ACADEMIC CURRICULA

UNDERGRADUATE DEGREE PROGRAMME

Bachelor of Science

(B.Sc. Chemistry)

Three Years

Learning Outcomes Based Curriculum Framework(LOCF)

Academic Year

2020 - 2021



SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

(Deemed to be University u/s 3 of UGC Act, 1956)

Kattankulathur- 603203, Chengalpattu District, Tamil Nadu, India

TABLE OF CONTENT

DEPARTMENT VISION STATEMENT	IV
DEPARTMENT MISSION STATEMENT	IV
PROGRAM EDUCATION OBJECTIVES (PEO)	IV
PROGRAM SPECIFIC OUTCOMES (PSO)	IV
CONSISTENCY OF PEO'S WITH MISSION OF THE DEPARTMENT	IV
CONSISTENCY OF PEO'S WITH PROGRAM LEARNING OUTCOMES (PLO)	V
PROGRAMME STRUCTURE	v
IMPLEMENTATION PLAN	VI
PROGRAM ARTICULATION MATRIX	VIII
STRUCTURE OF UG COURSES IN CHEMISTRY	IX

SEMESTER I

ULT20G01J	TAMIL-I	1
ULH20G01J	HINDI-I	4
ULF20G01J	FRENCH - I	7
ULE20AE1T	ENGLISH	9
UCY20101J	INORGANIC CHEMISTRY - I: ATOMICSTRUCTURE AND CHEMICAL BONDING	13
UCY20102T	PHYSICAL CHEMISTRY- I: STATES OF MATTER AND IONIC EQUILIBRIUM	16
UMA20A01T	ALLIED MATHEMATICS - I	19
UCY20A01T	BIOCHEMISTRY-I	21
UCY20S01T	IT SKILLS FOR CHEMISTS	23
UCY20S02T	FUEL CHEMISTRY	25
UCD20S01L	SOFT SKILLS	27

SEMESTER II

ULT20G02J	TAMIL-II	29
ULH20G02J	HINDI-II	32
ULF20G02J	FRENCH - II	35
UCY20201J	ORGANIC CHEMISTRY - I: BASICCONCEPTS AND HYDROCARBONS	37
UCY20202T	INORGANIC CHEMISTRY - II: S- AND P-BLOCK ELEMENTS	41
UMA20A02T	ALLIED MATHEMATICS - II	44
UCY20A02T	BIOCHEMISTRY-II	47
UCD20S02L	QUANTITATIVE APTITUDE AND REASONING	49
UJK20201L	COMMUNICATION SKILLS	51
UNS20201L	NSS	54
UNC20201L	NCC	54
UNO20201L	NSO	54
UYG20201L	YOGA	54

SEMESTER III

UCY20301T	PHYSICAL CHEMISTRY - II: CHEMICAL THERMODYNAMICS AND ITS APPLICATIONS	55
UCY20302J	INORGANIC CHEMISTRY - III: COORDINATION CHEMISTRY	58
UPY20A01J	ALLIED PHYSICS	61
UJK20301T	UNIVERSAL HUMAN VALUES	64

SEMESTER IV

UCY20401J	ORGANIC CHEMISTRY - II: HALOGENATED COMPOUNDS AND OXYGEN CONTAINING	
	FUNCTIONAL GROUPS	67
UCY20402J	PHYSICAL CHEMISTRY - III: PHASE EQUILIBRIA AND ELECTROCHEMICAL CELLS	70
UCY20D01T	POLYMER CHEMISTRY	73
UCY20D02T	ANALYTICAL CHEMISTRY	76
UCY20D03T	INDUSTRIAL CHEMISTRY	80
UCY20D04T	MOLECULAR MODELLING AND DRUG DESIGN	83
UMI20S01L	MY INDIA PROJECT	86
UJK20401T	PROFESSIONAL SKILLS	87

SEMESTER V

UCY20501J	INORGANIC CHEMISTRY - IV: ORGANOMETALLIC AND BIOINORGANIC CHEMISTRY	90
UCY20502T	ORGANIC CHEMISTRY - III: NITROGEN CONTAINING FUNCTIONAL GROUP, POLYAROMATIC AND	
	HETEROCYCLIC CHEMISTRY	93
UCY20503J	PHYSICAL CHEMISTRY - IV: CONDUCTANCE AND CHEMICAL KINETICS	98
UCY20S03T	GREEN CHEMISTRY	101
UCY20S04T	PHARMACEUTICAL CHEMISTRY	104
UES20AE1T	ENVIRONMENTAL STUDIES	106
UJK20501T	LEADERSHIP AND MANAGEMENT SKILLS	109

SEMESTER VI

UCY20601T	ORGANIC CHEMISTRY- IV: BIOMOLECULES	111
UCY20D05J	INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS	115
UCY20D06J	INTRODUCTION TO NANO CHEMISTRY AND APPLICATIONS	119
UCY20D07L	PROJECT WORK	122
UCY20S05T	RESEARCH METHODOLOGY	123
UCY20S06T	CHEMISTRY IN EVERYDAY LIFE	125
UCY20A03J	ALLIED CHEMISTRY	127



1. D	1. Department Vision Statement		
Stmt - 1	To provide students with the fundamental concepts of chemical sciences.		
Stmt - 2	To impart the ability of problems solving, critical thinking and analytical reasoning.		
Stmt - 3	t - 3 To prepare the students to pursue higher studies, required to work independently in research or in other industrial environments and to develop sustainable innovative solutions for the nation.		

2. Dep	Department Mission Statement		
Stmt - 1	To provide a detailed knowledge of the terms, concepts, methodologies, principles and experimental techniques involved in various fields of chemistry.		
Stmt - 2	To identify and solve chemical problems and explore new areas of research.		
Stmt - 3	Implementing global standards and nurturing the students through innovation and quality education.		
Stmt - 4	Nurturing the Chemistry Professionals to effectively contribute to the society with integrity and commitment.		
Stmt - 5	Developing the student on the ethical side and making them an environment friendly chemist		

3. Pro	gram Education Objectives (PEO)		
PEO - 1	To provide the students an in-depth understanding of the basic concepts of chemical sciences.		
PEO - 2	To develop student skill in problems solving, critical thinking and analytical reasoning.		
PEO - 3	To pursue higher studies, research and analysis in various disciplines of chemistry.		
PEO - 4	To attain entrepreneurship andself-empowerment in the area of chemical sciences.		
PEO - 5	Provide a contemporary grounding in professional responsibility and ability to find solutions in a global, economic, environmental d societal context.		
4. Prog	gram Specific Outcomes (PSO)		
PSO - 1	To provide a detailed knowledge of the terms, concepts, methodologies, principles and experimental techniques involved in various fields of chemistry.		
PSO - 2	To identify and solve chemical problems and explore new areas of research.		
PSO - 3	To prepare the students with a working knowledge of experimental techniques and instrumentation required to work independently in research or in other industrial environments.		

5. Cor	Consistency of PEO's with Mission of the Department				
	Mission Stmt 1	Mission Stmt 2	Mission Stmt 3	Mission Stmt 4	Mission Stmt 5
PEO - 1	Н	М	Н	L	М
PEO - 2	Н	Н	Н	М	М
PEO - 3	Н	М	Н	Н	Н
PEO - 4	Н	L	Н	М	Н
PEO - 5	Н	М	Н	Н	Н

H – High Correlation, M – Me	edium Correlation, L – Low Correlation

6. Cor	nsistency	of PEO	's with P	rogram L	earning	Outcom	es (PLO)								
						Pro	gram Lea	rning Ou	tcomes (F	PLO)					
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
	Fund	Ap pli	ΞΫ́́	F 8.2	S≣ :	Ab ilit	SIIs SIIs	An al	ln Ve eti	Pr bb	U 0 8	An al	о т с т	с Ч	Lif e
PEO - 1	Н	Н	Н	Н	Н	Н	Н	Н	М	Н	Н	Н	Н	Н	Н
PEO - 2	Н	М	Н	Н	Н	Н	Н	Н	Н	Н	L	Н	Н	Н	Н
PEO - 3	Н	Н	Н	L	Н	Н	Н	Н	Н	Н	Н	М	Н	Н	Н
PEO - 4	Н	Н	Н	Н	Н	М	Н	Н	Н	Н	Н	Н	L	Н	Н
PEO - 5	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н

7. Programme Structure

, , , , , , , , , , , , , , , , , , ,											
	1. Professional Core Courses (C)						2. Discipline Specific Elective Courses (D)				
	(12 Courses)			,	1		(4 Courses)				
Course	Course		lOUI Noc	rs/ sk				Ŀ	lour	c/	
Code	Title	1	T	P	C	Course	Course	, i	Vee	k k	
Couc	Inorganic Chemistry - I:Atomic	-	1	'	Ŭ	Code	Title	L	Т	Ρ	С
UCY20101J	Structure and Chemical Bonding	4	0	4	6	UCY20D01T	Polymer Chemistry				
UCY20102T	Physical Chemistry - I:States of Matter and Ionic Equilibrium	5	1	0	6	UCY20D02T	Analytical Chemistry	5	1	0	6
UCY202011	Organic Chemistry - I:Basic					UCY20D03T	Industrial Chemistry				
007202010	Concepts and Hydrocarbons	4	0	4	6	UCY20D04T	Molecular Modeling and Drug Design	5	1	0	6
UCY20202T	Inorganic Chemistry - II: s- and p- Block Elements	5	1	0	6	UCY20D05J	Instrumental Methods of Chemical Analysis				
UCY20301T	Physical Chemistry - II:Chemical	5	1	0	6	UCY20D06J	Introduction to Nano Chemistry and Applications	4	0	4	6
	Applications	5	1	0	0	UCY20D07L	Project Work	0	0	12	6
UCY20302J	Inorganic Chemistry - III:						Total Learning Credits				24
	Coordination Chemistry	4	0	4	6						
UCY20401J	Organic Chemistry - II:Halogenated	1	0	1	6		3 Conoric Elective Courses (C)				
	Functional Groups	4	0	4	0		(5 Courses)				
UCY20402J	Physical Chemistry - Ill:Phase Equilibria and Electrochemical Cells	4	0	4	6	Course	Course	H	ours Vee	s/ k	
UCY20501J	Inorganic Chemistry - IV:			1	1	Code	Title	1	T	P	С
	Organometallic and Bioinorganic	4	0	4	6	ULT20G01J	Tamil-I	-			
UCV20502T	Organia Chamiata / III: Nitragan					ULH20G01J	Hindi-I	2	0	2	3
001203021	Containing Functional Group.	_		0	0	ULF20G01J	French -I				
	Polyaromatic and Heterocyclic	5	1	0	6	ULT20G02J	Tamil-II				
	Chemistry					ULH20G02J	Hindi-II	2	0	2	3
UCY20503J	Physical Chemistry - IV: Conductance and Chemical Kinetics	4	0	4	6	ULF20G02J	French -II				
UCY20601T	Organic Chemistry - IV:	_				UMA20A01T	Allied Mathematics- I	3	0	0	3
	Biomolecules	5	1	0	6	UCY20A01T	Biochemistry-I	Ŭ	Ű	Ű	Ű
	Total Learning Credits				72	UMA20A02T	Allied Mathematics - II	3	0	0	3
						UCY20A02T	Biochemistry - II	Ŭ	Ŭ	Ŭ	Ŭ
						UPY20A01J	Allied Physics	4	0	4	6
							Total Learning Credits				18

.

	4. Skill Enhancement Courses (S) (6 courses)						5. Ability Enhancement Courses (A)				
Course	Course	F	lour. Nee	s/ k			(2 Courses)				
Code	Title	L	T	P	С	Course	Course	H V	ours /eek	'	
UCY20S01T	IT Skills for Chemists	2	0	0	2	Code	Title	1	т	P	C
UCY20S02T	Fuel Chemistry	_	Ŭ	v	2		The	-	1		Ŭ
UCY20S03T	Green Chemistry	2	0	0	2	ULE20AE11	English	4	0	0	4
UCY20S04T	Pharmaceutical Chemistry	2	0	U	2	UES20AE1T	Environmental Studies	3	0	0	3
UCY20S05T	Research Methodology	,	0	0	2		Total Loarning Crodits		-		7
UCY20S06T	Chemistry in Everyday Life	2	0	0	2		Total Learning Credits				'
UMI20S01L	My India Project	0	0	0	1		7 Extension activity	•			
UCD20S01L	Soft Skills	0	0	2	1		(NS/NC/NO/YG)				
UCD20S02L	Quantitative Aptitude and Reasoning	0	0	2	1	•	(1 Course)				
	Total Learning Credits				9	Course	Course		Hour	s/	
	6. Life Skill Courses (Jeevan					Code	Title	L	T	P	С
	(4 Courson)					UNS20201L	NSS				
	(4 Courses)	L	lour	~/		UNC20201L	NCC				0
Course	Course		Nee	s/ k		UNO20201L	NSO	0	0	0	0
Code	Title	L	Т	Р	С	UYG20201L	YOGA				
UJK20201L	Communication Skills	0	0	4	2		Total Learning Credit	s			0
UJK20301T	Universal Human Values	2	0	0	2						
UJK20401T	Professional Skills	2	0	0	2						
UJK20501T	Leadership and Management skills	2	0	0	2						
	Total Learning Credits				8						

AS SRMIST STRONGLY ENCOURAGES THE USE OF SWAYAM (Study Web of Active Learning by Young and Aspiring Minds) PLATFORM, THE STUDENTS ARE ENCOURAGED TO CHOOSE ATLEAST ONE CORE/ ELECTIVE COURSE FROM SWAYAM ON THE RECOMMENDATION OF THE FACULTY ADVISOR AND THE CREDITS WILL BE TRANSFERRED

8. Implem	entation Plan												
	Semester – I						Semester – II						
Code	Course Title	۲ ۱	lour Vee	s/ k	С	Code	Course Title	H V	our Vee	s/ k	с		
		L	Т	Ρ	•			L	Т	Ρ			
ULT20G01J	Tamil-I					ULT20G02J	Tamil-II						
						ULH20G02J	Hindi-II	2	0	2	3		
ULH20G01J	Hindi-I	2	0	2	3	ULF20G02J	French - II						
ULF20G01J	French – I							UCY20201J	Organic Chemistry - I:Basic Concepts and Hydrocarbons	4	0	4	6
ULE20AE1T	English	4 (0	4	UCY20202T	Inorganic Chemistry -II's- and n-Block						
UCY20101J	4 0 4			6	001202021	Elements	5	1	0	6			
						UMA20A02T	Allied Mathematics-II	2	0	0	2		
UCY20102T	and Ionic Equilibrium	5	1	0	6	UCY20A02T	Biochemistry-II	5	U				
UMA20A01T	Allied Mathematics-I				0	UCD20S02L	Quantitative Aptitude and Reasoning	0	0	2	1		
UCY20A01T	Biochemistry-I	3	0	0	3	UJK20201L	Communication Skills	0	0	4	2		
UCY20S01T	IT Skills for Chemists					UNS20201L	NSS						
UCY20S02T		2	0	0	2	UNC20201L	NCC	0	0	0	0		
UCD205011	Soft Skills	0	0	2	1	UNO20201L	NSO		U				
000203012	Solt Skills	0	U	2	1	UYG20201L	YOGA						
	Total Learning Credits				25		Total Learning Credits				21		
	Total number of hours /week 29 Total number of hours /week 27												

	Somester III		•	•			Semester - IV					
	Semester – m	H	Hour	rs/		Code	Course Title	Ho We	urs/ ek	,	С	
Code	Course Title	١	Wee	ek	С			L	Т	Ρ		
Code		L	Т	Ρ		UCY20401J	Organic Chemistry - II:Halogenated Compounds and Oxygen Containing	4	0	4	6	
UCY20301T	Physical Chemistry - II:Chemical Thermodynamics and its Applications	5	1	0	6	UCY20402J	Functional Groups Physical Chemistry - III:Phase	4	0	4	6	
UCY20302J	Inorganic Chemistry - III:Coordination Chemistry	4	0	4	6		Polymer Chemistry	5	1	0	6	
UPY20A01J	Allied Physics	4	0	4	6	UCY20D03T	Industrial Chemistry	-		0	•	
111K20301T	I Iniversal Human Values	2	0	0	2	UCY20D04T	Molecular Modeling and Drug Design	5	1	0	6	
0011200011	Chiversai Human Values	2	U	0	2	UMI20S01L	My India Project	0	0	0	1	
	Total Learning Credits				20	UJK20401T	Professional skills	2	0	0	2	
	Total number of hours /week				24					27		
							lotal number of hours /week				30	
	Semester –V			-/								
Codo	Course Title	H		S/	<u> </u>							
Code	Course Tille	1	T	K D	C		Semester - VI					
UCY20501J	Inorganic Chemistry - IV: Organometallic and Bioinorganic Chemistry	4	0	4	6	Code	Course Title	H V L	lour Vee T	s/ k P	С	
UCY20502T	Organic Chemistry - III:Nitrogen					UCY20601T	Organic Chemistry - IV: Biomolecules	5	1	0	6	
	Containing Functional Group, Polyaromatic and Heterocyclic	5	1	0	6		Instrumental Methods of Chemical analysis Introduction to Nano Chemistry and					
UCY20503.1	Chemistry Physical Chemistry - IV: Conductance		_			001202000	Applications	4	0	4	6	
001200000	and Chemical Kinetics	4	0	4	6	UCY20D07L	Project Work	0	0	12	6	
UCY20S03T	Green Chemistry	•	_		•	UCY20S05T	Research Methodology	2	0	0	2	
UCY20S04T	Pharmaceutical Chemistry	2	0	0	2	UCY20S06T	UCY20S061 Chemistry in Everyday Life					
UES20AE1T	Environmental Studies	3	0	0	3		I otal Learning Credits				20	
UJK20501T	Leadership and Management skills	2	0	0	2	<u> </u>	I OTAL NUMBER OF NOURS /WEEK				28	
	Total Learning Credits 25											
	Total number of hours /week				29							

9. Program	Articulation Matrix	1														
						Prog	ramn	ne Lo	earni	ing C	Dutco	mes	\$			
Course Code	Course Name	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
UCY20101J	Inorganic Chemistry - I:Atomic Structure and Chemical Bonding	Н	Н	L	М	Н	н	М	М	М	М	L	Н	М	H	Н
UCY201021	Physical Chemistry - I:States of Matter and Ionic Equilibrium	Н	Н	L	M	Н	H	M	M	M	M	L	H	M	H	H
UCY20201J	Organic Chemistry - I:Basic Concepts and Hydrocarbons	н	н	L	Μ	н	н	Μ	Μ	Μ	Μ	L	Н	Μ	н	н
UCY203011	Physical Chemistry - II:Chemical Thermodynamics and its Applications	Н	Н	L	М	Н	Н	М	М	М	М	L	Н	М	Н	Н
UCY20202T	Inorganic Chemistry - II: s- and p-Block Elements	Н	Н	L	М	Н	Н	М	М	М	М	L	Н	М	Н	Н
UCY20401J	Organic Chemistry - II:Halogenated Compounds and Oxygen	н	н	L	М	н	н	М	М	М	М	L	н	М	н	н
UCY20302.1	Containing Functional Groups	Н	н	-	M	Н	Н	M	M	M	M	-	Н	M	н	н
UCY20502T	Organic Chemistry - III:Nitrogen Containing Functional Group,	н	н	1	м	н	н	м	м	м	м	1	н	м	н	н
UCY20402.1	Polyaromatic and Heterocyclic Chemistry Physical Chemistry - III:Phase Equilibria and Electrochemical			L								L				
	Cells	Н	Н	L	М	Н	Н	М	М	М	М	L	Н	М	Н	Н
001200010	Chemistry	Н	Н	L	М	Н	Н	М	М	М	М	L	Н	М	Н	Н
UCY20601T	Organic Chemistry - IV: Biomolecules	Н	Н	L	М	Н	Н	М	М	М	М	L	Н	М	Н	Н
UCY20503J	Physical Chemistry - IV: Conductance and Chemical Kinetics	Н	Н	L	М	Н	Н	М	М	М	М	L	Н	М	Н	Н
UCY20D01T	Polymer Chemistry	Н	Н	L	М	Н	Н	М	М	М	М	L	Н	М	H	Н
UCY20D02T	Analytical Chemistry	Н	H	L	M	H	Н ц	M	M	M	M	L	Н	M	Н	Н
UCY20D031	Molecular Modeling and Drug Design	п Н	п Н	L	M	п Н	п Н	M	M	M	M	L	п Н	M	п	п
UCV20D051	Instrumental Methods of Chemical Analysis	н	н	L H	Н	н	н	Н	Н	Н	Н	L	н	M	M	M
UCY20D061	Introduction to Nano Chemistry and Applications	н	н	1	M	н	н	M	M	M	M	L 	н	M	Н	Н
UCY20D07L	Project Work	M	Н	M	M	H	H	H	H	H	H	H	H	M	H	H
ULT20G01J	Tamil- I	Н	Н	Н	М	Н	Н	М	Н	Н	Н	Н	Н	М	Н	Н
ULH20G01J	Hindi-I	Н	Н	Н	М	Н	Н	М	Н	М	Н	Н	Н	Н	Н	Н
ULF20G01J	French – I	Н	Н	Н	Н	Н	Н	М	Н	Н	Н	Н	Н	Н	Н	Н
ULT20G02J	Tamil- II	Н	Н	Н	М	Н	Н	М	Н	Н	Н	Н	Н	М	Н	Н
ULH20G02J	Hindi-II	Н	Н	М	Н	Н	Н	Н	Н	М	Н	Н	Н	М	H	H
ULF20G02J	French – II	H	Н	M	H	H	H	H	H	M	H	H	H	M	H	H
UMA20A011	Allied Mathematics - I	Н	IVI	IVI M	IVI M	IVI	Н	L	H	Н	L	L	L	IVI		
	Alleu Mallellalics - II Piechomistry I	п	M	M	M	M		L		п		L		M		
	Biochemistry - II	н	M	M	M	M	н	L	н	Н		L		M		
UPY20A01.1	Allied Physics	н	M	M	M	M	н	1	н	н		1	Н	M	1	1
UCY20S01T	IT Skills for Chemists	H	Н	L	M	H	н	M	M	M	M	L	H	M	Н	H
UCY20S02T	Fuel Chemistry	H	H	L	M	H	Н	M	M	M	M	L	H	M	H	H
UCY20S03T	Green Chemistry	Н	Н	L	М	Н	Н	М	М	М	М	L	Н	М	Н	Н
UCY20S04T	Pharmaceutical Chemistry	Н	Η	L	М	Н	Н	М	М	М	М	L	Н	М	Н	Н
UCY20S05T	Research Methodology	Н	Н	L	М	Н	Н	М	М	М	М	L	Н	М	Н	Н
UCY20S06T	Chemistry in Everyday Life	Η	Η	L	М	Η	Н	М	М	М	М	L	Η	М	Н	Η
UMI20S01L	My India Project	М	М	Н	М	М	М	L	Н	М	Н	Н	М	М	Н	Н
UCD20S01L	Soft Skills	Н	L	Н	Н	L	М	L	L	L	L	Н	М	М	H	L
UCD20S02L	Quantitative Aptitude and Reasoning	H	L	Н	H	L	M	L	L	L	L	H	М	M	H	L
ULE2UAE1T	English	H	H	H	H	H	H	M	H	H	H	H	H	H	H	H
UESZUAETT	Environmental Studies	Н	L	Н	Н	L	IVI Ц		L		L	П	IVI L	IVI L	Н	
031203011		п ц	п ц	П	П	п ц	п Ц	п	п	П М	П Ц	п	п	п ц	п	п
11.1K20201L	Professional Skills	л Н	л I	H	л Н		M					н	M	M	Н	<u>п</u> Г
UJK20501T	l eadershin Skills	н	1	H	н	1	M	1	1	1		H	M	M	Н	1
	Program average	H	H	L	M	H	H	M	M	M	M	M	Н	М	H	Н

H - High Correlation, M - Medium Correlation, L - Low Correlation

Structure of UG Courses in Chemistry

Semester	Compulsory Core Courses (CC) each with 06 credit (Total no. of Papers 12)	Discipline Specific Elective(DSE) With 06 credit (Total no. of Papers 4)	Ability Enhancement Compulsory Courses (AECC) With 04 credit (Total no. of Papers 2)	Life skills (JeevanKaushal)	Skill Enhancement Course (SEC) With 02 credit - 4 papers With 0 credit - 2 papers (Total no. of Papers 6)	Generic Elective (GEC) With 06 credit (T + P) & 03 credit (T) (Total no. of Papers 5)	Extension activity	Total Credits
Sem I	CC-1 CC-2 (12)		AECC-1 (4)(<i>English)</i>		SEC-1(2) SEC-2 (1) (Soft skills)	GE-1 (Language- l) (3)GE-2 (Maths-I /Biochemistry- l) (3)		25
Sem II	CC-3 CC-4 (12)			JK- 1(2)(Communication skills)	SEC-3(1) (Quantitative aptitude and reasoning)	GE-3 (Language-II) (3) GE-4 (Maths- II/ Biochemistry- II)(3)	NCC/ NSO/ NSS YOGA (0)	21
Sem III	CC-5 CC-5 (12)	-		JK-2(2)(Universal human values)		GE-5 (Physics) (4+2)		20
Sem IV	CC-7 CC-8 (12)	DSE-1 (6)DSE- 2 (6)		JK- 3(2) (Leadership skills)	SEC-4(1) (My India project)			27
Sem V	CC-9 CC-10 CC-11 (18)		AECC-2 (3)(EVS)	JK – 4 (2) (Professional skills)	SEC-5(2)			25
Sem VI	CC-12 (6)	DSE- 3(6) DSE - 4(6)			SEC-6(2)			20
Total Credits	72	24	7	8	9	18	0	138

SEMESTER I

Course Code	ULT20G01	J Co N	ourse lame			Tai	mil-l		C	Course ategoi	э У	G				Gene	ric El	ective	e Cou	rse			_	L 2	T 0	P 2	C 3
Pre-req Cour	uisite ses <i>Nil</i>				Co-requisit Courses	e A	Vil			P	rogre Coui	essive rses	Ni	1													
Course Of	fering Departm	ent	Tamil				Data Bo	ok / Codes/Star	dards									Ni									
Course Le	arning Rationa	e (CLR):	The purp	ose of lear	ing this course	e is to:					_earn	ing	[Pro	gram	Lear	ning	Outco	omes	(PLO)			
CLR-1 :	To enable then	n to learn	the nuances	of modern	poetry in Tamil	1				1	2	3	Γ	1	2 3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To explore New changes in the	/ historici modern s	sm through tl society	he works of	art written in T	amil to	enlighten the s	students to under	stand the							0											
CLR-3 :	Inculcate Ways	of life, m	oralities and	ethical fact	ors as an esse	ntial pa	irt of learning T	amil literature		Ē	(%)	()		e	S			edge									
CLR-4:	Develop strate	gies of co	mprehension	of texts of	different origin					0	y (9	it (%		- GC	iepi		u n	- Me		ata		ills	s				
CLR-5:	Strengthen the	language	e of the stude	ents both in	oral and writter	<u> </u>				B	enc	nen		ð		2 S	zati	Т Т	5	E D	<u>s</u>	ş	Skil				
CLR-6 :	Express their s	entiments	s, emotions a	ind opinions	, reacting to in	iformat	ion, situations			king	oficie	ainr		돈 (ciali	ze	eli	stpre	Ski	ving	<u>o</u>	ills			
Course Le (CLO):	arning Outcom	es	At the end o	of this cours	se, learners wil	l be abl	le to:			Level of Thin	Expected Pro	Expected Att		Fundamenta	Application o	Procedural K	Skills in Spec	Ability to Utili	Skills in Mod	Analyze, Inte	Investigative	Problem Solv	Communicat	Analytical Sk	PSO -1	PSO -2	PSO-3
CLO-1 :	Extend and ex	oand thei	r savoir-faire	through the	acquisition of	skills to	cater the need	ds of the modern	era.	2	75	60		H	H F	- 1	Н	Н	М	Н	Н	-	Н	Н	Н	Н	Н
CLO-2 :	Enable the stu	lents to a	ppreciate the	eir mother to	ongue and to E	nhance	e their thinking of	capacity		2	80	70		Н	Η ·	H	-	-	Н	-	-	Н	Н	-	Н	Н	Н
CLO-3 :	Make them lea	n the ba	sic rules of La	anguage an	d make them c	ommu	nicate better			2	70	65		H	H F	I M	-	-	Н	-	-	Н	Н	-	Н	Н	Н
CLO-4 :	Develop strate	gies of co	mprehension	of texts ba	sed on differen	t cultur	e and life style:	S		2	70	70	L	Н	- F	I H	Н	-	М	-	-	Н	Н	-	Н	Н	Н
CLO-5 :	Strengthen spo	ken and	written skills	of the stude	nt					2	80	70	Ļ		H ·	M	-	H	Н	-	-	Н	H	-	Н	Н	H
CLO-6 :	Will be able to	clear gov	/ernment exa	minations						2	75	70	L	H	4 F	H H	Н	H	Н	Н	Н	Н	Н	Н	Н	Н	Н

Du (I	iration hour)	12	12	12	12	12
S-1	SLO-1	தமிழ்இலக்கியப்போக்கு கள்	நவீனகவிதைதோற்றம்	தமிழரின்வீரமரபு	சிற்றிலக்கியத்தோற்றம்	மொழிவரலாறு
	SLO-2	இலக்கியநுட்பங்கள்	நவீனகவிதைவரலாறு	போர்விழுமியங்கள்	சிற்றிலக்கியவகைமை	மொழிப்பயிற்சி
6.2	SLO-1	தமிழ்க்கவிதைமரபு	நவீனகவிதைசெல்நெறிகள்	பரணிஅறிமுகம்	சிற்றிலக்கியங்கள்	தமிழும்அகராதியிய லும்
S-2	SLO-2	காலந்தோறும்கவிதைஉ ள்ளடக்கம்	செல்நெறிகளில்கோட்பாடு கள்	பரணிஇலக்கியங்கள்	முதன்மைச்சிற்றிலக்கியங்கள்	அகரவரிசைப்படுத்த ல்
6.2	SLO-1	கள் காலந்தோறும்கவிதைவ டிவம் – கவிதைமொழி	கலிங்கத்துப்பரணி (484)	புதுக்கவிதையும்இதழ்களும்	கலைச்சொல்அறிமு கம்	
3-3	SLO-2	தற்காலஇலக்கியம்	நவீனகவிமொழியின்நுட்பங் கள்	தலைவனின்வீரம்	மணிக்கொடிஇதழ்	கலைச்சொல்உருவா க்கநுட்பங்கள்

Du (h	ration our)	12	12	12	12	12
64	SLO-1	புதுக்கவிதைஉருவாக்க ம்	நவீனகவிஆளுமைகள்	தமிழ்இலக்கியமரபில் தாது	எழுத்துஇதழ்	தமிழில்கலைச்சொற் கள்
3-4	SLO-2	புதுக்கவிதைசெல்நெறிக ள்	நவீனகவிஆளுமைகளின்க வித்துவம்	தூதுஇலக்கியங்கள்	வானம்பாடிஇதழ்	நிலைபெற்றகலைச் சொற்கள்
6 F	SLO-1	பாரதியார் – காலத்தின்அடையாளம்	விளிம்புநிலைமனிதர்கள்	அழகர்கிள்ளைவிடுதூது (கண்ணிகள்)	சிறுகதைதோற்றம்	மரபுத்தொடர்
5-0	SLO-2	பாரதியார் - பன்முகஆளுமை	விளிம்புநிலைஇலக்கியம்	தூதுமரபில்கிளியும்பா ராட்டும்	சிறுகதைவளர்ச்சி	தமிழில்மரபுத்தொடர் கள்
	SLO-1	பாரதியார் - கண்ணன்என்சேவகன்	ராஜாசந்திரசேகரரின்கைவி டப்பட்டகுழந்தை	செய்யுள்மரபில்கலம்ப கம்	சிறுகதை – வரலாறு	நாட்டார்வழக்காறுக ள்
S-6	SLO-2	கண்ணன்என்சேவகன்க விதைசொல்லும்வாழ்வி யல்	புறக்கணிப்பும்வாழ்வியலு ம்	கலம்பகஇலக்கியங்கள்	சிறுகதைஆசிரியர்கள்	பழமொழிஅறிமுகம்
S-7	SLO-1	20 ஆம்நூற்றாண்டுக்கவி தைமரபில்பாரதிதாசன்	புலம்பெயர்தல்	நந்திக்கலம்பகம் (77)	புதினம்தோற்றம்	தமிழில்பழமொழிக ள்
	SLO-2	பாரதிதாசனும்தமிழும்	புலம்பெயர்வாழ்வியல்	மகள்மறுத்தலில்வீரம்	புதினம்வளர்ச்சி	பழமொழியும்பயன் பாடும்
S-8	SLO-1	பாரதிதாசன் – தமிழினிஇனிமை,	அனார் - மேலும்சிலஇரத்தக்குறிப்புக ள்	குறவஞ்சிஅறிமுகம்	புதினத்தின்வகைமை	தமிழ்இலக்கணநுட்ப ங்கள்
	SLO-2	தமிழின்பெருமையும்வள மையும்	உள்நாட்டுப்போர்ச்சூழலும் பெண்உளவியலும்	குறவஞ்சிஇலக்கியங்க ள்	புதினஆசிரியர்கள்	இலக்கணமும்பயன் பாடும்
50	SLO-1	வானம்பாடியில்அப்துல்ர குமான்	காலந்தோறும்பெண்	குற்றாலக்குறவஞ்சி (9)	அச்சுஊடகவரலாறு	தமிழில்சொல்வகை கள்
3-9	SLO-2	அப்துல்ரகுமான்கவிதை யின்தனித்தன்மைகள்	பெண்இலக்கியம்	மலையும்வாழ்வும்	அச்சுஊடகமும்தமிழும்	சொல்லும்பயன்பாடு ம்
	SLO-1	அப்துல்ரகுமான் - அவதாரம்	சுகிர்தராணியின்அம்மா	காப்பியஇலக்கணம்	அச்சுஊடகமும்உரைநடைவளர் ச்சியும்	பெயர்ச்சொற்கள்
S-10	SLO-2	அவதாரம் - நம்பிக்கையும்வெற்றியி ன்பாதைகளும்	பெண்மையும்தாய்மையும்	காப்பியவகைமைகள்	தமிழில்உரைநடை	பெயர்ச்சொற்கள்அ றிதல்
S 14	SLO-1	சுற்றுச்சூழலியல்	சமத்துவம்	தமிழில்பௌத்தஇலக்கி யங்கள்	சுவடிகள்	வினைச்சொற்கள்
3-11	SLO-2	தமிழ்க்கவிதையில்சுற்று ச்சூழலியல்	பாலியல்சமத்துவம்	ഥങ്ങിഥേക്കരെ	சிவதருமோத்திரச்சுவடிபெற்ற வரலாறு	வினைச்சொற்கள்அ றிதல்

Dui (h	ation our)	12	12	12	12	12
S-12	SLO-1	நரசிம்மன் – மகனேஎன்னைமன்னித் துவிடு	நா. முத்துக்குமாரின்தூர்கவிதை	பெண்சாபமும்காயச ண்டிகையும்	புழங்குபொருள்பண்பாடும்தமி ழர்வாழ்வியலும்	தமிழில்பெயரடை, வினையடை
	SLO-2	நவீனவாழ்வும்சுற்றுச்சூ ழலியல்அறிதலும்	தூர்கவிதைமுன்வைக்கும் பெண்சமத்துவம்	பெண்வரலாற்றில்சாப ங்களின்கதைகள்	கூஜாவின்கோபம்	பெயரடை, வினையடைஅறிதல்

	1.	குறிஞ்சித்தேன், தொகுப்பும்பதிப்பும் - தமிழ்த்துறைஆசிரியர்கள், எஸ்.ஆர்.எம்.
		அறிவியல்மற்றும்தொழில்நுட்பக்கல்விநிறுவனம், காட்டாங்குளத்தூர், 603203, 2020
Learning	2.	வல்லிக்கண்ணன், புதுக்கவிதைதோற்றமும்வளர்ச்சியும், ஆழிபதிப்பகம், சென்னை, 2018
Resources	3.	கா. சிவத்தம்பி, தமிழில்சிறுகதைதோற்றமும்வளர்ச்சியும், என்.சி.பி.எச்., சென்னை, 2013
	4.	தமிழ்இணையக்கல்விக்கழகம் - http://www.tamilvu.org/
	5.	மதுரைதமிழ்இலக்கியமின்தொகுப்புத்திட்டம் -https://www.projectmadurai.org/

				Continuous	s Learning As	Final Examination (50% weightage)									
	Bloom'sLevel of Thinking	CLA –	1 (10%)	CLA – 2 (10%)		CLA –	3 (20%)	CLA –	4 (10%)#		tion (50 % weightage)				
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice				
Lovel 1	Remember	20%		20%		20%		20%		30%					
Lever	Understand	30 %		30 %		30 %		30 %		50 %	-				
Lovel 2	Apply	10%		50%		50%		50%		50%					
	Analyze	40 /0		50 %		50 %		50 /8		50 %	-				
Loval 3	Evaluate	30%		20%		20%		20%		20%					
Level J	Create	50 /8		2070		2070		2070		2076	-				
	Total 100 %				0 %	10	0 %	1	00 %	100 %					

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Expert from Higher Technical Institutions	Internal Experts
	1. Dr. RSrinivasan Associate Professor, Department of Tamil, Presidency College, Chennai,	1. B.Jaiganesh, Assistant Professor & Head, FSH, SRMIST
		2. T.R.Hebzibah Beulah Suganthi, Assistant Professor, FSH, SRMIST
		3.S.Saraswathy, Assistant Professor, FSH, SRMIST

Course Code	ULH20G01J	Course Name	Hir	ndi-l	Cou Categ	rse jory		G	G Generic Elective Course							L 2	T 0	P 2	С 3		
Pre-re	equisite Courses	Nil	Co-requisite Courses	Nil					P	rogre	ssive	Cour	ses	Ni	1						
Course Off	ering Department	HINDI	Dat	a Book / Codes/Standards										N	il						
Course Lea	Course Learning Rationale (CLR): The purpose of learning this course is to:									Learning Program Learning Outcomes (PLO)											
CLR-1 :	To be able to conve	rse well in t	he Hindi Language			l 2	3		12	3	4	5	6	78	9	10	11	12	13	14	15
CLR-1: To be able to converse well in the Hindi Language CLR-2: To read and write and clarity CLR-3: To be willing listeners and translators – where need be CLR-4: To acquire the values/thought contents of the writers and practice in it in life. CLR-5: To find motivation through the various forms of literature and learn to overcome any challenges of life. CLR-6: To discover the importance of the language in making education as a means of growth in life and not mere literacy.						ever or miniming (broom) xpected Proficiency (%)	xpected Attainment (%)		unuamental knowledge toplication of Concepts	ink with Related Disciplines	Procedural Knowledge	skills in Specialization	whility to Utilize Knowledge	skills in Modeling	nvestigative Skills	roblem Solving Skills	Communication Skills	vnalytical Skills	sso -1	SO -2	SO-3
CLO-1 :	To appreciate the H	indi languad	ae in its various forms.			2 75	60		H	H	-	-	-		-	-	-	-	-	-	-
CLO-2 :	To understand the p	hilosophy c	of life and living through stories.			2 80	70		- H	-	Н	-	-		-	-	-	-	-	-	-
CLO-3 :	To help the students	learn and	develop the fundamentals of life, throug	gh One-Act plays.		2 70	65		H -	-	Н	-	-		-	-	-	-	-	-	-
CLO-4 :	CLO-4: To share the richness of thought and content presented in the Hindi language, into other languages so that the readers would stand to gain.						70		- 1	Н	Н	Н	-		-	-	Н	-	-	-	-
CLO-5 : To guide the students in the learning of the technical aspect of the Hindi language, this would help them in the field of administration.					e field	2 80	70		- H	-	Н	-	-		-	-	-	-	-	-	-
CLO-6 : To encourage the students to communicate with the public, on a large scale with the medium of Main stream and Documentary films.					and	2 75	70			-	-	-	-		-	-	-	-	-	-	-

Duratio	on (hour)	12	12	12	12	12
	SLO-1	Kahani kya Hai	Ekanki aur Natak kya hai	Patrkarita ka arambh	Film Samiksha	Takniki Shabdavali
S-1	SLO-2	Jivan ka anubhav	Vidhyarthiyon dono ke antar ko smajhkar apne dwara use prastut kar sakta hai	Vidhyarthiyon ka apne samaj ke prti jagrukta	Film ka prabhav ko smajhna	Vaignik tarike se bhashaon ka avishkaar karna
S-2	SLO-1	Kahani ke Tatva	EKANKI KA ARTH	Aazdi aur Patrkarita ka daiytava	SAMIKSHA KYA HAI	ARTH
	SLO-2	Vishleshan karne ki Kshmta	Vidhyarthi ke bhitar vishkleshan ki kshamta jagrit	Vidhyarthiyon ko patrkarita ka itihas smajkar samaj nirman ke liye sahyog dena	Tarkik vishleshan kshmta paida karta hai	Vidhyarthi uske arth dwara hi uske mahtav smjhenge
S-3	SLO-1	Vo Tera Ghar Ye Mera Ghar Parivar me Buzargon ke Mahtav ko Samjhana	PARIBHASHA	PATRKARITA KA MAHTAVA	SAMIKSHA KE PRAKAR	PARIBHASHA

Duration (hour)		12	12	12	12	12
	SLO-2	Bhartiya Sanskriti Se Vidhyarthiyon ko Jodna	Vidvano ke mat se parichay	Patrkarita se bhut se sawal ka smadhan ho jata hai	Vidhyarthiyon ka un prkaro ka adhyaan karna jisse vidhyarthi us samiksha ko tayaar kar payenge	Vibhinn vidwano dwara di gai paribhasha se us baat ko smjhenge vidhyathi
	SLO-1	MithaiwalaPyar Bantne se dukh kam hota hai	SWAROOP	PTRAKARITA KA ARTH	SAMIKSHA KA UDDESHYA	SHABDAVALI KI AVSHYAKTA
S-4	SLO-2	Manavata ka Path	Vidhyarthiyon me iski samajh se lekhan kshmata badegi	Vibhinn vidhvono ko padhne se vidhyarthiyon ki tarkik kshmta badhti hai ,	Vidhyarthi ke andar smaj ke prati Kartavya bodh paida hoga	Vaignikon ka awiskar kitna mahtavpurn
S-5	SLO-1	Bechadri PalChatro me Utsah Vardhan Karna	PATHYA VACHAN	PTRAKARITA KI PARIBHASHA	BHASHA VAIGYANIK	
3-3	SLO-2	Beta-beti ek saman ke mahtav ko smjhana.	Vidhyarthiyon ka path kaushal bdhega	K vidhvaono ki ukti ek smadhan bhi hota hai	Samajik uttar daiytav ko smjhana	Bhasha vaignikon ki jankari
8.6	SLO-1	Nadi aur JeevanParyavaran ke mahtav se awagat karana.	PRASTUTI	PRAMUKH SAMACHAR PATR	FILM KA VISHLESHAN	KARYALYIN SHABD
3-0	SLO-2	Manav Jeevan me nadi ki upyogita aur Mahtav.	Natak khelne par bahut si takniki bate samajhenge	Vidhyarthiyon ki jankari badhegi	Vidhyarthi tarkik vishleshan sikhega	Shabd kaise tayar kiye jate hain vidhyorthiyon ko jankari
67	SLO-1	Pachees chauka Ded SauJamindari Pratha se awagat karana	MAHTVA	TV.PATRKARITA	DRISTIKON NIRMAN	ANGREZI SE HINDI ANUVAD
S-7	SLO-2	Asprishya Vicharao ke Prati Sakaratamak Bnana.	Natak ka mahtav ko smajhkr samaj ke hito ke sath judna.	TV patrkar ke daiytav ko smajkar vidhyarthi ise apne rozgar se jod sakta hai	Vidhyarthi ka drishtikon nirmit hoga	Hindi adhikarai aur anuvadak ke pad ke liye tayaar karna
	SLO-1	Kahani ka Uddeshya	PRASHAN-ABHYAS	PHOTO PATRKARITA	DOCUMENTRY FILM	HINDI SE ANGREZI ANUVAD
S-8	SLO-2	Vidhyarthiyon ko Samaj se Jode rakhna	Vidhyarthiyon ka lekhan kshmata Badhna	Vidhyarthiyon me photo patrkarita ke mahtav ka smajh paida hona	Vidhyarthi samajik dharatal ki kathinai ko smajhkar desh se judega	Hindi adhikari aur anuvadak ke pad ke liye tayaar karna.
	SLO-1	Kahani Lekhan	UDDESHYA	PRASTUTIKARAN	MAIN STREAM FILM	EK DIN EK SHABD
S-9	SLO-2	Vidhyarthi Ko likhne ki aur Prerit karna	Vidhyarthi ko smaj upyog hito ki jankari dena	Vifhyarthi apni baat rakhne ki kshmta vikstit karta hai	Vidhyarthion ko jivan ke anchue pahluon se bhi sakshaktkar	Vidhyarthiyon ko rozgaar se jodna
	SLO-1	Seminar	PARICHARCHA	BHASHA-SHAILI	FILM KE DARSHAK	ATI MAHTVAPURN SHABD
S-10	SLO-2	Vidhyarthiyon dwara Prastuti karan	Vidhyarthi me vak-kaushal bdhana	Vidhyarthi ko apni report me bhasha-shaili ko sikh kar ek badhiya reporter ban sakta hai	Vidhyarthiyon ka samajik gyan	Shabdon ke mahtav ko smajhkar use yaad karna
S-11	SLO-1	Prashan Abhyas	BHASHA SHAILI	PATRKARITA KE NIYAM	FILM AUR BAZAAR	SAMANYA SHABD AUR PARIBHASHIK SHABDAVALI ME ANTAR
	SLO-2	Vidhyarthiyon me Lekhn Kaushal ki kshmata Viksit karna.	Vidhyarthiyon ko bhasha ka mahtav smjhna	Vidhyarthi ise sikh kar ek nyay priya patrkar ban sakta hai	Vidhyarthiyon ko rozgaar se jodna	Vidhyarthiyon ko vaighniko dwara tayaar ki gai bhasha ki samaj
	SLO-1	Path-Punravarti	EKANKI AUR RANGMANCH	PATRKAR KA DAIYTVA	FILM DARSHAK KA MAHTAVA	PARIBHASHIK SHABDAVALI KA MAHTAV
S-12	SLO-2	Pariksha ke liye Saksham	Vidhyarthi isse rangmanch ke mahtav ko smajhenge	Vidhyarthiyon ko patrkar ka daityva sikhkar smaj ke uttar daityva ko nibhana hai	Vidhyarthiyon ko darshak ki ruchiyon se awagat karvana	Rozgaar se vidhyarthiyon ko jodnaw

	The Prescribe Text Book Compiled and Edited by Department of Hindi
Learning Resources	www.gadyakosh.comwww.shabdkosh.com

Learning A	Learning Assessment														
	Dis analal avail of			Continuous	Learning As	sessment (50% weightag	e)		Final Examination //	50% weightene)				
	BIOOM SLEVEL OF	CLA – 1 (10%)		CLA – 2 (10%)		CLA -	CLA – 3 (20%)		4 (10%)#						
THINKING		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice				
Lovol 1	Remember	30%		30%		30%		30%		30%					
Level 1	Understand	50 %		50 /6		50 /6		5678		3078	-				
	Apply	10%		50%		50%		50%		50%	_				
Level Z	Analyze	40 /0		50 /0		50 /0		JU /0		5078	-				
Lovel 2	Evaluate	200/		200/		200/		200/		209/					
Level 3	Create	30%		20%		20%		20%		20%	-				
	Total	10	0 %	10	0 %	10	0 %	1	00 %	100 %	0				

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers										
Experts from Industry	Expert from Higher Technical Institutions	Internal Experts								
	1. Prof.(Dr.) S.Narayan Raju, Head, Department of Hindi,CUTN, Tamilnadu	1. Dr.S Preeti. Associate Professor & Head, SRMIST								
		2. Dr. Md.S. Islam Assistant Professor, SRMIST								
		3 Dr. S. Razia Begum, Assistant Professor, SRM IST								

Course Code	ULF20G01J	Course Name	Fr	rench-l	Co Cate	urse egory		G			Ge	neric	Elec	tive (Cours	se				L 2	T 0	P 2	C 3
Pre-requ Cours	uisite Ses <i>Nil</i>		Co-requisite Courses	Nil		Pro	ogres Cours	sive	Nil														
Course Off	ering Department	Fr	ench	Data Book / Codes/Standards			Nil																
Course Learning Rationale (CLR): The purpose of learning this course is to:								Learning Program Learning Outcomes (PLO)															
CLR-1 :	Extend and expand	their savoi	r-faire through the acquisition of curre	ent scenario		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Enable the students speaking French	to overcor	ne the fear of speaking a foreign lang	uage and take position as a foreigner							es			е									
CLR-3 :	Make them learn the	e basic rule	s of French Grammar.			Ē	(%	(%	ge	ts	iplin	_		ledg		~							
CLR-4 :	Develop strategies	of compreh	ension of texts of different origin			300	<u>ر</u>	ut (/led	ceb	lisc	dge	ion	NO		Date		kills	lls				
CLR-5 :	Strengthen the lang	uage of the	e students both in oral and written			g (F	ie.	me	Nou	l G	D D	wle	lizat	고	þ	ret [lls	g SI	ş				
CLR-6 :	Express their sentin	nents, emo	tions and opinions, reacting to inform	ation, situations		ki	ofic	tain	포	of	elate	Кро	Scial	lize	delir	erpi	Š	lvin	ltion	kills			
Course Lea (CLO):	arning Outcomes	At th	e end of this course, learners will be a	able to:		Level of Thi	Expected Pr	Expected At	Fundamenta	Application	Link with Re	Procedural	Skills in Spe	Ability to Uti	Skills in Mo	Analyze, Int	Investigative	Problem So	Communica	Analytical S	PSO -1	PSO -2	PSO-3
CLO-1 :	To acquire knowled	ge about F	rench language			2	75	60	Н	Н	Н	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	To strengthen the k	nowledge o	on concept, culture, civilization and tra	anslation of French		2	80	70	-	Н	-	Н	-	Н	-	-	-	-	М	-	-	-	-
CLO-3 :	0-3 : To develop content using the features in French language							75	Н	-	-	Н	-	Н	-	-	-	-	Μ	-	-	-	-
CLO-4 :	CLO-4 : To interpret the French language into other language							80	Н	-	Н	Н	Н	-	-	-	-	-	Н	-	-	-	-
CLO-5 : To improve the communication, intercultural elements in French language							80	70	-	Н	-	Н	-	-	-	-	-	-	Н	-	-	-	-
CLO-6 :									-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		12	12	12	12	12
6.4	SLO-1	Bonjour, ça va ?	Salut ! Je m'appelle Agnès	Qui est -ce ?	Dans mon sac, j'ai…	Il est comment ?
3-1	SLO-2	Salut	Paul, Valérie, Manish	Les exemples	Da ns ton sac	Les objectifs
	SLO-1	Les pays	Les pronoms personnels sujets	Les professions	La formation du féminin (3)	L'aspect physique
S-2	SLO-2	Les nationalités	Je, Tu, II/Elle Nous, vous, IIs/Elles	Les exemples	Les féminins	Le corps
6.2	SLO-1	Les animaux domestiques	Les verbes être et avoir	Quelques objets	La phrase interrogative	Le caractère
3-3	SLO-2	Les animaux	Les verbes auxiliaires	Objets	Les interrogatives	Les exemples
54	SLO-1	Les jours de la semaine	Les articles définis et indéfinis	La fiche d'identité	qu'est – ce que ?	Les prépositions de lieu (1)
3-4	SLO-2	Les mois de l'année	Les exemples	La carte d'identité	Les exemples	Dans, sur, sous etc,
S-5	SLO-1	Les nombres de 0 à 69	La formation du féminine (1)	La liaison	Qu'est – ce que C'est	Les nombre à partir de 70
	SLO-2	Les nombres	Les féminins	Les activités	Les objets	Les exemples

Durati	on (hour)	12	12	12	12	12
5.6	SLO-1	La famille (1)	La formation du pluriel (1)	L'élision	Qui est – ce ?	Allo ?
3-0	SLO-2	Ses parents	Les exemples	Les activités	Les personnes	Portable
87	SLO-1	L'accent	Les adjectifs possessifs	Intonation descendre	la phrase négative	La formation du féminin(3)
3-1	SLO-2	L'accent tonique	Les exemples	Les descendre	La négation	Les exemples
s SLO-1		Les articles définis	Entrer en contact : salut	Intonation montante	C'est	Les articles contractés
3-0	SLO-2	Les articles indéfinis	Entrer en contact : demander	Les montantes	ll est	Les articles partitifs
50	SLO-1	Bonjour, - Salut !	Dire comment ça va	Dans mon sac	Les verbes du premier group	Les pronoms personnels toniques
3-9	SLO-2	Ca va	Comment allez-vous ?	Des objets	Les exemples	Les pronoms
S 10	SLO-1	Je m'appelle Agnès	Se présenter	Les Mots	Les verbesaller	Les adverbes interrogatifs
3-10	SLO-2	Quel est votre nom	Présenter quelqu'un	Les expressions	Le verbe venir	Les interrogatifs
S 11	SLO-1	Les Mots	Demander	Demander poliment	Demander et répondre poliment	Les verbes du deuxième group
3-11	SLO-2	Les Expressions	Demander le temps	Répondre poliment	Les exemples	Les exemples
S-12	SLO-1	Entrer en contact	Demander la date	Demander des informations personnelles	Demander des informations personnelles	Décrire l'aspect physique
0-12	SLO-2	Se présenter.	Dire la date	Les exemples	Les activités	Décrire le caractère

Theory: "Génération-Al" Méthode de français, Marie-Noëlle COCTON, P.DAUDA, L.GIACHINO, C.BARACCO, Les éditions Didier, Paris, 2018. Cahier d'activités avec deux discs compacts.

Learning Assessment

1.

2.

