, washers, insect repellents,						
	suppositories, tincture, making herbal syrups, compresses, poultice, plaste	ers, oinments, hert	oal oils and				
	herbal salves. Surgical fibres, sutures and dressing.						
	Plants as Drugs	Periods	6				
Unit - IV	Organoleptic study of the following medicinal plants: Fruit - Amla, Bulb	- Garlic, Rhizome	- Ginger, seed -				
	castor, Bark - Cinchona, Leaves - Neem, Flower - Clove.						
	Analytical Studies	Periods	6				
Unit - V	Analytical Pharmacognosy - drug adultration and detection. Biological test	sting of herbal dru	ıg.				
	Phytochemical investigations with reference to secondary metabolites of I	locally available n	nedicinal plants.				
	Total Periods		30				

Text Books	
1	S.Lakshmi, Pharmaceutical Chemistry, S.Chand & Sons ,New Delhi,2004.
2	V.K.Ahluwalia and Madhu Chopra, Medicinal Chemistry ,Ane Books,New Delhi,Reprint 2009.
3	Industrial chemistry by B.N.Chakrabarty, Oxford and IBH publishing Co, NewDelhi, 1981.
4	Industrial chemistry by B.K.Sharma, Goel Publishing House, Meerut.
References	
1	Pharmacognosy, S.B.Gokhale, Dr.C.K. Kokate, A.P. Purohit, Publisher: Nirali Prakasham, Pune, 2002
2	Herbs that Heal, Acharya Vipul Rao – Diamond Pocket Books, New Delhi, 2005
3	Practical Pharmacognosy. Dr.C.K. Kokate et al. 2003
4	An Introduction to Medicinal Botany and Pharmacognosy – N.C. Kumar, Emkay Publications, New
	Delhi, 2004.
<b>E-References</b>	
1	https://www.docsity.com/en/classification-of-crude-drugs/2147112/
2	https://link.springer.com/content/pdf/10.1007%2F978-3-319-63862-1.pdf



EMPOWER.								
Programme	B.Sc	Programme Code		U	СН	Regula	tions	2018-2019
Department		Chemistry	Semester					3
			Period	ls	Credit	Maxim	um Mar	ks
Course Code	C	Course Name	per We	ek				
			L T	Р	С	CA	ESE	E Total
18U3CHN03	v	Vater Quality Analysis	3 0	0	2	25	75	100
COURSE OBJECTIVES	1.To study the ch 2.To learn the im 3.To analyse the	naracteristics of water aportance of water purificat quality measurement about	ion water					
POs		PRO	OGRAMM	E OU	TCOME			
PO 1	Capable of demo	onstrating comprehensive undergraduate programme	knowledge of study.	and	understandin	g of one o	or more	disciplines that
PO 2	Ability to expre appropriate medi	ss thoughts and ideas effe a; confidently share ones v	ectively in iews and e	writ xpres	ingand orally; ss herself/hims	Commun elf etc.,	icate wi	ith others using
PO 3	Capability to ap claims, beliefs or	ply analytic thought to a n the basis of empirical evic	body of k lence; iden	nowl tify 1	edge;analyse relevant assum	and evalua ptions or i	ate evid mplicati	ence,arguments, ons etc.,
PO 4	Capacity to extra non-familiar prob life situations.	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply ones learning to real life situations.						ifferent kinds of learning to real
PO 5	Ability to evaluarguments of oth	ate the reliability and re ers; analyse and synthesis c	levance of lata from a	f evi vari	dence;identify ety of sources;	logical f draw vali	laws ar d conclu	nd holes in the usions etc.,
PO 6	A sense of inqui and articulating; etc.,	A sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesizing and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses etc.,						
PO 7	Ability to work a on the part of a efficiently as a m	effectively and respectfully group, and act together as a nember of a team.	with diver group or	rse te a tea	eams; facilitate m in the intere	e cooperati	ive or co ommon	oordinated effort cause and work
PO 8	Ability to analys ideas, evidence a	e, interpret and draw concl and experiences from an ope	usions fror en-minded	n qua and 1	antitative/qual reasoned persp	itative data ective.	a; and cr	ritically evaluate
PO 9	Critical sensibilit	ty to lived experiences, with	n self awar	eness	s and reflexivit	y of both s	self and	society.
PO 10	Capability to use variety of relevan	e ICT in a variety of learn nt information sources; and	ing situation use approp	ons,d oriate	emonstrate ab e software for a	ility to aconalysis of	cess, va data.	luate, and use a
PO 11	Ability to work through to comp	independently, identify app letion.	propriate re	sour	ces required fo	or a projec	et, and m	nanage a project
PO 12	Possess knowled	ge of the values and beliefs	of multipl	e cul	tures and a glo	bal perspe	ective etc	с.,
PO 13	Ability to embra ethical issue from	ace moral/ethical values in multiple perspectives, and	conductin l use ethica	g on 11 pra	es life, formulactices in all w	late a Posi	ition/arg	ument about an
PO 14	Capability for m inspiring vision,	happing out the tasks of a building a team who can he	team or an	n org the v	anization, and vision, motivat	l setting d ing etc.,	irection,	, formulating an
PO 15	Ability to acquir in learning activi	e knowledge and skills, inc ties throughout life, throug	luding lear h self-pace	ning d etc	how to learn,	that are ne	cessary	for participating