Learning A													
	Pleam'el aval of			Continuous	Learning As	sessment (5	0% weightag	e)		Einal Exami	nation (50% weightage)		
	Thinking	CLA –	1 (10%)	CLA –	2 (10%)	CLA –	3 (20%)	CLA –	· 4 (10%)#		nation (50% weightage)		
	rninking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Lovel 1	Remember	200/		200/		200/		200/		20%			
Level I	Understand	30%		30%		20%		20%		30%	-		
Lovel 2	Apply	100/		50%		F0%		F0%		50%			
Level 2	Analyze	40 /0		50 %		50 %		50 %		50 %	-		
Lovel 3	Evaluate	200/		200/		200/		200/		20%			
Level 3	Create	30 %		20 /0		30 %		30 /0		2078	-		
	Total	10	0 %	10	0 %	10	0 %	1	00 %	100 %			

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Expert from Higher Technical Institutions	Internal Experts
	1. Dr. C. Thirumurugan Associate Professor, Department of French, Pondicherry University	1. Kumaravel K. Assistant Professor & Head, SRMIST
		2. Ponrajadurai M Assistant Professor, SRMIST

Cour Cod	ourse ULE20AE1T Course English						C	Cours ateg	se ory	A			Ab	lity E	nhan	ceme	nt Co	urse			L 4	T 0	P 0	C 4	
Pre- C	requisite ourses	Nil		C	o-requisite Courses	Nil			F	Progress Course	sive es	Nil													
Course	Offering	Department	English			Data Book /	Codes/Standard	S									Nil								
Course	Learning	g Rationale (C	LR): The purpo	se of learning t	this course is	to:				Learnin	g				l	Progr	am Le	earnir	ng Ou	tcom	es (Pl	_0)			
CLR-1	: Exten	d and expand t way of living	he integrity in an ir	dividual which	shall never a	llow him/her to compro	mise upon a	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2	Enable	e the students h a foreign lan	to overcome the fe guage.	ar of speaking	a foreign lang	guage and enable them	to think						s												
CLR-3	: Iviake	tnem commun	f comprehension of	Way of thinking	g in a better m	ture and life styles		Ê			e		line			dge									
CLR-4	· Strend	op silalegies o othen snoken a	nd written skills of	the student in F	In ailierent car English	itule allu ille styles		loo	V (%	t (%	edg	epts	scip	ge	ы	owle		ata		sli	s				
CLR-6	Help t	hem express the tized, cultured a	neir sentiments, en and humane manne	notions and opiner.	nions, and rea	actions to information a	ind situations in	ıking (B	oficienc	tainmen	al Knowl	of Conc	lated Di	Snowled	cializati	ize Kno	deling	erpret D	e Skills	ving Ski	tionSkill	kills			
								Thir	L P	Att	ente	on o	Re	ral F	Spe	Cŧi	Moc	Inte	ative	Sol	licat	l di	'		
Cours (CLO):	e Learnin	g Outcomes	At the end of this	course, learne	ers will be able	e to:		evel of	Expected	Expected	Fundam	Applicati	Link with	Procedu	Skills in	Ability to	Skills in	Analyze,	Investige	Problem	Commur	Analytica	PSO -1	PSO -2	PSO-3
CLO-1	: To ac	quire knowledg	e of becoming bet	er beings throu	igh the tools o	of Language and Litera	ture	2	75	60	H	Ĥ	H	-	-	Ĥ	-	Ĥ	-	H	H	Ĥ	-	-	-
CLO-2	: To ac	, quire a strong l	knowledge on cond	ept, culture, civ	/ilization throu	ugh English Literature		2	80	70	-	Н	-	Н	-	Н	-	Н	-	-	Н	Н	-	-	-
CLO-3	: To de	velop own con	tent and to be able	to translate usi	ing the feature	es in English Language)	2	70	65	Н	-	-	Н	-	Н	-	Н	-	-	Н	Н	-	-	-
CLO-4	: To inte	erpret the cont	ents in the texts pr	esented in Engl	lish Language)		2	70	70	Н	-	Н	Н	Н	Н	-	Н	-	-	Н	_	-	-	-
CLO-5	: To pre	esent an impro ture	ved and healthier o	ommunication	and intercultu	iral elements acquired t	through English	2	80	70	-	Н	-	Н	-	Н	-	Н	-	-	Н	-	-	-	-
CLO-6	: To pa	rticipate in any age and positiv	level of conversati re caliber in the cor	on and discuss itent of speech	ion presented	l in English with both pi	roficiency in the	2	75	70	Н	Н	-	Н	М	Н	М	Н	Н	Н	Н	Н	Н	Н	Н
Dui (h	ration our)		12		1:	2		12							12							12			
SLO-1 Introduction to the art of poetry writing will be done Post-colonial impacts in India as observed in their language and culture will be discussed. Story through the students					Story through in the students	mages	is exp	plained t	to i	The de monolo	finitio ogue i	n and is exp	purpo laineo	ose oi I	f		Homo be ex exam	ophon plaine ples c	es an ed in ti of usag	d Hom he cla: ge.	ionym ss alo	ns are ong wi	to th		
SLO-2 The rationale behind this unit will be discussed. The students will be encouraged to impart their views The students own stories their views					The students a own stories from	The students are asked to create their own stories from those images the sample monologues are to be provided to the learners How where and when the vocabulary can be used					these d is to	e as o be													

Duration (hour)		12	12	12	12	12
S-2	SLO-1	Feminism through Kamaladas' poem' In Kindergarten' is explained	Mathraboothan and the mother tongue influence in English – a discussion	Every day the students are made to bring their own cartoons to tell stories related to social issues and political issues.	The learners are made to create their own monologue contents.	Cross word puzzles are to be given to the students to make them understand the differences and usage of homophones and homonyms
	SLO-2	feminist critique's stand through poets like Meena Kandasamy is discussed	Students from different regions are asked to talk. The peculiarity in their pronunciation is to be identified by them	How to identify irony and sarcasm is taught	The contents are assessed and the lacuna is informed	The students are evaluated by making them use homophones and homonyms on their own
S-3	SLO-1	The writer Meena Kandasamy is invited to read her poems on women.	Enjoywithinlimits, says Mr Mathruboothamistaught and discussed	International Political memes to be created in the class	Discuss the contents created by the students and reiterate the idea that a monologue should mimic a story and has to have a proper beginning middle and an end.	How exactly to decide a proper word at a given situation is to be practically explained in the class.
	SLO-2	Questions on her perspectives are to be posed by the students	Everymistakefound in the textisanalysed	Memes on popular issues to be created in the class	The created monologues are to be assessed by the students themselves	Mundane situations are to be given to the students to check their ability to use those words
S-4	SLO-1	Gender inequality is discussed through A K Ramanujam and his poetry	The structure of sentence in English and the distorsion of the sentence isverified	Autobiography and biography differences are explained	To ask the students to bringnewspaper to class and makethem select a column and readitloudly.	To give all the parts of speech not according to the grammar book order but according to a method which would easily make one understand correlation of one with the other. For instance – Noun, Pronoun, Adjective, Verb, Adverb will have to be the order
	SLO-2	Different legal situations where both the genders suffer is explained in the class	Diffèrent sentences are given and tested	Certain Classic autobiographies and biographies are presented	No meaningis to beexplained. Just the flow is to bechecked.	The students are made to use as many adjectives as possible for describing their friends
S-5	SLO-1	Kalki the poetisinvited to conduct a guets lecture on herownpoem.	Nobel? What Nobel, asks MrMathrubootham is discussed	How to give voice to an inanimate object.	Another reading loud session of the same passages are to be conducted along with dictionary checking for meanings are to be done.	The parts of speech must beused in different sentences
	SLO-2	Questions on her perspectives are to be posed by the students	The attitudes of people in a ludicrous manner is discussed	Different objects are given to the students and they are asked to give autobiographical notes to them	The new meanings that the students get must be compared with the given word and the distance between the meanings are to be explained	the teacherought to use the board to draw a situation to make one understandeachpart's usage.
S-6	SLO-1	Seminar to generate discussion to enhance gender sensitivity is conducted	The Text is analyzed in detail	Practically test the students in class by giving them different concrete objects.	To make them compare and realize how they had overcome their fear for English	Along with parts of speech particularly when Verb is being taught Tenses ought to be taught with same methodology mentioned above.

Du (h	ration our)	12	12	12	12	12
i	SLO-2	Case studies are to be incorporated by the students in their seminar	More insights into Indian English is given	Ask the students to evaluate each other's autobiography on concrete objects	The comprehensive techniques are taught	The students are asked to create a lighter vein situation and asked to use all the tenses
S- 7	SLO-1	Human interest columns in news papers - tragedies on women men and transgender documented is read aloud and discussed in the class room.	Neutral accent is taught along with right pronunciation	Caption writing is taught	To develop the ability to pick up a conversation istaugh	The rules of Tenses are taught with live examples in the classes.
	SLO-2	. how much are the students able to relate with or able to feel emotionally for those situations is to be checked and analysed	Test is to be conducted to check how far a student is able to understand neutral accent	The purpose of the caption writing is to be instilled	to engage in conversations and be able to interupt and end conversation appropriatelywillIbetaught	Ability to use all the rules in tenses is taught.
S-8	SLO-1	Case studies to be given to the students to document their reactions	Mr Mathruboothamisfullysupporting all new technologies – discussion	Different examples for captions are given	Different situations to be given to the students to engage in a conversation.	The basic way to pick an error is by already knowing the rules of grammar thoroughly.
0-0	SLO-2	Find out if there is any student finding it hard to emote or is insensitive toward the moment	Humor and sarcasmisskimmedfrom the text	The studenst are asked to create captions similar to the ones shown in the class	The students are asked to find errors in each others' monologue	Hence all the rules are to be brushed up
S-9	SLO-1	Students are to made to createtheirownenactable content on the prevailinggenderinequalities	How to write a statement and question is to be taught with reference to the text.	The students are made to give captions different news articles, products and situations	To test how much one is able to use ironyhumor and sarcasm in one's conversation	Excercises on all sorts of possible errors are given to the students and asked to rectify.
	SLO-2	The students are asked to improvise on dialogue on theirown	The way sentences are constructed according to the regional impact is discussed	The best is appreciated for its qualities of being best	Natural usage of punisexplained	Mathrabootham's passages are given to the studentsagain to check the errors.
0.40	SLO-1	Feminism vs Gender inequality a test for the students to chart out the existing gulf	Pizza maavu : Welcome to Mr Mathruboothamfoodrecipiewebsiteisdiscussed	Public Speakingexamplessince Julius Caesar to Martin Luther isgiven	To teachdifferentkinds of reading skimming scanning and intensive reading extensive reading is taught	Definesynonym and antonym. Ask the sudents to identifysynonyms and antonyms in text.
5-10	SLO-2	False allegations and Legal situations sometimes created by women to corner men only degrades the freedom struggle of women – discuss	The students are made to explain the textthemselves	The techniques used by different leaders sinceagesisdiscussed	Teh students are practicallyasked to use thosemethodology to understand a text	Demonstartetheriunderstanding of synonyms and antonyms in active learning. Introduce thesaurus reference.
S-11	SLO-1	A detailed discussion on the 4 poets is done in the class through comparative method	Identify the errors and make students to rewrite first two texts	The Ted X talks are played in the class, different political leader's canvasing is presented	The students are made to read the passages loudly	Demeonstrateunderstanding of words by relatingthem to their opposites (antonyms)

Du (h	ration our)	12	12	12	12	12
	SLO-2	While comparison the students are able to get a deeper analytical way of thinking and are able to present an all encompassed points	Check if they are able to retain the humor in the text after correcting the sentences	What makes a talk impressive is identified and discussed	The students are asked questions from the passages to check their retention capacity	Demonstrateunderstanding of wordswithsimilar but not identicalmeanings (synonyms)
S-12	SLO-1	The comprehension and retention and application of all the acquired knowledge of the student is checked by initiating an informal discussion in the class.	Identify the errors and make the students to rewrite the last two texts	The students are givendifferent topics to give impromptu	The learner is made to select phrases and words from the given passages and is asked to use it in own sentences	With the studentsbrainstormshortlist of commonlyusedwords
	SLO-2	The overall development in the student's EQ pertaining to gender oriented issues will be sensible and objective.	Check if they are able to retain the humor in the text after correcting the sentences. Explain the result to them	The best talk isrecorded and made available for other'srefferences	The ability to converse with humor sarcasm or deep thoughts and with the capacity to emote the desired emotion in the other is checked	Askthem to rapidlygivesynonyms and antonyms to thosewords

1.

2.

Theory: Horizon- English Text Book – Compiled and Edited by the Faculty of English Department, FSH, SRMIST, 2020 English Gramar in Use by Raymond Murphy

Learning A	earning Assessment													
	Pleam's			Continuous	Learning As	sessment (5	50% weightag	e)		Final Examination (5	0% woightaga)			
	DIOUIII S	CLA –	1 (10%)	CLA –	CLA – 2 (10%)		3 (20%)	CLA –	4 (10%)#	Filiai Examination (J	0 % weightage)			
	Lever of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice			
Lovel 1	Remember	30%		30%		30%		30%		30%				
Level I	Understand	50 %	-	50 %	-	30 /0	-	50 /0	-	50%	-			
Lovel 2	Apply	200/		200/		200/		200/		20%				
	Analyze	50 %	-	50 %	-	30 /0	-	50 /0	-	50%	-			
Loval 3	Evaluate	10%		10%		10%		10%		40%				
Level 3	Create	40 /0	-	40 /0	-	40 /0	-	40 /0	-	40 %	-			
	Total 100 % 100 % 100 % 100 %													

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
	1. Prof. Daniel David, Prof & Head, Department of English, MCC, Chennai	1. Dr. Shanthichitra, Associate Professor, & Head, Department of English, FSH, SRMIST
		2. Dr K B Geetha, Assistant Professor, Department of English, FSH, SRMIST

Course Code	UC	(20101J	Course Name	Inorganic Chemistry-I: A	Atomic Struc	cture and Chemical Bonding		Course Category	se C Core o ory			cours	se		L 4	. T 0	Р 4	6	C			
Pre-requ Courses Course (isite Offering D	<i>Nil</i> epartment	Chemist	Co-requisite Courses	Nil	ata Book / Codes/Standards	Pr Co Ni	ogressive ourses	Nil													
Course L	earning	Rationale (C	CLR): The purp	cose of learning this course is to:			Lea	rning] P	rogra	m Lea	arning (Dutcoi	nes (I	PLO)							
CLR-1:	Exploit	the periodic	properties of e	lements for bulk property manipu	lation toward	ds scientific advancement	1	2 3	1	2	3	4 5	6	7	8	9	10 1	11	12	13	14	15
CLR-3 : CLR-4 : CLR-5 : CLR-6 :	CLR-2: Employ various theories towards the identification of structures and geometries of molecules CLR-3: Address concepts related to lattice energy CLR-4: Get knowledge on the metals, semiconductors and insulators and their conductivity behaviors CLR-5: Employ the fundamental concepts in different types of chemical bonds. CLR-6: Utilize the basic chemistry principles applied in various scientific problems and identify appropriate solutions						ing (Bloom)	iciency (%) inment (%)	Knowledge	Concepts	ted Disciplines	lowledge alization	e Knowledge	ling	pret Data	Skills	ng Skills	on Skills	S			
Course (CLO):	Learnii	ng Outco	omes At the en	d of this course, learners will be a	able to:		Level of Think	Expected Prof Expected Atta	Fundamental	Application of	Link with Rela	Procedural Kr Skills in Sneci	Ability to Utiliz	Skills in Mode	Analyze, Inter	Investigative S	Problem Solvi	Communicatic	Analytical Skil	PSO -1	PSO -2	PSO-3
CLO-1 :	Utilize t	he knowled	ge in quantum i	mechanics and periodic propertie	S		2	75 60	Н	Н	Н		-	-	-	-			-	Н	-	-
CLO-2:	Perceiv	e the import	ance of structur	res and geometries of molecules u	using Radius	Ratio Rules, VSEPRand MO theo	ry 2	80 70	-	Н	-	H -	-	-	-	-			-	H	-	-
CLO-3 :	Unders	tand the cor	ncept of lattice	energy using Born-Landé and Ka	pustinskii ex	pression	2	70 65	H	-	-	-	-	-	-	-	- -		-	H	-	-
CLO-4: rationalize the conductivity of metals, semiconductors and insulators based on the Band theory						2	10 10	Н	-	Н	<u>H</u> H	-	-	-	-	- -		-	H	M	-	
CLO-5:	unaersi	and the imp	onance and ap	plication of chemical bonds, wea	K Chemical I		2	80 70	-	н	-	H -	-	-	-	-			-	M	H	M
CLO-6 :	Utilize (concepts in (cnemistry for so	cientific advancement based on a	tomic and m	olecular level modification	Z	15 10	-	-	-		-	-	-	-			-	-	Н	-
Duration	(hour)		24	24		24					24							24	4			
	SLO-1	Introduction Structure	on to Atomic	Shapes of s and p orbitals	;	Electronegativity		Solvation	energy						I ₃ -	andBrF	2+	_				

Duratio	n (nour)	24	24	24	24	24
6.4	SLO-1	Introduction to Atomic Structure	Shapes of s and p orbitals	Electronegativity	Solvation energy.	I_3 -andBr F_2 +
3-1	SLO-2	Introduction to Atomic Structure	Shapes of d orbitals	Electronegativity	Solvation energy.	PCI6 ⁻
S_2	SLO-1	Recapitulation of Bohr's theory	Pauli's Exclusion Principle, Hund's rule of maximum multiplicity	Pauling's/ Allred Rochow's scales	Introduction to Covalent bond: Lewis structure	ICl ₄ .
0-2	SLO-2	limitations	Aufbau principle and its limitations	Pauling's/ Allred Rochow's scales	Valence Bond theory (Heitler-London approach)	SO4 ²⁻
6.2	SLO-1	atomic spectrum of hydrogen atom	Periodicity of Elements (with reference to s & p block and the trends shown)	Variation of electronegativity with bond order	Energetics of hybridization	Multiple bonding (s and π bond approach) and bond lengths.
3-3	SLO-2	atomic spectrum of hydrogen atom	Effective nuclear charge	Variation of electronegativity with bond order	equivalent and non-equivalent hybrid orbitals	Multiple bonding (s and π bond approach) and bond lengths.
64	SLO-1	Wave mechanics: de Broglie equation	shielding or screening effect	partial charge	Bent's rule	Covalent character in ionic compounds
3-4	SLO-2	Wave mechanics: de Broglie equation	shielding or screening effect	partial charge	Resonance and resonance energy	polarizing power and polarizability

Duratio	n (hour)	24	24	24	24	24
S-5	SLO-1	Lab Introduction	Acid-Base Titrations: Principles	Estimation of free alkali present in	Estimation of Fe(II) with K ₂ Cr ₂ O ₇ using internal	Experiment - Repeat – 2
toS-8	SLO-2		Estimation of sodium carbonate using standardized HCI	different soaps/detergents	indicator (diphenylamine, N-phenylanthranilic acid)	
S-0	SLO-1	Heisenberg's Uncertainty Principle	Slater rules	Hybridization	Introduction of Molecular orbitalTheory	Fajan's rules and consequences ofPolarization
0-3	SLO-2	significance	Slater rules	Hybridization	Introduction of Molecular orbitalTheory	Fajan's rules and consequences ofPolarization
S 40	SLO-1	Schrödinger's wave equation	Variation of effective nuclearcharge in periodic table	group electronegativity.	Molecular orbital diagrams of diatomic and simple polyatomic molecules	lonic character in covalent compounds
5-10	SLO-2	Schrödinger's wave equation	Variation of effective nuclearcharge in periodic table	group electronegativity.	N ₂ , O ₂ and their ions	Bond moment and dipole moment
C 11	SLO-1	Significance of ψ and $\psi^{\underline{a}.}$	Atomic and ionic radii	Introduction tolonic bond: General characteristics,	C ₂ and its ions	Percentage ionic character fromdipole moment and electronegativity difference.
3-11	SLO-2	Significance of ψ and ψ^{2}	Atomic and ionic radii	types of ions, size effects, radius ratio rule and its limitations	B ₂ and its ions	Percentage ionic character fromdipole moment and electronegativity difference.
6.40	SLO-1	Quantum numbers and	Ionization enthalpy	Packing of ions in crystals	F2and its ions	Introduction to Metallic Bond
5-12	SLO-2	their significance	Ionization enthalpy	Packing of ions in crystals	CO and its ions	Qualitative idea of valence bond and band theories.
S-13	SLO-1	Titrimetric Analysis: Calibration and use of	Estimation of carbonate and hydroxide present together in a mixture	Oxidation-Reduction Titrimetry : Principles Estimation of Fe(II) and	Estimation of Fe(II) with K ₂ Cr ₂ O ₇ using external indicator	Experiment - Repeat – 3
S-16	SLO-2	apparatus		oxalic acid using standardized KMnO4 solution		
6.47	SLO-1	Normalized and orthogonal wave functions	Successive ionization enthalpies	Born-Landé equation with derivation	NO and its ions	Semiconductors and insulators
5-17	SLO-2	Normalized and orthogonal wave functions	Successive ionization enthalpies	Born-Landé equation with derivation	HCI (idea of s-p mixing and orbital interaction to be given)	defects in solids.
C 10	SLO-1	Sign of wave functions	factors affecting ionization enthalpy	importance of Kapustinskii expression for lattice energy	Introduction to VSEPR Theory	Weak Chemical Forces: Van der Waals forces,
3-10	SLO-2	Sign of wave functions	factors affecting ionization enthalpy	importance of Kapustinskii expression for lattice energy	Introduction to VSEPR Theory	ion-dipole forces, dipole-dipole interactions
	SLO-1	Radial and angular wave functions forhydrogen atom	lonization enthalpy trends in groups and periods	Madelung constant	Shapes of the following simplemolecules and ions containing lone pairs and bond pairs of electrons:	induced dipole interaction
S-19	SLO-2	Radial and angular wave functions forhydrogen atom	lonization enthalpy trends in groups and periods	Madelung constant	H ₂ O, NH ₃ and PCI ₃	Hydrogen bonding (theories of hydrogen bonding, valence bond treatment)
6 20	SLO-1	Radial and angular distribution curves	Electron gain enthalpy and	Born-Haber cycle and	PCI ₅ , and SF ₆ ,	Effects of weak chemical forces, melting and boiling points,
3-20	SLO-2	Radial and angular distribution curves	Trends in groups and periods.	Application	CIF ₃	solubility, energetics of dissolution process
	SLO-1				Experiment - Repeat – 1	Demonstration Practical Session

Duration	n (hour)	24	24	24	24	24
S-		Preparation of solutions of	Estimation of carbonate and	Estimation of avalia axid and addium		
21toS-	SLO-2	titrants of different	bicarbonate present together in a	estimation of oxalic acid and sodium		
24		Molarity/Normality.	mixture.	oxalate in a given mixture.		

-		
	Theory:	Practicals:
	1. Lee, J.D., Concise Inorganic Chemistry, Fifth Edn., Wiley India.	1. Jeffery, G.H., Bassett, J., Mendham, J., Denney, R.C., Vogel's Textbook of Quantitative
	2. Huheey, J.E., Keiter, E.A., Keiter, R. L., Medhi, O.K., Inorganic Chemistry- Principles of	Chemical Analysis, 5th Edn., Longman Scientific & Technical, England, (John Wiley and
	Structure and Reactivity, Pearson Education 2009.	Sons Inc, 605 Third Avenue, NewYork NY 10158)
	3. Douglas, B.E., McDaniel, D.H., Alexander, J.J., Concepts and Models of Inorganic Chemistry,	
Learning	3rd Edn., John Wiley & Sons, Inc. 1993.	
Resource	4. P.W. Atkins, T.L. Overton, J.P. Rourke, M.T. Weller, and F.A. Armstrong, Shriver and Atkins'	
	Inorganic Chemistry, 5th Edn,©2010, W. H. Freeman and Company, 41 Madison Avenue, New	
	York, NY 10010 www.whfreeman.com.	
	5. Miessler, Gary L., Fischer Paul J., Tarr, Donald A., Inorganic Chemistry, Fifth edition,	
	Pearson, 2014.	

	Bloom's Level of Thinking	Continuous Lea CLA – 1 (10%)	arning Assessment	: (50% weightage) CLA – 2 (10%) CLA – 3 (20%)					%)#	Final Examination (50% weightage)					
	Level of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	ice Theory Practice		Theory	Practice				
Level 1	Remember Understand	20%	20%	15%	15%	15%	15%	15% 15% 1		15%	15%				
Level 2	Apply Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%				
Level 3	Evaluate Create	10% 10%		15% 15%		15%	15%	15%	15%	15%	15%				
	Total	100 % 100 %			100 %		100 %								

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. SudarshanMahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST
2. Dr. ShanmukhaprasadGopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. S. Shanmugan, SRMIST

Course Code	UCY20102T	Course Name	Phys	ical Chemistry -	I : States of Matter an	d Ionic Equilibrium		Cou Cateo	rse Jory	C	C Core course						L 5	T 1	P 0	С 6				
Pre-requ Course	isite es	Nil		Co-requisite Courses		Nil	F	Progre Cour	ssive ses	e Nil														
Course Of	fering Departmer	t Chem	istry		Data Book / Codes/S	itandards									Nil									
Course Le	arning Rationale	rning Rationale (CLR): The purpose of learning this course is to: Learning Program Learning Outcomes (PLO)																						
CLR-1 :	Understand states	of matter and	l interchange of	f states, intermole	cular interactions.		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Understand the g	aseous state ii	n terms of ideal	gas behavior.																1				
CLR-3:	Understand the m	atter at liquid	state with its su	rface tension and	viscosity.		5													1				
CLR-4:	Understand the co	oncept of solid	state and the s	symmetry in crysta	al system.		kinç						ç			ility				1				
CLR-5:	Understand state	of equilibrium	and the ionizat	ion factors.			hin	(%)	(%)	dge		t	ear			nab		Ł		Ð				
CLR-6:	Llearn the concep	t of pH, buffer	s, acids and ba	ses indicators.			of T	S S	art	vlec		ner	Ses	е		stai		Wo		anc	_			
							Level	roficier	ttainme	al Knov	alysis	evelopi	esign, I	ol Usag	ulture	nt & Su		Team	ation	. & Fina	earning			
Course Le (CLO):	arning Outcomes	At the e	nd of this cours	e, learners will be	able to:			Expected P	Expected A	Fundament	Problem An	Design & D	Analysis, Di	Modern Too	Society & C	Environmer	Ethics	Individual &	Communica	Project Mgt	Life Long Le	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Explain the differe	nce between	solid, liquid and	l gases in terms o	f intermolecular interac	tions.	2	75	60	Н	Н	Н	-	-	-	-	-	-	-	- 1	-	Н	-	-
CLO-2 :	CLO-2 : Explain the van der Waal's equation and its derivation with the ideal gas behavior, at constant temperature, pressure and volume.							80	70	-	Н	-	Н	-	-	-	-	-	-	-	-	Н	-	-
CLO-3 : Explain the concept of vapor pressure and the determination of refractive index.							2	70	70	Н	-	-		-	-	-	-	-	-	- 1	-	Н	-	-
CLO-4 : Explain the Bravais lattices and Bragg's law- it's determination.							2	80	70	-	Н	Н	-	-	-	-	-	-	-	- 1	-	-	Н	М
CLO-5: Explain the degree of ionization, pH and electrolyte behavior.								75	65	-	-	Н	-	-	-	-	-	-	-	-	-	-	Н	М
CLO-6 :	Explain buffers ar	d use them in	different experi	iments.			2	75	65	Н	-	-	-	-	-	-	-	-	-	-	-	-	Н	М
Duration	(hour)	18			18	18			1			18								18				

Duration (hour)		18	18	18	18	18
6.1	SLO-1	Gaseous state	Virial coefficients,	Refraction-	Analysis of powder diffraction patterns of CsCl	Buffer mixture of weak acid and its salts
3-1	SLO-2	Laws of gaseous state-	Calculation of Boyle temperature.	Refractive index-determination	Analysis of powder diffraction patterns of KCI.	Calculation of pH of buffer mixtures-
• •	SLO-1	Gas constant R in different units-	Isotherms of real gases	Specific and molar refraction	Crystal types- Molecular crystal,	Henderson equation
S-2	SLO-2	Deviation from ideal behavior.	and their comparison with van der Waals isotherms,	Molar volume and chemical constitution	covalent, metallic and ionic	Buffer mixture of a weak base and its salt
	SLO-1	Van der Waals equation for real gases	continuity of states,	Introduction to Solid state:	Imperfection in crystals-point defects	Hydrolysis of water- salts of strong acid and strong base
S-3	SLO-2	Van der Waals equation for real gases- its derivation	Critical state,	Nature of the solid state,	Schottky and Frenkel defects	salts of weak acid and strong base - strong acid and weak base- weak acid and weak base
S-4	SLO-1	and its application in explaining real gas behavior	Critical pressure	Difference between crystalline	Line defects,	Hydrolysis constant

Duration (hour)		18	18	18	18	18				
	SLO-2	its application in explaining real gas behavior	Determination of critical temperature and pressure	And amorphous solids	Edge dislocations	Relation between K _h , Ka and K _w				
0.5	SLO-1	Critical phenomenon,	relation between critical constants and van der Waals constants,	law of constancy of interfacial angles	Introduction to ionic equilibria-	Degree of hydrolysis- pH of the hydrolyzed salt solutions				
2-2	SLO-2	PV isotherm of real gases	law of corresponding states.	7Symmetry in crystal systems-	Strong electrolyte	Determination of degree of hydrolysis- Indirect method				
6.6	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Electrical conductance method				
3-0	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Freezing point depression				
S_7	SLO-1	PV isotherm of real gases including their temperature dependence	Liquefaction of gases	Plane of symmetry-axis of symmetry and	Moderate and weak electrolyte	Distribution law				
5-1	SLO-2	PV isotherm of real gases including their pressure dependence,	Joule-Thomson effect	Center of symmetry	Degree of Ionization,	Calculation of hydrolysis constant				
60	SLO-1	Critical temperature	Adiabatic expansion-	Elements of symmetry,	Factors affecting degree of Ionization	Concept of solubility product-relation between Ksp and				
3-0	SLO-2	Critical volume	Involving mechanical work	Rectangular and diagonal plane of symmetry,	Ionization constant	molar solubility of sparingly soluble salts				
	SLO-1	Maxwell distribution law —	Introduction to Liquid state:	Axis of 2,3,4 fold symmetry	lonization of weak acid and bases	Applications of solubility product principle-				
5-9	SLO-2	Molecular velocities-	Physical properties of liquids-	Points and	Arrhenius and	Determination of solubilities of sparingly soluble salts,				
S-10	SLO-1	root mean square, average and most probable velocities.	Vapor pressure and	space groups	Bronsted-Lowry concept	Predicting precipitation reactions				
5-10	SLO-2	collision number and mean free path	Vapor pressure measurements	Space lattices and unit cells	Conjugate acids and bases	Precipitation of soluble salts				
0.44	SLO-1	Collision diameter (σ).	Heat of vaporization-Trouton's rule	Bravais lattices	Relative strengths of acids-base pairs	Tutorial Session				
3-11	SLO-2	relation between mean free path and coefficient of viscosity (ŋ),	Surface tension-	Seven crystal systems	Influence of solvents on acid and base strengths	Tutorial Session				
	SLO-1	Tutorial Session	Effect of surface tension-Pressure and	Law of rational indices,	Lewis concept,	Ionic equilibria involving complex ions				
S-12	SLO-2	Tutorial Session	Temperature-Effect of addition of various solutes on surface tension.	Miller indices,	Dissociation of weak acids and bases	Theory of acid-base indicators				
6 12	SLO-1	calculation of σ from η ;	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session				
3-13	SLO-2	law of equipartition of energy,	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session				
	SLO-1	degrees of freedom	Measurement of surface tension	Lattice energy of ionic crystal	lonic product of water	Action of phenolphthalein and				
S-14	SLO-2	and molecular basis of heat capacities.	Interfacial tension and surface active agents	Lattice energy of ionic crystal	pH scale and	Methyl orange.				
	SLO-1	Behavior of real gases:	Viscosity-	X-ray diffraction,	other pH logarithmic expressions	Acid-base titrations and				
S-15	SLO-2	Deviations from ideal gas behavior,	Non-Newtonian liquids	Bragg's law and	Common-ion effect.	Selection of indicators.				

Duration (hour)		18	18	18	18	18
0.40	SLO-1	compressibility factor, Z,	Measurement of viscosity	Its derivation.	Mixture of weak acids and salts	Titrations of Strong acid vs. strong base,
5-16	SLO-2	and its variation with pressure and temperature for different gases.	Effects of viscosity-Temperature, pressure-Reynolds number	Experimental methods-	Buffer solutions-buffer capacity,	Weak acid vs. strong base
C 17	SLO-1	Causes of deviation from ideal behavior.	Temperature variation of viscosity of liquids	a simple account of rotating crystal method and powder pattern method	Buffer index.	Titration of weak base with strong acids.
3-17	SLO-2	Equation of states for real gases;	and comparison with that of gases.	Analysis of powder diffraction patterns of NaCl,	Salt hydrolysis-salts of strong acids	Limitations of indicators
C 10	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
3-10	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session

	The	ory:
Loomina	1.	Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry Ed., Oxford University Press 10th Ed ,2014.
Learning Resources	2.	Castellan, G. W. Physical Chemistry 4th Ed. Narosa 2004.
	3.	Mortimer, R. G. Physical Chemistry 3rd Ed. Elsevier: NOIDA, UP 2009.
	4.	Thomas Engel & Philip Reid Physical Chemistry Pearson Education 3rd Ed, 2013.

	Pleam's		Co		Final Examination (50% woightage)									
	DIOUIIIS	CLA – 1 (10	CLA –	2 (10%)	CLA –	3 (20%)	CLA –	4 (10%)#	Filiai Examinau	on (50% weightage)				
	Level of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice			
Lovel 1	Remember	10%		250/	-	200/	-	20%	-	20%	-			
Level I	Understand	40 /0	-	35%		30 %		30 %		30 /6				
Lovel 2	Apply	10%	-	10%	-	10%	-	40%	-	10%	-			
	Analyze	4070		40 /0		40 /0		40 /0		40 /0				
Lovol 3	Evaluate	20%	-	25%	-	200/	-	30%	-	30%	-			
Level 5	Create	2076		25%		30 %		30 %		30 /6				
	Total	100 %		10	0 %	10	0 %	1	00 %	100 %				

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers											
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts									
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Dr. S.Ashok Kumar , SRMIST									
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. J. Arockia Selvi, SRMIST									

Cou Coe	rse U le U	MA20A01T	Course Name		Allie		Co Cate	urse egory	G Generic Elective Co							Cour	se			L 3	T 0	P 0	C 3		
Pr	e-requisite Courses	Nil			Co-requisite Courses	Nil				Prog Co	ressiv urses	e N	lil												
Cours	e Offering	Department	t MATHEMA	TICS		Data Bo	ook / Codes/Stand	dards	I	Nil															
Cours (CLR):	e Learning	g Rationale	The purpose of lea	rning thi	s course is to:			Learning						Program Learning Outcomes (PLO)											
CLR-1	: Und	erstand the o	concept of sets, rela	tions an	d functions			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2	: Gair																								
CLR-3	: Obta	ain the know	ledge on polynomia	l equation	ons									Ę			lity								
CLR-4	: gain	knowledge	on Matrices and its	applicati	ons			(mo	(%)	(%)	ge		t	searc			inabi		¥		e.				
CLR-5	: com	prehend the	working principle of	various	calculus techniques			(Blo	ency	nent	wled		bmei	, Res	age		ustai		n Wo		nanc	b			
CLR-6	CLR-6: Understand various Mathematical evaluation procedure								ofici	ttainr	Kno	alysi	evelo	sign	I Use	ulture	t & S		Tear	tion	₩ S	arnir			
								f Thi	ed Pi	ed At	ering	n An	& De	s, De	1 Too	S S	nem		ıal &	unica	Mgt.	ng Le	~	~	33
Cours (CLO)	Course Learning Outcomes (CLO): At the end of this course, learners will be able to:							Level o	Expect	Expect	Engine	Probler	Design	Analysi	Moderr	Society	Enviror	Ethics	Individu	Commu	Project	Life Loı	- OSA	PSO - 3	- OSA
CLO-1	: Acq	uire the knov	vledge on sets and	functions	3			3	80	85	М	Н	-	-		-	-	-	-	-	-	Н	-	-	-
CLO-2	: Gair	n the ability to	o identify science ar	nd engin	eering problems logic	ally		1	75	80	М	Н	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3	: Und	erstand the l	pasic ideas about po	olynomia	l equations			3	85	80	М	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4	: App	reciate the c	oncepts of Matrices	in real li	fe situations			3	80	75	M	Н	-	-	-	-	-	-	-	-	-	-	-	-	-
	: App	iy the knowle	age of different cal	culus tec	nniques			1	75 80	85	IVI M	-	-	н	-	-	-	-	-	-	-	-	-	-	-
	. 0018		euge on Mathemati					3	00	00	IVI	-	-	-	-	-	-	-	-	-		П	-	-	-
Durati	on (Hour)	Coto coto d	Module 1 (9)		Module	e 2 (9)	N Delunemiel eru	Module	3 (9)			C	atria -	Mod	ule 4 (9)			atra di	untion	Mod	dule 5	(9)		
64	SLO-1	representati	on of sets		Statements		Polynomial equ	lations				Symm	ietric i	natrice	S ,				πιτοαι	uction	to cal	cuius			
5-1	SLO-2	Examples f representat	or sets and tions		Examples for staten	nents	Examples for	Polyno	mial e	quations	5	Skew	symn	netric	matric	es		[Differ	ential	calcu	ılus -lı	ntrodu	uctior	1
S-2	SLO-1	Types of set diagram	s, operation on sets	s, Venn	connectives, conjunc	tion	Irrational roots					Herm	tian, s	kew H	ermitia	n mat	trices	Γ	Maxin	na and	d mini	ima-In	trodu	iction	
0-2	SLO-2	Examples f operations	or types of sets ar on sets	d	Examples for conne	ctives, conjunctio	n Problems on i	rration	al roo	ots		Exam matri	ples f ces	or diff	erent t	ypes	of	5	Simple of func	e prob ctions	lems of sing	on ma: gle var	kima a riable	and m	inima
C ⁻3	S-3 SLO-1 Relation - Types of Relation Disjunction, negation complex root only)				complex roots(only)	oots(up to third order equation				quations Orthogonal, Unitary matrices					l r	More problems on maxima and minima									
SLO-2 Examples for types of relation Examples for Disjunction, negation Problems on roots			Problems on e roots	blems on equations with complex ts				iplex Examples for Orthogonal, Unitary matrices						l r	More problems on maxima and minima										
S-4	SLO-1	Equivalence	Relation		Tautology, Contradi	iction	Reciprocal equ	ocal equations				Cayley Hamilton Theorem					ľ	More problems on maxima and minima							

Duration (Hour)		Module 1 (9)	Module 2 (9)	Module 3 (9)	Module 4 (9)	Module 5 (9)
	SLO-2	Examples and problems on equivalence relation	Problems on tautology, contradiction	Problems on reciprocal equation	Problems on Cayley Hamilton Theorem	Radius of curvature – Introduction
S-5	SLO-1	Function - Introduction	logical equivalence	Approximation of roots of a polynomial equation	Problems on Cayley Hamilton Theorem	Problems on Radius of curvature- Cartesian co – ordinate
	SLO-2	Types of functions	Examples for logical equivalence	Newton's Method-Introduction	Eigen values– Eigen vectors	Problems on Radius of curvature
5.6	SLO-1	Problems for different functions	tautological implications	Newton's method- Finding positive roots	Problems on Eigen values– Eigen vectors	More problèmes on radius of curvature
3-0	SLO-2	Composite of two functions	Examples for tautological implications	More problems Newton's method- Finding positive roots	Problems on Eigen values– Eigen vectors	Partial differentiation
S-7	SLO-1	Examples for composite functions	arguments , Validity of arguments	Problems on Newton's method- Finding reciprocal of a given number	Problems on Eigen values– Eigen vectors	Problems on partial differentiation
	SLO-2	Composite of three functions	Normal forms	Problems on Newton's method- Finding Square root of a given number	Problems on Eigen values– Eigen vectors	More problems on partial diferentiation
6 0	SLO-1	Examples for composite of three functions	Principal disjunctive normal form	Horner's method- Introduction	Cramer's rule-Introduction	Euler's theorem- Introduction
3-0	SLO-2	Problems on functions	Problems for pdnf	Horner's method Finding positive roots	Solving system of linear equations- Crammer's rule	Problems on Euler's theorem
5.0	SLO-1	Problems on composite of two functions	Principle conjunctive normal form	Problems on Horner's method- finding roots between given values	Problems on Crammer's rule	More Problems on Euler's theorem
3-9	SLO-2	Problems on composite of three functions	Problems for pcnf	More Problems on Horner's method	More Problems on Crammer's ruLe	More Problems on Euler's theorem

T. Veerarajan, Discrete Mathematics, 7th Edition, Tata-Mcgraw hill, New Delhi, 2006.
 A. Singaravelu, ALLIED MATHEMATICS, 3rd Edition, Meenakshi Agency, Chennai, 2011.

3. P. R. Vittal, Allied Mathematics, 4th Edition Reprint, Margham Publications, Chennai, 2013. 4. S.G. Venkatachalapathy, Allied Mathematics, 1st Edition Reprint, Margham Publications, Chennai, 2007.

						Learning A	Assessment						
	Bloom'sLevel of Continuous Learning Assessment (50% weightage) Final Examination (50% weightage)												
	BIOOIII SLEVEI OI	CLA –	1 (10%)	CLA –	2 (10%)	CLA –	3 (20%)	CLA – 4	(10%) #				
	Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Lovel 1	Remember	40.0/		20.0/		20.0/		20.0/		20.0/			
Lever	Understand	40 %	-	30 %	-	30 %	-	30 %	-	30 %	-		
Lovel 2	Apply	40.0/		40.9/		40.9/		40.0/		40.0/			
Level 2	Analyze	40 %	-	40 %	-	40 %	-	40 %	-	40 %	-		
Lovel 2	Evaluate	20.9/		20.0/		20.0/		20.0/		20.0/			
Level 3	Create	20 %	-	30 %	-	30 %	-	30 %	-	30 %	-		
	Total	100) %	10	0 %	10	0 %	10	0 %		100 %		
	oon he from any combine	tion of those: A	ocianmonto S	minara Sajar	tifia Talka Mini	Projects Case 9	Studios Colf Stud	MOOCe Cartif	inations ata				

CLA – 4 can be from any combination of these: Assignments, Seminars, Scientific Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr. V. Maheshwaran, Cognizant Technology Solutions maheshwaranv@yahoo.com	Prof. Y.V.S.S. Sanyasiraju, IIT Madras, sryedida@iitm.ac.in	Dr. A. Govindarajan, SRMISTProf. K.S. Ganapathy Subramanian, SRMIST
	Prof. B. V. Rathish Kumar, IIT Kanpur, bvrk@iitk.ac.in	Dr. N. Balaji, SRMISTDr. P. Sampath, SRMIST

Cou Co	rse de	UCY2	0A01T	Course Name		Bio	ochemistry-l		C Ca	ourse	e ry	G	Generic Electi				ctive				-	L 3	T 0	P 0	C 3		
Pr	e-requi Course	isite es		Nil		Co-requisite Courses		Nil		Pro C	gres	sive es								Nil							
Cours	e Offe	ring Dep	artment	Chem	istry		Data Book / Coo	des/Standards										Nil									
Cours	e Lear	ning Rat	tionale (Cl	LR): The p	urpose of lear	ming this course is to				L	.earn	ing					Prog	gram	Learr	ning	Outco	omes	(PLC))			
CLR-1 CLR-2 CLR-3	1: Er 2: Ga 3: Le	numerate ain knowl earn abou	the molect ledge abou ut proteins,	cular motif o ut chemistry , their struc	of a living cell, y of amino acio tural features	structural and function ds, peptides and mether and techniques used	nal hierarchy of biom nods to synthesise th for purifying them.	nolecules nem		(m	(%)	(%)	e			arch			ability		~						
CLR-4	l: Di	scern ab	out differe	nt types of	lipids and thei	r importance in metal	polism				ې (nt (9	ledo		lent	ese	-		tain		Vorl		JCe				
CLR-S	Course Learning Outcomes At the end of this course, learners will be able to: CLO: Students will able to have basic knowledge about the chemistry of metabolism happeni					abolic events		Level of Thinking (B	Expected Proficienc	Expected Attainmer	Fundamental Know	Problem Analysis	Design & Developm	Analysis, Design, R	Modern Tool Usage	Society & Culture	Environment & Sust	Ethics	Individual & Team V	Communication	Project Mgt. & Finar	Life Long Learning	PSO - 1	PSO - 2	PSO – 3		
CLO-	:	Student	s will able	to have ba	sic knowledge	about the chemistry	of metabolism happe	ening in the living cell		2	70	65	Н	-	Н	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2	2:	Student	s will gain	insight abo	ut amino acid	s and techniques use	d to synthesize pepti	ides		2	80	70	H	-	-	Н	Н	-	-	-	-	-	-	-	-	-	-
CLO-	3:	Ability to	o understa	nd the influ	ence of amino	acid sequence on th	e protein structure			2	70	70	Н	-	-	Н	Н	-	-	-	-	-	-	-	Н	-	-
CLO-	4:	Explain	the role of	different ty	pes of lipids in	n cellular metabolism				2	80	70	-	Н	Н	-	-	-	-	-	-	-	-	-	-	Н	М
CLO-	5:	techniqu	and the ch les of biom	nolecules a	nd apply them	a in the synthesis, dep appropriately.	gradation separation	and purification		2	75	65	-	-	Н	-	-	-	-	-	-	-	-	-	-	Н	М
Durat (hour	ion			9			9		9							9							ę	Ð			
6.4	SLO-	1 Livin	g Cell - F	Plant cell.		Amino acids – class	sification	Proteins - classifica	ation				Lipids	s - Cla	ssifica	ition				Met - Th	aboli e ure	sm o a cyc	f ami le	no ac	ids a	nd lip	oids
5-1	SLO-	2 Living Cell – Plant cell. Amino acids – classification Proteins - classification				Proteins - classifica	ation				Lipids	- Clas	sifica	tion				Met - Th	aboli e ure	sm of a cyc	f ami le	no ac	ids a	nd lip	oids		
6.2	SLO-	1 Livin	g Cell - Ar	Cell - Animal cell. Amino acids – classification Proteins - classification				Proteins - classifica	ation				neutral glycolip	lipids bids	, phos	pho li	pids a	Ind		Met - Th	aboli e ure	sm of a cyc	f ami le	no ac	ids a	nd lip	bids
3-2	SLO-	LO-2 Living Cell - Animal cell. Amino acids – classification Proteins -			Proteins - classifica	ation				neutral glycolip	lipids bids	, phos	pho li	pids a	Ind		Met - Th	aboli e ure	sm of a cyc	f ami le	no ac	ids a	nd lip	oids			
6.2	SLO-	1 Cell r	Cell membrane synthesis of amino acids Proteins - prope			Proteins - propertie	es				neutral glycolip	lipids bids	, phos	pho li	pids a	Ind		Met - Th	aboli e ure	sm of a cyc	f ami le	no ac	ids a	nd lip	bids		
3-3	SLO-	LO-2 Cell membrane synthesis of amino acids Proteins - proper			Proteins - propertie	erties neutral lipids, phospho lipids and Metabolism of ami glycolipids - The urea cycle					no ac	o acids and lipids															
64	SLO-	1 Cell C	Organelles			Identification of am	no acids	acids Proteins - properties					Importa	ance-	synthe	esis a	nd deg	grada	tion	Cho	leste	rol bic	osynth	nesis			
3-4	SLO-	2 Cell C	Organelles	_		Identification of am	no acids	Proteins - propertie	es				Importa	ance-	synthe	esis a	nd de	grada	tion	Cho	leste	rol bic	osynth	nesis			
S-5	SLO-	1 functi	ions of mai	ior cellular	components	Identification of am	no acids	Determination of an	nino a	icid se	auen	nce	Importance- synthesis and degradation Cholesterol biosynthesis														

Duration		9	9	9	9	9
(hou	r)					
	SLO-2	functions of major cellular components	Identification of amino acids	Determination of amino acid sequence	Importance- synthesis and degradation	Cholesterol biosynthesis
66	SLO-1	functions of sub cellular components	Peptide bond- stereochemistry	Determination of amino acid sequence	Importance- synthesis and degradation	Cholesterol biosynthesis
3-0	SLO-2	functions of sub cellular components	Peptide bond- stereochemistry	Determination of amino acid sequence	Fatty acids	Cholesterol biosynthesis
67	SLO-1	Metabolism	synthesis of peptides by solution and solid phase techniques	Denaturation and renaturation of protein molecules	saturated fatty acids	Biosynthesis of lipids - synthesis of fatty acids
3-7	SLO-2	Metabolism	synthesis of peptides by solution and solid phase techniques	Denaturation and renaturation of protein molecules	saturated fatty acids	Biosynthesis of lipids - synthesis of fatty acids
c 0	SLO-1	Anabolism and their relation to metabolism.	synthesis of peptides by solution and solid phase techniques	Separation and purification of proteins - dialysis	unsaturated fatty acids	Biosynthesis of lipids - synthesis of fatty acids
3-0	SLO-2	Anabolism and their relation to metabolism.	synthesis of peptides by solution and solid phase techniques	gel filtration	unsaturated fatty acids	Biosynthesis of lipids - synthesis of fatty acids
5 0	SLO-1	catabolism and their relation to metabolism	synthesis of peptides by solution and solid phase techniques	Electrophoresis	EFA.	Biosynthesis of lipids - synthesis of fatty acids
3-9	SLO-2	catabolism and their relation to metabolism	synthesis of peptides by solution and solid phase techniques	Electrophoresis	EFA	Biosynthesis of lipids - synthesis of fatty acids

l earning	1. David L. Nelson and Michael M. Cox Lehninger, Principles of Biochemistry, Worth Publishers,	3. J. L. Jain, Biochemistry, Sultan Chand and Co, 1999.
Decouroos	4 th edition,New York, 2005.	4. U.Sathyanarayana, Biochemistry, Elsevier, 5 th edition, 2010.
Resources	2. L. Veerakumari, <i>Biochemistry</i> , MJP publishers, Chennai, 2004.	

Learning A	Learning Assessment													
	Pleam's		Conti	nuous Learr	ning Assessme	ent (50% we	ightage)			Final Examination (50% woightage)				
	DIUUIIIS	CLA – 1 (10)%)	CLA – 2 (10%)		CLA – 3 (20%)		CLA –	4 (10%)#	Filiali	zxamination (50 % weightage)			
	Level of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice			
Lovel 1	Remember	100/		200/		200/		200/		200/				
Lever	Understand	40%	-	30%	-	30%	-	30%	-	30%	-			
Lovel 0	Apply	400/		100/		100/		100/		400/				
Level 2	Analyze	40%	-	40%	-	40%	-	40%	-	40%	-			
Lovel 2	Evaluate	200/		200/		200/		200/		200/				
Create		20%	-	30%	-	30%	-	30%	-	30%	-			
	Total	100 %		10	0 %	10	0 %	10	0 %		100 %			

Course Designers										
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts								
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST								
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. M.R. Ganesh , SRMIST								

Course Code	UCY20S	1T	Course Name		rı	Γ Skills for Chemists	C C	cou ateg	rse Jory	S	S Skill Enhancement Course L T P 2 0 0 2						C 2									
Pre-requ Course	isite es <i>Nil</i>				Co-requisite Courses	Nil		Pro C	gress ourse	sive s	Nil															
Course Off	ering Departn	ent	Chemistry	/		Data Book / Codes/Star	ndards N	il																		
Course Lea	Course Learning Rationale (CLR): The purpose of learning this course is to: Learning Program Learning Outcomes (PLO)																									
CLR-1 :	To make the Language an	students d QBASI	of chemistry C	/ familiar wi	th the working o	f computer, programming			2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To use softwa	are as a t	tool to under	stand chen	nistry										h			ity								1
CLR-3 :	To solve cher	nistry ba	sedProblem	s using con	nputer language	S		1) (?	` (•		e			arc			abil		×						1
CLR-4:	To impart kno	wledge a	about the sta	atistical trea	tment using con	nputer language		0		it (edç		lent	ese			ain		Vor		ЭСe				1
CLR-5:	To develop th	e skill of	computer pl	rogramming	9			9		ner		M	ŝ	md	, R	age	a)	ust		۲ ۷		nar	б			1
CLR-6:	To create sin	ple progi	rams using (computer kr	nowledge			- in	fici	ainr		돈	lysi	/elc	sign	Usi	Itur	8		ea	Ы	ت م	illi			1
Course Lea (CLO):	arning Outcor	nes	At the end	d of this cou	ırse, learners wi	ll be able to:		or of Thin	Expected Pro	Expected Att		Fundamenta	Problem Ana	Design & De	Analysis, De	Modern Tool	Society & Cu	Environment	Ethics	ndividual &	Communicat	Project Mgt.	Life Long Le	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Develop algo	rithm to s	solve probler	ms and writ	e corresponding	programs in BASIC		1	70	65		H	-	H	-	-	-	-	-	-	-	-	-	Η	H	- 1
CLO-2 :	Write BASIC	program	s for perform	ning calcula	tions involved in	laboratory experiments a	nd research work.	1	80	70		Н	-	-	Н	Н	-	-	-	-	-	-	-	Н	-	- 1
CLO-3 :	Use various s	preadsh	eet software	to perform	calculations and	d plot graphs.		1	75	60		-	Н	-		-	-	-	-	-	-	-	-	-	Н	М
CLO-4 :	Execute vario	us comp	uter prograr	ns using va	rious operations																				Н	М
CLO-5 :	Perform BAS	C/FORT	RAN progra	ms for curv	e fitting																			Н	Н	Н
CLO-6:	Create progra	ms usinę	g computer l	languages								Н													Н	
Duration (hour)	1		6			6	6							6								6	i			
SLC	0-1 ^{Fundame}	ntals- ma	athematical f	functions	Types ofuncerta	ainties	Roots ofquadratic equation	bots ofquadratic equations analytically numerical differentiation Hierarchy of operations																		

(1	nour)	0	6	6	0	0
0.4	SLO-1	Fundamentals- mathematical functions	Types ofuncertainties	Roots ofquadratic equations analytically	numerical differentiation	Hierarchy of operations
5-1	SLO-2	Polynomial expressions	Combining uncertainties	Example:pH of a weak acid	change in pressure for small change in volume of a van der Waals gas	Inbuilt functions
6.2	SLO-1	Llogarithms	Statistical treatment	Roots ofquadratic equations iteratively	Numerical integration-	Elements of the BASIC language
3-2	SLO-2	The exponentialfunction	Mean, standard deviation	Examples	Trapezoidal and Simpson's rule	BASIC keywords and commands
	SLO-1	Units of a measurement	Relative error	Numerical methods offinding roots	entropy changefrom heat capacity data	Logical and relative operators
S-3	SLO-2	Inter-conversion of units	Data reduction and the propagation of errors	Newton-Raphson method	enthalpy changefrom heat capacity data	Strings and graphics
C 4	SLO-1	Constants and variables	Graphical data reduction	binary –bisection method	Computer programming-	Compiled versus interpreted languages
3-4	SLO-2	Equation of astraight line	Numerical data reduction	Apply on pH of a weak acid	Constants and variables	Debugging.

Dı (iration hour)	6	6	6	6	6
0.5	SLO-1	Plotting graphs	Numerical curve fitting-	Apply on volume of a van der Waals gas	Bits ands bytes	Simple programs using these concepts
5-5	SLO-2	Uncertainty in experimental techniques	The method of least squares (regression)	Apply on equilibrium constant expressions	Binary formats	Matrix addition and multiplication
5.6	SLO-1	Displaying uncertainties	Algebraic operations on realscalar variables	Differential calculus-	ASCII formats	BASIC/FORTRAN programs for curve fitting
3-0	SLO-2	Uncertainty in measurement	Manipulation of van der Waals equation in different forms	The tangent line and the derivative of a function	Arithmetic expressions	Simple programs using these concepts
			•	•	•	•

McQuarrie, D. A. Mathematics for Physical Chemistry University Science Books, 2008. Mortimer, R. Mathematics for Physical Chemistry. 3rd Ed. Elsevier 2005. 1. 2.

Yates, P. Chemical calculations. 2nd Ed. CRC Press 2007. 3.

Harris, D. C. Quantitative Chemical Analysis. 6th Ed., Freeman Chapters 3-5, 2007 4.

Learning As	_earning Assessment										
			Cor	ntinuous Lear	ning Assessme	nt (50% weig	htage)			Final Examinati	on (E09/ weightego)
	Bloom'sLevel of Thinking	CLA – 1 (1	0%)	CLA –	CLA – 2 (10%)		CLA – 3 (20%)		4 (10%)#	Filiai Examinau	on (50% weightage)
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
	Remember	100/		200/		200/		200/		200/	
Level I	Understand	40%	-	30%	-	30%	-	30%	-	30%	-
	Apply	100/		10%		100/		100/	_	100/	
Level 2	Analyze	4076	-	40%	-	4070	-	40%	-	40 %	-
	Evaluate	200/		200/		200/		200/		200/	
Level 5	Create	20%	-	- 30%		30%	-	30%	-	30%	-
	Total	100 %		10	0 %	10	0 %	10	0 %	1	00 %

CLA - 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers									
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts							
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, <u>gsekar@iitm.ac.in</u>	1. Dr. T.Pushpa Malini , SRMIST							
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories,shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, <u>vivekpol@tifr.res.in</u>	2. Dr. S.Rajeswari , SRMIST							

Cou Co	rse U de U	CY20S02T Cours Nam	se e	Fuel Chemistry						S	Skill Enhancement Cours									Course				
Pre- C Cour	requisi ourses se Offe	te <i>Nil</i> ring Department	Chemistry	Co-requisite Courses	F Nil	Progre Cour	ssive ses	Nil																
Cour	se Lear	ning Rationale (CL	R): The purpose of lear	ning this course i	s to:			Lea	rning					Pro	gram	Lear	ning	Outc	ome	s (PL)	0)			
CLR- CLR-	1: De 2: In	emonstrate broad kn part the basic know	owledge of Fuel chemis ledge about the types ar	of fuels		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CLR-3 : Impart the knowledge about composition and uses of fuels CLR-4 Develop skills in the analysis of coal and coal based chemicals CLR-5 Develop competence in the analysis of various physico-chemical properties of fuels CLR-6 limpart knowledge about Petroleum and Petrochemical products							inkina (Bloom)	Proficiency (%)	Attainment (%)	tal Knowledge	nalysis	Jevelopment	lesign, Research	ol Usage	Culture	nt & Sustainability		& Team Work	ation	t. & Finance	earning			
Cour (CLC	se Lear):	rning Outcomes	At the end of this cour	se, learners will b	, learners will be able to:					-undamen	² roblem A	Design & D	Analysis, D	Modern To	Society & (Environme	Ethics	ndividual 8	Communic	^o roject Mg	-ife Long L	- SO - 1	2 - OSc	- SO – 3
CLO-	1: 8	Students will gain ins		2	70	65	Ĥ	-	Η	-	-	-	-	-	-	-	-		-	-	-			
CLO-	2 : (Understand various of	categories of fuels and th	heir characteristic	S		2	80	70	Н	-	-	Н	Н	-	-	-	-	-	-	-		<u> </u>	-
CLO.	3: /	Attain knowledge abo	out composition and use	es of fuels			2	80	10	Н	-	-	-	-	-	-	-	-	-	-	-	Н	<u>-</u>	-
	4 L	Semonstrate the gas	tion and applications of	or coar	otrochomical products		2	73	60	- H	п	-	M	-	- Н	-	-	-	-	-	-	- H	- H	-
CLO	-6 /	Perceive the importa	nce of fuels in future	pelloleum and p		2	75	60	-	-	-	-	-	H	-	-	-	-	-		-	H	-	
	•											1	1			1	1				11			1
Dı (iration hour)		6		6	6		6							6									
S-1	SLO-	1 Review of energy	y sources- renewable	Manufactured S Characteristics	Solid Fuels and their	Blast Furnace Gas				carbonization of coal Petroleum and Petrocher Composition of crude pet								mical Industry: troleum						
	SLO-	2 non-renewable		Charcoal		Water Gas		Fractionation of coal tar							Cla	ssific	ation	of cru	ide Pe	etrole	um			
• •	SLO-	1 Classification of	fuels- Solid fuels	Briquettes		Producer Gas		Uses of coal tar based chemicals							Paraffinic Base Type Crude Petroleum							um		
5-2	SLO-	2 Liquid fuels		Bagasses		Oil Gas				Uses	of coa	l tar ba	ased o	chemi	cals		Asp	ohalite	c Bas	е Тур	e Cru	de Pe	etrole	JM
S-2	SLO-	1 Gaseous fuels		Manufactured L Characteristics	iquid Fuels and their	Composition of gased	ous Fu	els		Requis	sites c	of a go	od me	etallur	gical	coke	Mix	Mixed Base Type Crude Petroleum						
3-3	SLO-	2 Natural and Synt	thetic fuels	Gasoline or Petrol Uses of gaseous F						Requis	sites c	of a go	od me	etallur	gical	coke	Pet	Petroleum products						
6.4	SLO-	1 calorific value of	fuels-Introduction	Diesel Fuel		Uses of coal in variou	ıs indu	stries ·	– Fuel	Coal g	asifica	ation-	Hydro	gasifi	catior	n	App pro	Applications of various Petroleum products						
5-4	SLO-	2 calorific value of	fuels-Explanation	Kerosene Oil		Uses of coal in variou Fuel	ıs indu	ndustries -Non Catalytic gasification					Cra	Cracking - Thermal cracking										

Duration (hour)		6	6	6	6	6				
	SLO-1	Calorific value of wood	Heavy Oil	Composition of coal	Coal liquefaction – General idea	catalytic cracking				
5-5	SLO-2	Characteristics of Flame	Gaseous Fuels and their Characteristics	Characteristics of coal	Coal liquefaction – Process explanation	Petrochemicals ; Vinyl acetate				
86	SLO-1	Combustion Characteristics	Natural Gas	Analysis of Coal- Proximate Analysis of Coal	Solvent Refining-	Propylene oxide, Isoprene				
3-0	SLO-2	Ignition Temperature	Coal Gas	The Ultimate Analysis of Coal	Solvent Refining methods	Butadiene, Toluene and its derivatives Xylene				

	1.	Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK,1990		
Learning	2.	E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK, 1990	4.	P.C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi, 2015
Resources	3.	Richard A. Dave, IP, Modern Petroleum Technology, Vol 1, Upstream, Ed. 6th ed., John Wiley &	5.	B.K. Sharma: Industrial Chemistry, Goel Publishing House, Meerut, 2000
		Sons. Ltd, 2000		

Learning	Assessment																
	Pleam's	Continuous Learning Assessment (50% weightage)									Final Examination (E0% weighters)						
	DIOUIII S	CLA – 1 (10%)		CLA – 2 (10%)		CLA –	3 (20%)	CLA –	4 (10%)#	Final Examination (50 % weightage)							
	Lever or Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice						
Lovel 1	Remember	400/		200/		200/		200/		200/							
Level I	Understand	40%	-	30%	-	30%	-	30%	-	30%	-						
Lovel 2	Apply	400/		409/		100/		400/		400/							
Level Z	Analyze	40%	-	40%	-	40%	-	40%	-	40%	-						
Lovel 3	Evaluate	200/		200/		200/		200/		200/							
Level 3	Create	2076	-	30%	-	30%	-	30%	-	30%	-						
	Total	100 %		10	0 %	10	0 %	10	0 %	100 %							

CLA - 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers											
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts									
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Dr. T.Pushpa Malini , SRMIST									
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories,	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. S.Rajeswari , SRMIST									
shanmukhaprasadg@drreddys.com											

.

Cou	rse Code	UCD20S01L	Course Na	ne	Soft Skills		Course	e Cate	egory	S			Ski	ill Enl	nance	emer	nt Coi	urse			L 0	T 0	P 2	C
	Pre-requisite Courses Nil Co-requisite Courses Nil						Prog	gress	ive C	ourses	Ni	I												
Cours	Course Offering Department Career Development Centre Data Book / Codes/Standards														-									
Cours (CLR	se Learni	ng Rationale	The purpose	of learning this course is to	0:		L	Learning Program Learning Outcomes (PLO)																
CLR-	1: Expo	se students to right a	attitudinal and	pehavioral aspects and to	build the same through	h activities	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-	2: Deve	lop and nurture inter	personal skills	of the students through in	ndividual and group acti	ivities.																		
CLR-	3: Incre	aseefficiency and lea	adership skills	and to improve team resu	lts.																	ļ		
CLR-	4: Acqu	ire time managemen	nt skills and de	elop creative skills								les			Je							ļ		
CLR-	5: Unde	erstand intercultural o	communication	and etiquettes required in	n a professional environ	nment	w	(%)	(%)	de	ots	iplin	n	_	/ledc		g					ļ		
CLR-	6 : Instill place	confidence in stude ments	ents and deve	lop skills necessary to fa	ace the challenges of	competitive exams and	d (Blo	ciency	iment (nowled	Concep	ed Disc	wledge	lization	Know	ē	ret Dat	cills	g Skills	n Skills			ehavior	ing
							inkir	rofic	vttair	al K	of	elate	Kno	ecia	ilize	delii	terpi	e St	lvin	ation	skills	ļ	al Be	earn
Course Learning Outcomes (CLO): At the end of this course,				this course, learners will b	purse, learners will be able to:			Expected F	Expected A	undament	Application	ink with R	Procedural	skills in Sp	Ability to Ut	skills in Mo	Analyze, In	nvestigativ	roblem So	Communic	Analytical S	CT Skills	rofession	ife Long L
CLO-	1: Re-e	ngineer their attitude	and understa	d its influence on behavio	or		3	80	70	M	M	M	-	M	H	M	-	-	H	H	H	M	H	Н
CLO-	2: Acqu	ire inter personal ski	lls and be an e	ffective goal oriented tean	n player		3	80	70	М	М	М	-	М	Н	М	-	-	Н	Н	Н	М	Н	Н
CLO-	3: Unde	erstand the importance	ce of time man	agement and creativity			3	85	75	М	М	М	-	М	Н	М	-	-	Н	Н	Н	М	Н	Н
CLO-	4: Build	confidence during a	ny presentatio	1			3	85	75	M	М	М	-	М	Н	М	-	-	Н	H	Н	M	Н	H
CLO-	5: Deve	lop interpretation ski	lls and intercu	tural communication			3	85	75	M	M	M	-	M	H	M	-	-	H	H	H	M	Н	H
CLU-	o: neip	the students succee	u in competitiv	e exams and placements			3	00	10	IVI	IVI	IVI	-	IVI	п	IVI	-	-	п	п	п	IVI	п	п
Du (h	ration our)		6		6	6				6							6							
S-1	SLO-1	IKIGAI		Interpersonal Skil	ls	Creating brands – acti flyers, business cards,	tivity (posters, s)			Value of Time						Intercultural communication – beliefs, customs and attitude of people in different countries (US, UK, Japan, West Asia, China, Russia)								
	SLO-2	IKIGAI		Emotional Intellig	ence	Creating brands – acti flyers, business cards,	ivity (pos)	ters,		Diagnos	ing Ti	me M	anage	ement			Soci	ial an	d cult	ural e	etique	ttes		
S-2	SLO-1	Attitude		Importance of Tea	am Work	Causes of Stress and	lts Impa	ct		Weekly work	Plann	er, To	do lis	st, Prie	oritizii	ng	Corr	nmuni	catior	n etiq	uette	3		
SLO-2 Factors influencing Attitude Team Building Activity How to Manage Stress and				s and Di	nd Distress? Time management activity Telephone etiquette							ЭS												

Understanding the Circle of Control

Stress Busters

Dinning etiquettes

Grooming etiquettes

Creativity – think out of the box

Creativity Activity

SLO-1

S-3

SWOT Analysis

SLO-2 Individual SWOT Analysis – activity

Leadership skills

Leadership skills based Activity
Du (h	ration our)	6	6	6	6	6		
64	SLO-1	Extempore Practice Session	Networking skills	Conflicts in Human Relations – reasons	Creativity Assessment Activity	Ice breaking		
3-4	SLO-2	Extempore Practice Session	Networking skills based Activity	Approaches to conflict resolution	Creativity Assessment Activity	Designing ice breaker games		
S-5	SLO-1	Extempore Practice Session	Negotiation skills	Conflict resolution – case studies	Brainstorming, use of groups and individual brainstorming techniques to promote idea generation	Ice breaker activity		
	SLO-2	Extempore Practice Session	Negotiation skills based Activity	Conflict resolution – case studies	Brainstorming session activities	Ice breaker activity		
8.6	SLO-1	Extempore Practice Session	Entrepreneurial Skills	Importance and necessity of Decision Making	Brainstorming session	Introduction to resume building		
S-6 SLO-2		Extempore Practice Session	Entrepreneurial knowledge, Focus, Investment, Risk tolerance, Resilience, Negotiation, Ethics, Networking	Process of Decision Making, Practical Way of Decision Making, Weighing Positives and Negatives	Brainstorming session	Introduction to resume building		
Learning Resources		 Jeff Butterfield, Soft Skills fo. Dr. K. Alex, Soft Skills, S.Ch Covey Sean, Seven habits of 	r Everyone, CENGAGE, India, 2015 and Publishing & Company, India, 2014 f highly effective teens, Simon & Schuster,	4. Carnegie Dale, How to 5. Thomas A Harris, I an New York, 2014 6. Daniel Coleman , Emo	o win friends and influence people, Simon n ok, you are ok, Arrow, London, 2012 otional Intelligence , Bloomsbury, India, 20	and Schuster, New York, 2016 16		

Learning Assessment												
		Continuous Learning Assessment (100% weightage)										
Level	Bloom'sLevel of Thinking	CLA-1 (20%)	CLA-2 (20%)	CLA-3 (30%) #	CLA-4 (30%)##							
		Practice	Practice	Practice	Practice							
Level 1	Remember	10%	109/	30%	150/							
Lever	Understand	10%	10%	30%	15%							
Laural O	Apply	500/	50%	400/	50%							
Level 2	Analyze	00%	50%	40%	50%							
Level 2	Evaluate	40%	409/	30%	250/							
Level 5	Create	40%	40%	30%	35%							
	Total	100 %	100 %	100 %	100 %							

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.

CLA - 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
		1. Mr Priyanand, Assistant Professor, CDC, E&T, SRMIST
1. Ajay Zener, Director, Career Launcher	-	2. Ms Sindhu Thomas, Head in charge, CDC, FSH, SRMIST
		3. Ms Mahalakshmi, Assistant Professor, CDC, FSH, SRMIST

SEMESTER II

	Cours	urse Code ULT20G02J Course Name Tamil-II Course Category G Generic Elective Course $\frac{L}{2}$								T 0	P 2	C 3																
P	re-requi	site s	Nil			Co-requisite Courses	Nil			Pr	ogres	ssive	Nil															
Cou	rse Offer	ing De	partment	Tamil		0001000		Data Book / Codes/	Standards		ooure							Nil										
Cou	rse Leari	ning Ra	ationale (CLR):	: The pu	pose of lea	arning this course is t	0:			L	earni	ng				F	Progr	am L	earni	ng O	utco	mes ((PLO)				
CL	R-1 : 7	o gene	rate in students	s a sensitivit	/ to gende	r marginalization and	Eco sens	itivity.		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CL	R-2 : A	An evolv	ed consciousn	ess in the m	inds to acc	commodate all is deve	eloped								S													
CL	R-3 : 7	he abil	ity to accept all	and to co- e	xist is initia	ated				Ē			a		line			dge										
CL	R-4 : 7	o creat	e community co	onnectivity a	nd interde	pendence is initiated				noo	/ (%	t (%		epts	scip .	ge	Б	wle		ata		_s	s					
CL	R-5 : 7	o instill	language skills	3						BI (BI	enc	nen	MO		ΠD	vled	zatio	Kno	D	et D	lls	Ski	Skil					
CL	R-6 : 7	o give i	them all the his	torical insigh	nts					king	ofici	ainr	I Ku	0	late	Nov	ciali	ize	elin	srpre	Ski	ving	ion	cills				
										Thin	P	I Att	anta		Re	al x	Spe	Util	Mod	Inte	utive	Sol	licat	al Sk				
Cou (CLC	Course Learning Outcomes (CLO): At the end of this course, learners will be able to:						Level of .	Expected	Expected	Fundame	Applicati	Link with	Procedu	Skills in 3	Ability to	Skills in I	Analyze,	Investige	Problem	Commur	Analytica	PSO -1	PSO -2	PSO-3				
CL	0-1 : 7	o acqu	ire knowledge a	about Tamil	Language					2	75	60	H	H	Н	-	-	Н	Н	Н	Н	Н	Н	Н	Η	Н	Н	
CL	O-2 : 7	o stren	gthen the know	ledge on co	ncept, cult	ure, civilization and tr	anslation	of Tamil		2	80	70	-	Н	-	Н	Н	Н	Н	-	-	Η	Н	Н	Η	Η	Н	
CL	O-3 : 7	o deve	lop content usir	ng the featur	es in Tami	il language				2	70	65	H	-	-	Н	-	Н	Н	Н	-	Н	Н	Н	Н	Н	Н	
CL	O-4 : 7	o use 1	Famil Language	e and Literat	ure to enha	ance their creativity				2	70	70	H	-	Н	М	Н	-	-	-	Н	Н	Н	Н	Н	Н	Н	
CL	O-5 : 7	o impro	ove communica	tion and cre	ative expre	ession in Tamil langu	ıage			2	80	70	-	Н	-	Н	-	Н	Н	-	-	Н	Н	Н	Η	Н	Н	
CL	0-6 : T	o enab	le the students	to speak an	d write in c	haste Tamil				2	75	70	H	H	Н	Н-	Н	Н	Н	Η	Н	Н	Н	Н	Η	Н	Н	
Dı (ration hour)		12			12		12						12			12											
S-1	SLO-1	தமி அக	ழில்காலந் மரபு	தோறும்	களப்ப	ிரர்காலம்		பல்லவர்காலம்	Ċ	சங்	கக	ாலவ	பரலா,	று			தமிழ்ச்சிறுகதைப்போக்கு					தக6	π					
	SLO-2	அக குக	இலக்கியப் ள்	ப்போக்	அறமு	ம்வாழ்வியலும்)	பல்லவர்காலஇ	இலக்கியம்	சங்	கக	ாலம	க்கஎ	ின்	வாழ்	ചിu	பல்	Ę	தமி தவா	ழ்ச்8 ரழ்வ	சிறு விய	கன லும்	்தய ப	பும்த	;மிழ்	þ ē ð	ശ	
S-2	SLO-1	எட்(ளும்	டுத்தொகை பெயர்களு	கநூல்க நம்	திருக்(உலகட்	தறள் பபொதுமறை	-	பக்தியும்தமிழு	فن	முச்	சங்	கம்	- அறி	ഗ്രക	ம்			L	புது	തഥ	ப்பி	த்த	ன் -	அகல்யை				
	SLO-2	எட்(யில்	டுத்தொகை அகநூல்க	க ள்	திருக்கு	தறள்கட்டமைப	ΊЦ	பக்திஇலக்கிய	<u> </u>	முச்	சங்	கவ	ரலாற	Л				G	தொ	ன்ப	- فام	- கட்	6	തല	Ŀц			
S-3	SLO-1	ஐங்	குறுநூறு (2	03)	தமிழி	പ്പിതെ		சைவசமயஇல ள்	ுக்கியங்க ப	செம்மொழிஇலக்கியங்கள் அகிலன் - ஒருவேளைச்சோறு																		

Di (uration hour)	12	12	12	12	12
Ň	SLO-2	தலைவனின்நாட்டுப் பெருமை	திருக்குறள் - வினைத்திட்பம் (67)	தேவாரமூவர்	பாட்டும்தொகையும்	தொழிற்புரட்சியும்விவசாயமு ம்
S-4	SLO-1	குறுந்தொகை (130)	உழவும்தமிழர்வாழ்வும்	தேவாரம் – திருஞானசம்பந்தர்பாடல்	எட்டுத்தொகைஉருவாக்கப்பின்பு லம்	ஆண்டாள்பிரியதர்ஷினி – மாத்திரை
	SLO-2	அகவாழ்வில்நம்பிக் கைவேர்கள்	திருக்குறள் - உழவு (104)	தேவாரம் – திருநாவுக்கரசர்பாடல்	எட்டுத்தொகையும்தமிழர்வாழ்வி யலும்	குடும்பம் – கட்டமைப்பு
S-5	SLO-1	பண்டைத்தமிழரின் வாழ்வியல்	சமணசமயஇலக்கியங்க ள்	திருவாசகம்அறிமுகம்	பாரததேவி - மாப்பிள்ளைவிருந்து	
	SLO-2	பண்டைத்தமிழர்உண ர்வியல்	நாலடியார்	மாணிக்கவாசகர்பாடல்	பத்துப்பாட்டும்தமிழர்வாழ்வியலு ம்	எளியமனிதர்களின்கதை
S-6	SLO-1	அகநானூறு (44)	இலக்கியங்களில்நட்பு	வைணவசமயவளர்ச்சிப் போக்கு	பதினெண்கீழ்க்கணக்குநூல்கள்	சிங்காரவடிவேலு – தவிப்பு
	SLO-2	புறவாழ்வோடுகூடிய அகம்	நட்பில்பிழைபொறுத்தல் (221)	வைணவசமயஇலக்கியங் கள்	பதினெண்கீழ்க்கணக்கும்தமிழர் அறமரபும்	புறக்கணிப்பின்வலி
S-7	SLO-1	கற்றறிந்தார்ஏத்தும்க லி	தமிழர்மருத்துவம்	நாலாயிரத்திவ்யப்பிரபந் தம்	நீதிஇலக்கியங்கள்	செய்திஅறிக்கைஅறிமுகம்
	SLO-2	கலித்தொகைகட்ட மைப்பு	நீதிஇலக்கியத்தில்மருத்து வநூல்கள்	பெரியாழ்வார்பாடல்	செய்திஅறிக்கைதயாரித்தல்	
S-8	SLO-1	கலித்தொகை (149)	திரிகடுகம்	ஆண்டாள்பாடல்	காப்பியஇலக்கணம்	விமர்சனம்
	SLO-2	வாழ்வியல்அறமும்அ கமும்	செங்கோல்அரசு	தொண்டரடிப்பொடிஆழ் வார்பாடல்	காப்பியப்போக்குகள்	இலக்கியம், கலைவிமர்சனம்
S-9	SLO-1	தமிழர்புறமரபு	இனியவைநாற்பதுஅறிமு கம்	தமிழில்இஸ்லாமியஇலக் கியங்கள்	ஐம்பெருங்காப்பியங்கள்	நேர்காணல்அறிமுகம்
	SLO-2	புறஇலக்கியங்கள்	இனியவைநாற்பதின்தனி த்தன்மைகள்	இஸ்லாமியஇலக்கியங்க ளின்கொடை	ஐம்பெருங்காப்பியங்களின்சிறப் புகள்	நேர்காணல் – நுட்பங்கள்
S- 10	SLO-1	புறநானூறு (235)	இனியவைநாற்பது (14)	சீறாப்புராணம்	தமிழ்ச்சமூகமும்சமயத்தத்துவங் களும்	நேர்காணல்கேள்விதயாரிப்பு
	SLO-2	கையறுநிலை	இனிமையும்அழகும்	மானுக்குப்பிணைநின்றப டலம் (5 பாடல்கள்)	சமயத்தத்துவங்களும்வாழ்வியல் விழுமியங்களும்	நேர்காணல்பதிவும்எழுதுமுறை யும்
S- 11	SLO-1	ஆற்றுப்படைஅறிமுக ம்	பண்டைக்காலப்போரும் வாழ்வும்	கிறித்தவசமயஇலக்கிய ங்கள்	பன்னிருதிருமுறை – அறிமுகம்	பேச்சுக்கலைஅறிமுகம்
	SLO-2	ஆற்றுப்படைமரபுகள்	போர்இலக்கியங்கள்	கிறித்தவஇலக்கியங்களி ன்கொடை	பன்னிருதிருமுறை – வரலாறு	தமிழரின்பேச்சுக்கலை
S- 12	SLO-1	சிறபாணாற்றுப்படை	களவழிநாற்பது (14)	ஆதிநந்தாவனப்பிரளயம்	நாலாயிரத்திவ்யப்பிரபந்தம் – அறிமுகம்	பேச்சுக்கலையின்வகைகள்
	SLO-2	நல் <mark>லியக்கோடனும்</mark> பாணர்வாழ்வியலும்	தமிழர்வீர்ம்	ஏதேன்தோட்டவருண னை	பன்னிருஆழ்வார்கள்வரலாறு	பேச்சுப்பயிற்சி

	1.	மௌவல்,	தொகுப்பும்பதிப்பும்	-	தமிழ்த்துறைஆசிரியர்கள்,	தமிழ்த்துறை,	எஸ்.ஆர்.எம்.
		அறிவியல்ம	ற்றும்தொழில்நுட்பக்கல்விநிறுவ	னம், காட்	டாங்குளத்தூர், 603203, 2020.		
Learning	2.	தமிழண்ண	ம், புதியநோக்கில்தமிழ்இலக்கிய	வரலாறு, ப	ீனாட்சிபுத்தகநிலையம், மதுரை, 2017	,	
Resources	3.	மு. அருணாச	லம், தமிழ்இலக்கியவரலாறு, நூ	ற்றாண்டு	ழறை (9ஆம்நா. முதல் 16 வரை), திபார்	க்கர், சென்னை, 2005	
	4.	தமிழ்இணை	யக்கல்விக்கழகம் - http://www.tamily	u.org/			
	5.	மதுரைதமிழ்	இலக்கியமின்தொகுப்புத்திட்டம்	- https://www	v.projectmadurai.org/		

	Di l			Continuous	s Learning As	sessment (5	0% weightag	le)	Final Examination (50% weighteen)					
	Bloom's	CLA –	1 (10%)	CLA – 2 (10%)		CLA –	3 (20%)	CLA -	- 4 (10%)#	Final Examinatio	on (50% weightage)			
	Lever of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice			
ovol 1	Remember	20%		200/		200/		200/		209/				
	Understand			30%		30%		30%		30%	-			
aval 0	Apply	40%		E00/		E00/		E00/		E0%/				
Level 2	Analyze	40%	40%			50%		50%		50%	-			
aval 2	Evaluate	20%		200/		200/		200/		20%				
evel 3	Create			20%		20%		20%		20%	-			
	Total	10	0 %	10	00 %	10	0 %	1	00 %	10	0 %			
‡ CLA – 4	can be from any combinat	ion of these: As	signments, Se	eminars, Tec	h Talks, Mini-F	Projects, Cas	e-Studies, Se	If-Study, MO	OCs, Certificatio	ons, Conf. Paper etc.,				
Course D	esigners													
-			E		-									

Experts from Industry	Expert from Higher Technical Institutions	Internal Experts
	1. Dr. R. Srinivasan, Associate Professor, Department of Tamil, Presidency College, Chennai.	1. B.Jaiganesh, Assistant Professor & Head, FSH, SRMIST
		2. T.R.Hebzibah Beulah Suganthi, Assistant Professor, FSH, SRMIST
		3.S.Saraswathy, Assistant Professor, FSH, SRMIST

Course Code	ULH20G02J	Cour Nam	se e	Hindi-II Cou		rse Ca	atego	ry	G		Generic Elective Cou					Cour	se			L 2	T 0	P 2	C 3	
Pre-requ Cours	uisite Ses <i>Nil</i>			Co-requisite Courses	Nil		Pro	ogres	sive Co	urses	Ni	1												
Course Offe	ering Departmen	t	HINDI		Data Book / C	odes/Standards									Nil									
Course Lea	rning Rationale	(CLR):	The purpose of learnin	g this course is a	0:		L	earniı	ng				P	rogr	am Le	earnir	ng O	utcor	nes ((PLO)	1			
CLR-1 :	To be able to cor	verse wel	in the Hindi Language				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2: CLR-3: CLR-4:	To read and write To be willing liste To acquire the va	e and clarit eners and t alues/thoug	y ranslators –where need ht contents of the write	be rs and practice i	n it in life.	and of life	Bloom)	cy (%)	nt (%)	vladra	Icepts	Disciplines	edge	tion	nowledge		Data		kills	dills				
CLR-5 : CLR-6 :	LR-5 : To find motivation through the various forms of literature and learn to overcome any challenges of life. LR-6 : To discover the importance of the language in making education as a means of growth in life and not mere literacy.				fe and not mere	Thinking (I	l Proficien	l Attainme	untal Knov	on of Cor	Related [al Knowle	Specializa	Utilize Kr	Modeling	Interpret I	tive Skills	Solving S	lication Sk	ıl Skills				
Course Lea (CLO):	rning Outcomes	A	t the end of this course,	learners will be	able to:		Level of	Expected	Expected	Fundame	Applicati	Link with	Procedu	Skills in 3	Ability to	Skills in I	Analyze,	Investige	Problem	Commur	Analytica	PSO -1	PSO -2	PSO-3
CLO-1:	To acquire knowl	ledge abou	t Medieval and Modern	Poetry.			2	75	60	h	H	Н	-	-	-	-	-	-	-		-	-	-	-
CLO-2 :	To consider the r	elevance o	f the present trends in	Hindi and their d	ontemporary relevance.	. , , ,,	2	80	70	-	Н	-	Н	-	-	-	-	-	-	-	-	-	-	-
CLO-3 : CLO-4 :	To neip develop To understand th Language.	e usage of	the present Advertising	anguage by stu g trends and its	creative angles with the creative angles with the	erence to current reality. varied skills of Hindi	2	70	65 70	h	-	- H	н Н	- H	-	-	-	-	-	- H	-	-	-	-
CLO-5 :	To make translat versa.	ion of good	l literature and any rele	vant document i	rom the Hindi Language	to English and Vice-	2	80	70	-	Н	-	Н	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	To help the learn ease.	er to tackle	Administrative termino	logies, help the	m use Idioms and Phras	es in their daily life, with	2	75	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Duration	(hour)		12		12	12							12							1:	2			

Duration (hour)		12	12	12	12	12
S 1	SLO-1	Kavye ke guno se awagat karana – Jaysi	Kahani Idkiyan	VIGYAPAN	ANUVAD	Takniki Shabdavali
3-1	SLO-2	lshk hakiki evam moksh bhava se awagat karana	Nari Shakti ki sarthakata	Srijnatamak kshmata jagrit karna	Vidhyarthiyon ko sikhaya jayega anuvad kitna upyogi hai	Vaignik tarike se bhashaon ka avishkaar karna
6.2	SLO-1	Surdas – Vatsalya ras se awagat karana	Kahani gunda Prem ki prakashtha se awagat karvana	VIGYAPAN KYA HAI	ARTH	RTH
S-2	SLO-2	Bhakti Bhavna se vidhyarthiyon ko jodna	Prtantr bharat ki samajik vyavstha se awagat karvana	Shabdavali evam chitratamakta se awagat karvana	Vidhyarthiyon dwara arth smajkar samaj ke liye mahtavpurn karya kar payenge	/idhyarthi uske arth dwara hi uske nahtav smjhenge
S-3	SLO-1	Tulsidas-Manav mulyon ki prabal bhavna jagrit karna	KAHANI KE TATVA	VIGYAPAN KI BHASHA	PARIBHASHA	ARIBHASHA

Dura	tion (hour)	12	12	12	12	12		
	SLO-2	Dharmik Parvarti se awagat karana	Kahani ke tatva ki mahatta se awagat karvana	Bhasha ki abhivyakti ke pryog ko smjhana	Vibhinn vidwano dwara di gai paribhasha se us baat ko smjhenge vidhyathi	'ibhinn vidwano dwara di gai aribhasha se us baat ko smjhenge idhyathi		
64	SLO-1	Tiruvaluvaar – naitik mulyon ko jagrit karna	KAHANI KE AAYAM	IGYAPAN KA PRBHAV	MAHATVA	HABDAVALI KI AVSHYAKTA		
3-4	SLO-2	Vidhyarthiyon ko nitivaan bnana	Vidhyarthiyon ko kahani ke vidhinn ayam se awagat karvana	Shravaya-drishya samgri ke prbhav ki upyogita	Samijik jan-jeevan ke liye anuvad ke mahtav ko smjhana.	aignikon ka awiskar kitna mahtavpurn		
	SLO-1	Desh prem ki bhavna bharna	LEKHAK PARICHAY	IGYAPAN AUR BAZAR	UDDESHYA	HASHA VAIGYANIK		
S-5	SLO-2	Krantikari vicharon se Awagat karana	Lekhako ke jivan se awagat karvana	Vidhyarthioyon ko vigyapan se bazar me kaise sthapit kiya ja skata hai batana	Vidhyarthi anuvad ke uddeshya ko smajhkar samaj upyogi karya krne me apni sarthak bhumika nibhayenge	shasha vaignikon ki jankari		
8.6	SLO-1	Badal Raag- Desh prem ki bhavna bhrna	HINDI-ENGLISH	ARYALYIN SHABD				
3-0	SLO-2	Krantikari vicharo se awagat karana	Vidhyarthiyon ko kahani path ke dwara unka vak kausal majbut karna	Vidhyarthi savam ka ad-ajency bhi bna paye	Hindi adhikarai aur anuvadak ke pad ke liye tayaar karna	habd kaise tayar kiye jate hain idhyorthiyon ko jankari		
	SLO-1	Pret ka Byaan -Bhukhmari evam akaal se awagat karana	KAHANI KA SARANSH	VIGYAPAN KI NIYAM	ENGLISH-HINDI	NGREZI SE HINDI ANUVAD		
S-7	SLO-2	Samajik samanta banaye rkhne ki pravarti jagana	Lekhan kshmata ka vikas hona	Vigyapan ka ek hi niyam bhasha ka kashav jo vidhyarthiyon me viksit kiya jayega	Hindi adhikarai aur anuvadak ke pad ke liye tayaar karna	lindi adhikarai aur anuvadak ke pad ke ye tayaar karna		
6 0	SLO-1	Lahro se dark a nauka paar nhi hoti – chatro ko sahashi bnana	KAHANI KA UDDESHYA	VIGYAPAN KA MAHTVA	ANUVAD KI UPYOGITA	IINDI SE ANGREZI ANUVAD		
3-0	SLO-2	Karmaththa purn bhavna ko jagrit karna	Kahani ke uddeshy unke jiwan ke mahtav ko smjhne me sahayk banna	Vartman me uski prasangikta vidhyarthiyon ko smjhana	Vidhyarthiyon ko vibhin karyalayon me hindi adhikari pad ki jankari prapt	lindi adhikari aur anuvadak ke pad ke ye tayaar karna.		
	SLO-1	Javani –rashtr prem ki bhavna jagrit karna	KAHANI KA VISHELESHAN	PRINT VIGYAPAN	ANUVADK KI BHUMIKA	K DIN EK SHABD		
S-9	SLO-2	Vir ras evam virta ki pravati se awagat karana	Vishleshan kshmata viksit hota	Vidhyarthi iski bhasha sikhenge	Vidhyarthiyon ko anuvadak ki bhumika ka mahtav smajh aayega jiske adhar par vo kaam karenge	∕idhyarthiyon ko rozgaar se jodna		
	SLO-1	Dhool- saman vyavhar ki pravarti jagana	KAHANI PARICHARCHA	RADIO, TV.VIGYAPAN	SAHITYIK ANUVAD	PRYOJANMULAK SHABD KA AHTAVA		
S-10	SLO-2	Satah se jude rahne ke prerna dena.	Vaad-vivad se vidhyarthiyon me apni baat ko rkhne ki yogyata banna	Vidhyarthiyon ko abhyas karvaya jayega	Vibhinn bhashaon ke sahitya ka anuvad kaise kiya jane ki chunouti ko samjajh payenge	Vidhyarthiyon ko vaighniko dwara tayaar ki gai bhasha ki samaj		
S-11	SLO-1	KAVYA BIBM	KAHANI ANDOLAN	Ad agency	ANUVAD KE NIYAM	VIBHINN KSHETRO ME PRYOJANMULAK SHABDO KA MAHATAV		
	SLO-2	Vidhyarthiyon ko naye-naye bibm ki jankari prapt hona	Vibhinn kahani andolan se bhi awagat karana	Ad agency aur swarozgaar se jodna	Anuvad ke niyamo ko vidhyarthi smajh payenge	Hindi adhikari pad par karyarat		
S-12	SLO-1	SAMUHIK PARICHARCHA	KAHANI KA BADLTA SWAROOP	VIGYAPAN KA SWARUP	SHABDO KA MAHATAV	VAIGYANIK SHABDAVALI KI AVSHYAKATA		
5-12	SLO-2	Vidhyarthiyon ki bolne ki kaushal kshamta ko bdhana	Smay ke sath unke swarup ke bdlav ka bhi vidyarthi me samajh paida hona	Vidhyarthiyon ko vigyapan lekha ki barikayon ki samajh utpann hona	Shabda anuvad ke mahtva ko vidhyarthi smajhenge	Vidhyarthiyon ko shabdo ki vaignikta se jodna		

Learning Resources	The Prescribe Text Book Compiled and Edited by Department of Hindi
	www.kavitakosh.org
	www.shabdkosh.com

Learning A	Assessment										
	D I 1			Continuous	s Learning As	sessment (5	0% weightag	e)		Final Examination	(EQ)(weighters)
	Bloom's	CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA -	- 4 (10%)#		(50% weightage)
	Level of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Lovel 1	Remember	200/		200/		200/		200/		30%	
Leveri	Understand	30 %		30 /6		20 /0		20 /0		50 %	-
	Apply	40%		50%		50%		50%		50%	_
	Analyze	40 /0		50 /8		50 %		50 /6		50 %	-
Lovel 3	Evaluate	20%		200/		20%		20%		20%	
Level 3	Create	30 %		20 /0		30 /6		30 /6		2078	-
	Total	10	0 %	10	00 %	10	0 %	1	00 %	100	%

CLA - 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers							
Experts from Industry	Expert from Higher Technical Institutions	Internal Experts					
	1. Prof.(Dr.) S.Narayan Raju, Head, Department of Hindi,CUTN, Tamilnadu	1. Dr.S Preeti. Associate Professor & Head, SRMIST					
		2. Dr. Md.S. Islam Assistant Professor, SRMIST					
		3 Dr. S. Razia Begum, Assistant Professor, SRM IST					

Course Code	ULF	20G02J	Course Name		Fi	rench-ll	Cou	Course Category G Generic Elective Course				L 2	T 0	P 2	С 3										
Pre-rec Cour	quisite rses	Nil			Co-requisite Courses	Nil		Prog	iressi	ive Co	ourses /	Vil													
Course Of	fering De	partment	Fr	ench		Data Book / Cod	les/Standards									Nil									
Course Le	earning Ra	ationale (Cl	LR): Th	e purpose of lea	rning this course is to):		L	earni	ng				F	rogra	am Lo	earni	ing O	utcor	mes ((PLO)			
CLR-1: CLR-2: CLR-3:	Strength Express Make th	their sentin em learn the	uage of the nents, emot e basic rule	students both ir students both ir s of French Gran	n oral and written ns, reacting to inform mmar.	nation, situations		1	2	3	1	2	ines C	4	5	dge 🗢	7	8	9	10	11	12	13	14	15
CLR-4 : CLR-5 :	Develop Enable t speaking	strategies of the students g French	of compreh to overcor	ension of texts on the fear of sp	of different origin eaking a foreign lang	guage and take position as	a foreigner	ng (Bloom	ciency (%)	nment (%)	nowledge	Concepts	ed Discipl	owledge	alization	e Knowled	ing	oret Data	kills	ng Skills	n Skills	s			
CLR-6 :	Extend a	and expand	their savoi	r-faire through th	ne acquisition of curre	ent scenario		Thinki	l Profi	l Attaiı	ental k	on of	Relat	ral Kno	Specia	Utilize	Modeli	Interp	tive S	Solvir	licatio	ul Skill			
Course Le (CLO):	earning O	utcomes	At th	e end of this cou	ırse, learners will be	able to:		Level of ⁻	Expectec	Expectec	Fundame	Applicati	Link with	Procedui	Skills in 3	Ability to	Skills in I	Analyze,	Investiga	Problem	Commur	Analytica	PSO -1	PSO -2	PSO-3
CLO-1 :	To acqu	ire knowled	ge about F	rench language				2	75	60	Н	Н	Н	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	To stren	gthen the k	nowledge c	n concept, cultu	re, civilization and tra	anslation of French		2	80	70	-	Н	-	Н	-	-	-	-	-	-	М	-	-	-	-
CLO-3 :	To deve	lop content	using the fe	eatures in Frenc	ch language			2	70	65	Н	-	-	Н	-	-	-	-	-	-	Н	-		-	
CLO-4 :	To interp	oret the Frei	nch langua	ge into other lan	nguage			2	10	70	Н	-	Н	H	Н	-	-	-	-	-	H	-	-	-	
CLO-5 :	To impro	ove the com	munication	, intercultural ele	ements in French lan	guage	an a foreigner	2	80	70	-	н	-	н	-	-	-	-	-	-	Н	-		-	-
CLO-6 :	speaking	g French			speaking a loreign is	anguage and take position	l as a loreigner	2	75	70	Н	-	М-	Н	Н	-	-	-	-	-	-	-	-	-	-
Duratio	n (hour)		12			12		12						12								12			
	SLO-1	Les loisirs	6		La routine		Où faire ses co	ourses	?		Déc	ouvrez	z et de	égust	ez			Тс	out le	mono	de s'a	amus	е		
S-1	SLO-2	Les activit	tés		Les exemples		Les courses				Dég	ustez						Le	mon	de					
6.2	SLO-1	Les activit	tés quotidie	nnes	Les adjectifs inter	rogatifs	Les aliments				Les	article	s par	titifs				Le	es sor	ties					
3-2	SLO-2	Les quotio	diennes		Les trois formes		Les exemples				Du,	De la,	De l',	Des				Le	es exe	emple	es				
6.2	SLO-1	Les matiè	eres		Les nombres ordin	naux	Les quantités				Le p	ronom	i en (la qua	antité)			Si	tuer d	lans l	e ten	nps			
5-3	SLO-2	Les exem	ples		Les nombres		Les exemples				Le b	oon qu	antite	é				Le	es acti	ivités					
S-4	SLO-1	Le temps			L'heure	10	Les commerce	S			Très	?	2					Le	s vêt	emen	nts ine -				
	SL0-2	L'neure			Quelle neure est-i		Les activites	. 1 .			Bear	ucoup	(e . 7	0)			Le	es acc	esso	ires				
S-5	SL0-1	Les frequ	s fréquences Le pronom personnel COD Les commerçar			erçants La phrase negative (2)				Les ados au quotidien															
	SLO-2 Les activités Les exemples Les exemples			Les négation			s négations La vie q				La vie quotidienne														

Durat	ion (hour)	12	12	12	12	12
8.6	SLO-1	Les sons [u]	Les pronominaux	Demander le prix	C'est /II est	Les adjectifs démonstratifs
3-0	SLO-2	Les sons [y]	Se promener, se coucher etc,	Dire le prix	Les activités	Ce, Cet, Cette, Ces
67	SLO-1	Les loisirs	Les verbes du premier groupe	Les services	L'impératif	La formation du féminin
3-1	SLO-2	Les exemples	Parler, Demander, Poser	Les exemples	Les exemples	Les exemples
c 0	SLO-1	La routine	groupe en -e_er,é_er,-eler,-eter	Les moyens de paiement	Les verbes devoir, pouvoir	Le pronom indéfini on
3-0	SLO-2	Les activités	Appeler, Jeter etc,	La carte de crédits	Les verbes savoir, vouloir	Les activités
8.0	SLO-1	Les Mots	Le verbe prendre	les sons [ã]	II faut	Le futur proche
3-9	SLO-2	Les expressions	Les exemples	Les sons [an]	Le verbe impersonnel	S+Aller+Infinitif du verbe
S-10	SLO-1	Exprimer ses gouts	Parler de ses gouts	Découvrez !	Au restaurant : Commander et commenter	Le passe composé
0-10	SLO-2	Les exemples	Des gouter	Dégustez !	Les restaurant	Les exemples
6 11	SLO-1	Exprimer ses préférences	Parler de ses préférences	Au restaurant : commander	Inviter à une invitation	Les verbes voir et sortir
3-11	SLO-2	Les activités	Les exemples	Au restaurant : commenter	Répondre à une invitation	Décrire une tenue
6 42	SLO-1	Décrire sa journée	Décrire sa journée	Inviter à une invitation	Les Mots	écrire un message amical
3-12	SLO-2	Les exemples	Les activités	Répondre à une invitation	Les expressions	Lire un message

Learning Resources

Theory: 1. "Génération-Al" Méthode de français, Marie-Noëlle COCTON, P.DAUDA, L.GIACHINO, C.BARACCO, Les éditions Didier, Paris, 2018. 2. Cahier d'activités avec deux discs compacts.

Learning Assesment

	Plaam'a		Continuous Learning Assessment (50% weightage)							Final Examination (50%) weighters)					
	DIUUIII S	CLA – 1 (10%)		/%) CLA – 2 (10%)		CLA –	3 (20%)	CLA -	- 4 (10%)#	Final Exam	nation (50% weightage)				
	Level of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice				
Lovel 1	Remember	200/		200/		200/		200/		20%					
Level I	Understand	30 /0		30 %		20 /0		20 /0		50 %	-				
Lovol 2	Apply	10%		50%		50%		50%		50%					
	Analyze	40 /0		50 %		50 %		50 %		50 %	-				
Lovel 2	Evaluate	200/		200/		200/		200/		20%					
Level 3	Create	30%		20%		30%		30%		20%	-				
	Total	1(0 %	10	0 %	10	0 %	1	00 %		100 %				

CLA - 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Expert from Higher Technical Institutions	Internal Experts
	1. Dr. C. Thirumurugan Associate Professor, Department of French, Pondicherry University	1. Kumaravel K. Assistant Professor & Head, SRMIST
		2. Ponrajadurai M Assistant Professor, SRMIST

Course Code	UCY20201J	Course Name Orgar	iic Chemistry – I: Basic	Concepts and Hydrocarbons	Cour Categ	se ory	C				Со	e Co	urse				L 4	T 0	P 4		C 6	
Pre-requ Cours	iisite es		Co-requisite Courses	Nil							Pr	ogres	sive	Cours	es	Ni	I					
Course Offe	ering Department	Chemistry		Data Book / Codes/Standards						Nil												
Course Lea	rning Rationale ((CLR): The purpose of l	earning this course is to:			Le	arnin	g				I	Progr	ram Le	arning) Outc	omes	6 (PLC	D)			
CLR-1 :	Organic Chemisti for the subseque	ry I is designed in a ma nt semesters	nner that it forms a cardi	nal part of the learning of organic ch	nemistry	1	2	3	1	2	3	4	5	6	7	8 9) 10) 11	12	13	14	15
CLR-2 :	The course is inf new concept of v	used with the recapitulation is the second test in the second test is the second test in the second test is the second test in the second test is	ation of fundamentals of olecules in a three-dimen	organic chemistry and the introduct sional space	ion of a																	
CLR-3 :	To establish the introduced	applications of these of	concepts, the functional	groups- alkanes, alkenes and alky	nes are							÷		1	ll d							
CLR-4 :	To establish the a	applications of these cor	ncepts, the functional gro	ups aromatic hydrocarbons are intro	oduced	l evel of	(%)	(%)	ge		÷	earc		-	an	논		-				
CLR-5:	The constitution of	of the course strongly ai	ds in the paramount lear	ning of the concepts and their applic	ations	Thinking	icy (ent (vled		nen	Ses	Ð		2 Q	No No		ance				
Course Learning Outcomes (CLO):	At the end of this	course, learners will be	able to:			(Bloom)	Expected Proficier	Expected Attainme	Fundamental Kno	Problem Analysis	Design & Develop	Analysis, Design,	Modern Tool Usaç	Society & Culture	Ethics	Individual & Team	Communication	Project Mgt. & Fin	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Understand and e	explain the differential be	ehavior of organic compo	unds based on fundamental concept	s learnt.	2	75	60	Н	Н	Н	-	-	-		-	-	-	-	Н	-	-
CLO-2 :	Formulate the me reactants involve	echanism of organic rea d.	ctions by recalling and c	orrelating the fundamental propertie	s of the	2	80	70	-	Н	-	Н	-	-		-	-	-	-	Н	-	-
CLO-3 :	Learn and identify Addition and Electron	y many organic reaction ctrophilic Aromatic Subs	mechanisms including F titution.	ree Radical Substitution,Electrophili	ic	2	70	65	Н	-	-		-	-		-	-	-	-	Н	М	-
CLO-4 :	Correlate and dea	scribe the stereochemic	al properties of organic c	ompounds and reactions		2	70	70	Н	-	Н	Н	Η	-		-	-	-	-	-	М	Н
CLO-5 :	Understand and e	explain the reactivity of	alkenes and alkynes			2	80	75	Н													

Duratio	n (hour)	24	24	24	24	24
S-1	SLO-1	Recapitulation of Basics of Organic Chemistry :Hybridisation: Shapes of molecules	Chirality in molecules with one and two stereocentres	Carbon-Carbon sigma bonds (Alkanes and Cycloalkanes): General methods of preparation- Wurtz and Wurtz Fittig reaction	Cyclohexane confirmation with energy diagram	Aromatic Hydrocarbons :Concept of Aromaticity: Huckel's rule aromatic character of arenes with examples
	SLO-2	Hybridisation: Shapes of molecules	Chirality in molecules with one and two stereocentres	General methods of preparation- Wurtz and Wurtz Fittig reaction	Cyclohexane confirmation with energy diagram	Concept of Aromaticity: Huckel's rule aromatic character of arenes with examples
6.2	SLO-1	Electronic Displacements and their applications: Inductive & Electromeric	Chirality in molecules with no stereocentre (Allenes, biphenyls); meso configuration	General methods of preparation-Corey House synthesis	Axial and equatorial positions	Concept of Aromaticity: Huckel's rule aromatic character of cyclic carbocations with suitable examples
5-2	SLO-2	Resonance, Mesomeric effects and Hyperconjugation	Chirality in molecules with no stereocentre (Allenes, biphenyls); meso configuration	General methods of preparation-Corey House synthesis	Axial and equatorial positions	Concept of Aromaticity: Huckel's rule aromatic character of cyclic carbocations with suitable examples

Duratio	n (hour)	24	24	24	24	24
S_3	SLO-1	Concept of dipole moment, Acidity and Basicity and related pKa values	Racemic modification	Physical and chemical properties of alkanes	Conformations of monosubstituted alkanes	Concept of Aromaticity: Huckel's rule aromatic character of a carbanions with suitable examples
3-3	SLO-2	Concept of dipole moment, Acidity and Basicity and related pKa values	Racemic modification	Physical and chemical properties of alkanes	Conformations of monosubstituted alkanes	Concept of Aromaticity: Huckel's rule aromatic character of a carbanions with suitable examples
5.4	SLO-1	Homolytic and heterolytic fissions with suitable examples, types, shape and relative stability of Carbocations, Carbanions, Free radicals and Carbenes	Resolution of Racemic Modification	Isomerism and its effect on properties of molecule	Carbon-Carbon pi Bonds (Alkenes and Alkynes): Structure and isomerism	Concept of Aromaticity: Huckel's rule aromatic character of heterocyclic compounds with suitable examples
3-4	SLO-2	Homolytic and heterolytic fissions with suitable examples, types, shape and relative stability of Carbocations, Carbanions, Free radicals and Carbenes	Resolution of Racemic Modification	Isomerism and its effect on properties of molecule	Structure and isomerism	Concept of Aromaticity: Huckel's rule aromatic character of heterocyclic compounds with suitable examples
	SLO-1	Lab Introduction	Purification of organic compounds by	Effect of impurities on the melting point -	Calibration of Thermometer	Experiment-Repeat-2
S-5 to S-8	SLO-2		crystallization using the following solvents: aWater b. Alcohol	mixed melting point of two unknown organic compounds		
S-9	SLO-1	Homolytic and heterolytic fissions with suitable examples, types, shape and relative stability of Carbocations, Carbanions, Free radicals and Carbenes	Relative configuration: D/L designations	Free radical substitutions; Halogenation	General methods of preparation, physical and chemical properties	Electrophilic aromatic substitution: halogenation with mechanism
	SLO-2	Weaker forces like van der Waal's forces and Hydrogen bonding	Relative configuration: D/L designations	Free radical substitutions; Halogenation	General methods of preparation, physical and chemical properties	Electrophilic aromatic substitution: halogenation with mechanism
S 10	SLO-1	Electrophiles and Nucleophiles and introduction to types of organic reactions: Addition, Elimination and Substitution reactions	Relative configuration: D/L designations	Concept of relative reactivity v/s selectivity	Mechanism of E1 reactions	Nitration with mechanism
3-10	SLO-2	Electrophiles and Nucleophiles and introduction to types of organic reactions: Addition, Elimination and Substitution reactions	Relative configuration: D/L designations	Concept of relative reactivity v/s selectivity	Mechanism of E2 reactions	Nitration with mechanism
S_11	SLO-1	Stereochemistry: Optical Activity and Optical Isomerism	Absolute configuration: R/S designations	Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of Ethane)	Mechanism E1cb reactions	Sulphonation with mechanism
3-11	SLO-2	Optical Activity and Optical Isomerism	Absolute configuration: R/S designations	Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of Ethane)	Saytzeff and Hoffmann eliminations	Sulphonation with mechanism

Duratio	n (hour)	24	24	24	24	24
S-12	SLO-1	Asymmetry, Chirality, Enantiomers, Diastereomers	Absolute configuration: R/S designations	Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of propane)	Electrophilic Additions, mechanism with suitable examples, (Markownikoff /Antimarkownikoff addition)	Friedel Crafts alkylation/ acylation with their mechanism
5-12	SLO-2	Asymmetry, Chirality, Enantiomers, Diastereomers	Absolute configuration: R/S designations	Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of propane)	Electrophilic Additions, mechanism with suitable examples, (Markownikoff /Antimarkownikoff addition)	Friedel Crafts alkylation/ acylation with their mechanism
S-13 To S-16	<u>SLO-1</u> SLO-2	Organic Preparation:Bromination of acetanilide/ aniline/phenol	Purification of organic compounds by crystallization using the following solvents:a. Alcohol-Water	Chromatography (a) Separation of a mixture of two amino acids by ascending and radial paper chromatography (b) Separation of a mixture of two sugars by ascending paper chromatography (c) Separation of a mixture of o-and p- nitrophenol or o-and p-aminophenol by thin layer chromatography (TLC)	Detection of extra elements	Experiment-Repeat-3
S 17	SLO-1	Specific rotation; Configuration	Geometrical isomerism: cis-trans	Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of butane)	Syn and anti-addition; addition of H_2 , X_2 , methylene	Directing effects of groups in electrophilic substitution: Activating groups
5-17	SLO-2	Specific rotation; Configuration	Geometrical isomerism: cis-trans	Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of butane)	Oxymercuration-demercuration, hydroboration-oxidation	Directing effects of groups in electrophilic substitution: Activating groups
6 4 9	SLO-1	Projection Formulae: Newmann, Sawhorse, Fischer	Geometrical isomerism: syn-anti	General molecular formulae of cycloalkanes	Hydroxylation, Diels Alder reaction	Directing effects of groups in electrophilic substitution: Deactivating groups
5-10	SLO-2	Projection Formulae: Newmann, Sawhorse, Fischer	Geometrical isomerism: syn-anti	General molecular formulae of cycloalkanes	1,2-and 1,4-addition reactions in conjugated dienes	Directing effects of groups in electrophilic substitution: Deactivating groups
S 10	SLO-1	Projection Formulae: Newmann, Sawhorse, Fischer	E/Z notations with CIP rules	Relative stability of cycloalkanes	Mechanism of allylic and benzylic bromination in propene, 1-butene, toluene, ethyl benzene	Different groups effects on benzene
3-19	SLO-2	Projection Formulae: Newmann, Sawhorse, Fischer	E/Z notations with CIP rules	Relative stability of cycloalkanes	Mechanism of allylic and benzylic bromination in propene, 1-butene, toluene, ethyl benzene	Halides competing effects
S-20	SLO-1	Projection Formulae: interconversion	E/Z notations with CIP rules	Baeyer Strain Theory	Reactions of alkynes; acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylation of terminal alkynes	Directing effect on multiple substituents

Duratio	n (hour)	24	24	24	24	24
	SLO-2	Projection Formulae: interconversion	E/Z notations with CIP rules	Baeyer Strain Theory	Reactions of alkynes; acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylation of terminal alkynes	Directing effect on multiple substituents
S-21 to S-24	SLO-1 SLO-2	Organic Preparation: Nitration of nitrobenzene/toluene	Determination of the melting points of prepared organic compounds (Kjeldahl method and electrically heated melting point apparatus)	Determination of boiling point of liquid compounds. (boiling point lower than and more than 100 °C by distillation and capillary method)	Experiment-Repeat-1	Demonstration Practical Session

5th Ed., Pearson 2012. Ahluwalia, V.K. &Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press, 2000. Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press, 2000.
5 A A A

Learning A	Assessment										
	Pleam's		Conti	nuous Learn	ing Assessme	ent (50% we	ightage)			Final F	warmingtion (E0% waightage)
	Diouin's	CLA – 1 (10	%)	CLA –	2 (10%)	CLA –	3 (20%)	CLA –	4 (10%)#		xamination (50 % weightage)
	Level of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Lovol 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
Level I	Understand	20 %	20 %	1570	1576	1570	1576	1570	1576	10 /0	15 %
Lovol 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze	2076	2078	2070	2076	2070	2076	2070	2076	2076	2078
Lovel 3	Evaluate	100/	10%	150/	150/	150/	150/	150/	150/	150/	150/
Level 5	Create	10 /0	10 /0	1570	1576	1570	1576	1570	1576	10 /0	15 %
	Total	100 %		10	0 %	10	0 %	10	0 %		100 %

CLA - 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories,	2. Deef. Visiela Delekettissen TIED Murcheississieren 2004 febrer in	2 Da Ganal Chandry Grandi CDMICT
shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbal, vivekpolatifr.res.in	2. Dr. Gopal Chandru Senadi, SRMIST