COs	COURSE OUTCOME
CO 1	Students knew the various sources of water.
CO 2	Students able to understand the importance of various water quality parameters.
CO 3	Students able to determine the hardness of water.
CO 4	Students knowledge on sources, analysis and control methods of industrial waste water .
CO 5	Students learn how to treat polluted water.
Pre-requisites	

				ł	Know]	Knowledge Levels								
1.Remembering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing														
				С	0 / PO	) / KL I	Марріі	ıg						
	(3/2/	1 indic	ates the	e streng	th of co	orrelatio	on, 3-st	rong, 2	-mediu	m, 1-we	ak)			
;			]	KLs				POs	5			KI	Ls	
				2				PO	1			2	2	
								PO	2			1		
2				2				PO	3			5		
2				5				PO	4			5	í	
,				5				PO :	5			4		
ł				3				PO	5			6	j	
5				4				PO	/			2		
								PO	8			4	4	
8			]	KLs				PO 1	9 0			1		
1		3				PO 11				2				
						PO 11 PO 12					3	; ,		
2			4				PO 13				1			
							PO 15 PO 14				6			
3				1				PO 1	5			3	, ;	
					<b>CO</b> /]	PO Ma	pping							
	(3/2/	1 indic	ates the	e streng	th of co	orrelatio	on, 3-st	rong, 2	-mediu	m, 1-we	ak)			
					Р	ROGR	AMME (PO)	OUTC	OME					
PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
3	2	1	1	1	1	1	1	2	2	2	3	2	1	2
1	1	3	3	2	2	1	2	1	1	1	1	1	2	1
2	1	1	1	2	1	2	2	1	3	3	2	1	1	3
1	1	2	2	3	1	1	3	1	2	2	1	1	1	2
	PO1 3 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 1 2 1 1 1 2 1 1 1 1 2 1	bering, 2.1         (3/2) <td>abering, 2.Under         (3/2/1 indic         (3/2/1 indic</td> <td>abering, 2.Understand         (3/2/1 indicates the         (3/2/1 indicates the         1     <!--</td--><td>bering, 2.Understanding, 3         C         (3/2/1 indicates the streng         KLs         2       2         2       2         2       2         3       4         5       3         4       5         5       3         4       5         5       3         6       KLs         1       3         2       4         3       1         3       1         1       3       2         PO1       PO2       PO3       PO4       PO5         3       2       1       1       1         1       1       3       2       3         PO1       PO2       PO3       PO4       PO5         3       2       1       1       1         1       1       3       2       3         2       1       1       1       2       3</td><td>CO / PO         CO / PO         (3/2/1 indicates the strength of colspan="2"&gt;CO / PO         (3/2/1 indicates the strength of colspan="2"&gt;CO / PO         2         CO / PO         Strength of colspan="2"&gt;CO / PO         CO / PO         Strength of colspan="2"&gt;CO / PO         CO / PO         PO1       PO2       PO3       PO4       PO5       PO6         3       2         PO1       PO2       PO3       PO4       PO5       PO6         3       2       2         PO1       PO2       PO3       PO4       PO5       PO6         3       2        2       <t< td=""><td>Abbering, 2.Understanding, 3.Applying,         CO / PO / KL N         (3/2/1 indicates the strength of correlation         KLs       2         2       2         2       2         3       4         4       3         5       4         6       KLs         1       3         2       4         3       4         5       4         6       KLs         1       3         2       4         3       1         2       4         3       1         1       3       2         1       3       2       1         1       1       1       1         3       2       1       1       1         3       2       1       1       1       1         1       1       3       2       1       1       1         3       2       1       1       1       1       1         1       1       3       2       1       1       1         1       1</td><td>Abering, 2.Understanding, 3.Applying, 4.Ana         CO / PO / KL Mappin         (3/2/1 indicates the strength of correlation, 3-st         KLs         2         2         2         2         3         5         State         3         4         3         4         3         CO / PO         a         CO / PO Mapping         3         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-st         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-st         PROGRAMME         (3/2       1       1     <!--</td--><td>Detring, 2.Understanding, 3.Applying, 4.Analyzin         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2         KLs       PO         2       PO         2       PO         2       PO         2       PO         2       PO         2       PO         3       PO         3       PO         4       PO         5       PO         3       PO         4       PO         5       PO         4       PO         5       PO         6       KLs       PO         9       PO       PO         4       PO       PO         5       PO       PO         6       KLs       PO         9       PO       PO         1       3       PO         2       4       PO         6       PO       PO         1       1       PO         3       1       PO         3       2       PO         3       2</td></td></t<><td>Theoring, 2.Understanding, 3.Applying, 4.Analyzing, 5.E         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3         PO 1         2       PO 3         A       PO 3         PO 4         PO 4         PO 4         PO 6         PO 7         4       PO 9         PO 10         3       PO 11         PO 10         A       PO 10         PO 10         A       PO 11         PO 10         PO 10</td><td>Abering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluat         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         <math>3/2/1</math> indicates the strength of correlation, 3-strong, 2-medium, 1-we         <math>2</math>       PO s         2       PO 1         2       PO 3         3       PO 4         5       PO 4         5       