Course Code	UC	CY20202T	Course Name	Ir	norganic Chemis	stry - II: s- and p-Bloc	ck Elements	C Ca	ourse tegory	,	C					(Core	cour	se				-	L 5	T 1	P 0	C 6
Pre-re Cou	quisite rses Offering [Nil	Chemis	stru	Co-requisite Courses	Nil Data Bo	ook / Codes/Standards		Pro C	ogres ours	ssive ses	Ni	1														
Course	mening i	Jepartinent	Chemis	suy		Data Do	or / Coues/Stanuarus		1111																		
Course I	earning	Rationale (C	LR): The pu	irpose of leari	nina this course is	s to:			Le	arni	na					ŀ	Proa	ram L	earn	ina O	Jutco	mes	(PLO)			
					ing and couldo io											•	.•9						1 •	/			-
CLR-1 :	Explo	it the general	principals of	^r Metallurgy a	nd s-, p-block elei	ments			1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Expla	ins the princip	oles of oxida	tion and redu	ction as applied to	o the extraction proced	dures																				
CLR-3 :	Get k	nowledge on	metals and a	alloy behaviou	ir, and understand	d why alloys are prefe	rred over metal alone												_								
CLR-4 :	Addre	ess thermodyr	namic conce	pts like Gibbs	energy and entro	ppy to the extraction of	f metals		-	_						rch			bility								
CLR-5 :	Empl synth	oy the pattern esis, structure	s and trends e, bonding ar	exhibited by nd uses	s and p block elei	ments and their comp	ounds with emphasis or	ו	Bloom	icy (%	ent (%)		vledge		nent	Resea	e		stainal		Work		ance				
CLR-6 :	Utilize	e the basic ch	emistry princ	ciples applied	in various biologi	cal problems and iden	tify appropriate solution	S	iking (oficien	tainme		l Knov	alysis	velopi	sign, I	Usag	ilture	& Su		Team	ion	& Finé	arning			
Course ((CLO):	earning	Outcomes	At the	end of this co	urse, learners will	l be able to:			Level of Thin	Expected Pr	Expected Att		Fundamenta	Problem Ana	Design & De	Analysis, De	Modern Tool	Society & Cu	Environment	Ethics	Individual &	Communicat	Project Mgt.	Life Long Le	PSO - 1	PSO - 2	PSO-3
CLO-1 :	Utilize	e the principle	s of metallur	gy for extract	ion of pure metal	s			2	70	65		Н	Н	H	-	-	-	-	-	- 1	-	-	-	H	-	-
CLO-2 :	Explo	oit the basic a	nd practical	applications i	n metals and alloy	y to their manufacturin	g processes		2	80	70		Н	Н	-	Н		-	-	-	-	-	-	-	Н	-	-
CLO-3 :	Gaini metal	ng the knowle Is	edge in therm	nodynamic co	ncepts like that of	f Gibbs energy and en	tropy to the extraction o	f	2	75	60		-	-	-	Н	-	-	-	-	-	-	-	-	Н	-	-
CLO-4 :	Perce	eive the impor	tance of peri	odicity of the	elements				2	70	70		Н	Н	-	-	-	-	-	-	-	-	-	-	Н	М	-
CLO-5 :	Unde	rstand the uni	usual and rai	re oxidation s	tates of carbides a	and nitrides			2	80	70		-	Н	Н	-	-	-	-	-		-	-	-	Н	H-	-
CLO-6 :	Interp caesi	oret the vital ro um in devising	ole of Sodiun g photoelectr	n, Potassium, ric cells	Calcium and mag	gnesium in biological s	systems and the use of		2	75	65		-	-	-	-	Н	-	-	-	-	-	-	-	-	Н	Н
Duratio	n (hour)		18			18	· · · · · · · · · · · · · · · · · · ·	18							18								18				
6.4	SLO-1	General Prir	nciples of Me	etallurgy	Common feature formation of alka compounds	es such as ease of aline earth metal	beryllium nitrate				ŀ	nydrio	des o	f Gro	up 14	!		h	alides	s of pl	losph	norus					
3-1	SLO-2	General Prir	nciples of Me	etallurgy	Common feature formation of alka compounds	es such as ease of aline earth metal	beryllium nitrate				ŀ	nydrio	des o	f Gro	up 14			hi	alides	s of pl	ıosph	norus					
SLO-1 Chief modes of occurrence of metals based on standard electrode potentials. thermal stability and EDTA completing					EDTA complexes o	f calci	um		ł	nydrio vhere	des o e E =	f Gro N, P)	up 15)	5 (EH:	3	P	repar	ation	of Bo	orazin	e						
SLO-2 Chief modes of occurrence of metals based on standard electrode potentials. solubility of the following alkali and alkaline earth metal compounds: EDTA complexe					EDTA complexes o	f calci	um		ł	nydrio vhere	des o e E =	f Gro N, P)	up 15)	i (EH:	}	р	roper	ties of	i Bora	azine							
S-3	SLO-1	Ellingham di metal oxides carbon mon	iagrams for r s using carbo oxide as red	eduction of on and ucing agent	hydrides		EDTA complexes o	f magi	nesium	_	ł	nydrio vhere	des o e E =	f Gro As, S	up 15 Sb)	i (EH:	}	st	tructu	re of	Boraz	zine	_	_	_		_

Duratio	n (hour)	18	18	18	18	18
		Ellingham diagrams for reduction of	hydrides	EDTA complexes of magnesium	hydrides of Group 15 (EH ₃	uses of Borazine
	SL0-2	metal oxides using carbon and carbon monoxide as reducing agent			where $E = AS, SD$	
6.4	SLO-1	Electrolytic Reduction	oxides	Solutions of alkali metals in liquid ammonia	hydrides of Group 15 (EH ₃ where $E = Bi$)	Preparation of Silicates
3-4	SLO-2	Electrolytic Reduction	oxides	Solutions of alkali metals in liquid ammonia	hydrides of Group 15 (EH ₃ where E = Bi)	Preparation of Silicates
8.5	SLO-1	Hydrometallurgy with reference to cyanide process for silver and gold.	peroxides	Properties of alkali metals in liquid ammonia	hydrides of Group 16	structure of Silicates
3-3	SLO-2	Hydrometallurgy with reference to cyanide process for silver and gold.	peroxides	Properties of alkali metals in liquid ammonia	hydrides of Group 16	structure of Silicates
8.6	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
3-0	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
S-7	SLO-1	Methods of purification of metals	superoxides	Chemistry of p Block Elements: Electronic configuration, atomic and ionic size	hydrides of Group 17	Preparation and properties of silicones
	SLO-2	Methods of purification of metals	superoxides	metallic/non-metalliccharacter, melting point	hydrides of Group 17	structure and uses of silicones
6.0	SLO-1	Electrolytic process	carbonates	ionization enthalpy	hydrides of Group 17	Preparation of Phosphonitrilic halides {(PNCl ₂) _n where n = 3 and 4}
3-0	SLO-2	Electrolytic process	carbonates	electron gain enthalpy	oxides of phosphorus	properties of Phosphonitrilic halides {(PNCl ₂) _n where n = 3 and 4}
6.0	SLO-1	van Arkel-de Boer process	nitrates	electronegativity	oxides of phosphorus	Structure of Phosphonitrilic halides {(PNCl ₂) _n where n = 3 and 4}
3-9	SLO-2	Zone refining	nitrates	Catenation	oxides of phosphorus	uses of of Phosphonitrilic halides {(PNCl ₂) _n where n = 3 and 4}
S-10	SLO-1	Chemistry of s-Block Elements: General characteristics	sulphates	Allotropy of C	oxides of sulphur	Preparation of Interhalogen compounds
	SLO-2	melting point and flame colour	sulphates	Allotropy of C	oxides of sulphur	Preparation of Interhalogen compounds
S-11	SLO-1	reducing nature	sulphites	Allotropy of P	oxides of chlorine	properties of Interhalogen compounds
0-11	SLO-2	diagonal relationships	sulphites	Allotropy of P	oxides of chlorine	properties of Interhalogen compounds
S-12	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
0 12	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
S-13	SLO-1	Anomalous behavior of first member of each group	Complex formation tendency of s-block elements	Allotropy of S	oxoacids of phosphorus	structure of Interhalogen compounds
0-10	SLO-2	Anomalous behavior of first member of each group	Complex formation tendency of s-block elements	Allotropy of S	oxoacids of phosphorus	uses of Interhalogen compounds
	SLO-1	Reactions of alkali metals with oxygen and hydrogen	structure of the following complexes: crown ethers of Group I	inert pair effect	oxoacids of phosphorus	Preparation and properties of pseudohalogen compounds
S-14	SLO-2	Reactions of alkali metals with oxygen and hydrogen	structure of the following complexes: crown ethers of Group I	Diagonal relationship between B and Si and anomalous behaviour of first member of each group.	oxoacids of chlorine	structure and uses of pseudohalogen compounds
S-15	SLO-1	Reactions of alkali metals with nitrogen	structure of cryptates	Structure, bonding and properties: acidic/basic nature, stability	oxoacids of chlorine	Preparation and properties of Clathrate compounds of noble gases

Duratio	n (hour)	18	18	18	18	18
	81.0.2	Reactions of alkali metals with	structure of cryptates	ionic/covalent nature,	oxoacids of chlorine	structure and uses of Clathrate compounds of
	3LU-2	nitrogen		oxidation/reduction,		noble gases
	SI 0 1	Reactions of alkaline earth metals	cryptates of Group I	hydrolysis, action of heat of Hydrides	peroxoacids of sulphur	Preparation and properties of xenon fluorides.
S 16	310-1	with water.				
3-10	SI 0.2	Reactions of alkaline earth metals	cryptates of Group I	hydrolysis, action of heat of Hydrides	peroxoacids of sulphur	Preparation and properties of xenon fluorides.
	310-2	with water.				
	SI 0 1	Common features such as ease of	basic beryllium acetate	hydrides of Group 13	halides of silicon	structure and uses of xenon fluorides, MO
S 17	310-1	formation of alkali metal compounds				treatment of XeF ₂ .
5-17	81.0.2	Common features such as ease of	basic beryllium acetate	hydrides of Group 13	halides of silicon	structure and uses of xenon fluorides, MO
	310-2	formation of alkali metal compounds				treatment of XeF ₂ .
S-18	SL0-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
5-10	SL0-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session

Theory:

Learning Resources

-

 Douglas, B.E; Mc Daniel, D.H. & Alexander J. J. Concepts and Models of Inorganic Chemistry, New York: John Wiley, 1994.
 Miessler, G. L. & Donald, A. Tarr. Inorganic Chemistry 3 rd Ed.(adapted), Pearson, 2009
 Shriver, D.F., Atkins P.W and Langford, C.H., Inorganic Chemistry 2 nd Ed., Oxford University Press, 1994

4. Huheey, J.E., Keiter, E.A., Keiter, R. L., Medhi, O.K. Inorganic Chemistry, Principles of Structure and Reactivity, Pearson Education 2006.

5. Lee, J.D., Concise Inorganic Chemistry, Pearson Education, 2010.

Learning As	ssessment										
			Cor	ntinuous Lear	ning Assessme	nt (50% weig	jhtage)			Final Examinati	on (EQ%) weightenes
	Bloom'sLevel of Thinking	CLA – 1 (10	0%)	CLA –	2 (10%)	CLA –	3 (20%)	CLA –	4 (5%)#	Filiai Examinati	on (50% weightage)
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Lovel 1	Remember	100/		200/		200/		200/		200/	
Level I	Understand	4076	-	30%	-	30%	-	30%	-	30%	-
Lovel 2	Apply	100/		100/		100/		100/		100/	
Level Z	Analyze	4070	-	40%	-	40%	-	40%	-	4070	-
	Evaluate	200/		200/		200/		200/		200/	
Level 3	Create	2070	-	30%	-	30%	-	30%	-	3076	-
	Total	100 %		10	0 %	10	0 %	10	0 %	1	100 %
Level 1 Level 2 Level 3	Remember Understand Apply Analyze Evaluate Create Total	40% 40% 20%		30% 40% 30%		30% 40% 30%		30% 40% 30%		30% 40% 30%	

CLA - 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST
 Dr. Shanmukhaprasad Gopi, Dr. Reddy's Laboratories, shanmukhaprasadg@drreddys.com 	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. S. Shanmugan, SRMIST

Cou Co	rse de	UMA20A02T	Course Name	Allied	Mathematics - II		(Cour: Categ	se ory	G			G	eneric	Ele	ctive C	ourse				L 3	T 0	P 0	C 3
Pre (Cours	e-requis Courses e Offeri	ite UMA20A	∖01T t Mathemati	Co-requisite Courses cs	Nil Data Book / Codes	s/Standards	Progressive Courses Nil Irds																	
Cours	e Learr	ing Rationale (e (CLR): The purpose of learning this course is to: Learning Program Learning Outcomes (PLO)							D)														
CLR-	1:	To understand	the basics of integ	ration.			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-	2:	To learn the fur	ndamental concept	of Trigonometry.			Ē	_					Ъ									1		
CLR-	B: Understand to solve ordinary differential equations.					bon	%) /	%) :	a)		ät	sea					ş		e		1			
CLR-	4:	To understand	concepts of Laplac	e Transform and its properties	S.		B	ency	nent	edge	6	bme	, Re	age	6			א ר		nan	ور	1		
CLR-):	I o learn the col	ncepts of inverse L	aplace Transform.			king	ofici	ainr	Ivor	ılysi	velo	sign	Us	Iture	∞ _		Tear	<u>e</u>	& Fi	arnir			
Cours Outco	se Learr omes (C	ning LO):	At the end of this	course, learners will be able t	to:		Level of Thir	Expected Pr	Expected Att	Scientific Kr	Problem Ana	Design & De	Analysis, De	Modern Tool	Society & Cu	Environment	Ethics	Individual &	Communicat	Project Mgt.	Life Long Le	PSO - 1	PSO - 2	PSO – 3
CLO-	1:	Students will ab solid.	ble to apply the cor	ncepts of integral calculus, in f	inding area, surfaces, volum	e of the	3	85	80	Н	Н	L	-	-	-	-	-	M	L	-	Н	-	-	-
CLO-	2:	Students will ab	ole to be familiar w	th Trigonometry.			3	85	80	М	Н	-	М	М	-	-	-	М	-	-	Н	-	-	-
CLO-	3:	Students will ur and applying in	nderstand the conc mechanics and dy	ept of second order differentia namics.	al equations with constant co	pefficient	3	85	80	Н	н	-		-	-	-	-	М	-	-	Н	-	-	-
CLO-	4:	Students are at Engineering	ble to understand t	he concept of Laplace transfo	rmation and applying in Scie	ence and	3	85	80	Н	Н	Н	М	-	-	-	-	М	L	-	Н	-	-	-
CLO-	5:	Students are at and Engineering	ble to understand t g.	he concept of Inverse Laplace	transformation and applying	g in Science	3	85	80	М	Н	L	-	-	-	-	-	М	-	-	Н	-	-	-
		0		1		1					-													
Du (h	our)		9		9			9						9							9			
	SLO-1	Integral calcu formulae.	lus-Basic integral	Expansion of $\sin n\theta$, $\cos \theta$	$n\theta$ in powers of $\sin\theta$	Introduction differential e	to se equati	cond ons w	order vith cor	nstant	Intro Tra	oducti nsforr	on to La _l ns	blace			lr T	itrodu ransfo	ction orms	t Inve	erse L	aplac	е	
S-1				and $\cos\theta$, where n being	g a positive integer.	coefficients.																		
	SLO-2	Problems relation formulae.	ated to integral	tegral Expansion of tan nθ. Finding the order and degree of the differential equations. Standard results of Laplace transforms Standard results of transforms					sults	of Inv	ərse L	aplac	e											
S-2	S-2 SLO-1 $\int \frac{dx}{ax^2 + bx + c}$ Problems based on $\sin n\theta$ So $\int \frac{dx}{ax^2 + bx + c}$					Solution of the - Complement particular fur	the dir entary nctior	fferen y func n.	tial equ tion ar	uation Id	Der Lap	rivation blace t	n of the s ransform	tandaı s.	rd re	sults of	S	imple	probl	lems	based	1 on re	esults	•
	SLO-2	Problems rela integral type.	ated to the above	Problems based on sin n	θ	Problems back $(aD^2 + bD)$	ased D+c	on)y =	0		Der Lap	rivation blace t	n of the s ransform	tandaı s.	rd re	sults of	S	imple	probl	lems	based	d on re	esults	

Dui (h	ation our)	9	9	9	9	9
S-3	SLO-1	Integrals of the type $\int \frac{px+q}{ax^2+bx+c} dx$	Additional problems based on $\ sin n \theta$	Additional problems on $(aD^2 + bD + c)y = 0$	Simple problems based on results.	Simple problems based on results.
	SLO-2	Problems related to the above integral type.	Problems based on $\cos n\theta$	Problems based on $(aD^2 + bD + c)y = e^{ax}$	Simple problems based on results.	Simple problems based on results.
S-4	SLO-1	Integrals of the type $\int \frac{dx}{\sqrt{ax^2 + bx + c}}$	Problems based on $\cos n\theta$	Additional problems on $(aD^2 + bD + c)y = e^{ax}$	Properties of Laplace Transforms.	Simple problems based on results.
	SLO-2	Problems related to the above integral type.	Additional problems based on $\ \cos n \theta$	Problems based on $(aD^2 + bD + c)y = \sin ax$	Properties of Laplace Transforms.	Inverse Laplace transforms of $s F(s)$
	SLO-1	Integrals of the type $\int \frac{px+q}{\sqrt{ax^2+bx+c}} dx$	Problems based on $\cos n\theta$ and $tann\theta$	Problems based on $(aD^2 + bD + c)y = \sin ax$	Problems related to the properties of Laplace transforms.	Problems based on $L^{-1}[sF(s)]$
5-5	SLO-2	Problems related to the above integral type.	Expansion of $\sin^n \theta$ and $\cos^n \theta$ interms of multiples of $\sin \theta$ and $\cos \theta$ where n being a positive integer.	Additional problems based on $(aD^2 + bD + c)y = \sin ax$	Problems related to the properties of Laplace transforms.	Additional problems on $L^{-1}[sF(s)]$
5-6	SLO-1	Integration by Partial fraction method (Simple algebraic functions only)	Problems based on $\sin^n \theta$ interms of $\sin \theta$.	Additional problems based on $(aD^2 + bD + c)y = \sin ax$	Additional problems related to the first shifting property.	Inverse Laplace transforms of $\frac{F(s)}{s}$
3-0	SLO-2	Problems related to the partial fraction method.	Problems based on $\sin^n \theta$ interms of $\cos \theta$.	Problems based on $(aD^2 + bD + c)y = \cos ax$	Laplace transform of $tf(t)$	Problems based on $L^{-1}\left[\frac{F(s)}{s}\right]$
S_7	SLO-1	Additional problems related to the partial fraction method.	Problems based on $\sin^n\theta$ interms of $\cos\theta$.	Additional problems based on $(aD^2 + bD + c)y = \cos ax$	Problems on Laplace transform of $tf(t)$	Additional problems based on $L^{-1} \Bigg[\frac{F(s)}{s} \Bigg]$
5-7	SLO-2	Bernoulli's formula and related problems.	Problems based on $cos^n\theta$ interms of $cos\theta$.	Additional problems based on $(aD^2 + bD + c)y = \cos ax$	Problems on Laplace transform of $\frac{f(t)}{t}$	Inverse Laplace transforms -partial fraction method
6.0	SLO-1	Reduction formula for $\int \sin^n x dx$	Problems based on $cos^n\theta$ interms of $cos\theta$.	Problems based on $(aD^2 + bD + c)y = x^n$	Additional problems on Laplace transform of $\frac{f(t)}{t}$	Partial fraction method-Related problems.
5-8	SLO-2	Evaluation of $\int_{0}^{\frac{\pi}{2}} \sin^{n} x dx$	Problems based on $\sin^n\theta\cos^n\theta$ interms of multiples of $\sin\theta$ and $\cos\theta$	Additional problems on $(aD^2 + bD + c)y = x^n$	Problems on Laplace transform of $te^{at} f(t)$	Additional problems on partial fraction method.

Du (h	ration our)	9	9	9	9	9
	SLO-1	Reduction formula for $\int \cos^n x dx$	Problems based on $\sin^n \theta \cos^n \theta$ interms of multiples of $\sin \theta$ and $\cos \theta$	Additional problems on $(aD^2 + bD + c)y = x^n$	Additional problems on Laplace transform of $t e^{at} f(t)$	Additional problems on partial fraction method.
S-9	SLO-2	Evaluation of $\int_{0}^{\frac{\pi}{2}} \cos^{n} x dx$	Problems based on $\sin^n \theta \cos^n \theta$ interms of multiples of $\sin \theta$ and $\cos \theta$	Additional problems on $(aD^2 + bD + c)y = x^n$	Additional problems on Laplace transform of $t e^{at} f(t)$	Additional problems on partial fraction method.

	1.	Singaravelu. A, Allied Mathematics, 6th Revised Edition, Meenakshi Agency, 2014.	5.	E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10th edition,
Looming	2.	Vittal. P.R, Allied Mathematics, 4th Edition Reprint, Margham Publications, 2013.		2012.
Deseuress	3.	Venkatachalapathy, S.G, Allied Mathematics, 1st Edition Reprint, Margham Publications, 2007.	6.	T. Veerajan, "Engineering Mathematics I", Tata McGraw Hill Publishing Co., New Delhi, 5th
Resources	4.	T.K. Manickavasagam Pillai and S. Narayanan, Ancillary Mathematics, Reprint, S.Viswanathan		edition, 2006.
		Printers and Publishers Pvt. Ltd., Chennai.	7.	B.S. Grewal, Higher Engineering Mathematics, Khanna Publications, 42nd Edition, 2012.

Learning	Assessment										
	Dia am'a				Continuous L	earning Assessn	nent (50% weighta	ge)		Final Examinat	ion (50% weightage)
	DIUUIII S	CLA –	1 (10%)	CLA –	2 (10%)	CLA –	3 (20%)	CL	A – 4 (10%)#		
	Level of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40.9/		20.0/		20.0/		20.0/		20.0/	
Level I	Understand	40 %	-	30 %	-	30 %	-	30 %	-	30 %	-
Lovel 2	Apply	10.9/		40.9/		10.9/		10.9/		10.0/	
Level Z	Analyze	40 /0	-	40 %	-	40 /0	-	40 /0	-	40 /0	-
Lovel 2	Evaluate	20.9/		20.0/		20.0/		20.0/		20.0/	
Level 3	Create	20 /0	-	30 %	-	30 %	-	30 %	-	30 %	-
	Total	100) %	10) %	10	0 %		100 %		100 %

CLA - 4 can be from any combination of these: Assignments, Seminars, Scientific Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications etc.,

Course Designers							
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts					
Mr. V. Maheshwaran, Cognizant Technology Solutions	Prof. Y.V.S.S. Sanyasiraju, IIT Madras, sryedida@iitm.ac.in	Dr. A. Govindarajan, SRMIST					
maheshwaranv@yahoo.com		Dr. N. Parvathi, SRMIST					
	Prof. B. V. Rathish Kumar, IIT Kanpur, bvrk@iitk.ac.in	Mr. M. Balaganesan, SRMIST					
		Dr. T. Nirmala, SRMIST					
		Mrs.T.N.Saibhavani, SRMIST					

Course Code	Course UCY20A02T Course Name Biochemistry - II		Cour Categ	se ory	G				G	Generi	c Ele	ctive					L 3	T 0	P 0	C 3				
Pre-rec Cour Course Of	Pre-requisite Courses Nil Co-requisite Courses Nil burse Offering Department Chemistry Data Book / Codes/Stand				a Book / Codes/Standards	P Nil	rogre Cour	ssive ses	Nil															
Course Le	Course Learning Rationale (CLR): The purpose of learning this course is to:							Lear	rning					Pro	gram	Lear	ning	Outco	omes	(PLO))			
CLR-1 :	To develop an un	derstanding	about the role	of carbohydrates in	cellular metal	oolism																		
CLR-2 :	To learn about the	e structural c	chemistry of car	rbohydrates			(m	(%	(%	ç	2		arch			ability		¥						
CLR-3 :	To comprehend th	ne various as	spects of enzyr	me reactions and er	zyme inhibitic	n	3/00	5) Ac	nt (9	hoh		Jent	lese			tain		Wor		nce				
CLR-4 :	To gain basic kno	wledge abou	ut the function o	of DNA and RNA			g (E	ien	me	100	is is	udo	ч, Б	age	e	Sus		m		ina	ing			
CLR-5 :	To understand the	e process inv	volved in the m	ajor biochemical me	etabolic pathw	ays	jki	ofic	tain	N I C	SVIE	, level	sign	I Us	ultu	t &		Teá	tion	&F	am			
Course Le (CLO):	earning Outcomes	At the en	d of this course	e, learners will be al	ole to:		Level of Thi	Expected Pr	Expected At	- Tananat	Problem An	Design & De	Analysis, De	Modern Too	Society & C	Environmen	Ethics	Individual &	Communica	Project Mgt.	Life Long Le	PSO - 1	PSO - 2	PSO-3
CLO-1 :	.0-1 : Students will gain insight into the structure of Carbohydrates and its influence on cell metabolism		2	70	65	ŀ	-	Н	-	-	-	-	-	-	-	-	-	-	-	-				
CLO-2 :	CLO-2 : Elucidate the mechanism involved in the enzyme mediated reactions			2	80	70	ŀ	-	-	Н	Н	-	-	-	-	-	-	-	-	-	-			
CLO- 3:	CLO-3: Recognize the influence of molecular interactions on the structure of DNA and RNA			2	70	65	ŀ	-	-		-	-	-	-	-	-	-	-	Н	М	-			
CLO- 4:	CLO-4: Ability to understand the concept of cloning and its application.			2	70	70	ŀ	-	Н	Н	Н	-	-	-	-	-	-	-	Н	Н	-			
CLO- 5:	Information about c	rucial biosyn	thetic pathway	s and their role in m	etabolism		2	80	70	Ŀ	H	-	Н	-	-	-	-	-	-	-	-	Н	-	-
																	1							

Duration (hour)		9	9	9	9	9
6.4	SLO-1	Classification of carbohydrates	Disaccharides – reducing and non- reducing sugars	Nomenclature- classification and properties	Nucleosides and nucleotides - purine and pyrimidine bases	Glycolysis
3-1	SLO-2	Classification of carbohydrates	Disaccharides – reducing and non- reducing sugars	Nomenclature- classification and properties	Nucleosides and nucleotides - purine and pyrimidine bases	Glycolysis
6.0	SLO-1	Monosaccharides – aldoses	Disaccharides – reducing and non- reducing sugars	Nomenclature- classification and properties	Nucleosides and nucleotides - purine and pyrimidine bases	Glycolysis
5-2	SLO-2	Monosaccharides – aldoses	Disaccharides – reducing and non- reducing sugars	Nomenclature- classification and properties	Nucleosides and nucleotides - purine and pyrimidine bases	Glycolysis
6.2	SLO-1	Monosaccharides – ketoses	Carbohydrates of the cell membrane – starch	Nomenclature- classification and properties	Nucleosides and nucleotides - purine and pyrimidine bases	Glycolysis
3-3	SLO-2	Monosaccharides – ketoses	Carbohydrates of the cell membrane – starch	Nomenclature- classification and properties	Nucleosides and nucleotides - purine and pyrimidine bases	Glycolysis
6.4	SLO-1	Monosaccharides - stereoisomerism, epimers, mutarotation.	Carbohydrates of the cell membrane – starch	Mechanism of enzyme action - Lock and Key model, Induced fit models.	classification and function of RNA	TCA cycle.
3-4	SLO-2	Monosaccharides - stereoisomerism, epimers, mutarotation.	Carbohydrates of the cell membrane – starch	Mechanism of enzyme action - Lock and Key model, Induced fit models.	classification and function of RNA	TCA cycle

Du (ł	ration our)	9	9	9	9	9
0.5	SLO-1	Monosaccharides - stereoisomerism, epimers, mutarotation.	Carbohydrates of the cell membrane – Cellulose	Mechanism of enzyme action - Lock and Key model, Induced fit models.	classification and function of RNA	TCA cycle
5-5	SLO-2	Monosaccharides - stereoisomerism, epimers, mutarotation.	Carbohydrates of the cell membrane – Cellulose	Mechanism of enzyme action - Lock and Key model, Induced fit models.	classification and function of RNA	TCA cycle
	SLO-1	Glucose – structure, Furanose and pyranose forms of glucose and fructose	Carbohydrates of the cell membrane – Cellulose	Mechanism of enzyme action - Lock and Key model, Induced fit models.	classification and function of RNA	TCA cycle
3-0	SLO-2	Glucose – structure, Furanose and pyranose forms of glucose and fructose	Carbohydrates of the cell membrane – Cellulose	Mechanism of enzyme action - Lock and Key model, Induced fit models.	classification and function of RNA	TCA cycle
6.7	SLO-1	Glucose – structure, Furanose and pyranose forms of glucose and fructose	Carbohydrates of the cell membrane – Glycogen.	Mechanism of inhibition (competitive, non and uncompetitive and allosteric).	Biosynthesis of DNA- replication.	Biosynthesis and degradation of purines and pyrimidines
5-1	SLO-2	Glucose – structure, Furanose and pyranose forms of glucose and fructose	Carbohydrates of the cell membrane – Glycogen.	Mechanism of inhibition (competitive, non and uncompetitive and allosteric).	Biosynthesis of DNA- replication.	Biosynthesis and degradation of purines and pyrimidines
c •	SLO-1	Haworth projection formulae for glucose	Carbohydrates of the cell membrane – Glycogen.	Mechanism of inhibition (competitive, non and uncompetitive and allosteric).	Biosynthesis of DNA- replication.	Biosynthesis and degradation of purines and pyrimidines
3-0	SLO-2	Haworth projection formulae for glucose	Carbohydrates of the cell membrane – Glycogen.	Mechanism of inhibition (competitive, non and uncompetitive and allosteric).	Biosynthesis of DNA- replication.	Biosynthesis and degradation of purines and pyrimidines
• •	SLO-1	Haworth projection formulae for glucose	Carbohydrates of the cell membrane – Glycogen.	Mechanism of inhibition (competitive, non and uncompetitive and allosteric).	Cloning	Biosynthesis and degradation of purines and pyrimidines
S-9	SLO-2	Haworth projection formulae for glucose	Carbohydrates of the cell membrane – Glycogen.	Mechanism of inhibition (competitive, non and uncompetitive and allosteric).	Cloning	Biosynthesis and degradation of purines and pyrimidines

Learning Resources

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

J. L. Jain, *Biochemistry*, Sultan Chand and Co, 1999.
 U.Sathyanarayana, Biochemistry, Elsevier, 5th edition,2010.

Learning A	ssessment

	Bloom's Continuous Learning Assessment (50% weightage)									Final Examination (50% weightage)					
	DIUUIII S	CLA – 1 (*	CLA – 1 (10%)		CLA – 2 (10%)		3 (20%)	CLA	A – 4 (10%)#		ar Examination (50 % weightage)				
	Level of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice				
Lovel 1	Remember	400/	-	200/	-	200/	-	200/	-	200/	-				
	Understand	4076		30%		30%		30%		3076					
Lovel 2	Apply	400/	-	100/	-	100/	-	100/	-	409/	-				
Level 2	Analyze	40%		40%		40%		40%		40%					
Lovel 2	Evaluate	200/	-	200/	-	200/	-	200/	-	200/	-				
Level 3	Create	2076		30%		30%		30%		3076					
	Total	100 %	0	10	0 %	10	0 %	100 %			100 %				

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories,	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. M.R.Ganesh SRMIST
shanmukhaprasadg@drreddys.com		

Course (Code	UCD20S02L	Course Name	Quantitative Aptitude and Reasoning Co		Cour	se C	atego	ory	S				Skill	Enha	ancer	nent	Cour	se			L 0	T 0	P 2	C 1
Pre-	requisit	te Courses	Nil Co-rec	quisite Courses	Nil	Pı	ogre	ssive	Cou	rses	N	lil													
Course Of	ffering [Department	Career Development Ce	entre	Data Book / Codes/Standards	-																			
Course Le (CLR):	earning	Rationale	The purpose of learning	this course is to:			L	earnii	ng					Р	rogra	am Lo	earni	ng O	utcoi	nes ((PLO)			
CLR-1 :	: Demonstrate various principles involved in solving mathematical concepts		1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				
CLR-2 :	Develop	interest and awar	reness in students regard	ding profit/ loss, inte	rest calculations and average																				
CLR-3 :	Critically time and	v evaluate basic m I work	athematical concepts re	lated to mixtures an	d alligations,permutation and combination	n,							es			je									
CLR-4 :	Provide distance	students with skill and blood relation	s necessary to generate n.	and interpret data a	nd concepts related to time, speed and		(mool)	(%) (i	nt (%)		ledge	cepts	isciplin	lge	uo	owledo		ata		ills	ills			ior	
CLR-5 :	Enable s	students to unders	tand reasoningskills				(B)	enc	ner		§	ğ		kled	zati	Ř	D	эt D	S	ъ	ş			Jav	ğ
CLR-6 :	Create a its impoi	awareness in stude rtance in various c	ents regarding the variou competitive exams	is concepts in quant	itative aptitude and reasoning skills and	also	hinkinç	Profici	Attainr		ntal Kn	n of C	Related	al Knov	peciali	Jtilize	lodelin	nterpre	ive Ski	Solving	cation	Skills		nal Beł	Learni
							of T	ted	ted		me	atio	Ē	que	n S	to (≥ L	e,	gat	E	in	ical	cills	Siol	bug
Course Le (CLO):	earning	Outcomes	omes At the end of this course, learners will be able to:		Level (Expect	Expect		Funda	Applica	Link w	Proced	Skills i	Ability	Skills i	Analyz	Investi	Proble	Comm	Analyti	ICT Sk	Profes	Life Lo		
CLO-1:	Underst	and, analyze and	and solve questions based on numbers, logarithms.		3	80	70		Н	Ĥ	М	Н	L	М	-	Ĥ	-	Н	-	Ĥ	М	-	Η		
CLO-2:	Create,	solve, interpret an	erpret and apply basic mathematical models which are applicable in our day to day life		3	80	75	Γ	М	Н	М	Н	-	М	-	Н	-	Н	-	Н	М	-	Н		
CLO-3 :	Understand the concepts of mixtures and alligations, permutation and combinations, probability, time and work and to approach questions in a simpler and innovative method		3	85	70		М	Η	М	Н	-	М	-	Η	-	Н	-	H	М	-	Η				
CLO-4 :	: Understand the concept in time ,speed and distance			3	85	80	Γ	М	Н	М	Н	-	М	-	Н	-	Н	-	Н	М	-	Н			
CLO-5:	: Ability to solve the problems on reasoning		3	85	75	Γ	М	Н	Μ	Н	-	М	-	Н	-	Н	-	Н	М	-	Н				
CLO-6:	: Able to face different competitive exams		3	80	70		М	Н	М	Н	-	М	-	Н	-	М	-	Н	М	-	Н				

Dı (uration hour)	6	6	6	6	6
6.4	SLO-1	Classification of numbers	Profit and Loss-Introduction	Mixtures and Alligations-Introduction	Time, Speed and Distance-Problems onTrains	Direction Sense-Introduction
3-1	SLO-2	Test of divisibility	Profit and Loss-Basic Problems	Mixtures and Alligations-Problems	Time, Speed and Distance- Boats&Streams	Direction Sense-Problems
6.2	SLO-1	Unit digit	Statistics-Introduction	Permutation –Introduction& Basics	Data Interpretation – Bar chart	Number Series
3-2	SLO-2	Tailed zeroes	Statistics-Mean,Median,Mode	Combination-Introduction& Basics	Data Interpretation – Pie chart	Word Series
6.2	SLO-1	HCF, LCM	Simple Interest-Introduction,Formulas &Problems	Probability-Introduction & Basics	Data Interpretation – Table	Seating Arrangements - Linear
3-3	SLO-2	HCF, LCM - Solving problems	Compound Interest- Introduction,Formulas &Problems	Probability-Problems	Data Interpretation – Line graph	Seating Arrangements - Circular

Duration (hour)		6	6	6	6	6
6.4	SLO-1 Logarithm –Introduction of log rules Word problems on Line equations- Introduction Til		Time and work-Introduction	Data sufficiency-Introduction and Basics	Puzzles-Concepts	
3-4	SLO-2	Logarithm – Applications of log rules	Word problems on Line equations- Basic problems	Time and work-Men and Work	Data sufficiency-Problems	Puzzles-Problems
S F	SLO-1	Percentage -Introduction Averages-Introduction& Basics		Time and work-Pipes &Cisterns(Introduction)	Blood relation-Introduction	Clocks-Concepts Discussion
3-3	SLO-2	Percentage- Basic problems	Averages-Tricky Problems	Time and work-Pipes &Cisterns(Problems)	Blood relation-Problems	Clocks-Problems
5.6	SLO-1	Percentage-Increasing & Decreasing functions	Ratio and Proportions-Introduction	Time, Speed and Distance-Introduction	Coding – Decoding-Introduction	Calendars-Introduction of basic concept
S-6	SLO-2	Percentage- Miscellaneous problems	Ratio and Proportions-Basics & problems	Time, Speed and Distance-Basic problems	Coding – Decoding-Different types	Calendars-Problems

 Learning
 1. AbhijitGuha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 5th Edition
 4. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata McGraw Hill, 6th Edition

 Learning
 2. Dr. Agarwal.R.S, Quantitative Aptitude for Competitive Examinations, S. Chand and Company Limited, 2018 Edition
 4. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata McGraw Hill, 6th Edition

 S. Archana Ram, PlaceMentor: Tests of Aptitude for Placement Readiness, Oxford University Press, Oxford, 2018
 4. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata McGraw Hill, 6th Edition

Learning Assessment

			Continuous Learning Assessment (100% weightage)									
Level	Bloom'sLevel of Thinking	CLA-1 (20%)	CLA-2 (20%)	CLA-3 (30%) #	CLA-4 (30%) ##							
		Practice	Practice	Practice	Practice							
Lovel 1	Remember	108/	109/	20%	15%							
Level I	Understand	10%	10%	30%	15%							
	Apply	50%	50%	40%	50%							
Level 2	Analyze	50 %	50 %	40 %	50 %							
	Evaluate	40%	409/	20%	35%							
Level 5	Create	40 %	4078	50 %	35%							
	Total	100 %	100 %	100 %	100 %							

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.

CLA - 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers							
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts					
1 Aigu Zapar Diractor Carpor Launahar		1. Dr. P Madhusoodhanan, HoD, CDC, E&T, SRMIST					
T. Ajay Zener, Director, Career Launcher	•	2. Dr. M Snehalatha, Assistant. Professor, CDC, E&T, SRMIST					

Course Code	Course UJK20201L Course Name Communication Skills					Cours Catego	se ory	J	ĸ			I	_ife S	kill C	ourse	Ð				L T 0 (· P) 4	, †	C 2	
Pre-re	equisite Courses		Nil	Co-requisite Courses	Nil		F	Progre Cou	essive rses	٨	il													
Course Offer	ring Department		English		Data Book / Co	des/Standards									Nil									
Course Learning Rationale (CLR): The purpose of learning this course is to: Learning Program Learning Outcomes (PLO)																								
CLR-1 :	To make the stu	udents le	earn the native	e speakers' accent.			1	2	3		1 2	3	4	5	6	7	8	9	10	11	12 [·]	13 1	14	15
CLR-2 :	To educate the	m about	word stress o	f English															1					
CLR-3 :	CLR-3 : The enable them to participate in group discussion and debates					-				a)	ines			dge				ı İ						
CLR-4 : To improve their participation and participation skills					00	%) /	%)		age of the	scin l	e e	E	wlei		ata		_s	s						
CLR-5 :	To improve the	listening	g and speaking	g abilities in English			Ē) ou	Jent				led	zatic	Kno	Ē	ţĎ	<u>。</u>	SKi	Skill				
CLR-6 :	LSRW skills all	togethe	r is developed	in every student			king	officie	ainn	:	ב נ	atec	Nou	ciali z	ze	elinç	rpre	- Skil	/ing	Б	ills			
r							Lhin Thin	d Pro	d Att		enta	Rel	ral K	Spec	Utili	Mod	Inte	ative	Sol	licat	al Sk			
Course Lear	ning Outcomes (C	CLO):		At the end of this course, lea	arners will be able t	'o:	Level of	Expected	Expected			l ink with	Procedu	Skills in	Ability to	Skills in	Analyze,	Investige	Problem	Commur	Analytica	PSO -1	PSO -2	PSO-3
CLO-1 :	Understand the	native s	speakers' exa	ct pronunciation			2	75	60		Ηŀ	I H	Н	-	-	-	Н	Н	Н	Н	Н	-	-	-
CLO-2 :	Master the sour	nd syste	ms of English				2	80	70		Ηŀ	I H	-	-	-	-	Н	Н	Н	Н	Н	-	-	-
CLO-3 :	CLO-3 : Have a better Word stress, Rhythm and Intonation				2	70	65		Ηŀ	I H	-	Н	Н	-	-	Н	Н	Н	Н	-	-	-		
CLO-4 : Develop Neutral Accent			2	70	70		H I	I H	-	Н	-	-	-	, - I	-	Н	Н	-	-	-				
CLO-5 :	CLO-5 : Participate in any conversation with any native speaker				2	80	70		H I	- 1	Н	-	Н	-	Η	Η	Н	Η	Н	-	-	-		
CLO-6 :	CLO-6 : Clear any standardized tests conducted to measure the English language ability like IELTS and TOEFL			S and TOEFL	2	75	70		H I	I H	Н	Н	Н	Н	Н	Н	Η	Н	Н	H	Н	-		

Durat	ion (hour)	12	12	12	12	12
S-1	SLO-1	Introduction to Digital language lab - helps in the listening skills by providing an interactive environment to the students	Learners are enabled to record their speech and listen to it in order to correct their lacuna	Reading software is used to facilitate reading exercises for the students	To enable the students to familiarize with word processor blogging	Students are enabled to learn and pronounce stressed and unstressed words
	SLO- 2	The students will be able to converse fluently	One will know himself where he/ she has gone wrong	Flow in reading will be improved	online publishing. Will be learnt by the students	The practice will lead them to acquire neutral accent and understand foreign accent
6.2	SLO-1	Students are exposed to functionallanguage	Fluency and Pronunciation to be evaluated	The usage of phonetics will be mandated.	Enable the students in learning situational language	Common topics in IELTS speaking test and TOFEL will be provided to assess the students.
S-2 –	SLO- 2	This exposurewill help thempick up fluency	Their standard will measured	reading will be done in the class	Create imaginary situations and students are allowed to engage in conversations	Assessments will be provided for self scrutiny

Durat	ion (hour)	12	12	12	12	12
S-3	SLO-1	Lab 1 In the wall of Pink Floyed to be played for the students	Lab 4 Students are given a situation, they need to write a respond for it by writing a letter requesting information or explaining the situation	Lab 7 Introduction to the conversation of a native speaker/ interview of a native speaker	Lab 10 learners are asked to describe some visual information(table/charts/nature) in their own word	Lab 13students will listen to a passage and they need to give a suitable title
_ S-4	SLO- 2	The students will be able to understand the isolation of a wall. It helps them to enhance their pronunciation	This will lead to understand the English letter conventions	Learners will prove the fluency by listening	They need to have a well organized thought of it using language accurately in a academic style.	Assessment on their language competency and vocabulary
S-5	SLO-1	They get familiarized with pronunciation styles	Learners to record and repeat new wordsagain and again	New words are to be referred in the reading passages and checked with the help of dictionaries	Familiarize the students with e- journals , e-guidance, e-magazines, e- Books, e-Library	Listening topics in the IELTS listening test and TOFEL will be provided
SLO- 2	American and British styles are differentiated	Untill right prononciation isaquiredis not allowed to go to the Next session	Those new words are to be used in different contexts and sentences	Help students to access them as much as possible	Assessment on their listening capacity is to be provided	
S-6	SLO-1	Listening to news bulletins and songswillbeenabled to help them to understand use of vocabulary	Learnerscanspeak English and compare the notes and exchange ideas	Comprehensive skills are enhanced and checked the level	Enable the students to versatile writing	Reading topics in the IELTS reading test and TOFEL will be provided to assess the students.
SLO- 2		Will beenabled ti imitae the exact accent and prononciation	From the exchangedideascomprehensive questions willbeasked by the otherstudents	The levels are informed to the students and Icuna is explained	Diffrerence in writing and readingisexplained	Assesment on their capacity is explained
S-7	SLO-1	Lab 2TedX will be played for the student	Lab 5introduction to semi-formal/ neutral discursive essay will be taught.	Lab 8television news will be broadcasted to them	Lab 11learners are given with a set of images where they need to write a story from it	Lab 14 students will listen to the great monologues of the time
_ S-8	SLO- 2	It will help them to improve their fluency	It will teach them to write coherently and cohesively.	It will help them to understand the usage of words and the fluency of speaker	It helps them to keen on observation as well as to know their creativity.	They will learn the importance of pronunciation, stress and pause in a speech
50	SLO-1	To enable to listen to authentic sounds of the target language	Give different topics to debate to enable them talk fluently	The right pronunciation is checked with an access to articles fiction verses and speeches	Focus on writing is done	writing topics in the IELTS writing test and TOFEL will be provided to assess the students.
3-9	SLO- 2	To enable them imitate the different sounds and accents and make them repeat it	To check the pace of their speech	Minute details and differences are marked and rectified	Conversational skills are enhanced	Writing skills are assessed and tested
S-10	SLO-1	To enable to practice different accents focusing on intonation and voice modulation	Dialogue delivery be checked by asking them to prepare for their own e- learning materials	Read and repeat passages	Help in professionalwriting	Model IELTS and TOFEL test will be conducted for the students
	SLO- 2	The differences between intonation stress and modulations are explained	Make the students speak and record	Check the ability to repeat the exact pronounciation	Check and asses theirwritings	Assessment will be provided to the learners
S 11	S 11 SLO-1	Lab3 After listening to TedX, students need to jot down set of question.	Lab 6 learners will be taught to write a review for a film after watching	Lab 9 conversation between two people in every day context will be played for the studetns	Lab 12 students will listen to the writers note on publishing a novel/ short story	Lab 15 they will listen to grammar usage in the form of visual image and song
S 12	SLO- 2	This will help them to identify the key information in listening text.	Leaner will need to think for the apt word. Through this language competency will be evaluated	It Will help them to understand the target language	It will helps them to enhance their creativity also the language compétence	They will the foreign language easily and it enhances their competency of it

	Theory:
	1. Horizon- English Text Book – Compiled and Edited by the faculty of English Departement, FSH, SRMIST, 2020
	2. English Grammar in Use by Raymond Murphy
Learning	3. Raymond Murphy, Intermediate English Grammar, Cambridge University Press, 2007
Resources	4. R.P. Bhatnagar, English for Competitive Examinations, Trinity Press, 3 rd Edition,2016
	5. http://www.aptitudetests.org/verbal-reasoning-test
	6. https://www.assessmentday.co.uk/aptitudetests_verbal.htm

Learning Asses	sment											
		Continuous Learning Assessment (100% weightage)										
Level	Bloom'sLevel of Thinking	CLA – 1 (20%)		CLA – 2 (20%)		CLA –	3 (30%)	CLA – 4 (30%)#				
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice			
Level 1	Remember		30%		30%		30%		30%			
Level I	Understand	-	0070	-	0070	-	0070		0070			
	Apply		200/		20%		200/		20%			
Level 2	Analyze	-	30%	-	30%	-	30%		30%			
	Evaluate		40%		40%		40%		40%			
Level 3	Create	-	40 %	-	40 %	-	40 %	-	40 %			
	Total	100) %	100 %		100) %	100 %				

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
	1. Prof. Daniel David, Prof & Head, Department of English, MCC, Chennai	1. Dr. Shanthichitra, Associate Professor, & Head, Department of English, FSH,SRMIST
		2. Dr K B Geetha, Assistant Professor, Department of English, FSH, SRMIST

Course Code	UNS20201L/ UNC20201L UNO20201L/	Course Name		NS	SS/NCC/NSO/YOGA	Course Category		Extension Activity	L 0	T 0	P 0	С 0		
Pre-requi	equisite Nil Co-requisite Nil Courses Nil Courses													
Course	Courses Nil Courses			Courses	Nil	Cours	ses	Nil						
Course Offering Department NSS/NCC/NSO/YOGA				Data Book / Codes/Standards										
					Assessment is Fully	Internal								
Learning A	Assessment													
			Asse	essment Tools				Marks						
Continuous	Learning Assessn	nent –I (CLA-I)				20 Marks							
Continuous Learning Assessment –II (CLA-II)							30 Marks							
Continuous Learning Assessment –III (CLA-III)								30 Marks						
Continuous	Learning Assessn	nent -IV (CLA	-IV)				20 Marks							
			T	otal Marks				100 Marks						

Ρ С L Т Course Course Course UCY20301T С Physical Chemistry - II : Chemical Thermodynamics and its Applications Core course 5 0 6 1 Code Name Category Pre-requisite Co-requisite Progressive Nil Nil Nil Courses Courses Courses **Course Offering Department** Data Book / Codes/Standards Chemistrv Nil Course Learning Rationale (CLR): The purpose of learning this course is to: Learning Program Learning Outcomes (PLO) CLR-1 : Learn the thermodynamics properties and its limitations. 1 2 3 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 Understand the concepts of energy, heat, work, enthalpy, entropy, free energies and the relation between CLR-2: them. Environment & Sustainability Analysis, Design, Research CLR-3 : Understand the Carnot cycle and adiabatic expansion and compression. Level of Thinking (Bloom) Expected Proficiency (%) Fundamental Knowledge Expected Attainment (%) Individual & Team Work Design & Development Project Mgt. & Finance **CLR-4**: Learn the concept of entropy and it's change in reversible and irreversible process. Modern Tool Usage CLR-5 : Apply these processes, extend the thermodynamic properties to the system of variable compositions and Life Long Learning Problem Analysis Society & Culture eauilibrium. Communication **CLR-5**: Understand the colligative properties and Osmotic pressure. PSO - 1 ŝ \sim Ethics PSO-- OS4 **Course Learning Outcomes** At the end of this course. learners will be able to: (CLO): 2 75 60 Н Η H **CLO-1**: Explain three laws of thermodynamics, concepts of state and path functions, extensive and intensive properties. Н ----------**CLO-2**: Derive the expressions of ΔU , ΔH , ΔS , ΔG , ΔA for ideal gases under different conditions. 80 70 Н Н Н 2 -----. ----CLO-3: Explain the concept of partial molar properties. 2 70 65 Н --Н М ---------CLO-4: Derive the expression of equilibrium constants. 2 70 70 Н Н Н Н Н ----------80 70 2 Н **CLO-5**: Explain the thermodynamic basis of colligative properties -Н -Н ----------Explain the theory of semipermeable membrane. 2 80 70 Н Н Н Н CLO-6 ----------.

SEMESTER III

Duratio	n (hour)	18	18	18	18	18
	SI 0-1	Introduction to chemical	Joule Thomson effect	Carnot theorem	Determination of absolute entropies	Le-Chatlier principle,
S-1	0201	thermodynamics				
	SLO-2	and limitations of thermodynamics	Coefficient in real gas	Concept of entropy	Of solid, liquid and gas	Factors affecting Le-chatlier principle
	SLO-1	System- open, closed and isolated	Zeroth law of	Entropy change at constant T	Entropy of real gas	Free energy mixing and spontaneity
S-2 SLO-	8102	Macroscopic properties	thermodynamics	Calculation of entropy change during	Calculation of absolute entropy of	Equilibrium between ideal and pure
	310-2			flow of heat from higher to lower T	molecules	condensed gas
	SI 0-1	Phase, state of a system	Introduction to thermochemistry	Calculation of entropy change of an	Entropy changes in	Introduction to solution
6.2	310-1			ideal gas with change in P and V		
3-3	SI 0-2	Variable	Change enthalpy in a reaction,	Entropy change in Isothermal expansion	chemical reactions	colligative properties- dilute solutions
	310-2		exothermic and endothermic reaction	of an Ideal gas		
S-4 SLO-1		Thermodynamics equilibrium	Standard enthalpies of reaction,	Entropy change in reversible process-	Boltzman entropy equation	Colligative property- lowering of vapour
			combustion and neutralization	ideal gas		pressure

Duratio	n (hour)	18	18	18	18	18
	SLO-2	Extensive and Intensive properties	Enthalpy of solutions	Entropy change in irreversible process- ideal gas	Residual entropy	Raoults law
С. F	SLO-1	Thermodynamic process	Variation of enthalpy of a reaction with temperature	Entropy change accompanying change of phase	Partial molar property	Osmotic pressure- relation between osmotic pressure
3-0	SLO-2	Isothermal, adiabatic and reversible and irreversible properties	Kirchoff equation	Isothermal, Isobaric and Isochoric process	Partial molar free energy	And lowering of vapor pressure
S-6	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
-	SL0-2		I utoriai Session	Tutorial Session	Tutorial Session	Tutorial Session
0.7	SL0-1	First law of thermodynamics	Bond energies-	Entropy of mixture of ideal gas	Gibbs-Dunem equation	I neory of semipermeable membrane
5-7	SLO-2	Internal energy	enthalpy formation of the bond	Boltzmann equation	parameter on composition	Sieve, solubility theory
S-8	SLO-1	State functions	Application of	Standard entropy and physical significance of entropy	Variation of chemical potential with T	adsorption
	SLO-2	Exact and inexact differentials	Bond energies	Free energy function	Variation of chemical potential with P	And capillary theory
S-9	SLO-1	Eulers reciprocal	Flame and	Helmholtz free energy equation	Chemical potential in case of system of ideal gas	Reverse osmosis
	SLO-2	Cyclic rule	Explosion temperature	Gibbs free energy equation	-derivation	With phenomenon
C 40	SLO-1	Enthalpy - vaporization	Hess law of	Variation of free energy with T,P and V	Clapeyron-Clausius equation	Elevation of boiling point
3-10	SLO-2	fusion	constant heat summations	Criteria for reversible process	derivation	Boiling point elevation constant
6.44	SLO-1	Heat capacity- relationship between	Applications of	Criteria for irreversible process	Integrated Clapeyron-Clausius equation	Determination of molar mass from
5-11	SLO-2	Cp and Cv in gaseous system	Hess law	Limitation of criteria of reversible and irreversible process	Application of Clapeyron-Clausius equation for liquid = vapour	boiling point of elevation
0.40	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
5-12	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
6.42	SLO-1	Isothermal expansion	Second Law: Limitation of first law	Gibbs Helmholtz equation	Application of Clapeyron-Clauses equation for solid-liquid equilibria	Depression in freezing point
5-15	SLO-2	Work done in reversible isothermal expansion	Need for second law	Fugacity and physical significance	Change in thermodynamic function of mixing of ideal gas	Cryoscopic constant
S 14	SLO-1	Work done in reversible isothermal compression	Second law of thermodynamics	activity and physical significance	Chemical equilibria:Criteria of thermodynamic equilibrium	Determination of molar mass from
5-14	SLO-2	Work done in irreversible isothermal expansion	Spontaneous process	Activity coefficient	Law of mass action	Depression in freezing point
C 45	SLO-1	Adiabatic expansion	Cyclic process	Standard states	Vant Hoff reaction isotherm	Vant hoff factor
3-15	SLO-2	Calculation of ΔU , ΔH and W	Carnot cycle	Inversion temperature	Chemical equilibria of ideal gas	osmotic effect
0.40	SLO-1	Final temperature in reversible	Isothermal and adiabatic expansion	Maxwell equation	Thermodynamic derivation of relation between Gibbs free energy of a reaction and reaction coefficient.	Association and
5-10	SLO-2	adiabatic expansion relation between T&P, T&V	Isothermal and adiabatic compression	Relation between Joule-Thomson coefficient and other thermodynamic parameter	Equilibrium constants and their dependence on T	Degree of association
S-17	SLO-1	Irreversible adiabatic	Efficiency of heat engine	Third law of thermodynamics	Equilibrium constants and their dependence on P	Dissociation, and

Duratio	n (hour)	18	18	18	18	18
	8102	expansion	Free energy change -spontanity	Nernst heat theorem	Equilibrium constants and their	Degree of dissociation of salts
	3LU-2				dependence on concentration	
C 10	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
3-10	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session

		4.	McQuarrie, D. A. & Simon, J. D. Molecular Thermodynamics Viva Books Pvt. Ltd.:
	Theory:		NewDelhi, 2004.
Learning	1. Peter, A. & Paula, J. de. Physical Chemistry 9th Ed., Oxford University Press 2011.	5.	Assael, M. J.; Goodwin, A. R. H.; Stamatoudis, M.; Wakeham, W. A. & Will, S. Commonly
Resources	2. Castellan, G. W. Physical Chemistry 4th Ed., Narosa, 2004.		asked Questions in Thermodynamics. CRC Press: NY 2011.
	3. Engel, T. & Reid, P. Physical Chemistry 3rd Ed., Prentice-Hall , 2012.	6.	Levine, I.N. Physical Chemistry 6th Ed., Tata Mc Graw Hill, 2010.
		7.	Metz, C.R. 2000 solved problems in chemistry, Schaum Series, 2006.

Learning A	Assessment											
	Bleem'e		Cor	ntinuous Lear	ning Assessme	ent (50% weig	htage)			Final Eveninati	en (EQR(weightere)	
	BIOOM S	CLA – 1 (10%)	CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#		Final Examination (50% weightage)		
	Level of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	
Lovel 1	rel 1 Remember	400/		200/		200/		200/		200/		
Level 1	Understand	40%	-	30%	-	30%	-	30%	-	30%	-	
Lovel 2	Apply	409/		40%		409/		40%		409/		
Level 2	Analyze	40%	-	40%	-	40%	-	40%	-	40%	-	
Lovel 2	Evaluate	200/		200/		200/		200/		200/		
Level 3	Create	20%	-	30%	-	30%	-	30%	-	50%	-	
Total		100 %	0	1(00 %	10	00 %	1(0 %	1	00 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Dr. S.Ashok Kumar , SRMIST
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. J.Arockiaselvi , SRMIST

Course Code	UCY	(20302J	Course Name	Inor	ganic Chemisti	nic Chemistry-III: Coordination Chemistry				se ory	C					Core	cours	e				L 4	Т 0	P 4	C 6
Pre-req Cours	uisite ses	Nil		Co-requisit	e Courses	Nil			Pr	ogres Cours	sive es	Nil													
Course Of	fering De	epartment	Chemis	stry		Data Book / Codes/Stand	lards		Nil													·		·	
Course Le	arning R	ationale (CL	.R): The pu	rpose of learning	this course is to):				Learn	ing					Prog	ram L	earni	ng Ou	itcom	es (PL	.0)			
CLR-1 :	Exploit qualita	t concepts re tive and qua	lated to coo ntitative ana	rdination chemist Ilysis	try to manifold a	applications in diverse areas	s like	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Emplo pigmei	y various coo nts	ordination co	ompounds as cata	alysts in industri	s in industrial processes as medicines, paints and																			
CLR-3 :	Addres	ss concepts i	related to m	agnetic properties	s and color of co	omplexes																			1
CLR-4 :	Get kn additio	owledge on n to vertical	d and f block similarity in	elements and ge a group	et an idea about	n idea about horizontal similarity in a period in				(%	ge			sarch			lability		¥		-				ĺ
CLR-5 :	Emplo stabilit	y reaction m y	echanisms o	of coordination co	mpounds to diff	pounds to differentiate kinetic and thermodynamic				nent ('	owled	S	pmen	ı, Rese	age	Ð	Sustair		m Wo		inance	бu			
CLR-6 :	Utilize approp	the basic co priate solution	ordination c. ns	hemistry principle	es applied in var	ious scientific problems and	l identify	hinking	Profici	Attainr	ntal Kn	Analysi	Develo	Desigr	ool Us	Cultur	ent & S		& Tea	cation	gt. & F	Learni			ĺ
			r					of T	ited	ted	me	me	м 2	sis,	'n T	iy &	ũ.		lual	inni	ά	buc	÷	~	ŝ
Course Le (CLO):	earning O	outcomes	At the end	of this course, lea	arners will be ab	le to:		Level	Expec	Expec	Funda	Proble	Desig	Analy	Mode	Societ	Envirc	Ethics	Indivic	Comn	Projec	Life Lo	- OSA	- OSA	- OSd
CLO-1 :	Under	rstand the ba	asic terms ar	nd use standard r	rules to name co	oordination compounds		2	70	65	Н	-	-	Н	-	-	-	-	-	-	-	-	Н		-
CLO-2 :	Discu	ss the variou	is types of is	omerism possibl	e in in a metal c	omplex.		2	80	70	Н	Н	-	Н	-	-	-	-	-	-	-	-	Н	-	-
CLO-3 :	Predic	ct the structu	re of metal o	complexes and u	nderstand the in	ner and outer orbital comple	exes	2	75	60	-	Н	-	-	-	-	-	-	-	-	-	-	-	H	-
CLO-4 :	Gainii	ng the knowl	edge of mag	inetic properties a	operties and colour of complexes				70	70	Н	-	-	Н	Н	-	-	-	-	-	-	-	Н	-	
CLO-5 :	identii	rstand the im fy different ty	portant prop pes species	berties of transitio	on metals and us	lict and	2	80	70	-	Н	Н	-	-	-	-	-	-	-	-	-	-	Н	М	
CLO-6 :	Under therm	rstand reacti odynamic st	on mechanis ability	sms of coordination	on compounds a	netic and	2	75	65	-	-	Н	-	-	-	-	-	-	-	-	-	-	Н	М	
		11					r																		
Duration	n (hour)		24			24				-		24							e	24	<u>i </u>				
6.4	SLO-1	Introductio	n to Coordin	ation Chemistry	outer orbital co	ter orbital complexes Qualitative a octahedral s complexes				I heor and π-	y for accept	or	otassi	um fei	тосуа	nide				transi	tion st	ate			
5-1	SI 0-2	Introduction to Coordination Chemistry Examples Qualita					Qualitative a	litative aspect of MO Theory for potassium ferrocyanide transition						tion st	ate										

	SLO-2			octahedral sigma donor and π- acceptor		
				complexes		
	8101	Recapitulation of Werner's	Introduction to Crystal field theory	Qualitative aspect of MO Theory for π-	potassium ferricyanide	intermediate
6.2	310-1	Coordination theory		donor complexes		
3-2	SI O 2	Recapitulation of Werner's	Introduction to Crystal field theory	Qualitative aspect of MO Theory for π-	potassium ferricyanide	intermediate
	SL0-2	Coordination theory		donor complexes		
6.2	81.0.4	IUPAC nomenclature of coordination	Crystal field theory-Octahedral	Introduction to Transition Elements	Sodium nitroprusside	activated complex
3-3	310-1	compounds	coordination			-

Duratio	on (hour)	24	24	24	24	24
	SLO-2	IUPAC nomenclature of coordination compounds	Crystal field theory- Octahedral coordination	General group trends with special reference to electronic configuration	Sodium nitroprusside	activated complex
S.A	SLO-1	IUPAC nomenclature of coordination compounds	Calculation of CFSE in weak and strong fields	Colour, variable valency	sodium cobaltinitrite	Introduction to substitution reactions in square Planar complexes
5-4	SLO-2	IUPAC nomenclature of coordination compounds	measurement of Δo and concept of pairingenergies	Colour, variable valency	sodium cobaltinitrite	Introduction to substitution reactions in square Planar complexes
S-5 to S-8	SLO-1 SLO-2	Lab Introduction	Estimation of lodine Content in iodized salt	Estimation of Calcium content in milk.	Inorganic preparations- Cuprous Chloride, Cu ₂ Cl ₂	Experiment - Repeat - 2
6 .0	SLO-1	Introduction toisomerism in coordination compounds.	factors affecting the magnitude of Δo	magnetic properties	Lanthanoids and Actinoids: A brief discussion of electronic configuration and	Different types of substitution reactions in square Planar complexes
5-5	SLO-2	Introduction toisomerism in coordination compounds.	factors affecting the magnitude of Δo	magnetic properties	oxidation states	Different types of substitution reactions in square Planar complexes
S 10	SLO-1	Structural isomerism in coordination compounds with CN 4 and 6	Crystal field theory-tetrahedral coordination	catalytic properties	Lanthanoids and Actinoids: colour	Kinetics of substitution reactions in square Planar complexes
3-10	SLO-2	Structural isomerism in coordination compoundswith CN 4 and 6	Crystal field theory-tetrahedral coordination	catalytic properties	Lanthanoids and Actinoids: colour	Kinetics of substitution reactions in square Planar complexes
6 11	SLO-1	stereo isomerism in coordination compounds with CN 4 and 6	Crystal field theory-tetragonal distortions from octahedral geometry	Transition Elements-ability to form complexes	Lanthanoids and Actinoids: spectralproperties	Mechanisms of substitution reactions in square Planar complexes
3-11	SLO-2	stereo isomerism in coordination compoundswith CN 4 and 6	Crystal field theory-square planar geometry	Transition Elements-ability to form complexes	Lanthanoids and Actinoids: spectralproperties	Mechanisms of substitution reactions in square Planar complexes
	SLO-1	A brief idea about chelate effect	Introduction toJahn-Teller theorem	Latimer diagrams of Mn and Fe inacidic and basic media	Lanthanoids and Actinoids: magnetic properties	Examples of substitution reactions in square Planar complexes
5-12	SLO-2	A brief idea about chelate effect	Introduction toJahn-Teller theorem	Latimer diagrams of Mn and Fe inacidic and basic media	Lanthanoids and Actinoids: magnetic properties	Examples of substitution reactions in square Planar complexes
S-13 To S-16	SLO-1 SLO-2	lodo / lodimetric TitrationsEstimation of Cu(II) and K ₂ Cr ₂ O ₇ using sodium thiosulphate solution	Complexometric titrations using disodium salt of EDTAEstimation of Mg ²⁺ ,Zn ²⁺	Principles involved in chromatographic separations may be included: Paper cinematographic separation of following metal ions: a) Ni (II) and Co (II)	Inorganic preparations- Aluminium potassium sulphate KAI(SO4) ₂ .12H ₂ O (Potash alum) or Chrome alum.	Experiment - Repeat - 3
S 47	SLO-1	labile and inert complexes	Jahn-Teller theorem-Examples	Latimer diagrams of Cu in acidic and basic media	Lanthanoid contraction-causes	Introduction to Trans- effect
5-17	SLO-2	labile and inert complexes	Jahn-Teller theorem-Examples	Latimer diagrams of Cu in acidic and basic media	Lanthanoid contraction- effects	Introduction to Trans- effect
S-18	SLO-1	Valence bond theory	Qualitative aspect of Ligand field Theory for octahedral sigma donor complexes	A brief discussion of differences between the first, second and third transition series.	Separation of lanthanoids by ion exchange method.	theories of trans effect

Duratio	on (hour)	24	24	24	24	24
	SLO-2	Valence bond theory	Qualitative aspect of Ligand field Theory for octahedral sigma donor complexes	A brief discussion of differences between the first, second and third transition series.	Separation of lanthanoids by ion exchange method.	theories of trans effect
S-19	SLO-1	Its application to complexes of coordination numbers 4 and 6.	Qualitative aspect of Ligand field Theory for octahedral complexes	Some important compounds of Cr, Mn, Fe and Co and their roles as laboratory reagents;	Introduction to inorganic reaction mechanisms.	Trans- effect:Examples
	SLO-2	Its application to complexes of coordination numbers 4 and 6.	Qualitative aspect of Ligand field Theory for octahedral complexes	potassium permanganate	Introduction to inorganic reaction mechanisms.	Trans- effect:Examples
6 20	SLO-1	inner orbital complexes	Qualitative aspect of Ligand field Theory for π- donor complexes	potassium permanganate	Concept of reaction pathways	Thermodynamic and Kinetic stability (using VBT)
5-20	SLO-2	Examples	Qualitative aspect of Ligand field Theory for π- donor complexes	its application	Concept of reaction pathways	Thermodynamic and Kinetic stability (using VBT)
S-21	SLO-1	Estimation of antimony in tartar-emetic	Estimation of Ca2+ by substitution	Paper cinematographic separation of	Experiment - Repeat - 1	Demonstration Practical Session
to S-24	SLO-2	iodimetrically	method	following metal ions: Cu(II) and Cd(II)		
	Theo 1. 2.	ry: Atkins, P.,Overton, T. Shriver and Atkins' Pfennig, B. W. Principles of Inorganic che	inorganic chemistry 6th Ed. Oxford Univer emistry. John Wiley & Sons, 2015.	sity Press, USA, 2010.	Practicals: 1. Vogel, A.I. A text book of	Quantitative Analysis, ELBS 1986.

2	. Pten	nig, в. v	w. Principles	s of inorganic ch	emistry. John Wile	y & Sons, 2015.
3	. Purc	ell, K.F	& Kotz, J.C.	Inorganic Chen	nistry W.B. Saunde	ers Co, 1977.

4. Huheey, J.E., Inorganic Chemistry, Prentice Hall, 1993. Learning Res

ources	5.	Cotton, F.A.	& Wilkinson,	G.,	Advanced	Inorganic	Chemistry	Wiley-VCH,	1999.	
--------	----	--------------	--------------	-----	----------	-----------	-----------	------------	-------	--

6. Basolo, F, and Pearson, R.C., Mechanisms of Inorganic Chemistry, John Wiley & Sons, NY, 1967.

7. Greenwood, N.N. & Earnshaw A., Chemistry of the Elements, Butterworth-Heinemann, 1997.

Miessler, G. L. &. Tarr, Donald A. Inorganic Chemistry 3rd Ed.(adapted), Pearson, 2009
 Barnes, C. E. Inorganic Chemistry 4th Ed. (Catherine E. Housecroft and Alan G. Sharpe)

Barnes, C. E. Inorganic Chemistry 4th Ed. (Catherine E. Housecroft and Alan G. Sharpe). Journal of Chemical Education, 2003.

Learning Assessment

Ŭ			Cor	ntinuous Leari		Einal Examination (50% weightage)					
	Bloom'sLevel of Thinking	CLA – 1 (10	%)	CLA – 2 (10%)		CLA -	3 (20%)	CLA –	4 (10%)#	Filiai Examinati	on (50% weightage)
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Lovel 1	Remember	20%	20%	150/	15%	150/	15%	15%	15%	15%	15%
Level I	Understand	20 %	2076	1576	1576	1570	1576	1576	1576	10 /0	15 %
Lovel 2	Apply	20%	20%	20%	20%	200/	20%	20%	20%	200/	20%
Level Z	Analyze	20 %	2076	20 %	20 %	20 /0	20 %	20 %	20 /0	20 /0	2078
	Evaluate	10%	10%	150/	15%	150/	15%	15%	15%	15%	15%
Level 3	Create	10 /0	10 /0	1576	1576	1576	1576	1576	1570	10 /0	15 %
	Total	100 %		10	0 %	10	0 %	10	0 %	1	00 %

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy's Laboratories,	2. Prof. Vivek Polshettiwar, TIFR Mumbai,	2 Dr. S. Shanmugan, SPMIST
shanmukhaprasadg@drreddys.com	vivekpol@tifr.res.in	

2. G. Marr and B.W. Rockett, Practical Inorganic Chemistry

Course Code	UP	(20A01J	Course Name		Allied Physics					Co Cate	urse egory		G		(Gener	ric Ele	ctive	Cour	se			L 4	T P 0 4	, C	
Pre-requ Course C	re-requisite Courses Nil Co-requisite Courses Nil Courses Nil Ourse Offering Department Physics and Nanotechnology Data Book /										re Cou	irses	Nil													
	Ŭ	•	,		07	C	Codes/Stand	dards																		
Course L	earning R	ationale (CLR)): The purpose of	of learni	ing this cour	se is to:					Learn	ning] [Prog	jram l	_earn	ing O	utcom	nes (P	LO)			
CLR-1 :	Under	stand and solv	e problems on fu	ndame	ntals of phys	sics			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Acqui	e knowledge o	n materials prope	erties						»(%	(%	ge .	s							Ū						
CLR-3 :	Correl	ate the acquire	d knowledge and	d use it	for various a	applications				cy (nt (°	vled	cept		dge	tion			Data		kills	sliis				
CLR-4 :	Famili	arize themselve	es with interactio	n of ligh	ht and matte	r			p	cien	me	Nov	Sone	ß	wle	liza		g	ret [dills	g SI	х,				
CLR-5 :	Apply	physics metho	ds and principles	to solv	e problems	problems in the majors.			inkir	rofic	∖ttair	tal K	of C	elate	Knc	ecia	tilize	odelli	terp	e St	lvin	atior	Skills			
Course L	earning C	Outcomes (CLC	D): At the end	of this (course, lean	urse, learners will be able to:			evel of Th	Expected F	Expected /	Fundamen	Application	Link with R	Procedural	Skills in Sp	Ability to U	Skills in Mo	Analyze, Ir	Investigativ	Problem S	Communic	Analytical (PSO - 1	PSO - 2	PSO - 3
CLO-1 :	Under	stand the funda	amentals of phys	ics					2	80	75	H	Ĥ	H	H	H	H	H	Ĥ	H	H	M	Ĥ	H	H	H
CLO-2 :	Evalu	ate and learn th	ne structural, opti	cal, nuo	clear and ele	ectronic propertie	s of solids		2	80	70	Н	М	М	Н	Μ	Η	Н	Н	М	Н	М	Н	М	М	Μ
CLO-3 :	Emph	asize the signif	ficance of green t	echnol	ogy and its a	applications			2	75	70	H	M	Н	Н	Н	Н	Н	М	Н	Н	Н	Н	Н	Н	Н
CLO-4 :	Gain o prope	comprehensive rties	knowledge and	sound l	understandir	ng of fundamenta	ils of light an	d material	2	80	75	IVI	п	П	IVI	п	п	п	П	п	п	IVI	п	п	п	п
CLO-5 :	Reco	nize how and	when physics me	thods a	and principle	es can help addre	ess problems	in their major	2	80	75	Н	Н	Н	Н	Н	М	Н	Н	М	Н	М	Н	Н	Н	Н
CLO-6 :	Devel	op skills on pra	ctical, analytical	problen	n solving in	physics			2	80	70	Н	Н	Н	Н	Н	М	Н	Н	М	Н	М	Н	Н	Н	Н
Duratio	n (hour)		24			24			24							24							24			
Duratio		Sources of co	onventional energy	vc	Space lattic	ce basis		Kinetic theory	of gases	5			Electr	ic cha	rae - c	onser	vation	of ch	arge	24 ue _ Time period - amplitude - phase						
S-1	SLO-1 SLO-2	Need for non	- conventional e	nergy	Unit Cell, la	attice parameters		Basic postulat	ies	-			Perm	ttivity	. 3					Wave	e natu	e of li	ght	- 1		
	SI 0-1	resources Solar energy	and solar cells a	ndits	Two dimen	sional andthreedi	imensional	Ideal gas laws	3				Coulo	mb's l	aw					Huyg	ens's	princip	ole			
S-2	020-1	applications			Bravaislatti	ces																				
	SLO-2	calculating er	nergy generation	by a	The seven	crystal systems		Numerical pro	blem so	ving o	n Idea	l gas	Nume	rical p omb's	oroblen Iaw	n solv	ing on			Nume	erical itude.	oroble phase	m sol	ving o	n	
	SLO-1	Bio mass ene	ergy		Cubic cryst	al system	m Van Der Waal's			on of s	states		Electr	ic field	1					Interf	erence	Э				
S-3	SLO-2	Generation a mass energy	nd applications o	of bio	Crystal sym	stal symmetry Derivation of Var of states			/an Der	Waal's	equati	ion	Electr	ic pote	ential					Youn	g's do	uble s	lit exp	erime	nt	
	SLO-1	Wind energy applications	generation and		Reciprocal	iprocal lattice and its importance Pressure of an id			n ideal g	as			Gaus	s's law	1					Cohe	rence					
5-4	SLO-2	Numerical ev energy gener	aluation of wind		Density and atomic packing fraction Derivation of Pres			Pressure	of an	ideal g	jas	Applic	ations	s of Ga	iuss's	law			Interf	erence	e from	thin f	ilms			
S-5to	SLO-1	Introduction t experimentat	o the Lab ion		Calculation X-ray diffra	Calculation of lattice cell parameters by Determination of spectra diffraction of the liquid by Newt			of speci	fic hea ns's lav	it capa v of	acity	Calibr poten	ation tiomet	of Volt er	meter	using			Deter prism	rminat i usino	on of dispersive power of a spectrometer				
S-8	SLO-2 A ray diffraction of the liquid by N cooling																									

Duratio	on (hour) 24 24 24 24		24	24		
6.0	SLO-1	Nuclear energy - Atomic structure	Numerical on Density and atomic packing fraction	Laws of thermodynamics	Numerical problem solving onGauss's law	Michelson's interferometer
3-9	SLO-2	Alpha, beta and gamma radiation	Crystal directions and planes	Problem solving on laws of Thermodynamics	Conductors and dielectrics	Diffraction - Wave theory of light
	SLO-1	Law of radioactive decay	Introduction to Miller indices	Entropy	Electric Current	Numerical problem on interference
S-10	SLO-2	Example problems in radioactivity	Numerical on Miller indices	Calculating numerical on entropy change	Problem on dielectrics and conductors	Light and Optics
S 11	SLO-1	Decay constant	Interplanar distance	Change of entropy in reversible and irreversible processes	Ohm's law	Fermat's principle
5-11	SLO-2	Half-life and mean life	Numerical on interplanar distance	Change of entropy in irreversible processes	Magnetic induction	Laws of reflection and refraction
S-12	SLO-1	Nuclear energy	Hexagonal closely packed (HCP)structure	Low temperature	Permeability and susceptibility	Total internal reflection
5-12	SLO-2	Applications of nuclear energy	Derivation of HCP atomic packing fraction	Joule - Kelvin effect-introduction	Numerical problem solving on Permeability and susceptibility	Illustrations of total internal reflection
S-13	SLO-1	Study of the I-V Characteristic of a	Dielectric constant Measurement	Determination of thermal conductivity of	Calibration of Ammeter using	Study of attenuation and propagation
to S-16	SLO-2			method	potentiometer	
S 17	SLO-1	Mass defect and binding energy	Numerical problem solving on HCP structure	J-K effect- theory	Magnetic field due to a current carrying conductor-Biot-Savart's law	Problem solving on total internal reflection
3-17	SLO-2	Solving numerical based on binding energy and mass defect.	Diamond crystal structure	Applications of J-K effect	Numerical problem solving on Biot- Savart's law	Mirrors and lenses
S-18	SLO-1	Fission reaction	Derivation of APF for diamond structure	Liquefaction of gases	Ampere's circuital law	Lens makers formula
	SLO-2	Evaluating nuclear energy generation by fission reaction	Numerical problem solving on diamond structure	Linde's process	Faraday's law	Problem solving on Lens makers formula
6 40	SLO-1	Fusion reaction	X-ray diffraction	Nitrogen gas liquefaction	Basic Electronics	Defects of images
5-19	SLO-2	Fusion energy cycles	Problem solving on X-ray diffraction	H, He gas liquefaction	P and N type semiconductors	Coma distortion
	SLO-1	Biological effects of radiation	Single crystal diffraction	Adiabatic demagnetization-introduction	Junction Diode	Spherical aberration in lenses
S-20	SLO-2	Numerical problems involving Nuclear energy	powder diffraction	Working principle of adiabatic demagnetization-	Characteristics of Junction Diode	Chromatic aberration in lenses
S-21	SLO-1	Hall effect- Hall coefficient	Revision class for experiments	Determination of specific heat capacity	Band gap determination using Post	Revision class for experiments
S-24	SLO-2			method	Onice Box – Specific resistance	

Learning	1. 2.	ModernPhysics,MurugeshanandK.Sivaprasath,(S.Chandpublications,revisededition, 2015). FundamentalsofPhysics,ResnickR.andHallidayD.,(WileyPublication,8thEdition, 2011)	3.	Heat and Thermodynamics, Zemansky M. W. and Ditlman R.H., (Tata McGraw Hill,2011)
Resources			4.	Allied Physics I, Sundaravelusamy A., (Priya Publications, 2009)

Learning Assessment												
	Bloom's			Fina	Examination (50% weighta	age)						
	Level of Thinking	CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#				
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	
Level 1	Remember Understand	30 %	30 %	30 %	30 %	30 %	30 %	30 %	30 %	30 %	30 %	
Level 2	Apply Analyze	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	40 %	
Level 3	Evaluate Create	30 %	30 %	30 %	30 %	30 %	30 %	30 %	30 %	30 %	30 %	
	Total	100 %		100 %		100 %		100 %		100 %		

CLA – 4 can be from any combination of these: Assignments, Seminars, Scientific Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications etc.,

Course Designers																								
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts																						
Mr. R Seshadri, Titan Company Limited, seshadri@titan.co.in	Prof. C Vijayan, IIT Madras, cvijayan@iitm.ac.in	Mr. Sandeep K. Lakhera, SRMIST																						
Dr. N Vijayan, NPL, nvijayan @nplindia.org	Prof. S Balakumar, University of Madras, balakumar@unom.ac.in	Dr. Gunasekran, SRMIST																						
Course UJK20301T Course Name			e Name	Universal Hu	ıman Values	C	Course Category JK			Life Skill Course					L 2	T 0	P 0	C 2						
---	---	----------------------	-----------------------------	--	---------------------------------	-------------	--------------------	------------	------------	-------------------	-------------	-------------	-----------	--------------	--------------	-------------	-------------	-------------	-----------	----------	------------	--------	--------	-------
Pre-re	equisite Courses	1	Nil	Co-requisite Courses	Nil		Pro	ogres	sive C	ourses		Ni	1											
Course Offer	Course Offering Department English Data Book / Codes/Standards													Nil										
Course Learning Rationale (CLR): The purpose of learning this course is to:							L	earni	ng				Р	rograi	m Le	arniı	ng Oi	utcoi	nes	(PLO)			
CLR-1 :	To generate in st Eco sensitivity, v	tudents vision fo	s a sensitiv or the Nati	vity to current regional and national on and general humanness	issues such as gender margi	inalization	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 : CLR-3 :	An expanded cor The ability to acc	nsciou: cept all	sness with and to co·	a mind to accommodate all is deve - exist is initiated	loped		(F	(9)	()	e	s	olines			edge									
CLR-4 :	To create commu	unity co	onnectivity	and interdependence	ividuals and communities		(Bloor	ency (%	ient (%	owledg	oncept	Discip	ledge	ation	Knowle	_	t Data	s	Skills	Skills				
CLR-6 :	Make them learn	the ba	asic nature	e of human beings			iinking	roficie	Attainm	ital Kno	l of Co	Related	l Know	becializ	tilize I	odeling	Iterpre	ve Skill	olving	ation S	Skills			
Course Lear	ning Outcomes (Cl	LO):		At the end of this course, lea	rners will be able to:		Level of Th	Expected F	Expected /	Fundamer	Applicatior	Link with F	Procedura	Skills in Sp	Ability to L	Skills in M	Analyze, Ir	Investigati	Problem S	Communic	Analytical	PSO -1	PSO -2	PSO-3
CLO-1 :	Become sensitive values	e towa	rd every l	iving life and be able to respect eve	ery religion recognizing the ur	niversal	2	75	60	Н	Н	Н	Н	-	-	-	Н	Н	Н	Н	Н	-	-	-
CLO-2 : Every way of life and culture will kindle the curiosity in them to know them and will be able appreciate the beauty in it					iate the	2	80	70	Н	Н	Н	Н	-	-	-	Н	Н	Н	Н	Н	-	-	-	
CLO-3 :	CLO-3 : The presumptuous or prejudiced mentality will be overcome by them						2	70	65	Н	Н	Н	Н		-	-	-	-	-	-	-	-	-	-
CLO-4 :	Critical thinking a	and acc	commodat	ive nature will become so natural w	ay of thinking for them		2	70	70	Н	Н	Н	Н	Н	-	-	-	-	-	Н	-	-	-	-
CLO-5 :	CLO-5 : They will become aware of the social inequalities and justice						2	80	70	Н	Н	-	Н	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	CLO-6: Will be able to explore their own emotions, hopes & fear and be able to describe them verbally					2	75	70	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	
	· · · · · · · · · · · · · · · · · · ·																							

Dura	tion (hour)	06	06	06	06	06
S-1	SLO-1	What is love? Forms of love. For self, parents, family, friends, spouse, community, nation, humanity and other beings, both for living and non living	Love compassion empathy sympathy and non violence	Narratives and anecdotes from history, literature including local folklore	What will learners lose if they don't practice love and compassion?	Sharing learners' individual and/ or group experiences
	SLO-2	Love and Compassion inter relatedness	Individuals who are remembered in history for practicing compassion and love	Practicing Love and Compassion: what will they gain if they practice compassion?	Simulated situations	Case studies
S-2	SLO-1	WhatisTruth ?	Universal truth, truth as value, as fact,	Veracity, sincerity, honesty among others	Individuals who are remembered in the history who have practiced these values	Practicing truths

SI 0-2	what will they gain if they practice				06	
tru	ruth	What will learners lose if they don't practice truth?	Sharing learners' individual and/ or group experiences	Simulated situations	Case studies	
S-3 SLO-1	What is non violence – its need, love compassion,	empathy sympathy for others as pre- requisites for non- violence	Ahimsa as non violence and non killing	Individuals and their organizations which are known for their commitment for non violence	Narratives and anecdotes about non violence from history and literature including local folklore	
SLO-2 Pr	Practicing non violence	What will they gain if they practice non violence	What will learners lose if they don't practice non violence?	Simulated situations	Case studies	
SLO-1 W	Vhatisrighteousness ?	Righteousness and Dharma	Righteousness and priority	Individuals who are remembered in the history who have practicing righteousness.	Narratives and anecdotes about Righteousness from history and literature including local folklore	
SLO-2 Pr	Practicing Righteousness	: Sharing learners' individual and/ or group experiences	what will learners lose if they don't practice Righteousness	Simulated situations	Case studies	
SLO-1 W	What is peace?	Need of peace in Relation with harmony and balance	Narratives and anecdotes about peace from history and literature including local folklore	Individuals who are remembered in the history who have practicing peace	Practicingpeace	
SLO-2	What will they gain if they practice beace	what will learners lose if they don't practice peace	Sharing learners' individual and/ or group experiences	Simulated situations	Case studies	
SLO-1 W	Vhat is service and renunciation	Forms of service , & renunciation Individuals who have recommended service in history	Practicing service and renunciation	Narratives and anecdotes about Service & renunciation from history and literature including local folklore	Individuals who are remembered in the history who have practicing renunciation	
SLO-2 Sł	Sharing learners' individual and/ or roup experiences on renunciation	Sharing learners' individual and/ or group experiences on service	what will learners lose or gain if they do/don't practice Renunciation and service	Simulated situations	Case studies	

Learning	Theory:	
Resources	1.	"Universal Human Values: Text Book"- Compiled and Edited by the Faculty of Science and Humanites, SRMIST, 2020.

Learning Assessr	Learning Assessment															
			Continuous Learning Assessment (100% weightage)													
Level	Bloom'sLevel of Thinking	CLA –	1 (20%)	CLA –	2 (20%)	CLA –	3 (30%)	CLA – 4 (30%)#								
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice							
Lovel 1	Remember	409/		40%		409/		409/								
Level I	Understand	40%	-	40%	-	40%	-	40%	-							
	Apply	40%		40%		40%		40%								
	Analyze	40 %	-	40 %	-	40 %	-	40 %	-							
	Evaluate	20%		20%		20%		20%								
Level 3	Create	2078	-	20 %	-	20 %	-	2078	-							
	Total	10	0 %	10	0 %	10) %	10)0 %							

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
	1. Prof. Daniel David, Prof & Head, Department of English, MCC, Chennai	1. Dr. Shanthichitra, Associate Professor, & Head, Department of English, FSH, SRMIST
		2. Dr K B Geetha, Assistant Professor, Department of English, FSH, SRMIST

SEMESTER IV

Course Code	UCY20401J	Course Name	Organic Chemistry - II: Contain	Halogenated Compounds and Oxygen ing Functional Groups	C Ca	Course Category C							(Core	cour	se				_	L 4	T 0	P 4	С 6
Pre-requi Course	site s		Co-requisite Courses	Nil		Pro C	gres ours	sive es	Nil															
Course Offering Department Chemistry Data Book / Codes/Standards Nil																								
Course Lea	ourse Learning Rationale (CLR): The purpose of learning this course is to:													Prog	jram	Learr	ning (Outco	mes	(PLO))			
CLR-1 :	The core course Or functional groups	ganic Chem	istry II is designed in a manner	that gives a better understanding of the orga	nic	1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Gains extensive co	nceptual kno	wledge on halogenated hydroc	arbons and their reactivity patterns												٢								
CLR-3 :	Gains extensive co	nceptual kno	wledge on oxygen containing f	unctional groups and their reactivity patterns			(_		e			Б			oilit								
CLR-4 :	The detailed reaction	ons mechani	stic pathways for each function	al group will be discussed		B	%)	(%)		edç		ŧ	sea			inal		Ł		ø				
CLR-5 :	To unravel the spec	trum of orga	nic chemistry and the extent of	organic transformations		B	JCY	ent		N		me	Re	e		sta		Ň		anc	5			
Course Learning Outcomes (CLO): At the end of this course, learners will be able to:				be able to:		Level of Thinking	Expected Proficier	Expected Attainm		Fundamental Kn	Problem Analysis	Design & Develop	Analysis, Design,	Modern Tool Usaç	Society & Culture	Environment & Su	Ethics	Individual & Team	Communication	Project Mgt. & Fin	Life Long Learnin	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Understand prepara	ation, proper	ties and reactions of haloalkane	es estatution estatu		2	75	60		Н	Н	Н	-	-	-	-	-	-	-	-	-	Н-	-	-
CLO-2 :	Understand prepara	ation, proper	ties and reactions of haloarene	S		2	80	70		-	Н	-	Н	-	-	-	-	-	-	-	-	Н	-	-
CLO-3 : Understand preparation, properties and reactions of oxygen containing functional groups						2	70	65		Η	-	-		-	-	-	-	-	-	-	-	Н	-	-
CLO-4 :	CLO-4 : Use the synthetic chemistry learnt in this course to do functional group transformations					2	70	70		Η	-	Н	Н	Н	-	-	-	-	-	-	-	-	Н	Μ
CLO-5 :	CLO-5 : To propose plausible mechanisms for any relevant reaction					2	80	70		-	Н	-	Н	-	-	-	-	-	-	-	-	-	Η	Μ

Duratio	n (hour)	24	24	24	24	24
S-1	SLO-1	Chemistry of Halogenated Hydrocarbons :Alkyl halides: Methods of preparation	Nucleophilic aromatic substitution; Benzyne mechanism	Phenol: Ring substitution reactions	Mechanisms of Aldol and Benzoin condensation	Carboxylic Acids and their DerivativesGeneral methods of preparation
	SLO-2	Alkyl halides: Methods of preparation	Nucleophilic aromatic substitution; Benzyne mechanism	Phenol: Ring substitution reactions	Mechanisms of Aldol and Benzoin condensation	General methods of preparation
S-2	SLO-1	Alkyl halides: Properties	Relative reactivity of alkyl, allyl, benzyl, vinyl and aryl halides towards nucleophilic substitution reactions	Reimer–Tiemann reaction with mechanism	Knoevenagel condensation	Physical properties and reactions of monocarboxylic acids
	SLO-2	Alkyl halides: Properties	Relative reactivity of alkyl, allyl, benzyl, vinyl and aryl halides towards nucleophilic substitution reactions	Kolbe's–Schmidt Reactions with mechanism	Claisan-Schmidt reaction	Physical properties and reactions of monocarboxylic acids
6.2	SLO-1	Nucleophilic substitution reactions – S_N^1	Organometallic compounds of Mg (Grignard reagent)	Fries rearrangements with mechanism	Perkin reaction	Effect of substituents on acidic strength
5-3	SLO-2	Nucleophilic substitution reactions – S_N^1	Organometallic compounds of Mg (Grignard reagent)	Fries rearrangements with mechanism	Cannizzaro reaction	Effect of substituents on acidic strength

Duratio	n (hour)	24	24	24	24	24
	81.0.1	Nucleophilic substitution reactions – S_N^2	Grignard Reagent: Use in synthesis of	Claisen rearrangements with	Wittig reaction	Typical reactions of dicarboxylic
64	3LU-1		organic compounds	mechanism		acids
5-4	9102	Nucleophilic substitution reactions – S_{N^2}	Grignard Reagent: Use in synthesis of	Claisen rearrangements with	Beckmann rearrangements	Typical reactions of dicarboxylic
	3LU-2		organic compounds	mechanism	-	acids
	SLO-1	Lab Introduction	Organic Preparation: Acetylation of	Selective reduction of meta	S-Benzylisothiouronium salt of one each	Experiment-Repeat-2
S 5 to			one of the following compounds:	dinitrobenzene to m-nitroaniline	of water soluble and water insoluble	
3-J 10 C 0	SI 0 2		Phenols (ß -naphthol, vanillin, salicylic		acids (benzoic acid, oxalic acid, phenyl	
3-0	310-2		acid) using conventional and green		acetic acid and phthalic acid)	
			approach			
	SI 0-1	Nucleophilic substitution reactions – S_N	Alcohol, Phenol, Ether and Epoxides :	Ethers and Epoxides: Preparation	Benzil-Benzilic acid rearrangements	Typical reactions of hydroxy acids
S-9	010-1		Alcohols: preparation			
	SLO-2	Nucleophilic substitution reactions – S_{N}	Alcohols: preparation	Ethers and Epoxides: Preparation	Haloform reaction	Typical reactions of hydroxy acids
	SI 0-1	Mechanisms with stereochemical	Alcohols: Properties	Ethers and Epoxides: Reactions with	Baeyer Villiger oxidation	Typical reactions of unsaturated
S-10	010 1	aspects		acids		acids
0.10	SI 0-2	Mechanisms with stereochemical	Alcohols: Properties	Ethers and Epoxides: Reactions with	α - substitution reactions	Typical reactions of unsaturated
	0101	aspects		acids		acids
	SLO-1	Effect of solvent	Relative reactivity of 1°, 2°, 3°	Reactions of epoxides with alcohols,	Clemmensen reduction	Preparation and reactions of acid
S-11			alcohols	ammonia derivatives		chlorides and anhydrides
• · ·	SLO-2	Effect of solvent	Relative reactivity of 1°, 2°, 3°	Reactions of epoxides with alcohols,	Wolff-Kishner reduction	Preparation and reactions of acid
			alcohols	ammonia derivatives		chlorides and anhydrides
S-12	SLO-1	Nucleophilic substitution vs. elimination	Bouvaelt Blanc Reduction	Reactions of epoxides with LIAIH4	LIAIH4 reduction	Preparation and reactions of esters
	SLO-2	Nucleophilic substitution vs. elimination	Bouvaelt Blanc Reduction	Reactions of epoxides with LIAIH4	NaBH4 reduction	Preparation and reactions of esters
	SL0-1	Functional group tests for alconois,	Benzolyation of one of the following	Hydrolysis of amides and esters	Aldol condensation using either	Experiment-Repeat-3
C 42			annues (annue, 0-, m-, p- totulones		conventional of green method. The	
3-13 To		group	following phonols (<i>R</i> , pophthal		using 0.5.1g of the organic compound	
S-16	SLO-2		resorcing prenois (is -naprilitor,		The solid samples must be collected and	
0-10			Raumann reaction		may be used for recrystallization and	
			Baamann roadaon		melting point	
		Arvl halides: Preparation	Oxidation of diols by periodic acid and	Carbonyl Compounds : Structure and	MPV reduction	Preparation and reactions of amide
	SLO-1		lead tetraacetate	reactivity		
0.47		Arvl halides: Preparation	Oxidation of diols by periodic acid and	Structure and reactivity	PDC oxidation	Comparative study of nucleophilic
5-17		,	lead tetraacetate	·····,		substitution at acvl group -
	SL0-2					Mechanism of acidic and alkaline
						hydrolysis of esters.
		Preparation from diazonium salts	Pinacol-Pinacolone rearrangement	Preparation	Addition reactions of α , β - unsaturated	Comparative study of nucleophilic
	SI 0 1				carbonyl compounds: Michael addition	substitution at acyl group -
S 10	310-1					Mechanism of acidic and alkaline
3-10						hydrolysis of esters
1	SI 0-2	Preparation from diazonium salts	Pinacol-Pinacolone rearrangement	Preparation	Active methylene compounds: Keto-enol	Mechanism of Claisen condensation
	010-2				tautomerism	
S-19	SI 0-1	Aryl halides: Properties	Phenols: Preparation	Nucleophilic additions	Active methylene compounds:	Mechanism of Dieckmann reactions
0-10	320-1				Preparation	

Duratio	n (hour)	24	24	24	24	24
	SLO-2	Aryl halides: Properties	Phenols: Preparation	Nucleophilic additions	Active methylene compounds: Preparation	Mechanism of Reformatsky reactions
6 20	SLO-1	Nucleophilic aromatic substitution; S _N Ar	Phenols: Properties; Acidity and factors effecting it	Nucleophilic addition-elimination reactions with ammonia derivatives with mechanism	Synthetic applications of diethyl malonate and ethyl acetoacetate	Mechanism of Hofmann- bromamide degradation
S-20	SLO-2	Nucleophilic aromatic substitution; S _N Ar	Phenols: Properties; Acidity and factors effecting it	Nucleophilic addition-elimination reactions with ammonia derivatives with mechanism	Synthetic applications of diethyl malonate and ethyl acetoacetate	Mechanism of Curtius rearrangement
	SLO-1	Organic Preparation: Acetylation of one	Oxidation of ethanol/ isopropanol	Semicarbazone of any one of the	Experiment-Repeat-1	Demonstration Practical Session
S-21 to S-24	SLO-2	of the following compounds: Amines (aniline, o-, m-, p- toluidines and o-, m-, p-anisidine) using conventional and green approach	(lodoform reaction)	following compounds: acetone, ethyl methyl ketone, cyclohexanone, benzaldehyde		Demonstration Practical Session

Learning Resources	1. 2. 3. 4.	Theory: Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education 2009.	Practi 1. 2. 3.	 Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson, 2012 Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and QuantitativeAnalysis, University Press, 2000. Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, UniversityPress 2000.
-----------------------	----------------------	--	--------------------------	--

Learning As	Learning Assessment													
			Con	tinuous Leari	ning Assessme	nt (50% weig	jhtage)			Final Examination	(EQ%) weightege)			
	Bloom'sLevel of Thinking	CLA – 1 (10	%)	CLA –	2 (10%)	CLA –	3 (20%)	CLA –	4 (10%)#		(50% weightage)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice			
	Remember	200/	200/	150/	150/	150/	150/	150/	150/	150/	150/			
Level	Understand	20%	20%	10%	15%	10%	15%	10%	15%	15%	15%			
Loval 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%			
Level 2	Analyze	2070	2078	2070	2070	2078	2078	2070	2070	2078	2078			
	Evaluate	10%	10%	15%	15%	150/	15%	150/	15%	15%	15%			
Level 5	Create	1070	1070	1570	1570	1576	1370	1370	1570	1576	1576			
	Total	100 %			100 % 100 % 100 %					100 %				

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. Gopal ChandruSenadi, SRMIST

Course Code	Course CodeUCY20402JCourse NameCourse Physical Chemistry - III: Phase Equilibria and Electrochemical CellsCourse 						L 4	Т 0	P 4	C 6															
Pre-re Co	equisite urses	Nil			Co-requisite Courses Nil	1			Progr Cou	essive rses	Nil														
Course C	Offering [Department	Chemis	stry		Data Boo	k / Codes/Standards		Nil																
Course Learning Rationale (CLR): The purpose of learning this course is to:								Lea	rning					Pro	ogram	ı Lear	rning	Outc	omes	s (PLC))				
CLR-1:	To und	lerstand cond	cepts of elect	rochemistry ii	n batteries and fuel cell.				1 2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To und	lerstand the p	ohase, co-ex	istence of pha	ases, phase diagram.																				
CLR -3:	To und	lerstand the o	concept of Id	eal and non-id	deal solutions.									÷			līt								
CLR-4:	To lea	m the CST of	^r miscible liqu	ids and distri	bution laws.				(m (%	(%	ge		Ŧ	earc			labi		¥						
CLR-5:	To und	lerstand surfa	ace phenome	enon, adsorpti	ion and its factors.				5) () ()	ut (vlec		Jeni	lese	0		tain		Nor		nce				
CLR-6	To und	lerstand the v	arious adsol	rption isotherr	n - BET Equation.				g (E	me	No	<u>.</u>	udo	ц С	age	e	Sus		m /		ina	ing			
Course I (CLO):	_earning	Outcomes	es At the end of this course, learners will be able to:					Level of Thinkin Expected Profic	Expected Attain	Fundamental K	Problem Analys	Design & Devel	Analysis, Desig	Modern Tool Us	Society & Cultur	Environment &	Ethics	Individual & Tea	Communication	Project Mgt. & F	Life Long Learn	PSO - 1	PSO - 2	PSO – 3	
CLO-1 :	Explai	n the phase r	ule and its de	erivation with	applications.				2 75	60	Н	Н	Н	-	-	-	-	-	-	-	-	<u> </u>	Н	М	-
CLO-2 :	Explai	n phase equil	ibrium, criter	ia, Gibbs-Duh	em Margules Equation.				2 80	70	-	Н	-	Н	-	-	-	-	-	-	-	<u> </u>	Н	-	-
CLO-3 :	Explail concei	n the terms of ntration.	felectrochen	nistry, includir	ng different electrode applicati	ions and ro	le of electrolyte		2 75	60	Н					М						Н	Н		
CLO-4 :	Explai	n the applicat	ion of electro	chemistry in	cell battery, corrosion and hap	openings in	surroundings.		2 75	60	Н	Н	Н	Н	Н	Н	Н		Н					М	Н
CLO-5 :	Explai	the surface	chemistry of	adsorption.					2 75	60	H		M		H							H	H	<u> </u>	
CLO-6:	Derive	the various a	adsorption is	otherm expres	sions.				2 75	60	Н		М		Н							Н	Н		
Duratio	n (haun)	1	24		24			4			- <u>r</u>			24				1				4			
Duratio		Introduction	to Dhago rul	6	24	200	Z Eastors influencing th	4	bility of	a 00	Stand	ard al	ootro	24	ontial	1		Durin	oina c	winh	<u>Z</u>	4	troda		
S-1	SLO-1	and its com	ponents	C	Raoults law, Ideal solution	113	Correlation between I	Henry	and Ra	oults	Electr	ocher	nical s	eries	ential			And i	its lim	itatior	ns	5 6160			
	SI 0-1	Dearee of fr	reedom		Vapor pressure of		Nernst distribution				Electr	omoti	/e for	re of				nH d	eterm	inatio	n of c	nas el	lectro	de	
S-2	SLO-2	Conditions f	or equilibriur	n between	ideal solution And its derivation						galvar	nic ce	1	00 01				SbO/	/Sb ₂ C) ₃		100 01	0000	<i>uo</i> ,	
	SI 0-1	Derivation o	f Gibbs phas	e rule	Chemical potential of Ideal Application to					Activit	v and						Qual	itative	disci	ussio	n of				
S-3	SLO-2	For reactive	and non-rea	octive	Non-ideal solutions. Nernst equation.						Mean	ionic	activit	y of a	n eleo	ctrolyt	te	poter	ntiom	etric ti	itratio	ns,			
S-4	SLO-1	One compoi	nent system	m Gibbs- Duhem – Margules Introduction to Electi			Introduction to Electro	ocherr	nical cell	1	Conce	entrati ntratio	on cel	ll- Ele I	ctrode	e		Acid-	base)					
0-4	SLO-2	Water syste	m with applic	cations	auation with derivation. Galvanic cell					Electr	olvte -	Con	centra	tion c	ell		Titrat	tions							
S-5 to	SLO-1	1.Determina	tion of critical solution 4. Study of equilibrium of atleast one Repetition Lab						Repetition Lab Repetition Lab																
S-8	-8 SLO-2 temperature and composition at CST of the following reactions by																								

Duratio	n (hour)	24	24	24	24	24
		of the phenol water system andto	distribution method:a. I_2 (aq) + I-			
		and succinic acid on it	$(aq) \rightarrow 13 (aq)$ b $Cu^{2+} (aq) + nNH_2 \rightarrow [Cu(NH_2)_2]^{2+}$			
8.0	SLO-1	Clausius-Clapeyron equation	Thermodynamics of	Reversible electrodes-	Types of electrolyte – concentration cells	Redox Titrations
3-9	SLO-2	Meta stable equilibrium, effect of change of P and T	Ideal solution	Metal –Metal ion electrodes, gas electrode	Without transference,	Redox Titrations
S-10	SLO-1	Phase diagram for Sulphur	Vapour pressure of real	Metal – Insoluble metal salt electrode	Concentration cell-	Precipitations Titrations
3-10	SLO-2	With its applications	and non-ideal solutions	Oxidation-reduction electrodes	with transference	Precipitations Titrations
S-11	SLO-1	Including meta stable equilibrium	Fractional distillation of Binary miscible liquid	Single electrode Potential	Liquid junction	Introduction to surface
	SLO-2	And areas	Solution of type I, II and III	Single electrode Potential	Potential,	chemistry, adsorption-
S-12	SLO-1	Comparison between the phase diagram	Lever rule	Thermodynamics of reversible cell	Fuel cell-	Applications.
	SLO-2	of CO2 and Water	and distillation of immiscible liquids	And electrodes	(hydrogen-oxygen)	Factors influencing the adsorption
C 12	SLO-1	2. Construction of the phase diagram	5. Perform the following potentiometric	Repetition Lab	Repetition Lab	Repetition Lab
		using cooling curves or ignition tube	titrations:			
S-16	SLO-2	method: a.simple eutectic and b. congruently melting systems.	i. Strong acid vs. strong base ii. Weak acid vs. strong base			
	SLO-1	Polymorphism	Solubility of partially	Determination of ΔG° ,	Applications of EMF measurements	Freundlich adsorption
S-17	SLO-2	Two component system	Miscible liquids	ΔS° and ΔH°	Determination of activity coefficient of electrolytes	Isotherm,
C 10	SLO-1	Simple eutectic system	CST and	Electromotive force and	Determination of Transport number	Langmuir theory of Adsorption
3-10	SLO-2	Thermal analysis cooling curve	Phenol – water system	equilibrium constant of a cell	Valency of lons in doubtful cases	Langmuir theory of Adsorption
S 10	SLO-1	System in which two component form a stable compound	Aniline- Hexane system	Effect of concentration of electrolyte on cell potential	Determination of the solubility product constants	BET theory of multilayer Adsorption
3-19	SLO-2	Formation of compounds with congruent melting point	Triethylamine- Water system	Effect of concentration of electrolyte on cell potential	Determination of the solubility product constants	BET theory of multilayer Adsorption
0.00	SLO-1	Formation of compounds with incongruent melting point	Solution of gaseous in liquids	Effect of concentration of electrolyte on cell potential	Determination of pH- using hydrogen electrode	Types of adsorption Isoptherm
5-20	SLO-2	Transition temperature	Solution of gaseous inliquids	Effect of concentration of electrolyte on cell potential	Determination of pH- using hydrogen electrode	Types of adsorption Isoptherm
S 21	SLO-1	3. Distribution of acetic acid/benzoic	6. Perform the following potentiometric	Repetition Lab	Repetition Lab	Repetition Lab
to S-24	SLO-2	acid between water and chloroform or cyclohexane.	titrations: i. Dibasic acid vs. strong base ii. Potassium dichromate vs. Mohr's salt			

		Theory:	Practicals	:
	1.	Peter Atkins & Julio De Paula, Physical Chemistry 9th Ed., Oxford University Press 2010.	1.	Zundhal, S.S. Chemistry concepts and applications Cengage India, 2011.
	2.	Castellan, G. W. Physical Chemistry, 4th Ed., Narosa , 2004	2.	Ball, D. W. Physical Chemistry Cengage India, 2012.
Learning	3.	McQuarrie, D. A. & Simon, J. D., Molecular Thermodynamics, Viva Books Pvt. Ltd.: New Delhi , 2004.	3.	Mortimer, R. G. Physical Chemistry 3rd Ed., Elsevier: NOIDA, UP , 2009.
Resources	4.	Engel, T. & Reid, P. Physical Chemistry 3rd Ed., Prentice-Hall, 2012.	4.	Levine, I. N. Physical Chemistry 6th Ed., Tata McGraw-Hill , 2011.
	5.	Assael, M. J.; Goodwin, A. R. H.; Stamatoudis, M.; Wakeham, W. A. & Will, S. Commonly Asked	5.	Metz, C. R. Physical Chemistry 2nd Ed., Tata McGraw-Hill 2009
		Questions in Thermodynamics. CRC Press: NY, 2011.		· · · · · · · · · · · · · · · · · · ·

Learning Assessment

	Diaam'a		Con	tinuous Learr		Final Examination (50% weightage)					
	BIOOM S	CLA – 1 (109	%)	CLA –	2 (10%)	CLA –	3 (20%)	CLA –	4 (10%)#	rinai examinau	on (50% weightage)
	Lever of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Lovel 1	Remember	200/	200/	150/	150/	150/	150/	150/	150/	150/	150/
Lever	Understand	2070	20%	1370	1576	1576	1570	1370	1370	1370	1576
Lovel 2	Apply	200/	200/	200/	200/	200/	200/	200/	200/	200/	200/
Level 2	Analyze	2070	20%	20%	20%	20%	20%	20%	20%	2076	2078
Lovol 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	150/	15%	15%
Level 3	Create	1076	1076	1576	1576	1576	1576	1370	1376	1370	1576
	Total	100 %		10	0 %	10	0 %	10	0 %	1	00 %

CLA - 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Dr. S. Ashok Kumar, SRMIST
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories,		
shanmukhaprasadg@drreddys.com	2. Prof. Vivek Poisnettiwar, TIFR Mumbai, <u>vivekpol@tiff.res.in</u>	2. Dr. J.Arockiaseivi, SRMIST

Course Code	Durse codeUCY20D01TCourse NameCourse Polymer ChemistryCourse 							L 5	T 1	P 0	<u>С</u> 6															
Pre-requis Course	site s			Co-requisite Courses	Nil			Prog Co	gress ourse	sive s	Nil															
Course Off	ering Department	Chemi	stry		Data Book / C	odes/Standards		Nil																		
Course Learning Rationale (CLR): The purpose of learning this course is to:								Program Learning Outcomes (PLO)																		
CLR-1 :	To provide the kno polymers.	wledge rega	rding history of	polymeric materi	als, functionality, nomenclat	ture and texture of		1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Learning this cours and learn how actu	se will help to Ial polymeriz	o distinguish difi ation is perform	ferent polymeriza ned in the laborat	tion reactions and their med ory.	chanisms/kinetics,																				
CLR-3 : CLR-4 :	Get knowledge on property relationsh thermal properties properties.	<u>e to develop</u> glass transiti ips of the pol of polymers,	<u>skills to predict</u> ion temperature lymers, This wi and demonstra	which polymeriz (Tg), melting ter Il improve and ex ate an ability to p	ation reactions is suitable to mperature (Tm), crystallinity pand the skills in performing redict how the molecular we	r a new monomer and structure g and analyzing th eight will affect the	e Se	m)	(%	(%		ge			arch			ability		¥						
CLR-5 :	Learning this cours weight of polymers	se will develo s, solubility ar	p skills necess nd degradation	ary to synthesize of polymers.	and characterize polymeric	materials, molecu	lar	g (Bloo	ency ('	nent ('		Jowled	s	pment	ı, Rese	age	Ð	Sustain		m Wor		inance	бu			
CLR-6 :	Get knowledge on course will help to	preparation, design new p	structure, prop polymers for co	erties and applica mmercial applica	ation of various types of poly tion.	ymers. Learning th	is	Thinkinę	l Profici	Attain		ental Ki	Analysi	Develo	Desigr	Fool Us	Cultur	ient & S		l & Tea	ication	lgt. & F	Learni			
Course Lea (CLO):	arning Outcomes	At the	end of this cou	rse, learners will	be able to:			Level of ⁻	Expectec	Expectec		Fundame	Problem	Design &	Analysis,	Modern 7	Society 8	Environm	Ethics	Individua	Commun	Project N	Life Long	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Get knowledge on	history of po	lymeric materia	Is and their class	ification			2	70	65		-	-	-	-	-	-	-	-	-	-	-	-	Н	-	-
CLO-2 :	Learn about differe	ent mechanis	ms of polymeriz	zation and also p	olymerization techniques			2	80	70		Н	Н	Н	Н	-	-	-	-	-	-	-	-	Н	-	-
CLO-3 :	Get knowledge on	different met	hods of finding	out average mol	ecular weight of polymers, c	dispersity		2	75	60		-	Η	Н	Н	-	-	-	-	-	-	-	-	Н	М	-
CLO-4 :	Can determine Tg	and Tm, diffe	erentiate Tg and	d Tm and establis	sh structure property relatior	nships of polymers	i.	2	70	70		Н	Н	Н	Н	-	-	-	-	-	-	-	-	-	Н	М
CLO-5 :	Know about solution	on properties	of polymers					2	80	70		-	Н	-	-	-	-	Н	-	-	-	-	-	Н	-	-
CLO-6 :	Learn properties a	nd applicatio	ns of various us	setul polymers in	our daily life.			2	75	65		-	Н	Н	Н	Н	-	Н	-	-	-	-	-	-	-	Н
Duration (hour)	18			18		18								18								18			

Duratio	n (hour)	18	18	18	18	18
	SI 0-1	History of polymeric materials	Mechanism of step growth	Glass transition temperature	Introduction: Molecular weight of	Properties of Polymers: Brief
	0201		polymerization		polymers	Introduction
S-1		History of polymeric materials	Mechanism of step growth	determination of Tg,	Number – average molecular weights	preparation, structure, properties
	SLO-2		polymerization		(Mn)	and application of polymers-
						polyolefins
	SI 0-1	History of polymeric materials	Mechanism of step growth	determination of Tg,	Weight– average molecular weights	polyolefins
S-2	310-1		polymerization		(Mw)	
5-2	SI 0-2	History of polymeric materials	Mechanism of step growth	determination of Tg,	Determination of molecular weight of	polystyrene
	010-2		polymerization		polymers by-end group analysis	
S-3	SI 0-1	Different schemes of classification of	kinetics of step growth	determination of Tg,	-end group analysis	polystyrene
5-5	310-1	polymers				

Duratio	n (hour)	18	18	18	18	18
	SLO-2	Different schemes of classification of polymers	kinetics of step growth	Free volume theory	-viscometry	styrene copolymers
6.4	SLO-1	Different schemes of classification of polymers	kinetics of step growth	Free volume theory	-viscometry	styrene copolymers
5-4	SLO-2	Different schemes of classification of polymers	kinetics of step growth	Free volume theory	-viscometry	poly(vinyl chloride)
S-5	SLO-1	Polymer nomenclature	radical chain growth	WLF equation	- light scattering	poly(vinyl chloride)
	SLO-2	Polymer nomenclature	radical chain growth	WLF equation	-light scattering	poly(vinyl acetate)
S-6	SLO-1	tutorial hours	tutorial hours	tutorial hours	tutorial hours	tutorial hours
	SLO-2	tutorial hours	tutorial hours	tutorial hours	tutorial hours	tutorial hours
S-7	SLO-1	Polymer nomenclature	Kinetics of radical chain growth	Factors affecting glass transition temperature (Tg)	osmotic pressure	acrylic polymers,
	SLO-2	Molecular forces and chemical bonding in polymers	Kinetics of radical chain growth	Factors affecting glass transition temperature (Tg)	osmotic pressure	fluoro polymers,
5.9	SLO-1	Molecular forces and chemical bonding in polymers	ionic polymerization	Factors affecting glass transition temperature (Tg)	Molecular weight distribution and its significance	fluoro polymers,
3-0	SLO-2	Molecular forces and chemical bonding in polymers	Cationic polymerization	Factors affecting glass transition temperature (Tg)	Molecular weight distribution and its significance	polyamides,
6.0	SLO-1	Texture of Polymers.	Cationic polymerization	Determination of crystalline melting point	Polydispersity	polyamides,
3-9	SLO-2	Texture of Polymers.	Kinetics of Cationic polymerization	Determination of crystalline melting point	Polymer solutions: Introduction	polyamides,
0.40	SLO-1	Texture of Polymers.	Kinetics of Cationic polymerization	Determination of crystalline melting point	Criteria for polymer solubility and solubility parameter	phenol formaldehyde resins (Bakelite)
5-10	SLO-2	Texture of Polymers.	Kinetics of Cationic polymerization	Determination of degree of crystallinity,	Criteria for polymer solubility and solubility parameter	Novalac
	SLO-1	Criteria for synthetic polymer formation	Anionic polymerization	Determination of degree of crystallinity.	Thermodynamics of polymersolutions	polyurethanes
5-11	SLO-2	Criteria for synthetic polymer formation	Anionic polymerization	Determination of degree of crystallinity.	Thermodynamics of polymersolutions,	polyurethanes
0.40	SLO-1	tutorial hours	tutorial hours	tutorial hours	tutorial hours	tutorial hours
5-12	SLO-2	tutorial hours	tutorial hours	tutorial hours	tutorial hours	tutorial hours
6.42	SLO-1	classification of polymerization processes,	Kinetics of Anionic polymerization	Morphology of crystalline polymers,	entropy, enthalpy and free energy change of mixing of polymers solutions.	silicone polymers
5-13	SLO-2	classification of polymerization processes,	Kinetics of Anionic polymerization	Morphology of crystalline polymers,	entropy, enthalpy and free energy change of mixing of polymers solutions.	silicone polymers
6.44	SLO-1	functionality, extent of reaction and degree of polymerization.	Mechanism and kinetics of copolymerization	Morphology of crystalline polymers,	Degradation-Thermal	polydienes
5-14	SLO-2	functionality, extent of reaction and degree of polymerization.	Mechanism and kinetics of copolymerization	Factors affecting crystalline melting point.	-Thermal	Polycarbonates
	SLO-1	Bifunctional systems,	Mechanism and kinetics of copolymerization	Factors affecting crystalline melting point.	-oxidative	Conducting Polymer
S-15	SLO-2	Bifunctional systems,	Mechanism and kinetics of copolymerization	Factors affecting crystalline melting point.	-oxidative	polyaniline

Duratio	n (hour)	18	18	18	18	18
		Relationships between functionality,	polymerization techniques.	Structure Property relationships.	-Hydrolytic	polyaniline
	SLO-1	extent of reaction and degree of				
S 16		polymerization. Bifunctional systems,				
3-10		Relationships between functionality,	polymerization techniques.	Structure Property relationships.	-Hydrolytic	poly(p-phenylene sulphide)
	SLO-2	extent of reaction and degree of				
		polymerization. Polyfunctional systems,				
		Relationships between functionality,	polymerization techniques.	Structure Property relationships.	-photodegradation	polypyrrole
	SLO-1	extent of reaction and degree of				
S-17		polymerization. Polyfunctional systems,				
3-17		Relationships between functionality,	polymerization techniques.	Structure Property relationships.	-photodegradation	polythiophene
	SLO-2	extent of reaction and degree of				
		polymerization. Polyfunctional systems,				
S-18	SLO-1	tutorial hours	tutorial hours	tutorial hours	tutorial hours	tutorial hours
3-10	SLO-2	tutorial hours	tutorial hours	tutorial hours	tutorial hours	tutorial hours

Learning Resources

G.Odian, Principles of Polymerization, 4nd Ed., John Wiley & Sons, New York, 2004. Fred. W. Billmeyer, Textbook of Polymer Science, 3rd edition, Wiley India, Delhi, 2008. 1. 2. 3. P.J.Flory, Principles of Polymer Chemistry, Cornell University press, New York, 1953.