PO 6         3       PO 6         4       PO 7         4       PO 8         90 1       PO 10         1       3         2       4         PO 10       PO 10         1       3         1       3         1       3         1       3         1       1         2       4         PO 10         1       3         1       1         2       4         PO 13         9       PO 14         9       PO 15         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of P</td><td>CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         KLs       POs         2       PO 1         2       PO 2         2       PO 3         3       PO 4         90       PO 3         90       PO 4         90       PO 3         90       PO 4         90       PO 5         3       PO 6         90       PO 7         4       PO 8         90       PO 10         1       3         90       PO 11         90       PO 12         90       PO 13         90       PO 14         90       PO 15         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         PROGRAMME OUTCOME         (PO1         PO1         3       2       1       1       1</td><td>Define a strong source of the strength of correlation, 3-strong, 2-medium, 1-weak)         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         KLs       POs       KI         2       PO 1       2         2       PO 2       1         2       PO 3       5         3       PO 4       5         90 4       5       90 4         3       PO 6       6         4       PO 7       2         4       PO 7       2         90 10       3       3         90 10       3       3         1       3       PO 10       3         1       3       PO 11       3         1       3       PO 12       2         2       4       PO 13       1         3       1       PO 14       6         90 11       3       1       1       3         1       1       1       1       2       2       3         1       3       1       1       2       2       3       2         1       3       <t< td=""><td>Abering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         KLs       PO 1       2         PO 1       2         PO 2       1         2       PO 3       5         PO 4       5         PO 4       5         PO 4       5         PO 6       6         KLs       PO 9       1         PO 1       2         KLs       PO 9       1         PO 1       2         KLs       PO 9       1         PO 10       3         PO 11       3         PO 11       3         PO 10       1         PO 10       3         CO / PO Mapping         (3/2/1 indicates the strength</td></t<></td></td></td>	abering, 2.Under         (3/2/1 indic         (3/2/1 indic	abering, 2.Understand         (3/2/1 indicates the         (3/2/1 indicates the         1 </td <td>bering, 2.Understanding, 3         C         (3/2/1 indicates the streng         KLs         2       2         2       2         2       2         3       4         5       3         4       5         5       3         4       5         5       3         6       KLs         1       3         2       4         3       1         3       1         1       3       2         PO1       PO2       PO3       PO4       PO5         3       2       1       1       1         1       1       3       2       3         PO1       PO2       PO3       PO4       PO5         3       2       1       1       1         1       1       3       2       3         2       1       1       1       2       3</td> <td>CO / PO         CO / PO         (3/2/1 indicates the strength of colspan="2"&gt;CO / PO         (3/2/1 indicates the strength of colspan="2"&gt;CO / PO         2         CO / PO         Strength of colspan="2"&gt;CO / PO         CO / PO         Strength of colspan="2"&gt;CO / PO         CO / PO         PO1       PO2       PO3       PO4       PO5       PO6         3       2         PO1       PO2       PO3       PO4       PO5       PO6         3       2       2         PO1       PO2       PO3       PO4       PO5       PO6         3       2        2       <t< td=""><td>Abbering, 2.Understanding, 3.Applying,         CO / PO / KL N         (3/2/1 indicates the strength of correlation         KLs       2         2       2         2       2         3       4         4       3         5       4         6       KLs         1       3         2       4         3       4         5       4         6       KLs         1       3         2       4         3       1         2       4         3       1         1       3       2         1       3       2       1         1       1       1       1         3       2       1       1       1         3       2       1       1       1       1         1       1       3       2       1       1       1         3       2       1       1       1       1       1         1       1       3       2       1       1       1         1       1</td><td>Abering, 2.Understanding, 3.Applying, 4.Ana         CO / PO / KL Mappin         (3/2/1 indicates the strength of correlation, 3-st         KLs         2         2         2         2         3         5         State         3         4         3         4         3         CO / PO         a         CO / PO Mapping         3         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-st         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-st         PROGRAMME         (3/2       1       1     <!--</td--><td>Detring, 2.Understanding, 3.Applying, 4.Analyzin         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2         KLs       PO         2       PO         2       PO         2       PO         2       PO         2       PO         2       PO         3       PO         3       PO         4       PO         5       PO         3       PO         4       PO         5       PO         4       PO         5       PO         6       KLs       PO         9       PO       PO         4       PO       PO         5       PO       PO         6       KLs       PO         9       PO       PO         1       3       PO         2       4       PO         6       PO       PO         1       1       PO         3       1       PO         3       2       PO         3       2</td></td></t<><td>Theoring, 2.Understanding, 3.Applying, 4.Analyzing, 5.E         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3         PO 1         2       PO 3         A       PO 3         PO 4         PO 4         PO 4         PO 6         PO 7         4       PO 9         PO 10         3       PO 11         PO 10         A       PO 10         PO 10         A       PO 11         PO 10         PO 10</td><td>Abering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluat         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         <math>3/2/1</math> indicates the strength of correlation, 3-strong, 2-medium, 1-we         <math>2</math>       PO s         2       PO 1         2       PO 3         3       PO 4         5       PO 4         5       PO 6         3       PO 6         4       PO 7         4       PO 8         90 1       PO 10         1       3         2       4         PO 10       PO 10         1       3         1       3         1       3         1       3         1       1         2       4         PO 10         1       3         1       1         2       4         PO 13         9       PO 14         9       PO 15         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of P</td><td>CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         KLs       POs         2       PO 1         2       PO 2         2       PO 3         3       PO 4         90       PO 3         90       PO 4         90       PO 3         90       PO 4         90       PO 5         3       PO 6         90       PO 7         4       PO 8         90       PO 10         1       3         90       PO 11         90       PO 12         90       PO 13         90       PO 14         90       PO 15         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         PROGRAMME OUTCOME         (PO1         PO1         3       2       1       1       1</td><td>Define a strong source of the strength of correlation, 3-strong, 2-medium, 1-weak)         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         KLs       POs       KI         2       PO 1       2         2       PO 2       1         2       PO 3       5         3       PO 4       5         90 4       5       90 4         3       PO 6       6         4       PO 7       2         4       PO 7       2         90 10       3       3         90 10       3       3         1       3       PO 10       3         1       3       PO 11       3         1       3       PO 12       2         2       4       PO 13       1         3       1       PO 14       6         90 11       3       1       1       3         1       1       1       1       2       2       3         1       3       1       1       2       2       3       2         1       3       <t< td=""><td>Abering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         KLs       PO 1       2         PO 1       2         PO 2       1         2       PO 3       5         PO 4       5         PO 4       5         PO 4       5         PO 6       6         KLs       PO 9       1         PO 1       2         KLs       PO 9       1         PO 1       2         KLs       PO 9       1         PO 10       3         PO 11       3         PO 11       3         PO 10       1         PO 10       3         CO / PO Mapping         (3/2/1 indicates the strength</td></t<></td></td>	bering, 2.Understanding, 3         C         (3/2/1 indicates the streng         KLs         2       2         2       2         2       2         3       4         5       3         4       5         5       3         4       5         5       3         6       KLs         1       3         2       4         3       1         3       1         1       3       2         PO1       PO2       PO3       PO4       PO5         3       2       1       1       1         1       1       3       2       3         PO1       PO2       PO3       PO4       PO5         3       2       1       1       1         1       1       3       2       3         2       1       1       1       2       3	CO / PO         CO / PO         (3/2/1 indicates the strength of colspan="2">CO / PO         (3/2/1 indicates the strength of colspan="2">CO / PO         2         CO / PO         Strength of colspan="2">CO / PO         CO / PO         Strength of colspan="2">CO / PO         CO / PO         PO1       PO2       PO3       PO4       PO5       PO6         3       2         PO1       PO2       PO3       PO4       PO5       PO6         3       2       2         PO1       PO2       PO3       PO4       PO5       PO6         3       2        2 <t< td=""><td>Abbering, 2.Understanding, 3.Applying,         CO / PO / KL N         (3/2/1 indicates the strength of correlation         KLs       2         2       2         2       2         3       4         4       3         5       4         6       KLs         1       3         2       4         3       4         5       4         6       KLs         1       3         2       4         3       1         2       4         3       1         1       3       2         1       3       2       1         1       1       1       1         3       2       1       1       1         3       2       1       1       1       1         1       1       3       2       1       1       1         3       2       1       1       1       1       1         1       1       3       2       1       1       1         1       1</td><td>Abering, 2.Understanding, 3.Applying, 4.Ana         CO / PO / KL Mappin         (3/2/1 indicates the strength of correlation, 3-st         KLs         2         2         2         2         3         5         State         3         4         3         4         3         CO / PO         a         CO / PO Mapping         3         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-st         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-st         PROGRAMME         (3/2       1       1     <!