 P. Ghosh: Polymer Science & Technology, Tata Mcgraw-Hill.
 V.R.Gowariker, N.V.Viswanathan and J. Sreedhar, Polymer Science, New Age International, New Delhi, 2003.

6. Jeol R. Fried, Polymer Science and Technology, Prentice Hall of India PrivateLimited, New Delhi, 1999.

Learning A	ssessment										
	Bloom's		Con	tinuous Lear	ning Assessme	nt (50% weig	htage)			Einal Examinati	(E0%) weightage)
	DIUUIII S	CLA – 1 (10	%)	CLA –	2 (10%)	CLA –	3 (20%)	CLA –	4 (10%)#		on (50 % weightage)
	Lever of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Lovel 1	Remember	100/		200/		200/		200/		200/	
Level I	Understand	40%	-	30%	-	30%	-	30%	-	30%	-
Loval 2	Apply	100/		100/		100/		100/		100/	
Level Z	Analyze	40%	-	40%	-	40%	-	40%	-	4070	-
	Evaluate	200/		200/		200/		200/		200/	
Level 3	Create	2070	-	30%	-	30%	-	30%	-	30%	-
	Total	100 %		10	00 %	10	0 %	10	0 %	1	00 %

CLA - 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. Samarendra Maji, SRMIST

	Ľ	Categor	у	D			Di	iscipl	ine sj	pecif	ic ele	ctive				5	1	0	6
Pre-requisite Courses Nil Co-requisite Courses Nil		Pro C	gres ours	ssive ses	Nil														
Course Offering Department Chemistry Data Book / Co	des/Standards	Nil																	
Course Learning Rationale (CLR): The purpose of learning this course is to:			earn	ning					Proç	gram	Lear	ning	Outc	omes	i (PLC	D)			
CLR-1: Familiarization with fundamentals of analytical chemistry and basics of spectroscopic, therma techniques.	l, electrochemical	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 : Learning basics of separation techniques and its applications and Understanding analytical methods applied to analytical chemistry.	l tools, statistical																		
CLR-3: Understanding principle of UV-Vis spectroscopy and its applications.								÷			ility								ı.
CLR-4 : Understanding principles of thermo-gravimetric analysis and study of thermald materials/characterization of materials	ecomposition of	loom)	(%) (%)	nt (%)	vledge		ient	esear			tainab		Vork		nce			I	I
CLR-5: Understanding basics of electro-analytical techniques and its applications.		<u></u> 6 (Е	enc	mer	No L	<u>.s</u>	udc	Ľ.	age	e	Sus		Ē		ina	ng			
CLR-6 : Understanding principles of separation technology and its use in advanced Instrumentations.		Thinkin	Profic	Attain	intal K	Analys	Develo	Desigr	ool Us	: Cultur	ent & S		& Tea	ication	gt. & F	Learni			I
Course Learning Outcomes (CLO): At the end of this course, learners will be able to:		Level of 1	Expected	Expected	Fundame	Problem .	Design &	Analysis,	Modern T	Society &	Environm	Ethics	Individual	Commun	Project M	Life Long	PSO - 1	PSO - 2	PSO – 3
CLO-1: How to perform experiment with accuracy and precision.		2 7	75	60	Н	Н	Н	-	-	-	-	-	-	-	-	-	Н	-	-
CLO-2: Develop methods of analysis for different samples independently.		28	30	70	-	Н	-	Н	-	-	-	-	-	-	-	-	-	Н	Н
CLO-3 : Understand basic principle of instrument like, UV-VISIBLE.		2 7	70	65	Н	-	-		-	-	-	-	-	-	-	-	Н	-	-
CLO-4 : Learn separation of analytes by chromatography.		2 7	70	70	Н	-	Н	Н	Н	-	-	-	-	-	-	-	Н	-	-
CLO-5 : Thermo-gravimetric Analysis of different compounds and application of mathematicalmode	ls	28	30	70	-	Н	-	Н	-	-	-	-	-	-	-	-	М	Н	-
CLO-6 : Analysis of GC/HPLC data for known materials/compounds.		2	75	70	-	-	-	-	-	-	-	-	-	-	-	-	-	Н	М

Duratio	n (hour)	18	18	18	18	18
6.1	SLO-1	Qualitative and quantitative aspects of analysis : Tools in analytical chemistry	Interaction of radiation with matter	Theory of thermogravimetry (TG and DTG)	Technique of extraction: counter current extractions	Qualitative and quantitative aspects of chromatographic methods of analysis using TLC
5-1	SLO-2	Tools in analytical chemistry	Interaction of radiation with matter	Theory of thermogravimetry (TG and DTG)	Technique of extraction: counter current extractions	Qualitative and quantitative aspects of chromatographic methods of analysis using TLC
6.2	SLO-1	Tools in analytical chemistry	Fundamental laws of spectroscopy	Theory of thermogravimetry (TG and DTG)	Qualitative and quantitative aspects of solvent extraction	Qualitative and quantitative aspects of chromatographic methods of analysis using HPLC
5-2	SLO-2	Tools in analytical chemistry	Fundamental laws of spectroscopy	Theory of thermogravimetry (TG and DTG)	Qualitative and quantitative aspects of solvent extraction	Qualitative and quantitative aspects of chromatographic methods of analysis using HPLC
S-3	SLO-1	Its Applications	Selection rules	Instrumentation	Extraction of metal ions from aqueous solution	Atomic spectroscopy : Atomic absorption spectroscopy, theory

Duratio	n (hour)	18	18	18	18	18
	SLO-2	Its Applications	Selection rules	Instrumentation	Extraction of metal ions from aqueous solution	Atomic absorption spectroscopy, theory
64	SLO-1	Its Applications	Validity of Beer-Lambert's law	Instrumentation	Extraction of organic species from the aqueous and nonaqueous media	Atomic absorption spectroscopy, theory
3-4	SLO-2	Its Applications	Validity of Beer-Lambert's law	Instrumentation	Extraction of organic species from the aqueous and nonaqueous media	Atomic absorption spectroscopy, theory
0.5	SLO-1	Sampling	Vibration spectroscopy: Basic principles of instrumentation	Estimation of Ca and Mg from their mixture	Chromatography techniques: Classification	Application (with some examples)
5-5	SLO-2	Sampling	Vibration spectroscopy: Basic principles of instrumentation	Estimation of Ca and Mg from their mixture	Chromatography techniques: Classification	Application (with some examples)
S-6	SLO-1	Tutorial Session	Tutorial Session	Electroanalytical methods : Classification of electroanalytical methods	Tutorial Session	Tutorial Session
	SLO-2	Tutorial Session	Tutorial Session	Classification of electroanalytical methods	Tutorial Session	Tutorial Session
0.7	SLO-1	evaluation of analytical data	Sampling techniques	Basic principle of pH metric	Principle and efficiency of the technique	Application (with some examples)
5-7	SLO-2	evaluation of analytical data	Sampling techniques	Basic principle of pH metric	Principle and efficiency of the technique	Application (with some examples)
• •	SLO-1	Errors	Application of IR spectroscopy for characterization through interpretation of data	Potentiometric titrations	Mechanism of separation: adsorption	Analysis of fuel and drugs : Ultimate and proximate analysis of solid fuel
5-8	SLO-2	Errors	Application of IR spectroscopy for characterization through interpretation of data	Potentiometric titrations	Mechanism of separation: adsorption	Uultimate and proximate analysis of solid fuel
	SLO-1	Accuracy	Application of IR spectroscopy for characterization through interpretation of data	Conductometric titrations	Mechanism of separation: Partition	Determination of calorific value of solid fuel
2-9	SLO-2	Accuracy	Application of IR spectroscopy for characterization through interpretation of data	Conductometric titrations	Mechanism of separation: Partition	Determination of calorific value of solid fuel
0.40	SLO-1	Precision	Effect and importance ofisotope substitution	Techniques used for the determination of equivalence points	Mechanism of separation:lon-exchange	Determination of calorific value of liquid fuel
5-10	SLO-2	Precision	Effect and importance ofisotope substitution	Techniques used for the determination of equivalence points	Mechanism of separation:lon-exchange	Determination of calorific value of liquid fuel
6.44	SLO-1	Statistical test of data; F test	Introduction to Raman spectra	Determination of pKa values	Development of chromatograms: frontal method	Determination of calorific value of gaseous fuel
5-11	SLO-2	Statistical test of data; F test	Introduction to Raman spectra	Determination of pKa values	Development of chromatograms: frontal method	Determination of calorific value of gaseous fuel
0.40	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
3-12	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session

Duratio	n (hour)	18	18	18	18	18
C 12	SLO-1	Statistical test of data; Q test	UV-Visible Spectrometry: Basic principles of instrumentation	Separation techniques :Solvent extraction: Classification	Development of chromatograms: elution method	Flash point
5-15	SLO-2	Statistical test of data; Q -test	UV-Visible Spectrometry: Basic principles of instrumentation	Solvent extraction: Classification	Development of chromatograms: elution method	Flash point
S 14	SLO-1	Statistical test of data; t-test	principles of quantitativeanalysis using estimation of metal ions from aqueous solution	Principle and efficiency of the technique	Development of chromatograms: displacement method	Fire point
5-14	SLO-2	Statistical test of data; t-test	principles of quantitativeanalysis using estimation of metal ions from aqueous solution	Principle and efficiency of the technique	Development of chromatograms: displacement method	Fire point
C 45	SLO-1	Rejection of data	Determination of composition of metal complexes using Job's method of continuous variation	Mechanism of extraction: extraction by solvation and chelation	Qualitative and quantitative aspects of chromatographic methods of analysis using LC	Classification of drugs
5-15	SLO-2	Rejection of data	Determination of composition of metal complexes using Job's method of continuous variation	Mechanism of extraction: extraction by solvation and chelation	Qualitative and quantitative aspects of chromatographic methods of analysis using LC	Classification of drugs
S 46	SLO-1	Confidence intervals	Mole ratio method	Technique of extraction: batch	Qualitative and quantitative aspects of chromatographic methods of analysis using GLC	Classification of drugs
5-10	SLO-2	Confidence intervals	Mole ratio method	Technique of extraction: batch	Qualitative and quantitative aspects of chromatographic methods of analysis using GLC	Classification of drugs
S-17	SLO-1	Spectroscopy : Origin of spectra	Thermal Analysis : Theory of thermogravimetry (TG and DTG)	Technique of extraction: continuous	Qualitative and quantitative aspects of chromatographic methods of analysis using GLC	Analysis of some standard drug using various chromatographic techniques
	SLO-2	Origin of spectra	Theory of thermogravimetry (TG and DTG)	Technique of extraction: continuous	Qualitative and quantitative aspects of chromatographic methods of analysis using TLC	Analysis of some standard drug using various chromatographic techniques
	SLO-1	Tutorial Session	Tutorial Session	.Tutorial Session	Tutorial Session	Tutorial Session
5-18	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session

	Th	eory:
	1.	Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009
	2.	Willard, H.H. et al.: Instrumental Methods of Analysis, 7th Ed. Wardsworth PublishingCalifornia, USA, 1988.
	3.	Skoog, D.A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis, Saunder CollegePublications, 1998.
Learning	4.	Christian, G.D, Analytical Chemistry, 6th Ed. John Wiley & Sons, New York, 2004.
Resources	5.	Harris, D.C.: Exploring Chemical Analysis, 9th Ed. New York, W.H. Freeman, 2016.
	6.	Mikes, O. Laboratory Hand Book of Chromatographic & Allied Methods, Elles HarwoodJohn Wiley 1979.
	7.	Ditts, R.V. Analytical Chemistry; Methods of separation, van Nostrand, 1974.
	8.	Khopkar, S. M., Basic Concepts of Analytical Chemistry, New Age (Second edition)1998
	9.	Skoog D.A., Holler F.J., Nieman T.A., Principles of instrumental analysis, 5th Edn., Brooks &Cole,1997

Learning As	Learning Assessment												
			Cor	ntinuous Leari	ning Assessme	ent (50% weig	htage)			Einal Evominati	(E0%) (weighted)		
Bloom'sLevel of Thinking		CLA – 1 (10%)		CLA –	CLA – 2 (10%)		CLA – 3 (20%)		4 (10%)#				
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
	Remember	100/		200/		200/		200/		200/			
Level I	Understand	4076	4078		5070			30%		30%			
	Apply	10%		10%		10%		10%		10%			
Level 2	Analyze	4078		4070		4070		4070		4070			
	Evaluate	200/		200/		200/		200/		200/			
Level 5	Create	2070		30%		30%		30%		30%			
	Total	100 %	0	10	0 %	10	0 %	1(0 %	1	00 %		

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Dr. Ashok Sundaramoorthy , SRMIST
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. Gopal Chandru Senadi, SRMIST

Course		Course	la dua	trial Chamiatan	Course	e	~			Dia				ГІсс	41				L	Τ	Ρ	C	
Code	001200031	Name	Indus	strial Chemistry	Categor	ry	D			DIS	cipiin	e Spe	CITIC	Elec	tive				5	1	0	6	
	1			-																			
Pre-requis Courses	site Nil		Co-requisite Courses	Nil		Progr Cou	essiv Irses	e N	il														
Course Offe	ering Department	Chemistry		Data Book / Codes/Standard	s A	Vil																	
Course Lea	rning Rationale (CL	R): The purpose of lea	rning this course is	to:		Lea	irninc	1					Progr	am Lo	earnir	ng Oi	utcorr	nes (F	PLO)				
	Ŭ \	, , ,	0					,								0			,				
CLR-1 :	Exploit the water of	uality parameters and w	ater treatment			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Employ different n	nethods to control air and	water pollution																			1	
CLR-3 :	Address different	sources of energy										_			≥							.	
CLR-4 :	Get knowledge on	the fertilizers and insec	ticides used in agric	culture		ĉ			e			lic			bili							.	
CLR-5 :	Employ the conce	ots of chemistry in manu	acturing industrial g	gases		loc	%	%)	- De		ant	sea			ina		ž		e			.	
CLR-6 :	Utilize the chemist	ry behind the safe hand	ing of hazardous cl	hemicals		Ē	ncy	ent	No.		me	Re	ge		lsta		N		and	0		.	
						bu	icie	m	ž	'sis	de de	gn,	Jsa	ure	งี		ean	L	Ë	ui.		.	
Course Lea	rning Outcomes (Cl	O): At the end of this	course, learners wil	l be able to:		Level of Thinki	Expected Profi	Expected Attai	Fundamental	Problem Analy	Design & Deve	Analysis, Desi	Modern Tool L	Society & Cult	Environment 8	Ethics	Individual & Te	Communicatio	Project Mgt. &	Life Long Lear	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	learn the basic col	ncepts in water treatmen				2	75	60	Н	Н	Н	-	-	-	-	-	-	-	-	-	Н	-	-
CLO-2 :	understand the eff	ects and control measur	es oir pollution			2	80	70	-	Н	-	Н	-	-	-	-	-	-	-	-	Н	-	-
CLO-3 :	understand about	different types of energy				2	70	65	Н	-	-		-	-	-	-	-	-	-	-	Н	-	-
CLO-4 :	study in depth abo	out the use of various fert	ilizers and insecticio	des in agriculture		2	70	70	Н	-	Н	Н	Н	-	-	-	-	-	-	-	-	Н	М
CLO-5 :	gain knowledge al	pout manufacture and ap	plications and haza	rds in handling various Industrial gases		2	80	70	-	Н	-	Н	-	-	-	-	-	-	-	-	-	Н	-
CLO-6 :	gain knowledge al	oout analysis and hazard	s in handling variou	s industrial chemicals		2	75	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Н

Duration	(hour)	18	18	18	18	18
S-1	SLO-1	Indtoduction-Sources of water,	Major regions of atmosphere	Large scale production uses and hazards in handling industrial gases	Fertilizers - definition	Manufacture of hydrochloric acid
SLO-2		Temporary hardness and Permanent hardness, Units of hardness	Compositions of atmosphere	Introduction	Types of fertilizers	applications of hydrochloric acid
6.0	SLO-1	Disadvantages of hard water,	Chemical and photochemical reactions in atmosphere	Production and uses of oxygen	NPK	Analysis of hydrochloric acid
5-2	S-2 SLO-2	Effect of Iron and manganese in water.	Chemical and photochemical reactions in atmosphere	Hazards in handling:Oxygen	superphosphate	Hazards in handling hydrochloric acid
6.2	SLO-1	Equvalents of Calcium Carbonate	Pollution: Air pollution-causes and effects	Production and uses of Nitogen	triple superphosphate	Manufacture of nitric acid
5-3	SLO-2	Activity in Equvalents of Calcium Carbonate	Pollution by oxides of carbon, nitrogen, sulphur and H_2S	Hazards in handling: Nitogen	uses of mixed fertilizers	applications of nitric acid
S-4	SLO-1	Estimation of hardness in water-EDTA Method	Acid rain	Production and uses of Argon	Micronutrients and their role	Analysis of nitric acid

Duratio	ı (hour)	18	18	18	18	18
	SLO-2	Estimation of hardness in water-EDTA Method	Green house effect	Hazards in handling: Argon	Micronutrients and their role	Hazards in handling nitric acid
S-5	SLO-1	Numerival Problems in EDTA Method	Global warming -causes	Production and uses of Neon	Biofertilizers – definition, types	Manufacture of sulphuric acid
	SLO-2	Numerival Problems in EDTA Method	Global warming – Effects and control measures	Hazards in handling: Neon	Biofertilizers – components and importance	applications of sulphuric acid
6.6	SLO-1	O. Hehner's method (or) Alkali titration method – Principle and Procedure	Ozone layer depletion - Causes	Production and uses of Helium	plant growth harmones-definition, types	Analysis of sulphuric acid
3-0	SLO-2	O. Hehner's method (or) Alkali titration method- Calculation	Ozone layer depletion- Effects and control measures	Hazards in handling:Helium	plant growth harmones- importance	Hazards in handling sulphuric acid
6.7	SLO-1	Determination of Dissolved Oxygen (Winkler's method)	Photochemical Smog - Causes	Production and uses of Hydrogen	Pesticides- definition	Manufacture of caustic soda
5-7	SLO-2	Determination of Dissolved Oxygen (Winkler's method)	Photochemical Smog – Effects and Control measures	Hazards in handling:Hydrogen	Pesticides-classification with examples	applications of caustic soda
60	SLO-1	Determination of Alkalinity in water	Water Pollution-Sources	Production and uses of Acetylene	Insecticides-definition	Analysis of caustic soda
30	SLO-2	Determination of type of Alkalinity in water	Water Pollution-Effects	Hazards in handling:Acetylene	Classification of Insecticides	Hazards in handling caustic soda
8.0	SLO-1	Boiler troubles- Scales and Sludges	Water Pollution- control measures	Production and uses of Carbon monoxide	stomach poisons	Manufacture of borax
3-9	SLO-2	Other Boiler troubles	Impact on hydrological process	Hazards in handling:Carbon monoxide	contact insecticides	applications of borax
S-10	SLO-1	Water softening methods - General description	Impact on eco systems	Production and uses of Chlorine	Fumigants –definition with examples	Analysis of borax
0-10	SLO-2	Internal conditioning	Chemical oxygen demand –definition	Hazards in handling:Chlorine	Fumigants-importance	Hazards in handling borax
0.44	SLO-1	Zeolite process	COD estimation	Production and uses of Flourine	Manufacture and uses of insecticides	Manufacture of bleaching powder
5-11	SLO-2	Ion exchange process – Demineralization method	Biological oxygen demand -definition	Hazards in handling:Flourine	Manufacture and uses of insecticides	applications of bleaching powder
	SLO-1	Ion exchange process – Demineralization method	BOD estimation	Production and uses of Sulphur dioxide	DDT	Analysis of bleaching powder
5-12	SLO-2	Mixed bed deionization	Total organic carbon	Hazards in handling:Sulphur dioxide	BHC(gammaxane: conformation of gamma isomer)	Hazards in handling bleaching powder
0.42	SLO-1	Electrodialysis	Industrial effluents- definition	Sources of Energy	Banned pesticides and Herbicides	Manufacture of sodium thiosulphate
5-13	SLO-2	Reverse Osmosis	Industrial effluents - characteristics	Coal	Pyrethrin	applications of sodium thiosulphate
S-14	SLO-1	Domestic waste water treatment- Primary & Secondary trearment	Industrial effluent from electroplating industry	Petrol	manufacture of 2,4-D Fungicides	Analysis of sodium thiosulphate
3-14	SLO-2	Domestic waste water treatment - Tertiary trearment	And its treatment	Natural Gas	manufacture of 2,4,5-T. Fungicides	Hazards in handling sodium thiosulphate
S-15	SLO-1	Purification methods-Chlorination, break point chlorination	Industrial effluent from tannery industry	Nuclear Fusion	preparation of Bordeaux mixture, lime- sulphur mixture (formula only)	Manufacture, applications of hydrogen peroxide

Duration	(hour)	18	18	18	18	18
	SLO-2	Water Quality Parameters- Definition	And its treatment	Nuclear Fission	preparation of creosote oil (formula only)	Analysis and hazards in handling hydrogen peroxide
S 16	S 16 SLO-1 Water quality parameters for waste water		Industrial effluent from petroleum industry	Solar	Sugar industry-soluble sulphitation process	Manufacture, applications of potassium dichromate
3-10	SLO-2	Water quality parameters for Industrialwater	And its treatment	Hydrogen	Refining and grading of sugar	Analysis and hazards in handling of potassium dichromate
C 47	SLO-1	Water quality parameters for domestic water	Industrial effluent from agro fertilizer industry	Geothermal	Saccharin usage as a sugar substitute	Manufacture, applications of potassium permanganate
5-17	SLO-2	Water quality parameters for domestic water	And its treatment	Tidal and Hydel	aspartame.	Analysis and hazards in handling potassium permanganate
0.40	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
9-18	S-18 SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session

	Theory:
	1. K.H. Buchel, H.H. Moretto, P. Woditsch, Industrial Inorganic Chemistry, Wiley-VCH, Second
Learning	Edition 2003.
Resources	2. E. Stocchi, Industrial Chemistry, Vol-1, Ellis Horwood Ltd.,. UK.
	3. A.K. De, Environmental Chemistry, New Age International Pvt., Ltd., New Delhi, Eight Edition
	2017.

- S.E. Manahan, Environmental Chemistry, CRC Press 2005.
 G.T. Miller, Environmental Science, 11thEdition, Brooks/Cole 2006.

Learning As	ssessment										
			Cor	itinuous Leari	ning Assessme	ent (50% weig	htage)			Einal Examinati	on (E0% weightage)
	Bloom'sLevel of Thinking	CLA – 1 (10%)	CLA –	2 (10%)	CLA –	3 (20%)	CLA –	4 (10%)#		on (50 % weightage)
	_	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Lovel 1	Remember	100/		200/		200/		200/		200/	
Level I	Understand	40%		30%		30%		30%		30%	
	Apply	100/		100/		100/		100/		100/	
Level 2	Analyze	40%		4076		40%		40%		4070	
	Evaluate	20%		200/ 200		30%		200/		30%	
Level 5	Create	2076		30%		30%		30%		30%	
	Total	100 %	6	10	0 %	10	0 %	10	0 %	1	00 %

Course Designers						
Experts from Industry					Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethic	calsPvt. L	td, sudarshan.r	n@encı	ibeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST
2. Dr.ShanmukhaprasadGopi, shanmukhaprasadg@drreddys.com	Dr.	Reddy'	S	Laboratories,	2. Prof. VivekPolshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. J. ArockiaSelvi, SRMIST

Course Code	UC	Y20D04T	Course Name		Molecular N	lodeling and Drug Des	ign	C Ca	ourse tegor	y	D			Disc	ipline	e Spe	ecific	Elect	ive				L -	T 1	P 0	C 6
Pre-requ Cours	iisite es ∧	lil			Co-requisite Courses	Nil			Pro C	gress ourse	sive es	Nil														
Course O	ffering D	Department	Chem	istry		Data Book	c / Codes/Standards		Nil																	
Course Lo	earning	Rationale (CL	R): The p	urpose of lear	ning this course is	to:			L	earni	ing				Ρ	rogra	am Lo	earnii	ng Ou	utcor	nes (PLO))			
CLR-1 :	Under	standing the p	orinciples o	f quantum and	l classical mechar	ics methods and Coord	inates.		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Basic	principles of N	Nolecular N	lechanics and	Force Fields													>								
CLR-4 :	Under	standing pote	ntials and	simulation prot	ocol for Molecular	Dynamics			(C			e			Irch			bilit								
CLR-5 :	Funda	mentals of Ab	b initio and	DFT methods	and knowledge				loo	/ (%	t (%	edo		ent	see			aina		/ork		e				
CLR-6 :	Implei	mentation and	l workouts	of semi-empiri	cal and QSAR me	thods			B	enc	nen	MOL	6	bme	Å	age	0	ust		۲		nan	p			
Course Lo (CLO):	earning	Outcomes	At the	end of this co	urse, learners will	be able to:			Level of Thinkin	Expected Profic	Expected Attain	Eundamental K	: Problem Analys	Design & Develo	Analysis, Desigr	Modern Tool Us	Society & Cultur	Environment & {	Ethics	Individual & Tea	Communication	Project Mgt. & F	Life Long Learn	: PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Able t	o understand	theoretical	background of	f computational te	chniques			2	70	65	H	М	Н	L	-	-	-	-	-	-	-	Н	Н	-	-
CLO-2:	Stuale	es on various i na tho knowlo	molecular s	Systems and ei field based si	nergy minimization	1 process			2	80	60	н	- H	-	н	н	-	-	-	-	-	-		- H	Н	-
CLO-3 :	Learn	ing molecular	dvnamics	tools and tech	niques				2	70	70	H	H	-	н	-	-	-	-	-	-	-	-	-	- H	-
CLO-5 :	Under	standing the f	fundamenta	als of first princ	iples based calcu	lations			2	80	70	-	H	Н	-	-	-	-	-	-	-	-	-	Н	-	-
CLO-6 :	Utilize	the semi emp	pirical meth	ods and QSAI	R techniques to dr	ug design and delivery a	applications		2	75	65	-	М	Н	-	Н	-	Н	-	Н	-	-	Н	-	Н	Н
							F																			
Duration	(hour)		18			18	1	8						18								18	<u>}</u>			
S-1	SLO-1	Introduction	to Molecula	ar Modeling	Reaction mecha	nism in computational	Theory about Molec	cular c	lynam	ics	(Calculatio	on of o	xidatio	on an	d red	luction	י ו	Advar	ntage	s of a	ab-init	tio cal	culat	tion	
	SLO-2	Introduction	to Molecula	ar Modeling	Reaction mecha perspective	nism in computational	Theory about Molec	cular c	lynam	ics	(Calculatio	on of o	xidati	on an	d red	luctior	י ו	Advar	ntage	s of a	ab-init	tio cal	lculat	tion	
	SLO-1	Basic concep mechanics	pts of Quai	ntum	Steepest descer	t method	Radial Distribution I	⁻ uncti	ons (F	RDF)	1	Examples	6					1	Koopr	man's	s theo	orem				
5-2	SLO-2	Basic concep mechanics	pts of Quai	ntum	Newton-Raphso	n method	Radial Distribution I	⁻ uncti	ons (F	RDF)	ľ	Examples	5					I	Koopr	man's	s theo	orem				
	SLO-1	Basic conce mechanics	pts of Clas	sical	Hessian matrix		Intermolecular poter finite square)	ntials	(Hard	sphe	re, I	Extendea method	Huck	el the	ory ar	nd PF	P	1	Brief i Theor	introd v (DF	luctio -T)	n to E	Densit	ty Fu	nctio	nal
5-3	SLO-2	Ab initio Met	hods		Hessian matrix		Intermolecular pote	ntials	(Hard	sphe	re, I	Extendea method	Huck	el the	ory ar	nd PF	P	1	Brief i Theor	introd v (DF	uctio	n to E	Densit	ty Fu	nctio	nal
	SI 0-1	Semi-empirio	cal Method	s	Comparison of a	ll energy minimization	Periodic box and its	cond	ition		,	Ab-initio methods Applications of DFT														

Periodic box and its type

Hamiltonian of a system

Comparison of all energy minimization methods in computational perspective Comparison of all energy minimization methods in computational perspective

Applications of DFT

SLO-1

SLO-2

S-4

Molecular mechanics

Durati	on (hour)	18	18	18	18	18
6 F	SLO-1	Overview of Molecular dynamics simulations	Introduction to Molecular mechanics	Ensembles and Types of ensembles	Hamiltonian of a system	Semi-empirical methods
3-0	SLO-2	Overview of Molecular dynamics simulations	Introduction to Molecular mechanics	Ensembles and Types of ensembles	Hamiltonian of a system	Semi-empirical methods
5.6	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
0-0	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
S-7	SLO-1	Overview of Monte Carlo simulations	Overview of force field	Integration of newton's equation (leapfrog algorithm)	H-atom solution using Hamiltonian	Brief idea of CNDO,
0-1	SLO-2	Overview of Monte Carlo simulations	Overview of force field	Integration of newton's equation (verlet algorithm)	H-atom solution using Hamiltonian	Brief idea of INDO,
5.9	SLO-1	Coordinates(x,y,z) of the system	Optimization or Energy minimization	Water models (TIP and TIP3P)	Brief introduction about quantum and it units	MINDO/3, MNDO,
3-0	SLO-2	Cartesian coordinates (x,y,z)	Optimization or Energy minimization	Water models (TIP and TIP3P)	Brief introduction about quantum and it units	AM1, PM3 methods
S-0	SLO-1	Internal coordinates from bond length, angle and torsion.	Methods of energy minimization	Radial distribution functions of water models	Born-Oppenheimer approximation	Types of file formats eg. PDB
0-3	SLO-2	Internal coordinates from bond length, angle and torsion.	Multivariate grid search	Radial distribution functions of water models	Born-Oppenheimer approximation	Types of file formats eg. PDB
S 10	SLO-1	Understanding of Z-matrix	Bonded interactions (Bond length, angle, and torsion)	Types of MD simulation	Antisymmetry principles and slater determinants	Visualization of orbitals
3-10	SLO-2	Z-Matrix Examples (e.g. small molecules)	Bonded interactions (Bond length, angle, and torsion)	Types of MD simulation	Antisymmetry principles and slater determinants	HOMO-LUMO and ESP
S 11	SLO-1	Introduction to potential energy surface	Non-bonded interactions	Overview of Brownian and Langewin dynamics	Coulomb and exchange integrals	Descriptors of QSAR
3-11	SLO-2	Introduction to potential energy surface	Torsion for flexible molecules	Overview of Brownian and Langewin dynamics	Coulomb and exchange integrals	Descriptors of QSAR
S 12	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
3-12	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
S_12	SLO-1	Reactant to product mechanism	Lennard-Jones potential	Introduction to Monte Carlo simulation	Hartree fock methods for for H atom and He molecule	Descriptors of QSAR
5-15	SLO-2	Reactant to product mechanism	H-bonding and Electrostatic interactions	Introduction to Monte Carlo simulation	Hartree fock methods for for H atom and He molecule	Descriptors of QSAR
S-14	SLO-1	Stationary and equilibrium points	Applications of molecular mechanics	Metropolis algorithm	Basis sets and its function	Descriptors of QSAR
0-14	SLO-2	Stationary and equilibrium points	Applications of molecular mechanics	Metropolis algorithm	Basis sets and its function	Descriptors of QSAR
S-15	SLO-1	Reaction minima and maxima	Different variants of Force fields (MM1, MM2, MM3 and MM4)	Huckel Molecular orbital theory	Slater type orbitals (STOs) and Gaussian type orbitals (GTOs)	Descriptors of QSAR
3-13	SLO-2	Local minima and maxima	Variants of Force fields (Bio+ and OPLS. GUI)	Huckel Molecular orbital theory	Slater type orbitals (STOs) and Gaussian type orbitals (GTOs)	Descriptors of QSAR
S_16	SLO-1	Concepts of transition state	Variants of Force fields (Bio+ and OPLS. GUI)	Calculation energies, charges and dipole moments	Diffusion and polarization functions	Biological activities using QSAR
3-10	SLO-2	Concepts of transition state	Introduction to Amber and Validation of Force field	Calculation energies, charges and dipole moments	Diffusion and polarization functions	Biological activities using QSAR
S-17	SLO-1	Examples of transition state	Introduction to Molecular dynamics simulations	Calculation of bond order, electronic and resonance energies	Minimal and types of basis set	QSAR (LD50, IC50, ED50 etc).

Durati	ion (hour)	18	18	18	18	18
	SI 0 2	Examples of transition state	Introduction to Molecular dynamics	Calculation of bond order, electronic	Minimal and types of basis set	QSAR (LD50, IC50, ED50 etc).
	310-2		simulations	and resonance energies		
C 10	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
3-10	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session

Learning Resources	 A. R. Leach, Molecular Modelling, Prentice-Hall, 2001. Alan Hinchcliffe, Modelling Molecular Structures, John Wiley & Sons, 1996 Alan Hinchcliffe, Molecular Modelling for Beginners, John-Wiley, 2003. C. L. Gramer, Econotical of Computational Chamitan. John Wiley & Sons, 2004 	 E. Lewars, Computational Chemistry, Kluwer academic Publisher, 2003 Jonathan Goodman ,Chemical Applications of Molecular Modelling. Guy H, Grant & W. Graham Richards, Computational Chemistry, Oxford University Press
	4. C.J. CIAITIEL ESSETUAIS OF COTTIDUCATIONAL CHEMISTY, JOHN WIEV & SONS, 2004	

Learning As	sessment										
			Cor	itinuous Learr	ning Assessme	nt (50% weig	htage)			Final Evenination	(EQ)(weightere)
	Bloom'sLevel of Thinking	CLA – 1 (10	%)	CLA –	2 (10%)	CLA –	3 (20%)	CLA –	4 (10%)#	Final Examination	(50% weightage)
	_	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
lovel 1	Remember	400/		200/		200/		200/		200/	
	Understand	40%		30%		30%		30%		30%	
lovel 2	Apply	100/		100/		100/		100/		40%	
	Analyze	40%		40%		40%		40%		40%	
loval 3	Evaluate	20%		30%		30%		30%		30%	
	Create	20%		30%		30%		30%		30%	
	Total	100 %		10	0 %	10	0 %	10	0 %	100) %

Course Designers			
Experts from Industry		Experts from Higher Technical Institutions	Internal Experts
1. Dr. SudarshanMahapatra, EncubeEthicals Pvt. Lto	l,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST
2. Dr. ShanmukhaprasadGopi, Dr. shanmukhaprasadg@drreddys.com	Reddy' s Laboratories	^{3,} 2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. Prakash Muthuramalingam, SRMIST

Course Code	Course Code UMI20S01L Course Name My India Project							Skill Enhancement course	L 0	Т 0	P 0	С 1
Pre-requisite Courses Course Offering	<i>Nil</i> Department	CI	Co-requisite Courses	<i>Nil</i> Data Book / Codes/Standards	Progress Course Nil	sive s	Nil					
		L	•	(Assessment Method – Fu	lly Internal)							
			Assesment Too	bls					Ма	rks		
Review – I (Acti	ivities)								50			
Review – II (Pro	pject report and	Presentation	1)						50			
Total	100											

C (ourse Code	UJK20401T	Cour Nan	rse ne	Profe	essional Skills		Cou	urse (Categ	Jory	JK					_ife S	Skill	Cour	se				L 2	T 0	P 0	C 2
	re-req	uisite Courses	Nil		Co-requisite Co	ourses Nil			Prog	ressiv	ve Co	urses		Nil													
Cou	rse Of	ering Departmen	t Career	Development Ce	ontre Data E	Book / Codes/Stand	lards	-																			
Cou (CLI	rse Lea R):	arning Rationale	Th	e purpose of lear	ming this course is to:				L	earni	ing					Pro	gran	n Le	arnin	ng Ou	itcom	ies (F	PLO)				
ĊLF	-1: ε	xpose students to	the require	ements of job ma	arket				1	2	3		1	2	3	4	5 (6	7	8	9	10	11	12	13	14	15
CLF	- 2 : 0	evelop resume bu	iilding prac	tice											~												
CLF	- 3 : ^{//}	crease efficiency	in speakin	g during group d	iscussions				(m	(%	(%		ge	ts	iplines			edge									
CLF	2 -4 : p	repare students fo	or job interv	/iews					8	cy (nt (/led	ceb	lisci	dge		NO		Data		kills	dills			ìö	
CLF	2 -5 : ii	still confidence in	students a	and develop skills	s necessary to face aud	dience) [)	cien	me		Nor	Sol	2 2 2	Ne.		Z	ē	ret	dills	g S	S			sha	ing
CLF	-6 : a	evelop speaking a	and presen	tation skills in stu	ıdents				iki.	rofic	ttair		a X	oť	elate	, Xno		azili	deli	terp	e SI	l	atio	kills		al Be	earr
									۲Ľ	В В В	A be		Jent	tion	R R	al al		in o	ž	ц,	ativ	N N	ini.	a a	s	ion	Ъ
Cou	rse Le	arning Outcomes	s At	the end of this c	ourse, learners will be a	earners will be able to:			vel of	pecte	pecte		ndan	plica	lk wit	ced			ills in	alyze	/estig	oblen	mm	alytic	T Ski	ofess	e Lor
	J):	n do roto n d th o inor	artanaa of		tion and build requires	ad build resume			Le Le	Ш	Ш.		교	AP	<u> </u>	<u> </u>		A	ŏ_	A	<u> </u>	<u>د</u>	8	A V	<u>0</u>	Ě	<u> </u>
CLC	-1 : ^u			resume prepara		nd build resume			3	80	70		IVI M	IVI	L				-	-	-	M	п	L	п	п	<u>п</u>
CLC	-2 : a	cquire group aisci	USSION SKIII ofidoatly	S					3	85	/5		M	M	L			Н Ц	-	-	-	M	Н Ц	L	Н	Н Ц	<u>н</u>
		sk annronriate qu	nuenuy Astions du	rina an intonview					3	00	00	-	M	M				н	-	-	-	M	H		Н	H	
	-4.	nderstand various	types of n	resentation and	use presentation skills	in projects			3	85	80		M	M	1	1 1		н	-	-	-	M	Н	1	Н	Н	H
		uild confidence du	iring any n	resentation					3	85	80		M	M	1	1 1	/ I	H I	-	-	-	M	Н	1	Н	Н	H
			ang any p						Ū	00					-									-			
D	uratior (hour)		6		6	i		6							6								6				
	SLC	-1 Introduction of importance	of resume a	and its	Meaning and method discussion	ds of group	Meaning and types face, telephonic, vio	of inter leo)	rview	(face	to T	Types - Arousir	- Info ng, P	rmati ersua	/e, In sive,	structi Decisi	onal, on-m	akin	g la	Power angua	Point age ar	pres nd sta	entat age e	tion—l etique	oody ttes		
S-1	SLC	-2 Difference be Bio Data	etween a C	V, Resume and	Procedure of group of	discussion	Dress code, backgr	ound re	esear	ch	s I t	Structu Introdu 'he spe	re of ction eaker	a pre of the vote	senta e evei of tha	ntion – nt, Intr anks	oduci	ing	P la	Power	Point age ar	pres nd sta	entat age e	tion—l etique	oody ttes		
S-2	SLC	Essential com resume, com while prepari	nponents o mon errors ng a resum	of a good s people make ne	Group discussion – s	up discussion – simulation STAR Technique (approach and resp interview			n, tasl or faci	k, ing ar	ן ו	Norkin Creatin	g wit g a 'l	h aud Plan E	ience 3',	– ice-	breal	king,	P si	Power essio	Point n	pres	entat	tion–µ	oracti	ce	
	SLC	-2 Resume build	ding format	•	Group discussion – c	Group discussion – common errors Interview procedure (or skills, closure, asking q			ing, li stions	stenir)	ng (V	Getting vorking	the with	audie 1 emo	ence tions,	in the	mood	d,	P s	Power essio	Point n	pres	entat	tion-	pract	ice	_
6-2	SLC	-1 Resume build	ding using t	templates	Group discussion – ty	Group discussion – types – Topic based Important questions generation an interview			ally a	sked	in 	mprovi presen feedba	isatic tatior ck —	on and ns, ma appre	l unpi an-wo ciatio	repare man v n and	d iew, critiq	ue	P se	Power essio	Point n	pres	entat	tion—µ	oracti	ce	
3-3	SLC	-2 Resume build	ding using t	templates	Group discussion – ty based	roup discussion – types – Case study Important questions gene ased an interview			ally a	sked	in F f	mprov presen feedba	isatic tatior ck —	on and ns, ma appre	l unpi an-wo ciatio	repare man v n and	d iew, critiq	ue	P se	Power essio	Point n	pres	entat	tion-	pract	ice	

Du (ł	ration iour)	6	6	6	6	6
6.4	SLO-1	Resume building activity	Group discussion – practice session- Topic based	Mock interview – face to face	Power point presentation, skit, drama, dance, mime, short films and documentary – Dos and Don'ts	PowerPoint presentation–practice session
3-4	SLO-2	Resume building activity - Feedback	Group discussion - Feedback	Mock interview- Feedback	Power point presentation, skit, drama, dance, mime, short films and documentary – Dos and Don'ts	PowerPoint presentation– practice session
с F	SLO-1	Video resume – Tips and tricks	Group discussion – practice session- Topic based	Mock interview - face to face	PowerPoint presentation – content preparation	PowerPoint presentation–practice session
3-3	SLO-2	Video resume – Do's and Don'ts	Group discussion - Feedback	Mock interview - Feedback	PowerPoint presentation–logical arrangement of content	PowerPoint presentation– practice session
5 6	SLO-1	Video resume – Templates	Group discussion – practice session- Case study based	Mock interview - face to face	PowerPoint presentation–using internet source, citations, bibliography	PowerPoint presentation–practice session
3-0	SLO-2	Video resume – Templates	Group discussion - Feedback	Mock interview- Feedback	PowerPoint presentation–using internet source, citations, bibliography	PowerPoint presentation- practice session

Learning Resources	1. 2. 3.	Scott Bennett, The Elements of Resume Style: Essential Rules for Writing Resumes and Cover Letters That Work, AMACOM, 2014 David John, Tricks and Techniques of Group Discussions, Arihant, 2012 Singh O.P., Art of Effective Communication in Group Discussion and Interview, S Chand & Company, 2014	4. Paul Newton, How to deliver a presentation ; e-book 5.Eric Garner, A-Z of Presentation, Eric Garner and Ventus Publishing ApS, 2012, bookboon.com
-----------------------	----------------	--	---

Learning Assessment	earning Assessment											
			Continuous Learning Ass	essment (100% weightage)								
Level	Bloom's Level of Thinking	CLA-1 (20%)	CLA-2 (20%)	CLA-3 (30%)#	CLA-4 (30%) ##							
		Theory	Theory	Theory	Theory							
l ovol 1	Remember	10%	10%	20%	15%							
Level I	Understand	10 /8	10 %	50 %	15 %							
Lovel 2	Apply	F0%/	E00/	409/	E0%/							
Level Z	Analyze	50%	50%	40%	50%							
l ovol 3	Evaluate	40%	40%	20%	25%							
Level 3	Create	40 %	40 %	50 %	35%							
	Total	100 %	100 %	100 %	100 %							

CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews, etc.

##CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
		 MrPriyanand, Assistant Professor, CDC, E&T, SRMIST
1. Ajay Zener, Director, Career Launcher	-	2. Ms Sindhu Thomas, Head in charge, CDC, FSH, SRMIST
		3. MsMahalakshmi, Assistant Professor, CDC, FSH, SRMIST

SEMESTER V

Course Code	, no	CY20501J	Course Name	Inorganic C	hemistry-IV: Or	ganometallic	and Bioin	organic Chemistry	C Ca	ourse tegor	y	С		Core course						L 4	T 0	P 4	С 6					
Pre-req Cour Course (uisite ses Offering [<i>Vil</i> Department	Chemi	stry	Co-requisite Courses	Nil	Data Book	/ Codes/Standard	S	Pro C Perio	gress ourse odic T	sive es able	Nil															
Course L	earning	Rationale (Cl	L R): The pl	irpose of learr	ning this course is	s to:				L	earnii	ng					Ρ	rogra	am Le	earnir	ng Oı	utcor	nes ((PLO)				
CLR-1 : Exploit the basic principles of qualitative inorganic analysis for the separation of cations and anions CLR-2 : Get knowledge on organometallic compounds as various types of catalyst CLR-3 : Employ various organic reactions towards the design of fine chemical and drug molecules for industries CLR-4 : Address concepts related to organometallic chemistry using stability based on 18-electron rule								1 (moo	2 (%)	t (%) 🛛		edge 1	2	ent E	search 4	5	6	ainability 2	8	lork G	10	11 8	12	13	14	15		
CLR-5 : CLR-6 :	Addre	e the bioinorga	anic cnemis pts related t	try in various p the active si	narmaceutical pr tes and action cyc	cles of the meta	entity appro	opriate solutions es		f Thinking (BI	ed Proficiency	ed Attainment		nental Knowl	n Analysis	& Developme	s, Design, Re	Tool Usage	& Culture	iment & Susta		ual & Team W	unication	Mgt. & Finan	ng Learning	-	2	3
(CLO):	Undo	ratand and av	At the	end of this co	urse, learners will	l be able to:				ہ Level ہ	5 Expect	Expecte		c Fundar	Probler	c Design	Analysi	Moderr	Society	Enviror	Ethics	Individu	Commu	Project	Life Lor	- PSO -	PSO - 2	PSO-
CLO-1 :	Relat	e the concent	piain the ba s of solubilit	sic principles v product and	or quantative more	ganic analysis ct to the senar:	ation of cat	ions and anions		2	80	00 70		п Н	-	п	- H	- H	-	-	-	-	-	-	-	Π	- H	
CLO-3 :	Alaak	18-electron r	ule to ration	alize the stabi	lity of organometa	allic compound	ls			2	75	60	-	-	Н	-		-	-	-	-	-	-	-	-	Н	M	
CLO-4 :	Deve	lop a general	idea of cata	lysis and desc	ribe the mechanis	sm in detail	-			2	70	70		Н	Н	-	Н	-	-	-	-	-	-	-	-	-	М	-
CLO-5 :	Expla certai	in the sources in metal ions	s and conse	quences of ex	cess and deficien	ncy of trace me	etals and le	arn about the toxicit	y of	2	80	70		-	Н	Н	-	-	-	-	-	-	-	-	-	-	Н	-
CLO-6 :	Utilize	e concepts in	bioinorganio	chemistry for	scientific advanc	ement towards	s the develo	opments of various	drugs	2	75	65		-	-	-	Н	-	-	-	-	-	-	-	-	-	-	Н
Duratio	n (hour)		24			24			24							24								24				
	SLO-1	Introduction	to Theoretic Analysis	al Principles	Introduction to C	Drganometallic		Structures of mono	nuclea	ar and	VRT		classifi their au	cation	n of e in hio	leme Iogic	nts a	ccord	ding to	o (Cispla	atin a	s an i	anti-c	ancei	r drug	9	
S-1	SLO-2	Introduction in Qualitative	to Theoretic e Analysis	al Principles	Introduction to C Compounds	Drganometallic		Structures of mono binuclear carbonyls	nuclea s of Co	ar and using	VBT		classifi their ad	cation ction	n of e in bio	leme logica	nts a al sys	ccord stem	ding to	o (Cispla	atin a	s an a	anti-c	ancei	r drug)	
S-2	SLO-1	Basic princip of cations ar	oles involved nd anions	l in analysis	Definition and			π -acceptor behavio diagram of CO to b	our of (e disc	CO (M ussed)	0		Geoch of meta	emica als	al effe	ect or	the	distril	butior	n I	lron a	nd its	s app	licatio	on in t	oio-sy	/sterr	S
SLO-2 Basic principles involved in analysis of cations and anions classification of organometallic compounds on the basis of bond type π-accepto (MOdiagr						π-acceptor behavio (MOdiagram of CO	our of (to dis	CO cusse	d)be		Geoch of meta	emica als	al effe	ect or	the	distril	bution	n I	lron a	nd its	s app	licatio	on in t	oio-sy	/sterr	S		
	SLO-1	Solubility pro	oducts		Concept of hapti	icity oforganic l	ligands	synergic effect and	·				Sodiun	n / K-	pump)				ŀ	Haem	noglol	bin					
S-3	SLO-2	Solubility pro	oducts		Examples			Use of IR data to e. bonding.	xplain	extent	of ba	ack	Sodiun	n / K-	ритр)				/	Myog	Iobin						
S-4	SLO-1	common ion	effect		Introduction to N	letal carbonyls	3	Zeise's salt: Prepa	ration a	and sti	ructur	e	carbon	ic an	hydra	ise				c,	Stora	ge an	nd tra	nsfer	of iro	n		
	SLO-2	common ion	effect		Introduction to N	letal carbonyls	3	Zeise's salt: Prepa	ration a	and sti	ructur	e carbonic anhydrase Storage and transfer of iron																
S-5 to SLO-1 Lab Introduction																			E	Exper	rimen	t - Re	epeat	- 2				

Duratio	n (hour)	24	24	24	24	24
S-8	0.00		Qualitative semimicro analysis of	Qualitative semimicro analysis of	Inorganic Preparations: Acetylacetonate	
	5L0-2		mixtures-3(anions and cations)	mixtures-6 (anions and cations)	complexes of Cu ²⁺ /Fe ³⁺	
S-9	SLO-1	Principles involved in separation of cations into groups and	18 electron rule	Zeise's salt: evidences of synergic effect and comparison of synergic effect with thatin carbonyls	carboxypeptidase	Catalysis by Organometallic Compound General principles of catalysis, properties of catalysts
	SLO-2	Principles involved in separation of cations into groups and	18 electron rule	Zeise's salt: evidences of synergic effect and comparison of synergic effect with thatin carbonyls	carboxypeptidase	homogeneous and heterogeneous catalysis (catalytsteps, examples and industrial applications),
S 10	SLO-1	choice of group reagents	electron count of mononuclear and polynuclear metal carbonyls of 3d series	Metal Alkyls: Important structural features of methyl lithium (tetramer) and	Excess and deficiency of some trace metals	deactivation and regeneration of catalysts
3-10	SLO-2	choice of group reagents	electron count of mononuclear and polynuclear metal carbonyls of 3d series	trialkyl aluminium (dimer)	Excess and deficiency of some trace metals	Catalytic poison, promoter.
S 11	SLO-1	Interfering anion-fluoride	electron count of substituted metal carbonyls of 3d series	Metal Alkyls: concept of multicentre bonding in these compounds	Toxicity of metal ions:	Alkene hydrogenation (Wilkinson's Catalyst)-industrial processes
3-11	SLO-2	Interfering anion-fluoride	electron count of substituted metal carbonyls of 3d series	Metal Alkyls: concept of multicentre bonding in these compounds	Toxicity of Hg	Alkene hydrogenation (Wilkinson's Catalyst)-industrial processes
S-12	SLO-1	Interfering anion-borate	General methods ofof mononuclearcarbonyls of 3d series	Ferrocene: Preparation, physical properties and	Toxicity of Pb	Alkene hydrogenation (Wilkinson's Catalyst)-mechanism
0-12	SLO-2	Interfering anion-borate	General methods of of mononuclearcarbonyls of 3d series	Reactions (acetylation, alkylation, metallation, Mannich Condensation).	Toxicity of Pb	Alkene hydrogenation (Wilkinson's Catalyst)-mechanism
S-13 To S-16	SLO-1 SLO-2	Qualitative semimicro analysis of mixtures-1(anions and cations)	Qualitative semimicro analysis of mixtures-4 (anions and cations)	Qualitative semimicro analysis of mixtures-7 (anions and cations)	Inorganic Preparations:Potassium tri(oxalato)ferrate(III)	Experiment - Repeat - 3
6.47	SLO-1	Interfering anion-oxalate	General methods of of binuclearcarbonyls of 3d series	Structure and aromaticity	Toxicity of Cd	Synthetic gasoline (Fischer Tropsch reaction)-industrial processes
5-17	SLO-2	Interfering anion-oxalate	General methods of of binuclearcarbonyls of 3d series	Structure and aromaticity	Toxicity of Cd	Synthetic gasoline (Fischer Tropsch reaction)-industrial processes
S_18	SLO-1	Interfering anion-phosphate	Structures of mononuclear carbonyls of Cr and Ni using VBT	Comparison of aromaticity and reactivity with that of benzene	Toxicity of As	Synthetic gasoline (Fischer Tropsch reaction)-mechanism
0-10	SLO-2	Interfering anion-phosphate	Structures of mononuclear carbonyls of Cr and Ni using VBT	Comparison of aromaticity and reactivity with that of benzene	Toxicity of As	Synthetic gasoline (Fischer Tropsch reaction)-mechanism
S-19	SLO-1	Need to remove them after Group II and methods of removal	Structures of mononuclear and binuclear carbonyls of Mn using VBT	Introduction to Bioinorganic Chemistry	reasons for toxicity	Polymerisation of ethene using Ziegler- Natta catalyst-industrial processes
0-10	SLO-2	Need to remove them after Group II and methods of removal	Structures of mononuclear and binuclear carbonyls of Mn using VBT	Introduction to Bioinorganic Chemistry	reasons for toxicity	Polymerisation of ethene using Ziegler- Natta catalyst-industrial processes
S-20	SLO-1	Analysis of insoluble substances	Structures of mononuclear and binuclear carbonyls of Fe using VBT	Metal ions present in biological systems	Use of chelating agents in medicine	Polymerisation of ethene using Ziegler- Natta catalyst-mechanism
0-20	SLO-2	Analysis of insoluble substances	Structures of mononuclear and binuclear carbonyls of Fe using VBT	Metal ions present in biological systems	Use of chelating agents in medicine	Polymerisation of ethene using Ziegler- Natta catalyst-mechanism
S-21	SLO-1	Qualitative semimicro analysis of	Qualitative semimicro analysis of	Inorganic Preparations: .	Experiment - Repeat - 1	Demonstration Practical Session
to S-24	SLO-2	mixtures-2(anions and cations)	mixtures-5 (anions and cations)	Tetraamminecopper (II) sulphate, [Cu(NH ₃) ₄]SO ₄ .H ₂ O		

Learning A	Assessment												
	Pleom's		Cor	ntinuous Leari		Einal Examinati	(50%) ($50%$)						
	DIOUIII S	CLA – 1 (10	%)	CLA –	CLA – 2 (10%)		3 (20%)	CLA –	4 (10%)#		ion (50 % weightage)		
	Lever or Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Lovel 1	Remember	200/	200/	150/	150/	150/	150/	150/	150/	150/	15%		
Level I	Understand	20%	2076	1370	1570	1570	1376	1370	1376	1570	15%		
Lovol 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%		
Level 2	Analyze	20%	20%	2070	2078	20%	2078	20%	20%	2070	2078		
Lovol 3	Evaluate	10%	10%	15%	150/	150/	150/	15%	150/	15%	15%		
Level 3	Create	1070	1070	1370	1370	1370	1370	1370	1370	1070	1578		
	Total	100 %		10	0 %	10	0 %	10	0 %	100 %			

Course Designers											
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts									
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST									
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. S. Shanmugan, SRMIST									

Course Code	UCY20502T	Course Name	Organic	Chemistry - III: N Polyaromatic a	Nitroge and He	en Containing Functional eterocyclic Chemistry	l Group,		Cour	rse Ca	tegory	y	()	Core course				L 5	T 1	P 0	C 6				
Pre-ree Course Off	Pre-requisite Courses Nil Co-requisite Courses Nil Progressive Courses Nil purse Offering Department Chemistry Data Book / Codes/Standards Nil Nil																									
Course Lea (CLR):	Durse Learning Rationale The purpose of learning this course is to: LR): The purpose of learning this course is to:									rning						Pro	ogran	n Lea	rning	g Out	come	s (PL	0)			
CLR-1 :	The Core Course O	rganic Chemistry	y III is infuse	d with the details	of Nitro and na	ogen containing functional	groups	1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 : CLR-3 : CLR-4 : CLR-5 :	CLR-2 : Introduction of polynuclear hydrocarbons, heterocyclic systems and natural compounds viz terpenes and alkaloids CLR-3 : A comprehensive understanding of these topics will be developed by taking examples of 2-3 representatives members of each class CLR-4 : The constitution of the course strongly aids in the paramount learning of the concepts and their applications CLR-5 : The chemical synthesis, properties and reactions of these compounds will be discussed in details with some key applications of each class of compounds in diverse fields						plications with some	king (Bloom)	oficiency (%)	ainment (%)		Knowledge	lysis	velopment	sign, Research	Usage	lture	& Sustainability		Feam Work	ion	& Finance	arning			
Course Lea (CLO):	arning Outcomes	At the end of th	this course,	learners will be at	ble to:			-evel of Thin	Expected Pro	Expected Att		- undamental	^{>} roblem Ana	Jesign & Dev	Analysis, Dee	Modern Tool	Society & Cu	Environment	Ethics	ndividual & J	Communicati	Project Mgt.	Life Long Lea	-SO - 1	-SO - 2	-SO - 3
CLO-1 :	Gain theoretical u heterocyclics, poly synthesis through	nderstanding of c /nuclear hydrocal application of the	chemistry of arbons, alkal a synthetic o	compounds havii oids and terpenes organic chemistry	ng nitro s which conce	gen containing functional includes various methods ots learnt so far.	groups, s for	2	75	60		Н	Н	Н		-	-	-	-	-	-	-	-	H	-	-
CLO-2 :	 Become familiar with their particular properties, chemical reactions, criterion of aromaticity with reference polynuclear hydrocarbons and heterocyclic compounds, trends in basicity of amines and heterocyclic compounds, and their behavior at different nH 							2	80	70		-	Н	-	Н	-	-	-	-	-	-	-	-	Н	-	-
CLO-3 :	LO-3 : Learn practical approach to structural elucidation of organic compounds with specific examples of terper and alkaloids.						of terpenes	2	70	65		Н	-	-		-	-	-	-	-	-	-	-	Н	М	-
CLO-4 :	Predict the carbo methylation and E	n skeleton of ar mde's modificatio	amines and ion methods	heterocyclic com	pounds	s via use of Hoffmann's	exhaustive	2	70	70		Н	-	Н	Н	Н	-	-	-	-	-	-	-	Н	Н	М
CLO-5 :	0-5 : Understand the applications of these compounds including their medicinal applications through their reaction chemistry							2	80	70		-	Н	-	Η	-	-	-	-	-	-	-	-	Η	М	-

Duration (hour)		18	18	18	18	18
Q_1	SLO-1	Nitrogen Containing Functional Groups : Amines: Introduction and Classification	Nitro compounds: Reduction- electrolytic reduction, reduction in acidic	Properties: Physical properties	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution- Nitration	Natural occurrence
5-1	SLO-2	Amines: Introduction and classification	Nitro compounds: Reduction in basic and neutral medium (for aromatic compounds)	Discussion on Addition and oxidation reactions with mechanism	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution- Nitration	Natural occurrence

Duratio	on (hour)	18	18	18	18	18
S-2	SLO-1	Chirality in amines (pyramidal inversion)	Nitro compounds: Reaction with nitrous acid	Discussion on Addition and oxidation reactions with mechanism	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution- Sulphonation	Classification
0-2	SLO-2	Chirality in amines (pyramidal inversion)	Nitro compounds: Electrophilic substitution-Halogenation	Discussion on Electrophilic substitution- Friedel Craft reaction with mechanism	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution- Sulphonation	Classification
6.2	SLO-1	Amines: General methods of preparation	Nitro compounds: Nitration and sulphonation reaction	Discussion on Chloromethylation with mechanism	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution: Halogenation	Uses
3-3	SLO-2	Amines: General methods of preparation	Nitro compounds: Nucleophilic substitution on the ring	Discussion on Halogenation, Formylation with mechanism	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution: Halogenation	Uses
S-4	SLO-1	Amines properties : Physical properties	Nitriles: Introduction, Nomenclature and uses	Discussion on Nitration, Sulphonation with mechanism	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution: Formylation	General structural features
5-4	SLO-2	Basicity of amines: Effect of substituent	Nitriles: Introduction, Nomenclature and uses	Discussion on Reduction reaction, Diels Alder reaction with mechanism	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution: Formylation	General structural features
9.5	SLO-1	Solvent and steric effects	Nitriles: Preparation from the dehydration of amides and aldoximes	Heterocyclic Compounds :Introduction, importance, classification	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution: Formylation	General methods for structure elucidation: Hoffmann's exhaustive methylation
3-3	SLO-2	Solvent and steric effects	Nitriles: Preparation from the substitution reaction in alkyl halides and tosylates	Introduction, importance, classification	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution: Formylation	General methods for structure elucidation: Hoffmann's exhaustive methylation
5-6	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
3-0	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
S-7	SLO-1	Distinction between Primary , secondary and tertiary amines using Hinsberg's method	Nitriles: From Grignard reagents and from dehydrogenation of primary amines	Nomenclature of heterocyclic compounds (containing only one hetero atom)	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution: Mercuration	General methods for structure elucidation: Emde's method
0-7	SLO-2	Distinction between Primary , secondary and tertiary amines using nitrous acid method	Properties: Physical properties of Nitriles	Nomenclature of heterocyclic compounds (containing only one hetero atom)	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution: Mercuration	General methods for structure elucidation: Emde's method

Duratio	on (hour)	18	18	18	18	18
S-8	SLO-1	Reactions with emphasis on the mechanistic pathway: Gabriel PhthalimideSynthesis	Nitriles: Reaction with Grignard reagent and hydrolysis with mechanism discussions	General discussion on Structure, aromaticity in 5-membered rings containing one heteroatom	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution: Carboxylation	Structure elucidation of Nicotine
0-0	SLO-2	Reactions with emphasis on the mechanistic pathway: Hoffmann- Bromamide reaction	Nitriles: Addition reaction with HX, NH ₃ and reaction with aqueous ROH with mechanism	General discussion on Structure, aromaticity in 5-membered rings containing one heteroatom	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution: Carboxylation	Structure elucidation of Nicotine
S-9	SLO-1	Reactions with emphasis on the mechanistic pathway: Carbylamine reaction	Reduction reactions-catalytic reduction and Stephen's reaction, Condensation reactions-Thorpe Nitrile Condensation with mechanism	General discussion on Structure, aromaticity 6-membered rings containing one heteroatom	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Oxidation	Synthesis of Nicotine
	SLO-2	Reactions with emphasis on the mechanistic pathway: Mannich reaction	Isonitriles: Introduction, Nomenclature and uses	General discussion on Structure, aromaticity 6-membered rings containing one heteroatom	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Oxidation	Synthesis of Nicotine
S-10	SLO-1	Reactions with emphasis on the mechanistic pathway: Hoffmann's exhaustive methylation	Preparation of Isonitriles from Carbylamine reaction, substitution in alkyl halides and dehydrogenation of N- substituted formamides	Basicity and relative reactivity towards electrophilic substitution reactions (amongst five membered and six membered rings)	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Reduction	Physiological action of Nicotine
0-10	SLO-2	Reactions with emphasis on the mechanistic pathway: Hofmann- elimination reaction	Isonitriles properties: Physical properties, discussion on reactions with mechanism ofHydrolysis and reduction	Basicity and relative reactivity towards electrophilic substitution reactions (amongst five membered and six membered rings)	Discussion the reaction mechanism for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Reduction	Physiological action of Nicotine
C 11	SLO-1	Reactions with emphasis on the mechanistic pathway: Cope elimination	Isonitriles: Discuss on reaction mechanism of addition with – HX, X ₂ and sulphur	General methods of synthesis for Furan	Reactions showing acidic /basic character	Terpenes : Introduction, Occurrence and Uses
5-11	SLO-2	Diazonium Salts: Preparation	Isonitriles: Discuss on reaction mechanism of Grignard reagent reaction, oxidation and rearrangement	General methods of synthesis for Furan	Reactions showing acidic /basic character	Introduction, Occurrence and Uses
S-12	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
0-12	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
S-13	SLO-1	Synthetic applications of diazonium salts including preparation of arenes, haloarenes, phenols, cyano and nitro compounds	Polynuclear Hydrocarbons : Introduction, Classification, Structure, Nomenclature and uses	Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis)	Ring opening and Ring expansion	Classification, isoprene and special isoprene rule
	SLO-2	Synthetic applications of diazonium salts including preparation phenols, cyano and nitro compounds	Introduction, Classification, Structure, Nomenclature and uses	Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis)	Ring opening and Ring expansion	Classification, isoprene and special isoprene rule
S-14	SLO-1	Coupling reactions of diazonium salts (preparation of azo dyes)	Aromaticity of polynuclear hydrocarbons	General methods of synthesis for Thiophene	Reaction with diazonium salts	general methods of structure elucidation including distinction between isopropylidene and isopropenyl group

Duratio	on (hour)	18	18	18	18	18
	SLO-2	Nitro compounds (Aliphatic and Aromatic): Nomenclature & classification	Structure elucidation of Naphthalene	General methods of synthesis for Thiophene	Reaction with diazonium salts	general methods of structure elucidation including distinction between isopropylidene and isopropenyl group
6 45	SLO-1	Nitro compounds: General methods of preparation from alkyl halides and alkanes	General methods of preparation of naphthalene, phenanthrene and anthracene: Howarth method	General methods of synthesis for pyridine (Hantzsch synthesis) and for Indole (Fischer indole synthesis)	Nucleophilic substitution reactions	general methods of structure elucidation including distinction between isopropylidene and isopropenyl group
3-15	SLO-2	Nitro compounds: Oxidation of amines and oximes and diazonium salts	Friedel Craft acylation	Indole: Madelung synthesis, reduction of o-nitro benzaldehyde)	Nucleophilic substitution reactions	general methods of structure elucidation including distinction between isopropylidene and isopropenyl group
	SLO-1	Nitro compounds: Properties: Physical properties	Diels Alder reaction	Quinoline Synthesis: Skraup synthesis, Friedlander's synthesis	Nucleophilic substitution reactions	Citral: Elucidation of structure
S-16	SLO-2	Nitro compounds: Mechanism and reaction with alkali and its synthetic applications	Elbs reaction	Knorr quinoline synthesis, Doebner- Miller synthesis	Nucleophilic substitution reactions	Citral: Elucidation of structure
S-17	SLO-1	Nitro compounds: Condensation reaction with mechanism	Pschorr Synthesis	Bischler-Napieralski reaction, Pictet- Spengler reaction, Pomeranz-Fritsch reaction)	Alkaloids : Introduction	Synthesis of Citral, its industrial application.
	SLO-2	Nitro compounds: Mannich reaction and Hydrolysis reaction with mechanism	Relative reactivity of naphthalene, phenanthrene and anthracene in comparison to benzene.	Properties: Physical properties	Introduction	Synthesis of Citral, its industrial application.
S_18	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
5-10	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session

-

T

Learning Assessment													
		Final Examination (50% weightage)											
	Bloom'sLevel of Thinking	CLA – 1 (10 ^o	CLA – 2 (10%)		CLA -	- 3 (20%)	CLA –	4 (10%)#	Final Examination (50% weightage)				
	_	Theory	Practice	Theory	Practice	Theory	Practice	Theory Practice		Theory	Practice		
Level 1	Remember	100/		200/		200/		200/		200/			
	Understand	4070	-	30%	-	30%	-	30%	-	30%	-		
Level 2	Apply	10%		10%		10%		10%		10%			
	Analyze	4070	-	4070	-	4070	-	4070	-	4070	-		
Level 3	Evaluate	200/		200/		200/		200/		200/			
	Create	20%	-	30%	-	30%	-	30%	-	30%	-		
Total		100 %		100 %		10	0 %	10	0 %	100 %			

Course Designers										
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts								
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST								
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. Gopal Chandru Senadi, SRMIST								

Course Code	UCY	20503J	Course Name	Physical Che	emistry - IV:	Conductance and Che	emical Kinetics	Cours Catego	e ory	С		Core course				e				-	L 4	T 0	P 4	С 6		
Pre-requisite Courses Nil Co-requisite Courses Nil Course Offering Department Chemistry Data Book / Codes/Standards									ogres Cours	ssive ses	Nil															
Course Learning Rationale (CLR): The purpose of learning this course is to:								Learn	ning					F	Progr	am L	earni	ing O	utco	mes ((PLO)				
CLR-1 :	underst conduc	and the laws g tance	overning mi	igration of ions ar	nd evaluate	important paramenters	from the concept of	1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 : CLR-3 :	Elabora Analyze	te the concept various theori	of rates law ies of kinetic	vs and identify the cs of chemical rea	e order and i actions	molecularity of reactions	3								ch			ility								
CLR-4 : CLR-5 :	Explain Infer the	the mechanisr e laws of photo	ns of differe chemistry a	ent catalytic reacti and explore its ap	ions plication in p	hotochemical reactions			(%)	of (%) nt (%)	(a.)	vledge		nent	Resear	æ		stainab		Work		nce				
CLR-6	CLR-6 understand the photochemical reactions and the consequences of light absorption.) paid		tainme		l Knov	alysis	velopr	sign, F	l Usage	ulture	t & Sus		Team	tion	& Fina	arning				
Course Le (CLO):	Course Learning Outcomes (CLO): At the end of this course, learners will be able to:					int of Thir	Expected Pr	Expected At		Fundamenta	Problem An:	Design & De	Analysis, De	Modern Too	Society & Cr	Environmen	Ethics	Individual &	Communica	Project Mgt.	Life Long Le	PSO - 1	PSO - 2	PSO – 3		
CLO-1 :	underst in solut	and and learn ions, various w	the concept ays of quar	t of ionic dissocial tifying conductan	tion and type ice and its ex	es of electrolytes, laws g xperimental determination	overning migration of ion on.	ns 2	2 75	5 60)	Н	Н	Н	-	-	-	-	-	-	-	-	-	Н	-	-
CLO-2 :	underst dissocia	and and apply ationconstants,	this knowle rate of read	dge in determinin ctions and the fac	ng important ctors that affe	parameters like solubilit ect the rates of reaction.	ty product,	2	2 80	70)	-	Н	-	Н	-	-	-	-	-	-	-	-	Н	-	-
CLO-3 :	underst of react	and the conception in the conceptinet in the conception in the conception in the con	ot of rate lav 10w these a	ws e.g., order, mo ccount for experir	olecularity, h mental obse	alf-life etc. and their detervations.	ermination, various theo	ries	2 70	0 65	5	Н	-	-		-	-	-	-	-	-	-	-	Н	-	-
CLO-4 :	D-4: deduce rate laws from reaction mechanisms thereby grasping the concepts of elementary and complex reactions and chain reactions, steady state approximation and rate determining step.						ns 2	2 70	70)	Н	-	Н	Н	Н	-	-	-	-	-	-	-	Н	-	-	
CLO-5 :	CLO-5 : understand the mechanism of catalytic action on reactions for homogeneous, surface catalysed and enzyme catalysed reactions, laws of absorption of light energy by molecules and the subsequent photochemical reactions					ns.	2 80	70)	-	Н	-	Н	-	-	-	-	-	-	-	-	Н	М	-		
CLO-6 :	CLO-6 : understand the concept of quantum efficiency and mechanisms of photochemical reactions.							2 75	5 70)	-	-	-	-	-	-	-	-	-	-	-	-	Н	-	-	
Duration	ı (hour)		24			24	24							24								24	1			
	SLO-1 Introduction to conductance Ostwald dilution law Order and molecularity or reaction				of con	plex		Influ	ence o	f solv	vent i	n read	ction	rate		Photo	ochen	nisty-l	Introc	luctio	n					

Bulution (nour)		27	4 4	27	27	E7
S-1 -	SLO-1	Introduction to conductance	Ostwald dilution law	Order and molecularity of complex reaction	Influence of solvent in reaction rate	Photochemisty-Introduction
	SLO-2	Faraday law of electrolysis	Debye-Huckel equation	Mechanism of complex reactions	Reactions in flow system	Characteristics of electromagnetic radiation
S-2	SLO-1	First and second law	Onsager equation	Effect of temperature on reaction rate	Types of flow system	Consequences of light absorption – Jablonski diagram
	SLO-2	Ohm's law	Debye-Falkenhagen effect	Concept of activation energy	Plug flow method	Beer-Lamberts law
S-3	SLO-1	Conductance, specific conductance and equivalent conductance	Wien effect	Concept of energy barrier	Qualitative treatment of the theory of absolute reaction rates	And its limitations
	SLO-2	Relation between specific conductance and equivalent conductance	Activity coefficient and mean activity coefficient	Arrhenius equation	Molecular reaction dynamics.	Physical significance of molar absorption coefficients.

Duration (hour)		24	24	24	24	24				
84	SLO-1	Molar conductance and cell constant	Debye-Huckel theory of mean activity of coefficients	Collision theory	Flash photolysis	Laws of photochemistry				
3-4	SLO-2	Variation of molar conductance with dilution	Debye-Huckel limiting law	Collision theory of bimolecular reaction	Pulse radiolysis	Quantum yield				
S-5 to S-8	SLO-1 SLO-2	1. Determination of cell constant.	4. To study the kinetics of Acid hydrolysis of methyl acetate with HCl using integrated rate law method.	7. To study the kinetics of saponification of ethyl acetate	Repetition Lab	Repetition Lab				
6.0	SLO-1	Ionic mobility	Determination of equivalent conductance	Activated complex theory	Catalysis:Catalyst, catalysis and auto catalysis	Experimental determination of quantum yield				
0-3	SLO-2	Transport number	Relation between molar ionic conductance and ionic activity	Activated complex theory of bimolecular reaction	General characteristics of catalyst	actinometer				
S-10	SLO-1	Transport number determination	Ionic mobility determination	Evaluation of standard enthalpy of activation and standard entropy of activation	Types of catalyst	Types of photochemical reaction				
	SLO-2	Moving Boundary method	Ionic strength	Lindemann theory of unimolecular reaction	Acid-base catalysis	Example of low and high quantum yields				
	SLO-1	Hittorf method	Introduction to chemical kinetics	Lindermann derivation	Kinetics of acid-base catalysis reaction	Rate law for photochemical reaction				
S-11	SLO-2	Effect of concentration on transport number	Rate equation and rate constant	Kinetics of complex reaction	Enzyme catalysed reaction	Kinetics of photochemical reaction				
S-12	SLO-1	Molar conductivity at infinite dilution	Order of reaction	Opposing reaction	Michaelis-menten mechanism	Photosensitized reaction,				
	SLO-2	Kohlraush's law	Rate laws	Opposing reaction derivation	Mechanism of catalysed reaction at the surface	Fluorescence quenching				
S-13	SLO-1	2. Determination of conductivity, molar	5. To study the kinetics of iodide-	Repetition Lab	Repetition Lab	Repetition Lab				
То S-16	SLO-2	conductivity, degree of dissociation and dissociation constant of aweak acid.	persulphate reaction by initial rate method							
S-17	SLO-1	Application of Kohlraush's law- calculation of molar conductance at infinite dilution for weak electrolyte	Integrated form of rate equation- first order,	Kinetics of consecutive reaction	Langumir-Hinshelwood mechanism	Stern-volmer equation				
	SLO-2	Determination of transport number	Integrated form of rate equation- second order	consecutive reaction derivation	Kinetics of surface reaction	Chemiluminescence				
	SLO-1	Waldens rule	Half-life time of a reaction	Kinetics of chain reaction	Kinetics of unimolecular reaction derivation	Role of photochemical reaction in biochemical process				
S-18	SLO-2	Application of conductometric measurements Degree of dissociation of weak electrolyte	t ^{1/2} for n th order reaction	chain reaction example	Kinetics of bimolecular reaction derivation	Photostationary state				
	SLO-1	Ionic product of water,	Method for determining order of a reaction	Kinetics of branched chain reaction	Effect of temperature on heterogeneous reaction	Photocatalytic decomposition of HI				
S-19	SLO-2	Solubility and solubility product of sparingly soluble salts (uses of Kohlraush's law)	Different methods	with examples	Temperature effect on uni and bimolecular reactions	Lasers				
S-20	SLO-1	Conductometric titrations	Molecularity of a reaction	Kinetics of reaction in solution	pH dependence of rate constant	Uses of lasers				
Duration (hour)		24	24	24	24	24				
-----------------	--------	--	-------------------------------------	---	----------------	--				
	81.0.2	Hydrolysis constant of salts	Order and molecularity of a	Diffusion constant reaction in solution	and derivation	Geometry of excited state and its life				
	3LU-2		simple reaction			time				
	SLO-1	3.Perform the following conductometric	6. To study the kinetics of iodine-	Repetition Lab	Repetition Lab	Repetition Lab				
S-21		titrations.(i)strong acid vs. strong	persulphate reaction using							
to	SI 0-2	base,ii.weak acid vs.strong base, iii.	integrated rate law method.							
S-24	010-2	Mixture of strong acid and weak acid vs.								
		Strong base								

	Theory: 1.Atkins, P.W & Paula, J.D. Physical Chemistry, 10th Ed., Oxford University Press 2011. 2. Mortimer, R. G. Physical Chemistry 3rd Ed., Elsevier: NOIDA, UP, 2009.	Practicals:
Learning Resources	3. Silbey, R. J.; Alberty, R. A. & Bawendi, M. G. Physical Chemistry 4th Ed., John Wiley & Sons, Inc., 2005	1. Khosla, B.D., Garg, V.C. and Gulati, A. Senior Practical Physical, R.Chand & Co., New Delhi, 2011.
	4. Kapoor, K.L. A Textbook of Physical Chemistry, McGraw Hill Education (India), 2014	
	5. Ball, D,W. Physical Chemistry, Cengage India Private Limited 2nd Ed., 2017	
	6. Laidler K.J. Chemical Kinetics 3rd Ed. Pearson Education India, 2003	

	Learning Assessment													
	Bloom's		Einal Examination	on (50% weightage)										
	BIOOM S	CLA – 1 (10 ^o	CLA –	CLA – 2 (10%)		3 (20%)	CLA –	4 (10%)#	Final Examinatio	on (50% weightage)				
	Lever of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice			
Lovel 1	Remember	200/	200/	150/	150/	150/	150/	150/	150/	150/	150/			
Level I	Understand	20%	20%	15%	15%	10%	15%	15%	15%	10%	1576			
	Apply	200/	200/	200/	20%	20%	20%	20%	20%	200/	20%			
Level 2	Analyze	2070	20%	20%	20%	20%	20%	20%	20%	2070	2076			
	Evaluate	100/	100/	150/	150/	150/	150/	150/	150/	150/	150/			
Level 5	Create	1076	1076	1570	1570	15%	1570	1370	1370	1370	1576			
Total 100 % 100 % 100 % 100 %											00 %			

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc., *Attendance includes 5% weightage in internals

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Dr. Ashok Kumar Sundaramoorthy,, SRMIST
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy's Laboratories,	2. Prof. Vinak Delebettimer, TIED Mumbri, vinakoal@tifr.reg.in	2 Dr. I Arachiacabri SDMIST
shanmukhaprasadg@drreddys.com	2. Proi. Vivek Poisnelliwar, TIFR Mumbal, Vivekpol@liir.res.in	2. Dr. J.Arockiaseivi, SRIMIST

Course Code	UCY20S03T	Course Name	Green Chemistry	Course Category			s			5	Skill e	nhanc	emen	nt coui	rse			L 2	T 0	P 0	C 2
CLR-1:	Γo gain knowledge a	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
CLR-2:	Jnderstanding the p	rinciples gove																			
CLR-3:	To employ nonconve	entional reaction	on techniques for synthesis of molecules							_			ty								
CLR-4: 0	Gain ability to desigi	n of chemical r	eactions/chemical synthesis using green chemistry principles.	Ē			e			arc			abili								
CLR-5:	earn about future ti	ends in Green	chemistry	oo	/ (%	t (%	ebe		ant	ses			aine		/ork		e				
				B	lic)	ien	W/e		Ĕ	R	ge		uste		Š		าลท	g			
Course Learning Outcomes (CLO): At the end of this course, learners will be able to:					Expected Proficie	Expected Attainm	Fundamental Kno	Problem Analysis	Design & Develo	Analysis, Design,	Modern Tool Usa	Society & Culture	Environment & Si	Ethics	Individual & Tean	Communication	Project Mgt. & Fir	Life Long Learnin	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Students will gain I	nowledge abo	ut Atom economy and principles involved in Green chemistry.	2	70	65	Н	-	Н	-	-	-	-	-	-	-	-	-	Н	М	-
CLO-2 :	Student will have a	blilty to visuali	ze a green chemistry approach to existing synthetic reactions	2	80	70	Н	H H							-	Н	-	М			
CLO-3:	To employ noncon	ion methods to existing conventional synthetic methods	2	80	70	Н	-	-	Н	Н	-	-	-	-	-	-	-	-	Н	-	
CLO-4 :	Utilize the knowled	ge gained in th	ne course for experimenting with solventless reactions	2	80	70	-	-	-	-	Н	-	-	-	-	-	-	-	Н	Н	
CLO-5 :	To identify reaction	s wherein sus	tainable synthetic methods can be employed	2	80	70	Н	-	Н	-	-	-	-	-	-	-	-	-	Н	-	М
	•																				

Pre-requisite	Co-requisite	Nil	Progressive
Courses	Courses		Courses
Course Offering Department	Chemistry	Data Book / Codes/Standards	Nil

Course Learning Rationale (CLR): The purpose of learning this course is to:

Learning

Program Learning Outcomes (PLO)

Duration (hour)		6	6	6	6	6
6.4	SLO-1	Introduction to Green Chemistry	Principles of Green Chemistry and Designing a Chemical synthesis: Twelve principles of Green Chemistry with their explanations and examples	Green Synthesis / Reactions I: Green Synthesis of Adipic acid	Green Synthesis / Reactions II : Surfactants	Future Trends in Green Chemistry: Oxidation reagents and catalysts
S-1	SLO-2	Introduction to Green Chemistry	Principles of Green Chemistry and Designing a Chemical synthesis: Twelve principles of Green Chemistry with their explanations and examples	Green Synthesis / Reactions I: Green Synthesis of Adipic acid	Green Synthesis / Reactions II : Surfactants	Future Trends in Green Chemistry: Oxidation reagents and catalysts
S_2	SLO-1	Goals of Green Chemistry	Principles of Green Chemistry and Designing a Chemical synthesis: Twelve principles of Green Chemistry with their explanations and examples	Green Synthesis of catechol	Surfactants for carbon dioxide – replacing smog producing and ozone depleting solvents with CO2 for precision cleaning and dry cleaning of garments.	Biomimetic, multifunctional reagents;
SLO-2		Goals of Green Chemistry	Principles of Green Chemistry and Designing a Chemical synthesis: Twelve principles of Green Chemistry with their explanations and examples	Green Synthesis of disodium iminodiacetate (alternative to Strecker synthesis).	Surfactants for carbon dioxide – replacing smog producing and ozone depleting solvents with CO2 for precision cleaning and dry cleaning of garments.	Biomimetic, multifunctional reagents;

Duration (hour)		6	6		6	6	6
6.2	SLO-1	Basic introduction and explaining goals of Green Chemistry	Specialemphasis on Designing a Green Synthesis using these principles	Microwave assisted Hofmann Elimination	reactions in water: n	Designing of Environmentally safe Marine antifoulant.	Combinatorial green chemistry
3-3	SLO-2	Basic introduction and explaining goals of Green Chemistry	Prevention of Waste/ byproducts	Microwave assisted methyl benzoate to	reactions in water: benzoic acid	Designing of Environmentally safe Marine antifoulant.	Combinatorial green chemistry
64	SLO-1	Basic introduction and explaining goals of Green Chemistry	Maximum incorporation of the materials used in the process into the final products	Microwave assisted oxidation of toluene	reactions in water:	An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn	Proliferation of solventless reactions;
3-4	SLO-2	Basic introduction and explaining goalsAtom Economy - calculation of atom economy of the rearrangementMicrowave assisted reaction oxidation of alcohols				An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn	Proliferation of solventless reactions;
0 F	SLO-1	Limitations/Obstacles in the pursuit of the goals of Green Chemistry	Additionreactions	Reactions in organic Alder reaction	c solvents - Diels-	Healthier Fats and oil by Green Chemistry: Enzymatic Inter esterification for production of no Trans-Fats and Oils	co crystal controlled solid state synthesis (C2S3);
3-0	SLO-2	Limitations/Obstacles in the pursuit of the goals of Green Chemistry	Additionreactions	Reactions in organic Decarboxylation rea	c solvents - iction	Healthier Fats and oil by Green Chemistry: Enzymatic Inter esterification for production of no Trans-Fats and Oils	co crystal controlled solid state synthesis (C2S3);
5.6	SLO-1	Limitations/Obstacles in the pursuit of the goals of Green Chemistry	Substitutionreactions	Ultrasound assisted Sonochemical Simm (Ultrasonic alternativ	reactions: nons-Smith Reaction ve to lodine	Healthier Fats and oil by Green Chemistry: Enzymatic Inter esterification for production of no Trans-Fats and Oils	Green chemistry in sustainable development
3-0	SLO-2	Limitations/Obstacles in the pursuit of the goals of Green Chemistry	Elimination reactions	Ultrasound assisted sonochemical Simm (Ultrasonic alternation	reactions: ons-Smith Reaction ve to lodine)	Healthier Fats and oil by Green Chemistry: Enzymatic Inter esterification for production of no Trans-Fats and Oils	Green chemistry in sustainable development
		1 Abluwalia V.K. Kidwai M.R. New	Trends in Green Chemistry, Anamalaya P	Publishers 2005	4 Cann M Can	d Connely, M.E. Real-World cases in Gree	an Chamistry ACS 2000
Learr Reso	ning urces	 Anastas, P.T. & Warner, J.K. Gree 1998. 	en Chemistry- Theory and Practical, Oxford	University Press,	5. Ryan, M.A. ar 2002.	nd Tinnesand, M. Introduction to Green Ch	emistry, American Chemical Society,
		Matlack, A.S. Introduction to Green	1 Chemistry, Marcel Dekker, 2001.		Lancaster, M	. Green Chemistry: An Introductory Text R	SC Publishing, Second Edition, 2010.

Learning Assessment													
		Final Examinati	on (EQ9(weightere)										
	Bloom'sLevel of Thinking	CLA – 1 (10%)		CLA –	2 (10%)	CLA –	3 (20%)	CLA –	4 (10%)#	Filiai Examinau	on (50% weightage)		
		Theory	Theory Practice T		Practice	Theory	Practice	Theory	Practice	Theory	Practice		
	Remember	100/		200/	1	200/		200/		200/			
Level I	Understand	40 %	-	30%	-	30%	-	30%	-	30%	-		
	Apply	10%		10%	1	10%		10%		10%			
	Analyze	4070	-	4070	-	4070	-	4070	-	4070	-		
	Evaluate	200/		200/	1	200/		200/		200/			
Level 5	Create	20%	- 1	30%	-	30%	-	30%	-	30%	-		
	Total 100 % 100 % 100 % 100 %									1	00 %		

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. M. R. Ganesh, SRMIST

Cou Coo	rse U de U	ICY20S04T	Course Name		Pharmaceutical Chemistry		C Ca	ourse tegor	y y	S				Skill	Enh	ance	ment	urse	rse				T 0	P 0	C 2					
Pre-r Co Cours	equisite ourses e Offering	Nil Department	Chemistry	(Co-requisite Nil Courses Data Boo	k / Codes/Standards		Pro C	gres: ours	sive es	Nil																			
Cours	e Learning	g Rationale (C	LR): The purpose of	learning	this course is to:			L	_earning Program Learning Outcomes (PLO)																					
CLR-1	• Dev	elon basic und	erstanding of drugs di	scoverv	design development and their side e	ffects		1	2	3	1	1	2	3	4	5	6	7	8	٩	10	11	12	13	14	15				
CLR-2	: Dev : Con	nprehend the m	node of action of antiir	flammat	orv agents, antibacterial, antifungal ag	gents ans antiviral ag	ents	-	2	5		-	2	5	-	5	0	1	0	3	10	11	12	10	14	10				
CLR-3: Comprehend the mode of action of antiminating agents, antibacterial, antibing agents and antifum agents Give the knowledge of synthesis of major drug classes including-analgesics, antipyretics, antiinflammatory agents, antibacterial and antifungal agents antiviral agents, Central Nervous System agents and drugs for HIV AIDS.										nt (%)		rledge		nent	tesearch	6		tainability		Nork		nce								
CLR-4	: Gair	n knowledge ab	pout enzyme reactions	and infl	uence of cofactors on the reactions			g (E	ien (me		No⊓	<u>.</u>	udo	ц Ц	sage	e	Sus		m		lina	ing							
CLR-5 : Gain an overview of fermentation process and production of certain dietary supplements and certain common antibiotics will be discussed.										ed Attain		nental K	n Analys	& Devel	s, Desig	i Tool Us	& Cultu	iment &		ial & Tea	Inication	Mgt. & F	ng Learn	-	0	3				
Cours	e Learnin	g Outcomes (0	CLO): At th	e end of	this course, learners will be able to:			Level o	Expect	Expect		Fundar	Probler	Design	Analysi	Moderr	Society	Enviror	Ethics	Individu	Comm	Project	Life Lo	- OSd	- OSA	PSO -				
CLO-1	: Stud	dents will dvelo	p ability to apply retro	synthes	is approach to synthsize drug molecu	les		2	70	65	_	Н	-	Н	-	-	-	-	-	-	-	-	-	-	-	-				
CLO-2	2: Abil	ity to correlate	various features of the	drug to	its biological action			2	80	70	-	Н	-	-	Н	Н	-	-	-	-	-	-	-	-	-	-				
CLO-3	5: 100 I III	interentiate bet	ween drug and poisor	l so to svn	thesize of molecules			2	80	70	-	- H	н	- H	-	- H	-	-	-	-	-	-	-	- H	- H	-				
CLO-4	i Und vitar	lerstand the fer mins	mentation process an	d produc	tion of ethanol, citric acids, antibiotics	and some classes of	f	2	80	75	_	Н	-	-	-	-	-	H	-	-	-	-	-	Н	Н	M				
Durat	tion (hour))	6		6		6							6								6								
S-1	SLO-1	Introduction	- Drug discovery	Dru Stu diat	igs and Pharmaceuticals – I idy of pharmaceutical aids - talc, tomite and kaolin	Drugs and Pharmac Definition and action agents	ceuticans of A	als – II Antivira	l al		Introc	luctior	ı - En	zyme	es				Ferm ferme	ientai entati	tion on	Aerol	oic ar	id ani	aerot	oic				
	SLO-2	Introduction developmen	- Design and It	Stu ber	dy of pharmaceutical aids - ntomite, gelatin and natural colours	Synthesis of the rep Antiviral agents (Ac	oresen yclovi	tative r)	drug	S	Introc	luctior	ו - En	zyme	es				Ferm ferme	ienta entati	tion on	Aerol	bic ar	id ana	aerot	oic				
	SLO-1	Sources of o	drugs: biological, mari d plant tissue culture	ne, Det dru	finition and actions of antipyretic	Definition and action Nervous System ag	ns of (ents	Centra	al		Class -	ificati	on of	enzy	mes				Prod	uctio	n of E	thyl a	lcoho	bl						
S-2	SLO-2	Physio-chen geometric a molecules a	nical aspects (optical, nd bioisosterism) of d nd biological action	ug the	nthesis of the representative drugs of following classes: antipyretic agents	Synthesis of the rep Central Nervous Sy (Phenobarbital, Diaz	tative agents 1)	drug: s	S	Enzyi	me sp	ecific	ity					Prod	uctio	n of ci	itric a	cid								
	SLO-1	Drug recept	or interaction	tion Definition and actions of anti- Definition and actions inflammatory drug drug					vasci	ular	Mech	anism	of er	nzym	e acti	on			Prod	uctio	n of A	ntibic	otics -	Peni	cillin					
S-3	S-3 Drug receptor interaction Synthesis of the representative drugs of the following classes: antiinflammatory agents (Aspirin) Synthesis of the representative drugs of the representative drugs of the representative drugs of the representative drugs of the following classes: antiinflammatory agents (Aspirin)						of Synthesis of the represer y Cardiovascular drug(Glyc				Synthesis of the represen Cardiovascular drug(Glyc					anism	of er	ızym	e acti	on			Prod Ceph	uction nalos	n of A porin	ntibic	otics -			
S-4	SLO-1	Basic Retro- developmen	-synthetic approach fo it of drug.	r Del ant	finition and actions of representative ibacterial agent	Definition and action drug	Definition and actions of antilaprosy drug						Enzyme cofactor								Production of Antibiotics - Chloromycetin									

Durat	ion (hour)	6	6		6	6	6
	SLO-2	Basic Retro-synthetic approach for development of drug.	Synthesis of the representative drugs of the following classes: antibacterial agent (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim	Synthesis of the rep antilaprosy drugs (D	resentative)apsone)	Role of enzyme cofactor in reactions	Production of Antibiotics -Streptomycin
6 E	SLO-1	Cause of side effect of drugs like ibuprofen, cetirizine, thalidomide, etc	Synthesis of the representative drugs of the following classes: antibacterial agent (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim	Definition and actior related drugs	ns of HIV-AIDS	coenzyme - – its role in enzyme reactions	Production of - Lysine,Glutamic acid
S-5 -	SLO-2	Cause of side effect of drugs like ibuprofen, cetirizine, thalidomide, etc	Synthesis of the representative drugs of the following classes: antibacterial agent (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim	Definition and actior related drugs	ns of HIV-AIDS	ATP	Production of - Vitamin B2
86	SLO-1	Difference between drug and poison.	Synthesis of the representative drugs of the following classes: antifungal agent	Synthesis of the rep AIDS related drugs	resentative HIV- (AZTZidovudine)	Immobilization of enzymes	Production of - Vitamin B12
3-0	SLO-2	Difference between drug and poison.	Definition and actions of representative antifungal agent	Synthesis of the rep AIDS related drugs	resentative HIV- (AZTZidovudine)	Immobilization of enzymes	Production of - Vitamin C
Learning Resources		 Patrick: Introduction to Medic Hakishan, V.K. Kapoor: Medi Pitampura, New Delhi. William O. Foye, Thomas L., B.I. Waverly Pvt. Ltd. New De 	inal Chemistry, Oxford University Press, U cinal and Pharmaceutical Chemistry, Valla Lemke , David A. William: Principles of Me elhi.	K. bh Prakashan, dicinal Chemistry,	4. Richard A. Kjonaa Ibuprofen. in the Intr 5. Daniel G. Marsh, iodometric and could	as, Peggy E. Williams, David A. Counce, a oductory Organic Laboratory, J. Chem. Ec Deborah L. Jacobs, and Hans Veening, Ar ometric titrimetry, J. Chem. Educ., 50 (9), p	nd Lindsey R. Crawley, Synthesis of Juc., 88 (6), pp 825–828, 2011. ralysis of commercial vitamin C tablets by p 62,61973.

			Learn	ing Assessm	ent						
			Cor	Final Examinati	en (EQR(weightene)						
	Bloom'sLevel of Thinking	CLA – 1 (10 ^o	CLA –	2 (10%)	CLA-	3 (20%)	CLA –	4 (10%)#	Final Examination	on (50% weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Lovel 1	Remember	400/		200/		200/		200/		200/	
Level I	Understand	40%		30%		30%		30%		30%	
Lovel 2	Apply	100/		100/		10%		10%		100/	
	Analyze	4070		40%		40%		40%		4070	
Lovel 2	Evaluate	200/		200/		200/		200/		200/	
Level 3	Create	20%		30%		30%		30%		30%	
	Total	100 % 100 %		0 %	10	0 %	100 %				
#CIA 40	an he from any combination of	thoso: Assignments Som	inare Toch Ta	Ike Mini Droje	octe Caco Stu	dias Salf Stu	dy MOOCe C	ortifications (Conf Danor ato	·	

Course	Designers

Г

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories,	0. Deef. Minels Delek ettingen TIED Murek ei uitgebrei lefte ere in	0 Dr. M. D. Ormank, ODMOT
shanmukhaprasadg@drreddys.com	2. Proi. vivek Poisnelliwar, TER Wumbal, vivekpol@tiff.res.in	2. DI. M. K. Ganesh, SKIMIST

Course C	ode	UES20AE1T	Course Name	Enviro	Environmental Studies Co				Course Category A Ability Enhancement							ent Co	ourse	es		L 3	Т 0	P 0	C 3	
Pre	-requisi	ite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses Nil																		
Course Off	ering D	epartment	Computer Appli	cations	Data Book / Codes/Standards	Nil																		
Course Lea	arning F	Rationale (CLR):	The purpose	of learning this course is to:		L	earni	ng				F	Progr	am L	earniı	ng Oı	utcor	nes (I	PLO)	0)				
CLR-1 :	To tead	ch the importance of	environment			1	2	3		1 2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CLR-2 :	To imp	art the knowledge at	oout ecosystem																					
CLR-3 :	To tead	ch about Biodiversity	ersity								es			e										
CLR-4 :	CLR-4 : To create awareness about environmental pollution							(%		de de	i la			ledg		~								
CLR-5 :	To und	lerstand about Enviro	onment Protection			Bloc	<u>ر</u>	ent (Disc	gge	tion	MOL		Data		kills	dills					
						 bu	cien	nme			ed [- Me	aliza	Ā	ng	ret	kills	g S	т С	s				
Course Lea	arning (Outcomes (CLO):	At the end o	f this course, learners will be	nis course, learners will be able to:					Fundamental r Annlination of	Link with Relat	Procedural Kn	Skills in Specia	Ability to Utilize	Skills in Model	Analyze, Interp	Investigative S	Problem Solvir	Communicatio	Analytical Skill	PSO -1	PSO -2	PSO-3	
CLO-1 :	To ga	in knowledge on the	importance of natu	ral resources and energy	2	75	60		H H	H	-	-	-	-	-	-	-	-	-	-	-	-		
CLO-2 :	To un	derstand the structur	e and function of a	n ecosystem				70		- H	-	Н	-	-	-	-	-	-	-	-	-	-	-	
CLO-3 :	To imi appre	bibe an aesthetic val ciate the concept of i	ue with respect to l interdependence	piodiversity, understand the th	diversity, understand the threats and its conservation and					4 -	-		-	-	-	-	-	-	-	-	-	-	-	
CLO-4 :	To un	derstand the causes	of types of pollutio	on and disaster management				70		Η -	Н	Н	Н	-	-	-	-	-	-	-	-	-	-	
CLO-5 :	To ob	serve and discover th	he surrounding env	nding environment through field work			80	70		- H	-	Н	-	-	-	-	-	-	-	-	-	-	-	

Duratio	on (hour)	9	9	9	9	9
6.1	SLO-1 Environmental Studies- Concept		Environmental Studies- Concept Concept of an ecosystem Biodiversity at Global, Nation Local Levels		Causes, Effects and Control	Need for equitable utilization
3-1	SLO-2	Scope and Importance of Environmental Studies	Ecosystem degradation and Resource utilization	India as a Mega Diversity Nation	Measures of Nuclear hazards	Equity – Disparity
6.2	SLO-1	leed for public awareness. Structure and Functions of an ecosystem Threats to biodiversity: habitat loss, poaching of wildlife		Solid Waste ManagementCauses,	Urban – rural equity issues	
3-2	SLO-2	Institutions in Environment	Producers, consumers and decomposers	man-wildlife conflicts	Urban and Industrial Waste	The need for Gender Equity
	SLO-1	People in Environment Energy flow in the ecosystem		Endangered species of India		Preserving resources for future generations
S-3 SLO-2		Awareness about Environmental Studies	The water cycle , The Carbon cycle , The Oxygen cycle , The Nitrogen cycle , The energy cycle and, Integration of cycles in nature	Endemic species of India	Role of Individuals In Pollution Prevention	The rights of animals

Duratio	on (hour)	9	9	9	9	9
54	SLO-1	Introduction to natural resources- Associated Problems	Ecological succession	Environmental Pollution- Definition	Disaster management- NatureFloods,	The ethical basis of environment
3-4	SLO-2	Renewable and Nonrenewable resources	Food chains, Food webs and Ecological pyramids		Earthquakes	education and awareness
S-5	SLO-1	Forest resources Ecosystem, Introduction, Types, Characteristic features, Structure and functions		Causes, Effects and Control Measures of Air Pollution	Cyclones Landslides	The conservation ethic and traditional value systems of India
	SLO-2	Water Resources	Forest ecosystem			
	SLO-1	Mineral Resources	Grassland ecosystem	Causes Effects and Control	Social Issues and the	
S-6	SLO-2	Food Resources	Desert ecosystem	Measures of Water Pollution	EnvironmentFrom Unsustainable to Sustainable Development	Wasteland Reclamation
S-7	SLO-1	Energy Resources	Aquatic ecosystems (ponds, lakes, streams)	Causes, Effects and Control	WaterConservation	Climato chango & Clobal warming
3-1	SLO-2	Land Resources	Aquatic ecosystems (rivers, estuaries, oceans)	Measures ofSoil Pollution		Chimate change & Global warning
6.0	SLO-1	Renewable and non-renewable resources- Wind	Value Of Biodiversity	Causes, Effects and Control	Dain Water Llan sating Watershad	Acid min & Orang lower deplotion
3-0	SLO-2	Renewable and non-renewable resources- geothermal	Consumptive Value And Productive Value	Measures of Marine pollution	Rain water narvestingwatersneu	Actu rain & Ozone layer depretion
50	SLO-1	Renewable and non-renewable resources- Solar	Social Value and Ethical Value	Causes, Effects and Control Measures of Noise Pollution	Environmental Ethics: Issues and Possible Solutions	Nuclear Accidents and Nuclear
3-9	SLO-2	Renewable and non-renewable resources- Biomass	Aesthetic Value and Option Value	Causes, Effects and Control Measures of Thermal Pollution	Resource consumption patterns	Holocaust

	Theory	
Learning	1.	BharuchaErach, (2013), Textbook of Environmental Studies for Undergraduate Courses (Second edition). Telangana, India: Orient BlackSwan.
Learning	2.	BasuMahua, Savarimuthu Xavier, (2017), SJ Fundamentals of Environmental Studies. Cambridge, United Kingdom: Cambridge University Press
Resources	3.	Dr.R.Jeyalakshmi.2014.,Text book of Environmental Studies, Devi publications, Chennai
	4.	BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380013, India, Email:mapin@icenet.net (R)

Learning	earning Assessment													
	Bloom'sLevel of Thinking				Final Examination (50% weighters)									
Level		CLA –	1 (10%)	CLA –	2 (10%)	CLA –	3 (20%)	CLA – 4	l (10%)#					
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice			
Lovel 1	Remember	40		40		40		40		40				
Level I	Understand	40	-	40	-	40	-	40	-	40	-			
Lovel 2	Apply	20		20		20		20		20				
Level Z	Analyze		-		-	50	-	- 50	-	50	-			
Lovel 2	Evaluate	20		20		20		20		30				
Level 3	Create		-		-	50	-	- 50	-	50	-			
	Total	100 % 100 %				100) %	100) %	100 %				

Course Designers									
Experts from Industry	Experts from Academic	Internal Experts							
1. Mr. Suresh S, Program Head, Hello FM	1. Dr. G Balasubramania Raja, Prof & Head, ManonmaniamSundranar University Mail-gbs_raja@yahoo.com	1. Dr. Rajesh R, Head, SRM IST							
		2.Dr.S.Albert Antony Raj, Associate Professor and Head, SRMIST							

Co C	ourse ode	UJK20501T	Course Name	Leadership a	and Managem	ent Skills		Cours	se Ca	tegory		JK			Life Skill Courses						-	L 2	T 0	P 0	C 2
	Pre-requ	isite Courses	Nil	Co-requisite Courses	Nil		Pro	gres	sive (Courses	Nil														
Cours	se Offerin	ng Department	Career Develo	pment Centre Data E	Book / Codes/S	Standards	-																		
Cour (CLR	se Learn):	ing Rationale	The purpose	of learning this course is to:				L	earni	ing				F	Progr	ram L	earni	ng O	utco	mes	(PLO)			
CLR-	, 1 : help	students to develop	essential skills	to influence and motivate oth	ers			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-	2 : Incu	lcate emotional and	social intelliger	ice and integrative thinking for	r effective lead	ership																			1
CLR-	3: crea	te and maintain an e	effective and mo	ptivated team to work for the s	society			_					nes			ge									1
CLR-	4 : nurti	ure a creative and e	ntrepreneurial n	nindset				E S	(%)	(%)	dge	pts	cipli	e	c	vled		ta		s	s			<u>ـ</u>	ĺ
CLR-	5 : mak	e students understa	nd the persona	values and apply ethical prin	and apply ethical principles in professional and social contexts						(nowle	Conce	ed Dis	owledg	alizatio	Knov	ing	oret Da	kills	ıg Skill	n Skill	s		ehavio	ning
CLR-	6 : man	age competency-mi	x at all levels fo	r achieving excellence with et		inki	Profi	Attai	Ital k	o	Relat	l Kn	Decia	Itilize	odel	Iterp	ve S	olvir	atio	Skill		al B	-ear		
Cour (CLO	se Learn):	At the end of this course, learners will be able to:								Expected	Fundamer	Application	Link with F	Procedura	Skills in S _I	Ability to L	Skills in M	Analyze, lı	Investigati	Problem S	Communic	Analytical	ICT Skills	Profession	Life Long I
CLO-	examine various leadership models and understand / assess their skills, strengths and abilities that affect the								80	75	L	Ŵ	Ħ	-	M	Ŵ	-	-	-	M	H	Ĺ	-	Ħ	H
CLO-	2: lear	and demonstrate a	set of practical	skills such as time managem	nent, self-mana	gement, handling conflicts	team	3	80	75	L	М	Н	-	М	М	-	-	-	М	Н	L	-	Н	Н
CLO-	3: unde	erstand the basics of	f entrepreneurs	hip and develop business plai	n			3	75	70	L	М	Н	-	М	М	-	-	-	М	Н	L	-	Н	Н
CLO-	4: appl	y the design thinking	g approach for l	eadership				3	75	70	L	М	Н	-	М	М	-	-	-	М	Н	L	-	Н	Н
CLO-	5: appr	eciate the important	ce of ethics and	moral values for making of a	balanced pers	onality		3	75	70	L	Н	Η	-	М	М	-	-	-	М	Н	L	-	Н	Η
CLO-	6: be a	n integral human be	ing					3	75	70	L	Н	Н	-	М	М	-	-	-	М	Н	L	-	Н	Н
Du (r	ration iour)		6	6	6 6					6 6							6								
	SLO-1	Leadership - definit	tion	Team building	Team building Management – definition				И	Vomen in	n management Entrepreneurship														
S-1	SLO-2	Leadership – qualit	ies	Team dynamics	Manager – traits				G bi m	ilobal gen usiness. L nanagers?	der pe Do wor ? - disc	rspec nen n cussic	tive i nake on	n good		Ent	repre	neurs	ship						
• •	SLO-1	Leadership – styles	3	Work delegation	Scheduling work				Confronting problems faced by women managers – case study					Successful Indian entrepreneurs – case study											
5-2	SLO-2	Leadership – styles	3	Work delegation – activ	n – activity Scheduling work – activity				C w	onfronting	g probl inager:	lems i s – ca	faced ise st	by udy		Suc	cess	ful Inc	dian e	entrep	orene	urs –	case	stud	y
S-3	SLO-1	Difference betweer	n leader and bo	SS Decision making	sion making Strategic planning				Successful women managers – documentary screening Successful women entrepreneurs – ca:					– cas	e stu	dy									