--</td--><td>Detring, 2.Understanding, 3.Applying, 4.Analyzin         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2         KLs       PO         2       PO         2       PO         2       PO         2       PO         2       PO         2       PO         3       PO         3       PO         4       PO         5       PO         3       PO         4       PO         5       PO         4       PO         5       PO         6       KLs       PO         9       PO       PO         4       PO       PO         5       PO       PO         6       KLs       PO         9       PO       PO         1       3       PO         2       4       PO         6       PO       PO         1       1       PO         3       1       PO         3       2       PO         3       2</td></td></t<> <td>Theoring, 2.Understanding, 3.Applying, 4.Analyzing, 5.E         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3         PO 1         2       PO 3         A       PO 3         PO 4         PO 4         PO 4         PO 6         PO 7         4       PO 9         PO 10         3       PO 11         PO 10         A       PO 10         PO 10         A       PO 11         PO 10         PO 10</td> <td>Abering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluat         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         <math>3/2/1</math> indicates the strength of correlation, 3-strong, 2-medium, 1-we         <math>2</math>       PO s         2       PO 1         2       PO 3         3       PO 4         5       PO 4         5       PO 6         3       PO 6         4       PO 7         4       PO 8         90 1       PO 10         1       3         2       4         PO 10       PO 10         1       3         1       3         1       3         1       3         1       1         2       4         PO 10         1       3         1       1         2       4         PO 13         9       PO 14         9       PO 15         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of P</td> <td>CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         KLs       POs         2       PO 1         2       PO 2         2       PO 3         3       PO 4         90       PO 3         90       PO 4         90       PO 3         90       PO 4         90       PO 5         3       PO 6         90       PO 7         4       PO 8         90       PO 10         1       3         90       PO 11         90       PO 12         90       PO 13         90       PO 14         90       PO 15         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         PROGRAMME OUTCOME         (PO1         PO1         3       2       1       1       1</td> <td>Define a strong source of the strength of correlation, 3-strong, 2-medium, 1-weak)         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         KLs       POs       KI         2       PO 1       2         2       PO 2       1         2       PO 3       5         3       PO 4       5         90 4       5       90 4         3       PO 6       6         4       PO 7       2         4       PO 7       2         90 10       3       3         90 10       3       3         1       3       PO 10       3         1       3       PO 11       3         1       3       PO 12       2         2       4       PO 13       1         3       1       PO 14       6         90 11       3       1       1       3         1       1       1       1       2       2       3         1       3       1       1       2       2       3       2         1       3       <t< td=""><td>Abering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         KLs       PO 1       2         PO 1       2         PO 2       1         2       PO 3       5         PO 4       5         PO 4       5         PO 4       5         PO 6       6         KLs       PO 9       1         PO 1       2         KLs       PO 9       1         PO 1       2         KLs       PO 9       1         PO 10       3         PO 11       3         PO 11       3         PO 10       1         PO 10       3         CO / PO Mapping         (3/2/1 indicates the strength</td></t<></td>	Abbering, 2.Understanding, 3.Applying,         CO / PO / KL N         (3/2/1 indicates the strength of correlation         KLs       2         2       2         2       2         3       4         4       3         5       4         6       KLs         1       3         2       4         3       4         5       4         6       KLs         1       3         2       4         3       1         2       4         3       1         1       3       2         1       3       2       1         1       1       1       1         3       2       1       1       1         3       2       1       1       1       1         1       1       3       2       1       1       1         3       2       1       1       1       1       1         1       1       3       2       1       1       1         1       1	Abering, 2.Understanding, 3.Applying, 4.Ana         CO / PO / KL Mappin         (3/2/1 indicates the strength of correlation, 3-st         KLs         2         2         2         2         3         5         State         3         4         3         4         3         CO / PO         a         CO / PO Mapping         3         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-st         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-st         PROGRAMME         (3/2       1       1 </td <td>Detring, 2.Understanding, 3.Applying, 4.Analyzin         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2         KLs       PO         2       PO         2       PO         2       PO         2       PO         2       PO         2       PO         3       PO         3       PO         4       PO         5       PO         3       PO         4       PO         5       PO         4       PO         5       PO         6       KLs       PO         9       PO       PO         4       PO       PO         5       PO       PO         6       KLs       PO         9       PO       PO         1       3       PO         2       4       PO         6       PO       PO         1       1       PO         3       1       PO         3       2       PO         3       2</td>	Detring, 2.Understanding, 3.Applying, 4.Analyzin         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2         KLs       PO         2       PO         2       PO         2       PO         2       PO         2       PO         2       PO         3       PO         3       PO         4       PO         5       PO         3       PO         4       PO         5       PO         4       PO         5       PO         6       KLs       PO         9       PO       PO         4       PO       PO         5       PO       PO         6       KLs       PO         9       PO       PO         1       3       PO         2       4       PO         6       PO       PO         1       1       PO         3       1       PO         3       2       PO         3       2	Theoring, 2.Understanding, 3.Applying, 4.Analyzing, 5.E         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-mediation, 3-strong, 2-mediation, 3         PO 1         2       PO 3         A       PO 3         PO 4         PO 4         PO 4         PO 6         PO 7         4       PO 9         PO 10         3       PO 11         PO 10         A       PO 10         PO 10         A       PO 11         PO 10         PO 10	Abering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluat         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we $3/2/1$ indicates the strength of correlation, 3-strong, 2-medium, 1-we $2$ PO s         2       PO 1         2       PO 3         3       PO 4         5       PO 4         5       PO 6         3       PO 6         4       PO 7         4       PO 8         90 1       PO 10         1       3         2       4         PO 10       PO 10         1       3         1       3         1       3         1       3         1       1         2       4         PO 10         1       3         1       1         2       4         PO 13         9       PO 14         9       PO 15         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-we         (3/2/1 indicates the strength of P	CO / PO / KL Mapping (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         KLs       POs         2       PO 1         2       PO 2         2       PO 3         3       PO 4         90       PO 3         90       PO 4         90       PO 3         90       PO 4         90       PO 5         3       PO 6         90       PO 7         4       PO 8         90       PO 10         1       3         90       PO 11         90       PO 12         90       PO 13         90       PO 14         90       PO 15         CO / PO Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         PROGRAMME OUTCOME         (PO1         PO1         3       2       1       1       1	Define a strong source of the strength of correlation, 3-strong, 2-medium, 1-weak)         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         KLs       POs       KI         2       PO 1       2         2       PO 2       1         2       PO 3       5         3       PO 4       5         90 4       5       90 4         3       PO 6       6         4       PO 7       2         4       PO 7       2         90 10       3       3         90 10       3       3         1       3       PO 10       3         1       3       PO 11       3         1       3       PO 12       2         2       4       PO 13       1         3       1       PO 14       6         90 11       3       1       1       3         1       1       1       1       2       2       3         1       3       1       1       2       2       3       2         1       3 <t< td=""><td>Abering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         KLs       PO 1       2         PO 1       2         PO 2       1         2       PO 3       5         PO 4       5         PO 4       5         PO 4       5         PO 6       6         KLs       PO 9       1         PO 1       2         KLs       PO 9       1         PO 1       2         KLs       PO 9       1         PO 10       3         PO 11       3         PO 11       3         PO 10       1         PO 10       3         CO / PO Mapping         (3/2/1 indicates the strength</td></t<>	Abering, 2.Understanding, 3.Applying, 4.Analyzing, 5.Evaluating, 6.Synthesizing         CO / PO / KL Mapping         (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)         KLs       PO 1       2         PO 1       2         PO 2       1         2       PO 3       5         PO 4       5         PO 4       5         PO 4       5         PO 6       6         KLs       PO 9       1         PO 1       2         KLs       PO 9       1         PO 1       2         KLs       PO 9       1         PO 10       3         PO 11       3         PO 11       3         PO 10       1         PO 10       3         CO / PO Mapping         (3/2/1 indicates the strength

CO / PSO Mapping								
	(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)							
COs		Program	nme Specific Outcom	e (POs)				
COS	CO1	CO2	CO3	CO4	CO5			
PSO1	2	2	1	3	2			
PSO2	1	1	2	2	3			
PSO3	2	2	1	1	1			

# Course Assessment Methods

#### Direct

1. Continuous Assessment Test I, II & Model

2. Assignment

3. End Semester Examinations

#### Indirect

## 1. Course End Delivery

	Content of the Syllabus							
	Introduction to Hydrology	Periods	6					
Unit - I	- I World water resource; water resources of India- Different ecosysytem of hydrology- River							
	Characteristics of Water	Periods	6					
Unit - II	Water quality parameters and their interaction-physical and chemical characteristics- colour, odour, taste, turbidity, temperature-chemical constituents- electrical conductivity - suspended solids - dissolved solids - acidity - total acidity - alkalinity - pH - free CO2 - dissolved O2 - free chlorine - chlorine demand.							
	Water Treatment	Periods	6					
Unit - III	<b>hit - III</b> Water comPosition analysis - Hardness of water- Type of Hardness-Determination of hardness b method, Removal of hardness-Zeolite process, demineralization and Reverse osmosis - Salinity comPosition - Minerals-pollutants- BOD, COD- Water quality standard - ISI, EPA, WHO.							
	Industrial Water Pollution, Its Control & Analysis	Periods	6					
Unit - IV	Sources of water pollution - domestic - industrial - agricultural - soil an pollution. Water pollutants and their effects. Heavy metal pollution-public Chromium - Copper - Lead - Zinc - Manganese. Prevention and control it	d radioactive was c health significan s measures.	stes as sources of ace of Cadmium -					
	Industrial Waste Water Treatment	Periods	6					
Unit - V Aerobic treatment; Suspended growth aerobic treatment processes; Activated sludge process and modifications; Attached growth aerobic processes; Tricking filters and Rotating biological contacted Anaerobic treatment; suspended growth, attached growth, fluidized bed and sludge blanket systems;								
			20					
	Total Periods		30					

Text Books	
1	B. K. Sharma, Industrial Chemistry; 8th Ed., Goel Publishing House, New Delhi, 1997.
2	B.K. Sharma and H. Kaur, "Environmental chemistry", Goel Publishing House, Meerut, 2008
3	Industrial chemistry by B.N.Chakrabarty, Oxford and IBH publishing Co, NewDelhi, 1981.
4	Industrial chemistry by B.K.Sharma, Goel Publishing House, Meerut.
References	
1	Chemical Process Industries Norrish Shreve, R. and Joseph A. Brink Jr. McGraw Hill, Industrial Book Company, London.
2	Production and Properties of Industrial Chemicals "Brain A.C.S. Reinhold" NewYork.
3	Outlines of Chemical Technology "For the 21st Century M. Gopala Rao & Matshall Sittig (3rd Edition)
4	College Industrial chemistry by P.P.Singhn, T.M.Joseph, R.G.Dhanvale, Himalaya Publishing house, Bombay 4th edition, 1983.
5	Applied chemistry by Jayashree Ghosh, S.Chand Publication Reprint 2013
E-References	
1	https://www.cdc.gov/healthywater/drinking/public/water_treatment.html
2	https://www.hunterwater.com.au

HOLEN ENDOREMENT	VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS) Elayampalayam, Tiruchengode-637 205.						ISO 90012008	
Programme	B.Sc Programme Code UCH Regulations						2018-2019	
Department		Chemistry			Semester			4
			Per	riods	Credit	Maxim	um Marl	<b>K</b> S
Course Code		ourse Name	per L	Week T P	С	СА	ESE	Total
18U4CHN04	FOOD	2	25	75	100			
COURSE OBJECTIVES	<ol> <li>To provide energy for doing works.</li> <li>To protect the human beings from infections and deficiency disorders.</li> <li>To increase knowledge on food and nutrition security concepts at the national and sub-national levels.</li> </ol>							
POs		PRO	GRAM	IME OU	TCOME			
PO 1	Capable of demotion form a part of an	onstrating comprehensive k undergraduate programme o	nowled of study	dge and y.	understanding	g of one o	or more	disciplines that
PO 2	Ability to express thoughts and ideas effectively in writingand orally; Communicate with others using appropriate media; confidently share ones views and express herself/himself etc.,							
PO 3	Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications etc.,							
PO 4	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply ones learning to real life situations.							
PO 5	Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyse and synthesis data from a variety of sources; draw valid conclusions etc.,							
PO 6	A sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesizing and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses etc.,							
PO 7	Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.							
PO 8	Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.							
PO 9	Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.							
PO 10	Capability to use ICT in a variety of learning situations, demonstrate ability to access, valuate, and use a variety of relevant information sources; and use appropriate software for analysis of data.							
PO 11	Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.							
PO 12	Possess knowledge of the values and beliefs of multiple cultures and a global perspective etc.,							
PO 13	Ability to embrace moral/ethical values in conducting ones life, formulate a Position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work etc.,							
PO 14	Capability for m inspiring vision,	Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating etc.,						
PO 15	Ability to acquire knowledge and skills, including learning how to learn, that are necessary for participating in learning activities throughout life, through self-paced etc.,							

COs	COURSE OUTCOME
CO 1	Students will gain knowledge in describing general nutritional components emphasizing regulation of
	dietary carbohydrates, fat, and protein metabolism and their impact on nutritional status and health.
CO 2	Students will evaluate others aspects of food quality.
CO 3	Students can impact of food preservation, processing, packaging and distribution on food quality.
CO 4	Students produce a variety of food products applying principles of food handling and preparation
CO 5	Students can give an overview of the main classes of compounds influencing color and flavor of food and
	have knowledge on important sources of vitamins and minerals in food
Pre-requisites	

					J	Know	ledge	Level	s							
1.Remer	nberi	ng, 2.	Under	rstand	ling, 3	B.App	lying,	4.Ana	alyzin	g, 5.Ev	valuat	ing, 6.	Synth	esizing	5	
					С	O / PO	) / KL I	Mappin	ng							
		(3/2	/1 indic	ates the	e streng	gth of c	orrelati	on, 3-st	rong, 2	-mediu	m, 1-we	eak)		_		
CO	8			]	KLs			POs					KLs			
CO	1		4				PO 1					2				
CO	n		2					PO	2		1					
CO	2						PO 3				5					
00	3		6					PO 4	4			5	í			
	5						PO 5				4					
CO	4				5				PO	6		6				
CO	5		4				PO 7					2				
							PO 8					4				
PSOs		KLs				PO 9				1						
PSO 1							PO 10				3					
		3				PO 11					3					
			4				PO 12					2				
PSO 2							PO 13				1					
DCO 2			1				PO 14				6					
PSO 3			1					PO 15				3				
						<b>CO</b> / 1	PO Ma	pping								
(3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)																
COs				Р	ROGR	AMME PO?	OUTC s)	OME								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	
CO1	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2	
CO2	3	2	1	1	1	1	1	1	2	2	2	3	2	1	2	
CO3	1	1	2	2	1	3	1	1	1	1	1	1	1	3	1	
CO4	1	1	3	3	2	2	1	2	1	1	1	1	1	2	1	
CO5	1	1	2	2	3	1	1	3	1	2	2	1	1	1	2	

<b>CO / PSO Mapping</b> (3/2/1 indicates the strength of correlation, 3-strong, 2-medium, 1-weak)										
COr	Programme Specific Outcome (POs)									
COs	CO1	CO2	CO3	CO4	CO5					
PSO1	2	2	1	1	2					
PSO2	3	1	1	2	3					
PSO3	1	2	1	1	1					

Course Assessment Methods			
Direct			
1. Continuous Assessment Test I, II & Model			
2. Assignment			
3. End Semester Examinations			
Indirect			
1. Course End Delivery			

Content of the Syllabus									
	Food Sources         Periods								
Unit - I	Introduction-types-sources-nutrients of foods: carbohydrate, protein, fats, oils - functions of food.								
TL	Food Poisoning and Adulteration	Periods	6 hours						
0mt - 11	Food poisoning: Sources, causes and remedy- Food adulteration: Types, common adulteration in food.								
	Food Preservation and Processing	Periods	6 hours						
Unit - III	Importance of food preservation- principles of food preservation -Food spoilage, causes of food spoilage -								
	types of Food spoilage - preservation and processing by heating: sterilisation, pasterusation.								
Unit IV	Vitamins	Periods	6 hours						
	Definition-types-functions, Sources, deficiency diseases of A, C, K, E and B1,B12,B6.								
Unit - V	Minerals	Periods	6 hours						
	Mineral elements in food - source and daily requirements of ca, Na, K, Mg, Fe and P.								
	Total Periods		30 hours						

Text Books	
1	Sumati R.Mudambi, M.V.Rajagopal, Fundamentals of Foods and nutrition, Fourth edition 2003, New
	Age International Publishers, New Delhi .
2	. M.Swaminathan, Handbook of Food and Nutrition, The Bangalore printing and publishing Co.,Ltd,
	Bangalore.
References	
1	N.Shaguntala Manay, M.shadaksharaswamy, Foods Facts and Principles, second edition, New Age
	International Publishers, New Delhi .
2	B.Srilakshmi, Food Science, Second edition, New Age International Publishers, New Delhi.
3	Dr.Kusum Gupta, Dr.L.C.Gupta, Abhishek Gupta, Food and Nutrition, Fourth edition, Jaypee Brothers
	medical publishers, New Delhi.
<b>E-References</b>	
1	https://Foodandnutrition.net
2	https://www.edx.org