Du (h	ration our)	6		6		6			6		6			
	SLO-2	Case study (based on leader styles)	rship	Decision making - activity		Strategic planning		Successful women documentary scre	n managers – ening	Successful wo	omen entrepreneurs – case study			
6.4	SLO-1	Case study (based on leader styles)	rship	Motivation		Change management		Women labour for	Ethics – defini	ition				
3-4	SLO-2	Case study (based on leader styles)	Case study (based on leadership tyles) Motivating for results Change managemen				 activity 	Problems faced by force in work place	Corporate eth	ics				
S 5	SLO-1	Leadership in diverse organiz structures, cultures and communications	ship in diverse organizational Argumentation, Persuasion Energy management incations					Sexual harassmer workplace (prever and redressal) Act	t of women at tion, prohibition, , 2013	Essential elements of business ethics				
3-3	SLO-2	Leadership in diverse organizational structures, cultures and communications Negotiation , Networking Novel ways to manage energy work place – activity					e energy in	Documentary scree harassment of wo	ening - Sexual men at workplace	Activity (students formulate ethical code of the business organization)				
	SLO-1	Leading the organisation thro stability and turbulence	ough	Budget planning		Work force manageme	ent	Transgender pers rights act, 2019	ons protection of	Ethical dilemma				
S-6	SLO-2	Case study	Grievance redressal p organisations	olicy in	Documentary scree inclusiveness of the workplace	ening –based on e third gender in	Ethical dilemma - case study							
Learning Resources 1. Craig E Johnson, Meeting the ethical challenges of leadership, Sage publications, 2018 4. Alexander Osterwalder, Business Model Generation, Wiley, 2013 1. Craig E Johnson, Meeting the ethical challenges of leadership, Sage publications, 2018 5. Deborah Tannen, Talking from nine to five: Women and men in publishers, 2010 3. T V Rao, Managers who make a difference: Sharpening your management skill, Random house India, 2016 6. Amish Tandon, Law of sexual harassment at workplace: Practice 2017							2013 en in the workplace, Harper Collins actice and procedure,Niyogi books,							
Learn	ing Asse	ssment												
							Continu	ous Learning Ass	essment (100% weig	ghtage)				
		Level Blo	Bloom'sLevel of Thinking CLA-1 (20%)		CLA-1 (20%)	CLA	·2 (20%)	CLA-3 (30	l%) #	CLA-4 (30%)##				
						Theory	Tł	neory	Theory		Theory			
Level	1		derstand			10%	1	10%	30%		15%			
	r	Арр	ply			50%		50%	100/		50%			

Create 100 % 100 % 100 % 100 % Total # CLA-1, CLA-2 and CLA-3 can be from any combination of these: Online Aptitude Tests, Classroom Activities, Case Studies, Poster Presentations, Power-point Presentations, Mini Talks, Group Discussions, Mock interviews,

50%

40%

40%

30%

50%

40%

etc. ## CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Analyze Evaluate

Level 2

Level 3

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1 Aiou Zonor Director Corport Journhor		1. Ms Sindhu Thomas B, AssistantProfessor& Head in Charge, CDC, FSH, SRMIST
T. Ajay Zener, Director, Gareer Launcher	-	2.MrRajsekar, Assistant Professor, CDC, FOM, SRMIST

50%

35%

SEMESTER VI Ρ L С Course Course Course UCY20601T **Organic Chemistry - IV: Biomolecules** С Core course 5 0 6 Code Name Category 1 Progressive Nil Pre-requisite Co-requisite Nil Nil Courses Courses Courses **Course Offering Department** Chemistry Data Book / Codes/Standards Nil **Course Learning Rationale** The purpose of learning this course is to: Program Learning Outcomes (PLO) Learning (CLR): The core course of Organic Chemistry IV is an extrapolation of fundamental concept and functional group CLR-1: 2 3 2 3 4 5 6 7 8 9 10 11 12 13 14 15 1 1 chemistry studied in the previous core courses CLR-2: The focus area of this course is on the chemistry of biomolecules i.e. amino acids, peptides and proteins The focus area of this course is on the chemistry of biomolecules i.e. enzymes and nucleic acids CLR-3 : Environment & Sustainability Analysis, Design, Research CLR-4 : The focus area of this course is on the chemistry of biomolecules i.e. carbohydrates and lipids -evel of Thinking (Bloom) Expected Proficiency (%) Expected Attainment (%) Through the study of energetics in biological systems, it aims to build the concept of metabolism for biological Individual & Team Work Design & Development Project Mgt. & Finance CLR-5 : Scientific Knowledge svstems more lucid Modern Tool Usage -ife Long Learning Problem Analysis Society & Culture Communication Course Learning Outcomes က 2 At the end of this course, learners will be able to: PSO - 1 (CLO): Ethics PSO -PSO 75 60 2 Н Н Н CLO-1: Understand and demonstrate how structure of biomolecules determines their reactivity and biological functions Н ----. ------CLO-2: Gain insight into concepts of heredity through the study of genetic code, replication, transcription and translation. 2 80 70 Н -Н Н -----------Demonstrate and understanding of metabolic pathways, their inter relationship, regulation and energy production 70 65 Н Н CLO-3 : 2 -----------from biochemical processes. CLO-4 : Understand the synthetic importance of amino acids, peptides, enzymes and nuclei acids 2 70 70 Н Н Н Н Н ----. -----CLO-5 : Able to demsonstrate and imply the synthetic chemistry knowledge of carbohydrates 2 80 70 Н -Н Н -----------

Duration (hour)		18	18	18	18	18
6.1	SLO-1	Carbohydrates : Carbohydrates: Occurrence, classification and their biological importance	Polysaccharides – Elementary treatment of starch	α-Amino Acids – Ionic properties	Proteins and its classification	Enzyme inhibitors and their importance
3-1	SLO-2	Carbohydrates: Occurrence, classification and their biological importance	Polysaccharides – Elementary treatment of starch	α-Amino Acids – Ionic properties	Proteins and its classification	Enzyme inhibitors and their importance
6.2	SLO-1	Carbohydrates: Occurrence, classification and their biological importance	Polysaccharides – Elementary treatment of cellulose	α-Amino Acids – Ionic properties	primary, secondary and tertiary structures of proteins	Enzyme inhibitors and their importance
5-2	SLO-2	Carbohydrates: Occurrence, classification and their biological importance	Polysaccharides – Elementary treatment of cellulose	α-Amino Acids – Ionic properties	primary, secondary and tertiary structures of proteins	Enzyme inhibitors and their importance

Duratio	n (hour)	18	18	18	18	18
6.2	SLO-1	Monosaccharides: Constitution and absolute configuration of glucose	Polysaccharides – Elementary treatment of glycogen	α-Amino Acids – Reactions	primary, secondary and tertiary structures of proteins	Enzyme inhibitors and their importance
3-3	SLO-2	Monosaccharides: Constitution and absolute configuration of glucose	Polysaccharides – Elementary treatment of glycogen	α-Amino Acids – Reactions	primary, secondary and tertiary structures of proteins	Enzyme inhibitors and their importance
64	SLO-1	Monosaccharides: Constitution and absolute configuration of fructose	Lipids : Introduction to oils and fats	α-Amino Acids – Reactions	primary, secondary and tertiary structures of proteins	Nucleic Acids : Structure of components of nucleic acids: Bases and sugars
5-4	SLO-2	Monosaccharides: Constitution and absolute configuration of fructose	Introduction to oils and fats	α-Amino Acids – Reactions	primary, secondary and tertiary structures of proteins	Structure of components of nucleic acids: Bases and sugars
8.5	SLO-1	Monosaccharides: Epimers and anomers	Common fatty acids present in oils and fats	Zwitterions, pKa values andlsoelectric point	Denaturation	Structure of components of nucleic acids: Nucleosides
3-5	SLO-2	Monosaccharides: Epimers and anomers	Common fatty acids present in oils and fats	Zwitterions, pKa values andIsoelectric point	Denaturation	Structure of components of nucleic acids: Nucleosides
8.6	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
3-0	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
S-7	SLO-1	Determination of ring size of glucose	Hydrogenation of fats and oils	Zwitterions, pKa values andlsoelectric point	Enzymes : Enzymes: Introduction	Structure of components of nucleic acids: Nucleotides
0-1	SLO-2	Determination of ring size of glucose	Hydrogenation of fats and oils	Zwitterions, pKa values andIsoelectric point	Enzymes: Introduction	Structure of components of nucleic acids: Nucleotides
c 0	SLO-1	Determination of ring size of Fructose	Saponification value	Electrophoresis	Classification and characteristics of enzymes	Nomenclature of nucleosides
3-0	SLO-2	Determination of ring size of Fructose	Saponification value	Electrophoresis	Classification and characteristics of enzymes	Nomenclature of nucleosides
50	SLO-1	Haworth projections and conformational structures	Acid value	Peptides and its classification	Classification and characteristics of enzymes	Nomenclature of nucleotides
3-9	SLO-2	Haworth projections and conformational structures	Acid value	Peptides and its classification	Classification and characteristics of enzymes	Nomenclature of nucleotides
S 10	SLO-1	Interconversions of aldoses and ketoses	lodine number	Study of peptides: determination of their primary structures-end group analysis	Mechanism of enzyme action (taking chymotrypsin as an example)	Structure of polynucleotides (DNA and RNA)
3-10	SLO-2	Interconversions of aldoses and ketoses	lodine number	Study of peptides: determination of their primary structures-end group analysis	Mechanism of enzyme action (taking chymotrypsin as an example)	Structure of polynucleotides (DNA and RNA)
6 11	SLO-1	Interconversions of aldoses and ketoses	Reversion	Study of peptides: determination of their primary structures-end group analysis	Mechanism of enzyme action (taking chymotrypsin as an example)	Structure of polynucleotides (DNA and RNA)
3-11	SLO-2	Interconversions of aldoses and ketoses	Reversion	Study of peptides: determination of their primary structures-end group analysis	Mechanism of enzyme action (taking chymotrypsin as an example)	Structure of polynucleotides (DNA and RNA)
S-12	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
3-12	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
S-13	SLO-1	Killiani- Fischer synthesis	Rancidity	Synthesis of peptides using N- protecting, C-protecting and C- activating groups	Factors affecting enzyme action	Biological roles of DNA and RNA

Duratio	n (hour)	18	18	18	18	18
	SLO-2	Killiani- Fischer synthesis	Rancidity	Synthesis of peptides using N- protecting, C-protecting and C- activating groups	Factors affecting enzyme action	Biological roles of DNA and RNA
6 14	SLO-1	Ruff degradation	Amino Acids, Peptides and Proteins :Amino acids and its classification	Synthesis of peptides using N- protecting, C-protecting and C- activating groups	Factors affecting enzyme action	Concept of heredity: Genetic Code
3-14	SLO-2	Ruff degradation	Amino acids and its classification	Synthesis of peptides using N- protecting, C-protecting and C- activating groups	Factors affecting enzyme action	Concept of heredity: Genetic Code
S-15	SLO-1	Disaccharides – Structure elucidation of maltose	Amino acids and its classification	Synthesis of peptides using N- protecting, C-protecting and C- activating groups	Coenzymes and cofactors (NAD, FAD)	Concept of heredity: Replication
	SLO-2	Disaccharides – Structure elucidation of maltose	Amino acids and its classification	Solid-phase synthesis	Coenzymes and cofactors (NAD, FAD)	Concept of heredity: Replication
S 16	SLO-1	Disaccharides – Structure elucidation of lactose	a-Amino Acids – Synthesis	Solid-phase synthesis	Coenzymes and cofactors (NAD, FAD)	Concept of heredity: Transcription
3-10	SLO-2	Disaccharides – Structure elucidation of lactose	a-Amino Acids – Synthesis	Solid-phase synthesis	Coenzymes and cofactors (NAD, FAD)	Concept of heredity: Transcription
S-17	SLO-1	Disaccharides – Structure elucidation of sucrose	a-Amino Acids – Synthesis	Solid-phase synthesis	Specificity of enzyme action (including stereospecificity)	Concept of heredity: Translation
	SLO-2	Disaccharides – Structure elucidation sucrose	a-Amino Acids – Synthesis	Solid-phase synthesis	Specificity of enzyme action (including stereospecificity)	Concept of heredity: Translation
S-18	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
5-10	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session

		Theory	4.	Finar, I.L. Organic Chemistry, Volume 2, Fifth Edition, Pearson Education, 2008
	1	Dera IM Tumpazka II. and Stavar I. Disabamistav VIth Edition W/H. Ercoman and Co. 2006	5.	P. Y. Bruice, Organic Chemistry, 5th Ed., Pearson, 2014.
Loorning	1.	Derg, J.M., Tymouzko, J.L. and Suyer, L. Diourennistry. Viul Educin. W.H. Freeman and Co.	6.	Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt.
Descurees	Ζ.	Nelson, D.L., Cox, M.M. and Lenninger, A.L. Finicipies of Diochemistry. IV Edition. W.H. Freeman and Co.,	'	Ltd.(Pearson Education).
Resources	2	2009 Murroy D.K. Cronner, D.K. Neuse, D.A. and Deducil V/W/ Herner's Illustrated Dischemistry, VV/VI	, 7.	Kemp, W. Organic Spectroscopy, Palgrave
	з.	Mulldy, R.N., Glatiner, D.N., Mayes, P.A. and Rouwell, V.W. Harper's inustrated biochemistry. XXVIII	8.	Spectrometric Identification of Organic Compounds By Robert M. Silverstein, Francis X.
		edilion. Lange medical Books/McGraw-Filli, 2009		Webster, David J. Kiemle, David L. Bryce

Learning	Assessment										
	Pleam'el aval of			Final Examination (50% woightage)							
Level	Thinking	CLA –	1 (10%)	CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4	4 (10%)#	Filial Examination (5	weiginage)
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Lovel 1	Remember	40		40		40		40		40	
Level I	Understand	40	-	40	-	40	-	40	-	40	
Lovel 2	Apply	20		20		20		20		20	
Level Z	Analyze		-		-		-		-	50	-
Lovol 3	Evaluate	30		30		30		30		30	
Level 3	Create	50	-		-	50	-	50	-	50	-
	Total	100	0 %	10	0 %	10	0 %	10	0 %	100 %	1

Course Designers										
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts								
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST								
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2.Dr. Gopal Chandru Senadi, SRMIST								

Course		Course		natrumental Matheda of Chemical Analysia	Co	urse		~	D Discipline Specific Elective				Р	C									
Code	001200000	Name	1	Istrumental methods of Chemical Analysis	Cate	egory	'	U						4	0		4	6					
Pre-requ	isite			Co-requisite		Prog	ressi	Ve															
Course	es Nil			Courses		Co	urses		Nil														
Course Off	ering Department	Chemis	stry	Data Book / Codes/Standa	rds N	lil																	
Course Lea (CLR):	arning Rationale	The pu followi	urpose of lear ing concepts::	ning this course is to make students aware about the		Le	arnir	g					I	Progra	am Le	arnin	g Ou	tcom	es (F	PLO)			
CLR-1 :	Knowledge of ar Infrared, UV, Vis	alytical dat	ta analysis an ar IR and Mas	nd classification of analytical methods. Basic components spectrophotometer.	nts in	1 2	2	}	1	2	3	4	5 6	6 7	8	9	10	11	12	13	14		15
CLR-2 :	Advantages of F and issues regar	ourier-Tran ding quality	nsform Infrare v assurance a	d (FTIR) and NMR spectroscopy. Portable instrument	ation																		
CLR-3 :	Single and Dou fluorescence and	ible Beam I the use of	instruments time, photoa	Interpretation like quantification, mixtures, absorption ccoustic, fluorescent tags.	i vs.																		
CLR-4 :	To unravel the s	pectrum of o	organic chem	istry and the extent of organic transformations.					Ð			ЧĊ		bilit									
CLR-5 :	Separation techr	niques like (Chromatograp	hy, Electrophoresis and DNA techniques			0/ /0/	0	be		nt	sea		ina		Ł		e					
CLR-6 :	Elemental analys spectroscopy.	sis, Electroa	analytical Met	thods, Radiochemical Methods, X-ray analysis and ele	ctron	ng (bid			Anowle	sis	lopme	jn, Re	sage	Susta		am W	۲	Financ	puir				
Course Lea	arning Outcomes	At the o	nd of this cou	rsa, laamars will be able to:	of Thinki			יובח עוומו	amental	em Analy	n & Deve	sis, Desiç	rn Tool U	nment &		dual & Te	nunicatio	st Mgt. &	ong Lear	÷	- 2		ε Γ
(CLO):		At the er				Level		LAPG	Funda	Proble	Desig	Analy	Mode	Enviro	Ethics	Individ	Comn	Proje	Life L	PSO.	PSO.		PSO
CLO-1 :	How to handle A	nalytical da	ta. Basic Con	nponents of IR, FTIR , UV-Visible and Mass spectrome	er. 2	2 7	5 6	0	Н	Н	Н	-			-	-	-	-	-	М	Н		-
CLO-2 :	Interpretation of	IR, FTIR, U	V-visible spec	ctra and their applications.	2	28	0 7	0	-	Н	-	Н	-		-	-	-	-	-	-	Н-		Н
CLO-3 :	Signal detections	s in photoce	ells, photomul	tipliers, etc. Use of single and double beam instruments	. 2	2 7	0 6	5	<u>H</u> H M							-							
CLO-4 :	Separations tech	niques like	Chromatogra	phy, DNA techniques.	2	2 7	0 7	70 <u>H</u> - <u>H</u> <u>H</u> <u>H</u> - <u>-</u> - <u>-</u> - <u>-</u> <u>H</u>						-									
CLO-5 :	Mass spectra an	d its applica	ations.		2	<u>2 80 70</u> <u>- H - H H</u>						Н											
CLO-6 :	Elemental analy analysis and ele	sis, NMR s ctron spectr	spectroscopy, roscopy.	, Electroanalytical Methods, Radiochemical Methods,	X-ray	2 7	5 7	0	-	-	-	-	-		-	-	-	-	-	-	М		Н

Duration (hour)		24	24	24	24	24
		Introduction to analytical methods of data analysis	UV-Visible/ Near IR Spectroscopy		Elemental analysis	
64	SLO-1	Treatment of analytical data, including error analysis	Emission	Detection: simple vs. specific (gas and liquid)	Mass spectrometry (electrical discharges)	Electroanalytical Methods: Potentiometry
5-1	SLO-2	Treatment of analytical data, including error analysis	Absorption	Detection: simple vs. specific (gas and liquid)	Mass spectrometry (electrical discharges)	Electroanalytical Methods: Potentiometry
S-2	SLO-1	Classification of analytical methods	Fluorescence	Detection as a means of further analysis (use of tags and coupling to IR and MS)	Atomic spectroscopy: Atomic absorption	Electroanalytical Methods: Potentiometry

Durat	ion (hour)	24	24	24	24	24
	SLO-2	Classification of analytical methods	Photoaccoustic	Detection as a means of further analysis (use of tags and coupling to IR and MS)	Atomic spectroscopy: Atomic absorption	Electroanalytical Methods: Potentiometry
S-3	SLO-1	The types of instrumental methods	Excitation sources (lasers, time resolution)	Electrophoresis (plates and capillary) and use with DNA analysis	Atomic spectroscopy: Atomic emission	Electroanalytical Methods: Voltammetry
0-0	SLO-2	The types of instrumental methods	Excitation sources (lasers, time resolution)	Electrophoresis (plates and capillary) and use with DNA analysis	Atomic spectroscopy: Atomic emission	Electroanalytical Methods: Voltammetry
S.4	SLO-1	Consideration of electromagnetic radiations	wavelength dispersion (gratings, prisms, interference filters, laser, placement of sample relative to dispersion, resolution)	Immunoassays and DNA techniques	Atomic spectroscopy: Atomic fluorescence	Electroanalytical Methods: Voltammetry
3-4	SLO-2	Consideration of electromagnetic radiations	wavelength dispersion (gratings, prisms, interference filters, laser, placement of sample relative to dispersion, resolution)	Immunoassays and DNA techniques	Atomic spectroscopy: Atomic fluorescence	Electroanalytical Methods: Voltammetry
	SLO-1	Lab Introduction	Study of Electronic Transitions in	Separation and identification of the	Determination of the isoelectric pH of a	Experiment-Repeat-2
S-5 to S-8	SLO-2		Organic Molecules (i.e., acetone in water)	monosaccharides present in the given mixture (glucose & fructose) by paper chromatography. Reporting the Rf values	protein	
		Infrared spectroscopy		Mass spectroscopy		
• •	SLO-1	Interaction of radiations with molecules	Detection of signal (photocells, photomultipliers, diode arrays, sensitivity and S/N)	Making the gaseous molecule into an ion (electron impact)	Excitation and getting sample into gas phase (flames, electrical discharges, plasmas)	Radiochemical Methods: Radiochemical Nuclides
2-9	SLO-2	Interaction of radiations with molecules	Detection of signal (photocells, photomultipliers, diode arrays, sensitivity and S/N)	Making the gaseous molecule into an ion (electron impact)	Excitation and getting sample into gas phase (flames, electrical discharges, plasmas)	Radiochemical Methods: Radiochemical Nuclides
S-10	SLO-1	Absorption and scattering	Single and Double Beam instruments	Making the gaseous molecule into an ion (chemical ionization)	Wave length separation and resolution(dependence on technique)	Radiochemical Methods: Instrumentation
0-10	SLO-2	Absorption and scattering	Single and Double Beam instruments	Making the gaseous molecule into an ion (chemical ionization)	Wave length separation and resolution(dependence on technique)	Radiochemical Methods: Instrumentation
S 11	SLO-1	Means of excitation (light sources)	Interpretation (quantification, mixtures, absorption vs. fluorescence)	Making liquids and solids into ions (electrospray, electrical discharge)	Detection of radiation (simultaneous/ scanning, signal noise)	Radiochemical Methods: Neutron Activation Methods
3-11	SLO-2	Means of excitation (light sources)	Interpretation (quantification, mixtures, absorption vs. fluorescence)	Making liquids and solids into ions (electrospray, electrical discharge)	Detection of radiation (simultaneous/ scanning, signal noise)	Radiochemical Methods: Neutron Activation Methods
6 40	SLO-1	separation of spectrum (wavelength dispersion, time resolution)	Interpretation (the use of time, photoaccoustic, fluorescent tags)	Making liquids and solids into ions (laser desorption, fast atom bombardment)	Interpretation (errors due to molecular and ionic species, matrix effects, other interferences)	Radiochemical Methods: Isotope Dilution Methods
3-12	SLO-2	separation of spectrum (wavelength dispersion, time resolution)	Interpretation (the use of time, photoaccoustic, fluorescent tags)	Making liquids and solids into ions (laser desorption, fast atom bombardment)	Interpretation (errors due to molecular and ionic species, matrix effects, other interferences)	Radiochemical Methods: Isotope Dilution Methods
S-13	SLO-1					Experiment-Repeat-3

Duration (hour)		24	24	24	24	24
To		IR Absorption Spectra (Study of	Potentiometric Titration of a	Chromatographic separation of the	Cyclic Voltammetry of the	
5-16	SL0-2	Aldenydes and Ketones)	Chioride-Iodide Mixture	active ingredients of plants, flowers and juices by TLC	Ferrocyanide/Ferricyanide Couple	
			Separation techniques			
S-17	SLO-1	Detection of the signal (heat, differential detection)	Gas chromatography	Separation of ions on basis of mass to charge ratio, magnetic	NMR spectroscopy: Principle	X-ray analysis (surface analysis)
5-17	SLO-2	Detection of the signal (heat, differential detection)	Gas chromatography	Separation of ions on basis of mass to charge ratio, magnetic	NMR spectroscopy: Principle	X-ray analysis (surface analysis)
C 10	SLO-1	Interpretation of spectrum (qualitative, mixtures, resolution)	Liquid chromatography	time of flight	Instrumentation	X-ray analysis (surface analysis)
3-10	SLO-2	Interpretation of spectrum (qualitative, mixtures, resolution)	Liquid chromatography	Electric quadrupole	Instrumentation	X-ray analysis (surface analysis)
S-10	SLO-1	Advantages of Fourier-Transform Infrared (FTIR) spectroscopy	Importance of column technology (packing,capillaries)	Resolution, time and multiple separations	Factors affecting chemical shift	Electron spectroscopy (surface analysis)
0-13	SLO-2	Advantages of Fourier-Transform Infrared (FTIR) spectroscopy	Importance of column technology (packing,capillaries)	Resolution, time and multiple separations	Spin-coupling	Electron spectroscopy (surface analysis)
S-20	SLO-1	Applications: Issues of quality assurance and quality control	Separation based on increasing number of factors (volatility, solubility, interactions with stationary phase, size, electrical field)	Detection and interpretation	Applications	Electron spectroscopy (surface analysis)
5-20	SLO-2	Special problems for portable instrumentation and rapid detection.	Separation based on increasing number of factors (volatility, solubility, interactions with stationary phase, size, electrical field)	Detection and interpretation	Applications	Electron spectroscopy (surface analysis)
S 21	SLO-1	Determination of a Mixture of Cobalt	Quantitative Analysis of Mixtures	Titration curve of an amino acid	Experiment-Repeat-1	Demonstration Practical Session
to S-21 S-24	SLO-2	and Nickel (UV-visible spectroscopy)	by Gas Chromatography (i.e., chloroform and carbon tetrachloride)			Demonstration Practical Session

Learning Resources	 Principles of Instrumental Analysis - 6th Edition by Douglas A. Skoog, F. James Holler, and Stanle Crouch (ISBN 0-495-01201-7) Instrumental Methods of Analysis, 7th ed, Willard, Merritt, Dean, Settle P.W. Atkins: Physical Chemistry G.W. Castellan: Physical Chemistry C.N. Banwell: Fundamentals of Molecular Spectroscopy Brian Smith: Infrared Spectral Interpretations: A Systematic Approach W.J. Moore: Physical Chemistry 	 Practicals: Principles of Instrumental Analysis - 6th Edition by Douglas A. Skoog, F. James Holler, and Stanley Crouch (ISBN 0-495-01201-7) Instrumental Methods of Analysis, 7thed, Willard, Merritt, Dean, Settle. Y.R. Sharma, Elementary Organic Spectroscopy: Principles and Chemical Applications, 5th edition, S. Chand and company Ltd., Ram Nagar, New Delhi, 2010. D.A. Skoog, D.M. West and F.J. Holler, Analytical Chemistry: An Introduction, 5th edition, Saunders college publishing, Philadelphia, 1990
-----------------------	--	--

			Learn	ing Assess	ment							
	Dia ami'a		Conti	nuous Leari	ning Assessme	ent (50% we	ightage)					
	BIOOM S	CLA – 1 (10)%)	CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#		Final Examination (50% Weightage)		
	Lever or Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%	
	Understand											
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	
2010.2	Analyze	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	
Loval 3	Evaluate	10%	10%	150/	15%	15%	15%	15%	15%	15%	15%	
Level J	Create	1070	1070	1370	1370	1070	1370	1070	1370	1070	1576	
	Total	100 %		1(0 %	10	0 %	1(00 %		100 %	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Prof. M. Arthanareeswari, SRMIST
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. Gopal Chandru Senadi, SRMIST

Course Coo	le UCY	20D06J	C	ourse	Introduction To I	lanoch	emistrv	and Ar	plicatio	ıs			Course D Discipline Selective L T P C						C				
			r	Name									Cate	gory			E	lective		4	. 0	4	6
Pre-requ Cours	isite es				Co-requisite Courses	NIL								Progre Cou	essive rses	NIL							
Course Offe	ering Depar	tment		Chemistry				Data Bo	ook / Coo	les/Stai	ndards		Ν	IIL									
Course Lea (CLR):	nning Ratio	nale	The purpos	se of learning this co	urse is to:		Learnir	ing Program Learning Outcomes (PLO)															
CLR-1 :	To stimul nanochem	ate the istrv	e learner	in understanding	the basic conceptsof	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 : CLR-3 : CLR-4 :	To help the To help the To make ti SEM, TEM	e studen e studen hem und I andAFI	ts in synth tsn charac derstand P M	esizing th various n terizing the nanopar rinciples, instrument	anoparticles ticles 'ation and applications of										ţ								
CLR-5 :	To make nanopartic	them ur les	nderstand	the properties and	applications of various	Bloom)	cy (%)	nt (%)	vledge		nent	Research	θ		stainabilit		Work		ance				
Course Lea (CLO):	nrning Outco	omes ,	At the end	of this course, learn	ers will be able to:	Level of Thinking (Expected Proficien	Expected Attainme	Fundamental Knov	Problem Analysis	Design & Developr	Analysis, Design, H	Modern Tool Usag	Society & Culture	Environment & Sus	Ethics	Individual & Team	Communication	Project Mgt. & Fina	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Understan	d the ba	sic concep	ts and classification	of nanomaterials.	2	70	65	Н	-	Н	-	-	-	-	-	-	-	-	-	Н	-	-
CLO-2 :	Study the of of nanomat	common erials.	properties	s and size dependen	t absorption behavior	2	80	70	Н	-	-	Н	Н	-	-	-	-	-	-	-	Н	-	-
CLO-3 :	Demonstra	te the pl	hysical and	d chemical synthetic	routes of nanomaterilals.	2	75	60	-	Н	-	-	-	-	-	-	-	-	-	-	-	Н	М
CLO-4 :	Analyze the catalysis,p	e applica hotonics	ation of nai s, and med	nomaterials in variou icine.	us fields including	2	70	70	Н	Н	-	Н	-	-	-	-	-	-	-	-	-	Н	-
CLO-5 :	Characteria	ze the na	anomateria	als using various mic	croscopic techniques.	2	80	70		Н	Н	-	-	-	-	-	-	-	-	-	-	Н	М
CLO-6 :	Understan	d the me	echanism c	of synthesis of nanop	particles	2	75	65	Н	H	H	H	Н	-	-	-	-	-	-	-	H	-	-
			earning N	Module	Learning M	Iodule				l earnii	na Mod	ule			Lea	rnina I	Aodule			Lea	rnina l	Aodule	

		Learning Module	Learning Module	Learning Module	Learning Module	Learning Module
		1	2	3	4	5
Dura	tion (hour)	24	24	24	24	24
	SLO-1	Introduction to nanoscience nanostructure	Size dependent properties of	Thermal properties	Characterization Techniques of	ICP-AES (Atomic Emission
S-1	SLO-2	and nanotechnology	nanomaterials:uniqueness in these properties compared to bulk and microscopic solids		Nanomaterials: Basic principles and applications of UV-Vis-NIR,	Spectroscopy)
6.2	SLO-1	Properties of nanomaterials	Quantum confinement	Catalytic properties	FTIR	Atomic Force Microscopy
3-2	SLO-2				FT-Raman	(AFM).
S-3	SLO-1	Particle size	Electrical Properties:Properties, Electronic materials, Band structures	Synthesis of Nanomaterials: Top-down and Bottom-up approaches	Photoluminescence	Applications of Nanomaterials: Catalysis on nanoparticles

		Learning Module	Learning Module	Learning Module	Learning Module	Learning Module				
		1	2	3	4	5				
Durat	ion (hour)	24	24	24	24	24				
	SLO-2	Particle shape			NMR	semiconductors				
6.4	SLO-1	Particle density	Brillouin zones	self-assembly techniques of	ESR	sensors				
5-4	SLO-2	Specific surface area and pore	Hall effects	nanoparticles synthesis	Light Scattering methods	electronic devices				
	SLO-1	semiconducting nanoparticles	Magnetic and Dielectric properties: Brief	Solvothermal process	X – ray techniques: X-ray powder	photochemistry				
S-5	SLO-2	nanowires	review on Dia, Para, Ferromagnetic materials, Superparamagnetism and limitation		diffraction –Quantitative determination of phases	nanophotonics				
	SLO-1	nanoclusters	Important properties in relation to	Preparation of gold nanoparticles	particle size analysis using Scherer	applications of CNTs				
S-6	SLO-2	quantum wells	nanomagnetism	Preparation of silver metallic nanoparticles	formula					
S-7	SLO-1	LAB INTRODUCTION	Chemical synthesis of CdS nanoparticles;	Characterize the TiO ₂ nanoparticles	Synthesis of metal oxide nanoparticles	Characterisation of metal oxide				
TO S-10	SLO-2			using XRD and SEManalysis	by Chemical reduction method	nanoparticles byXRD and SEM analysis				
S-11	SLO-1	Synthesis of ZnOnanoparticles	UV absorption studies of CdS nanoparticles	measuring the crystallitesize	UV-VIS absorption studies	Determination of particle size				
ТО S-14	SLO-2									
S-15	SLO-1	Classification of the nano materials	Dielectric properties: Effect of particle size	self-assembled nanostructures	Particle Size Analyzer	Applications of				
0-13	SLO-2	zero dimensional, one dimensional	on dielectric properties			superconducting materials				
	SLO-1	Classification of the nano materials -two	Ferroelectrics	Control of nanoarchitecture	Ellipsometry	Organic superconductors				
S-16	SLO-2	dimensional and three dimensional nanostructures	Multiferroics							
S-17	SLO-1	Quantum dots	Optical Properties:	one dimensional control	thicknessmeasurements	nanomaterials in biology				
5-17	SLO-2	Nanowires	Photoconductivity							
S-18	SLO-1	Nanotubes	Optical absorption & transmission	Carbon nanotubes	X-Ray Photoelectron Spectroscopy,	medical field				
0-10	SLO-2	2D films	Optical absorption & transmission							
	SLO-1	Calculation of percentage of surface atom	Surface Plasmon resonance phenomena	Carbon nanotubes	Auger Electron Spectroscopy	environmental issue				
S-19	SLO-2	and surface to volume ratio of spherical, wire shaped nanoparticle	variation in colors (Blue shift & Red shift)							
S-20	SLO-1	Calculation of percentage of surface atom and surface to volume ratio of	optical properties of semiconductor nanoparticles	inorganic nanowires	Optical spectroscopy: Inductively coupled Plasma- mass spectroscopy	toxicity				
	SLO-2	rod, and disc shapes nanoparticles.	Photoluminescence		(ICP-MS)	biosafety and ethical issues.				
S-21	SLO-1	UV absorption studies of ZnO	Synthesis of TiO ₂ Nanoparticles by Sol-Gel	Synthesis of metal oxide nanoparticles	Synthesis of metal oxide nanoparticles	cles Synthesis of Hydroxyapatite by				
ТО S-24	SLO-2	nanoparticles	Method	by Sol-Gel Method	by Polyol method	Sol-gel method				

	Theory:	Practicals:
	1.C. N. R. Rao, A. Muller, A. K. Cheetam, The Chemistry of Nanomaterials:	1.Pradeep T., A text book of nanoscience and nanotechnology, Tata McGraw Hill Education Pvt. Ltd., New
1	Synthesis, Properties and Applications, Willey-VCH Verlag, Germany, 2005.	Delhi, 2012
Learning	2.G. Cao, Nanostructures and Nanomaterials: Synthesis, Properties and Appications,	
Resources	Imperial College Press, London, 2004	
	3.R.W.Kelsall, I.W.Hameley, M.Geoghegan, NanoscaleScience and Technology, John	
	Wiley & Sons, England,2005	

Learning A	ssessment													
			Cor	itinuous Leari	ning Assessme	nt (50% weig	htage)			Einal Examinati	(E0%) (weightage)			
	Bloom'sLevel of Thinking	CLA – 1 (10	%)	CLA –	2 (10%)	CLA –	3 (20%)	CLA –	4 (5%)#		on (50 % weightage)			
	_	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice			
Lovel 1	Remember	20%	20%	15%	15%	150/	15%	15%	15%	15%	15%			
Level I	Understand	2070	2070	1576	1370	1576	1370	1576	1578	1070	1576			
Lovol 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	2004	20%			
Level 2	Analyze	2070	2070	2070	2070	2070	2078	2070	2078	2070	2078			
Lovol 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%			
Level 5	Create	1070	1078	1576	1570 1570 1570 1570 157					1576 1576				
	Total	100 %		100 % 100 % 100 %						100 %				

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc. *Attendance includes 5% weightage in internals

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Dr. S. Rajeswari , SRMIST
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. T.Pushpamalini , SRMIST

Course		Course		Course	_		L	Τ	Ρ	С
Code	UCY20D07L	Name	Project Work	Category	D	Discipline Specific Elective	0	0	12	6

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil
Course Offering [Department	Chemistry			Data Book / Codes/Standards	Nil	

	Continuous Learning Assessmen	t (50% weightage)	Final Evaluation (5	0% weightage)
	Review – 1	Review – 2	Project Report	Viva-Voce
Project Work	20%	30 %	30 %	20 %

Cou Co	rse de	UCY20S05T	Course Name		Res	earch Methodology		Ca Ca	ourse ategoi	e ry	S		Skill Enhancement C							irse				L 2	T 0	P 0	C 2
Pre-	requisite ourses	• Nil			Co-requisite Courses	Nil			Prog	gress ourse	sive es	Nil															
Cours	e Offerin	g Department	Chemist	У		Data Book /	Codes/Standards	I	Vil			I															
Cours	e Learn	ing Rationale (Cl	LR): The pur	pose of learr	ing this course i	s to:			l	_earn	ning						Prog	ram L	.earni	ing O	utcon	nes (F	PLO)				
CLR-	: To	o understand the o	concept of res	search and d	ifferent types of r	research in the context of	f chemistry		1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2	2: To	o evaluate the diff	erent method	s of scientific	writing and repo	orting	ononnouy		<u> </u>	-	Ŭ	-	L.	-	J		Ū	,		Ŭ	Ū	10			10		
CLR-3): To	To impart the knowledge about the statistical distribution and applications														Ę.			lity								I
CLR-4	l: To	To develop the skill of technical writing										-	e		Ŧ	earc			labi		¥						I
CLR-	i: To	o inculcate the kno	ulcate the knowledge of intellectual property and rights									-	ledo		nen	Sese	e		stair		No		ance				I
Course Learning Outcomes (CLO): At the end of this course, learners will be able to:									Level of Thinking	Expected Proficie	Expected Attainm	-	FundamentalKnov	Problem Analysis	Design & Develop	Analysis, Design,	Modern Tool Usaç	Society & Culture	Environment & Su	Ethics	Individual & Team	Communication	Project Mgt. & Fin	Life Long Learninç	PSO - 1	PSO - 2	PSO – 3
CLO-	l: l	Understand the ke	ey areas of re	search					2	70	0 65	i	Н	-	Н	-	-	-	-	-	-	-	-	-	Н	-	-
CLO-2	2: [Develop laborator	y experiment	related skills					2	80	0 70	1	Н	-	-	Н	Н	-	-	-	-	-	-	-	-	Н	М
CLO-	B: [Develop competer	nce on data c	ollection and	process of scier	tific documentation			2	75	5 60	1	-	Н	-		-	-	-	-	-	-	-	-	-	Н	Н
CLO-4	1: l	Understand the re	esearch ethics						_	_		_														H	
CLU-): (Submit proposais	tor lunding a	jencies																						Π	
Du (ł	ration nour)		6			6		6							6								6	;			
	SLO-1	Objectives of re	esearch		Citation indices	i	Basic statistical dist	tributi	on-ap	plicat	tions	Crea	tivity i	n res	earch	– Ba	sic id	lea		Ethic	s in re	esear	rch - a	autho	rs		
S-1	SLO-2	Introduction ab	out research		Principles unde	rlying impact factor	Basic statistical dist	tributi	on-ap	plicat	tions	Crea	tivity i	n res	earch	- Exp	lana	tion		Acko	wledg	geme	nt				
• •	SLO-1	types of resear analytical	rch-Descriptiv	e vs	Library researc	h, field research	Sample test - Stud	ent –	-test	, F- te	est	Good	d prac	ticals	– Un	its, nı	umbe	rs		Grou	p diso	cussio	on on	ethic	s in r	resea	rch
5-2	SLO-2 types of research -applied vs fundamental Laboratory research κ² test											Repr	oduci	bility						Outco	ome	of gro	up di	scuss	sion		
6.2	SLO-1	types of resear qualitative	rch- quantitati	ve vs	Data collection laboratory reco	– Maintaining a rd	Modelling skills					Scier	ntific v	vriting	j - Abl	brevia	ations	6		Plagi	arism	1					
3-3	SLO-2	types of resear empirical	rch- conceptu	al vs	Tabulation and	generation of graphs	Static Model					nome	enclat	ure						Tools	s to a	void p	olagia	rism			
SLO-1 Research methods and methodologies- Basic statistical distribution Dynamic Mod						Dynamic Model					Writi	ng ref	erenc	es					Propo agen	osal s cies	submi	issior	n for fi	undin	g		
S-4 BLO-2 Research methods and methodologies Binomial distribution Limitations					Limitations Research report writing Knowledge of					e of fi	undin	g age	encies	S													

Duration (hour)		6	6	6	6	6
S-5	SLO-1	Literature-review	Poisson distribution	Technical writing	Presentations - Power-point presentation.	Intellectual property
0-0	SLO-2	Consolidation of Literature-review	Normal distribution	Activity in Technical writing	Posterpresentation	Intellectual property rights
	SLO-1	Online databases	Exponential distribution	Technical presentation	Elements of excellent presentation	Copy rights
3-0	SLO-2	Search tools	Geometric distribution	Activity in Technical presentation	Communication skills	Patent rights

Dawson, C.. Practical research methods. UBS Publishers, New Delhi, 2002 1. Learning 2. Walpole R.A., Myers R.H., Myers S.L.and Ye King: Probability and statistics for engineers and scientist, Pearson Prentice Hall, Pearson Education, Inc. 2007 Resources

3. Kothari C.K., Research Methodology-Methods and Techniques(New Age International, New Delhi), 2004

			Learn	ing Assessn	nent								
			Cor	itinuous Leari	ning Assessme	ent (50% weig	htage)			Einal Examinati	on (50% weightage)		
	Bloom'sLevel of Thinking	CLA – 1 (10	%)	CLA – 2 (10%)		CLA – 3 (20%)		CLA –	4 (10%)#		on (50 % weightage)		
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Lovel 1	Remember	400/		200/		200/		200/		200/			
Level I	Understand	40%		30%		30%		30%		30%			
Lovel 2	Apply	100/		10%		10%		10%		100/			
Level 2	Analyze	40%		40%		40%		40%		40%			
Laval 2	Evaluate	2007		2007		200/		200/		2007			
Level 3	Create	20%		30%		30%		30%		30%			
	Total 100 % 100 %									100 %			

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc. *Attendance includes 5% weightage in internals

Course Designers										
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts								
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Dr. T.Pushpa Malini,, SRMIST								
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. S. Rajeswari								

Cou Co	rse de	UCY20S06T	Course Name		Chemistry in Everyday Life		Cou Cate	urse gory	s			Ş	Skill E	nhan	ceme	ent Co	ourse	•			L 2	T 0	P 0	C 2
	Pre-req	uisite Courses	Nil		Co-requisite Courses Nil			Pro	gress	ive Cour	ses		Nil											
Cours	e Offer	ing Department	Chemisti	у У	Data Book /	Codes/Standards	Vil																	
Cours	e Learr	ning Rationale (Cl	LR): The pur	pose of lean	ning this course is to:			Lea	rning					Pro	gram	ı Leai	rning	Outo	omes	s (PL)	(PLO)			
CLR-1	: T	o familiarize the st	tudents on ch	emistry in ev	veryday life		1	2	3	1	2 3 4 5 6 7				7	8	9	10	11	12	13	14	15	
CLR-2	: T	o gain necessary	details and in	formation re	ated to preparation of cosmetic items																			
CLR-3	: T	o know about the	health hazard	is of the cos	metic items and food colors		-									~								
CLR-4	:	o understand the	properties of I	tood compos	sition and adulterants in food				_				ch			bilit								
CLR-	: 1	o understand the	concept of typ	bes of fibre b	lodegradable polymers			%	%)	dge	•	ţ	sea			ina		ъ,		e				
Cours (CLO)	e Learr :	ning Outcomes	At the end	l of this cour	se, learners will be able to:		Level of Thinking (B	Expected Proficienc	Expected Attainmen	FundamentalKnowle	Problem Analvsis	: Design & Developm	Analysis, Design, Re	Modern Tool Usage	Society & Culture	Environment & Sust	Ethics	Individual & Team V	Communication	Project Mgt. & Finar	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1	: A	Apply the knowledg	e gained to g	enerate horr	ne made products like soap and camphor t	tablets	2	70	65	Н	-	Н	-	-	-	-	-	Z U g Outcomes (PLO) 9 10 11 12 13 y 10 10 10 10 y 10 1 1 10 y 10 1 1 1 1 y 10 1 1 1 1				-	-	
CLO-2	2: A	bility to identiy the	adulterants p	present in re	gular food items		2	80	70	Н	-	-	Н	Н	-	-	-	· H			H	-		
CLO-3	5: L	Inderstand the haz	ards of food	colors and it	s real life implications		2	/5	60	-	Н	-	-	-	-	H	-	-	-	-	-	-	H	-
CLO-4	1: A	Application of vario	us food prese	ervation tech	niques	Ale a Rode a constant	2	/5	70	H	-	Н	-	-	-	Н	-	Н	-	-	Н	H	H	
CLU-:):	ne students will be	e able to unde	erstand the in	riponance and benefits of antioxidants to	the living system	2	75	70	п	-	-	-	-	п	-	-	-	-	-	-	п	п	IVI
Du (h	ration our)		6		6	6	6 6						6											
6.1	SLO-1	Cosmetics: Intro	oduction		Definitions and sources – Carbohydrates	Food preservatives- examples	Definiti	on-		Signifi living s	cance syste	e of Ra n	adical	chem	istry i	n	Fib	ers: r	natura	l fiber	ſS			
3-1	SLO-2	2 Cosmetics: Pre Powder-	paration of Ta	alcum	Definitions and sources - Carbohydrates	methods of preserva temperature-	tion-Lo	w and	high	Radica	al pro	ductio	n in er	nviron	ment		and	d artif	icial fi	bers				
6.2	SLO-1	Preparation of s	shampoo		Definitions and sources - proteins -fats	methods of preserva osmotic pressure	tion-de	hydrat	tion-	superc	oxide	and p	eroxid	е			arti	ficial	fibers	- pol	yamid	es		
3-2	SLO-2	2 Preparation of t	ooth paste		Definitions and sources - proteins -fats	methods of preserva irradiation	tion- fo	od		superc	oxide	and p	eroxid	е			acr	ylic a	cid					
S-3	SLO-1	Preparation of	Nail Polish		Definitions and sources - minerals	Food colour chemicals used in food - soft drinks and its health hazards Health impacts Action of radicals				PV	С													
3-3	SLO-2	Preparation of I	Perfumes		Definitions and sources – vitamins	tamins chemicals in food production Diseases caused by free radicals				PV	A													
	SLO-1	Cottage industr	ies: agarbatti		physiological importance-balanced diet.	fertilizers used in na	tural so	ources		cance	r Rad	ical qu	enche	ər			Ex pol	ampl ymer	es of i s-	natura	al biod	legra	dable	,
S-4	SLO-2	2 Cottage industr	ies: agarbatti		physiological importance-balanced diet	fertilizers used in nat	ural so	urces		Anti-o	kidan	ts.				cellulose, cellulose acetate, cellopha soy protein, corn, zein protein, whea gluten protein,		ane, at						

Du (uration hour)	6	6	6	6	6
	SI 0-1	Soaps and detergents -General	Adulterants in milk – ghee – oil -	fertilizers-urea- NPK and super	Natural anti-oxidants like vegetables,	synthetic
6 5	010-1	formulations and preparation	identification	phosphates need -uses and hazards	beverages like tea and coffee, fruits	biodegradable polymers
3-5	8102	Soaps and detergents -General	Adulterants in coffee powder - tea -	fertilizers-urea- NPK and super	Natural anti-oxidants like vegetables,	synthetic
	310-2	formulations and preparation	identification	phosphates need -uses and hazards	beverages like tea and coffee, fruits	biodegradable polymers
	SI 0-1	Possible Hazards of cosmetic use.	Adulterants in asafoetida - chilli nowder	Pesticides -definition and examples	Radical destroying enzymes:	Lise of polymeric materials in daily life
8-6	010-1		Additerants in asaloetida - chilli powder	r esticides –definition and examples	superoxide dismutase	Ose of polymene materials in daily life
0-0	81.0.2	Possible Hazards of cosmetic use.	Adulterants in pulses and turmeric	Postigidas definition and examples	Radical destroying enzymes: catalase,	Lico of polymoria materials in daily life
	310-2		powder - identification	resucides –delinition and examples	peroxidase	Ose of polyment materials in daily life

Looming	1	.Poucher, W.A., Perfumes, Cosmetic and Soaps (Vol 3),10th edition.	4.	Bagavathi Sundari . K.,
Learning	2.	Vermani, O. P., A. K. Narula Industrial Chemistry Galgotia Publications Pvt. Ltd., New Delhi.	5.	Lillian Hoagland Meyer
Resources	3	Berg J. M., Tymoczeko J. L., Stryer I. Biochemistry, W. H. Freeman, 2008	6	V. R. Gowariker, N. V.V

, Applied chemistry - MJP Publishers, New Delhi. 2006. :, Food Chemistry , CBS publishes & distributors. 2004. /iswanathan, J. Sreedhar, Polymer science, New Age, International.

			Learn	ing Assessn	nent						
	Diagon's		Co	ntinuous Lear	rning Assessme	ent (50% weig	htage)			Einel Exemination	(EQ)(weightege)
	BIOOITI S	CLA – 1 (10%)	CLA -	- 2 (10%)	CLA -	3 (20%)	CLA –	4 (10%)#		on (50% weightage)
	Level of Thinking	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Lovel 1	Remember	100/		200/		200/		200/		200/	
Level I	Understand 40%					30%		30%		30%	
Lovel 2	Apply	400/		400/		400/		400/		400/	
Level Z	Analyze	40%		40%		40%		40%		4070	
Loval 3	Evaluate	20%		30%		30%		30%		30%	
Level 3	Create	2076		30%		30%		30%		30%	
	Total	100 %	0	1(00 %	10	0 %	10	00 %	10	00 %
# CLA – 4	can be from any combination or	f these: Assignments, S	eminars, Tech Ta	ılks, Mini-Proj	jects, Case-Stu	dies, Self-Stu	dy, MOOCs, C	ertifications,	Conf. Paper et	C.,	
Course De	signers										
Experts fro	om Industry			Exp	erts from Highe	er Technical Ir	stitutions			Internal Experts	
1. Dr. Suda Ltd,sudars	arshan Mahapatra, Encube Eth han.m@encubeethicals.com	iicals Pvt.		1.	Prof. G. Sekar,	IIT Madras, g	gsekar@iitm.a	c.in		1. Prof. M. Arthanareeswar	i, SRMIST
2. Dr. Sha	nmukhaprasad Gopi, Dr. Redd	y' s Laboratories,		0							от.
abanmukh	anragada@drraddyg.aam			2.	Prot. Vivek Pol	snettiwar, Th	·R Mumbal, VIV	/ekpoi@tifr.re	s.in	Z. Dr. M.R.Ganesh , SRMIS	51

shanmukhaprasadg@drreddys.com

Course Code	UCI	(20A03J	Course Name			Allie	d Cher	nistry			Course Category				G	Ge	eneric e	lective	Course	L 4	Т 0	P 4	C 6
Pre-r	equisite C	Courses	NIL		Co-requ	isite Co	ourses	1	NIL				Р	rogres Cours	sive es	NIL							
Course Offer	ring Depar	rtment	Chemistr	у				Data E	Book / Coo	es/Stand	ards		NIL										
Course Learn Rationale (Cl	ning LR):	The purpo	se of learning	g this course is	to:	L	earnin	9						Prograr	n Learn	ing Out	comes ((PLO)					
CLR-1 :	Make students understand the nature of Chemical Bonding compounds						2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Provide basic knowledge about the chemistry of hydrogen, silico other metals																						
CLR-3 : CLR-4 :	Make aware of the fuels, fertilizers and other detergents Understand the basic principles of chemical kinetics														~								
CLR-5 :	Study the	concepts in elec	ctrochemistry	/		(moc	(%)	(%)	edge		ut	search			inabilit		ork		e				
						BIG	sucy	nent	lowle	(0	bme	Re	age	0	usta		Ň		nanc	b			
Course Learr Outcomes (C	ning CLO):	At the end	of this cours	e, learners will l	be able to:	Level of Thinking	Expected Proficie	Expected Attainn	Fundamental Kr	Problem Analysis	Design & Develo	Analysis, Design	Modern Tool Use	Society & Culture	Environment & S	Ethics	Individual & Tear	Communication	Project Mgt. & Fi	Life Long Learnir	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Gain know	vledge on the b	asic fundame	entals in organi	c chemistry.	2	2	75	ŀ	H	Н	Ĥ	-	-	-	-	-	-	-	-	Н	-	-
CLO-2 :	Acquire k	nowledge about	t hydrocarbo	n and their reac	tions.	2	2	80		-	Н	-	Н	-	-	-	-	-	-	-	Н		
CLO-3 :	Promote th	ne importance o	of silicon and	metals.		2	2	70	F	H	-	-		-	-	-	-	-	-	-	-	М	
CLO-4 :	Understand the facts in chemical kinetics and photochemistry.					2	2	70	F	H	- -	Н	H	Н	-	-	-	-	-		H		-
CLO-5 .	Acquire kn	owledge in the	principles of	electrochemistry	v	2	2	75		-	-	-	<u>- </u>						-				
020 01	/ loquito tui	ioniougo in the			J	-	-	10															
		Lea	rning Modul	e	Learnir	ng Mod	ule			Learı	ning Mo	dule			L	earning	g Modu	le		Learning Module			
1				2					3	4			5										
Duration (hour) 24				24 24						24				24									

Duration (hour)		24	24	24	24	24
S-1	SLO-1	Introduction of Hybridisation and Isomerism: Hybridisation - sp, sp ² and sp ³	Chemical Kinetics:Rate of reaction	Gobar gas and natural gas	Chelation	Electrochemistry:Faradays laws of electrolysis
	SLO-2	Bond length- bond angle- dipole moment	order- molecularity		Industrial applications	-
S-2	SLO-1	inductive effect- mesomeric effect and hyperconjucation	first order rate law and simple problems	Fertilizers –NPK and mixed	Industrial Chemistry: Hardness of water – Temporary and permanent hardness	Specific conductance, equivalent conductance
	SLO-2	Isomerism- geometrical and optical isomerism	Half-life period of first order reaction	soaps and detergents.	disadvantages of hard water	Cell constant

		Learning Module	Learning Module 2	Learning Module	Learning Module 4	Learning Module 5
Durat	ion (hour)	24	24	24	24	24
	SLO-1	optical activity- asymmetry- dissymmetry	pseudo first order reaction	Carbohydrates, Benzene and Heterocyclic Compounds:Classification of carbohydrates	Boiler scales and sludges	Arrhenius theory of electrolytic dissociation
S-3	SLO-2	elements of symmetry- R, S notations.	zero and second order reactions			Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Molar conductivity at infinite dilution
S-4	SLO-1	LAB INTRODUCTION	Estimation of FAS using standard oxalic	Estimation of Zn/Mg	Estimation of K ₂ Cr ₂ O ₇ using	Determination of Molecular
TO S-8	SLO-2		acid		decinormal solution of Sodium thiosulphatesolution	Weight of a Polymer
6.0	SLO-1	Hydrocarbons: Methods of preparation of alkanes	Arrhenius and collision theories	Properties and uses of glucose and fructose	Softening of hard water – Zeolite process	Ostwald"s dilution law
3-9	SLO-2	Properties - Reactions		mutarotation	demineralization process	Kohlrausch law of independent migration of ions
0.40	SLO-1	Free radical mechanism of halogention of alkanes	Arrhenius and collision theories	Chemistry of benzene	reverse osmosis	Nernst equation
5-10	SLO-2	Methods of preparation of alkenes	Arrhenius and collision theories	Preparation	Purification of water for domestic use	Standard electrode (reduction) potential and its
S-11	SLO-1	Stereochemistry of dehydrohalogenation (E1, E2, E1CB mechanism)	Industrial Chemistry:Introduction-Fuel gases	Mechanism of electrophilic substitution reactions	use of Chlorine	application to different kinds of half-cells.
	SLO-2	Properties of alkenes, Electrophilic and nucleophilic addition mechanisms.			Ozone and UV light	
S-12	SLO-1	Estimation of NaOH using standard	Estimation of EAS using standard	Estimation of ascorbic acid	Estimation of Copper using	Conductometric Titrations- II
TO S-15	SLO-2	sodium carbonate	potassium dichromate		decinormal solution of Potassium dichromate solution	(KClvs AgNO₃)
S-16	SLO-1	Estimation of HCI using standard oxalic	Estimation of KMnO4using standard	Estimation of phenol / aniline	Estimation of Nickel using	Potentiometric Titration
TO S-20	SLO-2	acid	potassium dichromate		decinormal solution of EDTA	(Redox Titrations)
S-21	SLO-1	Chemistry of Hydrogen, Silicon and Metals: Occurrence- extraction of iron-	Water gas	Heterocyclic compounds– Preparation of pyrrole and pyridine.	Phase Rule and Adsorption: Phase rule- Definition of terms	Electromotive force of a cell and its measurement
	SLO-2	cobalt- nickel and copper		Propertiesofpyrrole and pyridine.	involved	
S-22	SLO-1	chemical properties of iron- cobalt-		Coordination Chemistry:Nomenclature and	phase diagram of H ₂ O	Nernst equation; Standard
	SLO-2	nickel and copper		Isomerism of coordination compounds	phase diagram of Pb-Ag	electrode (reduction) potential
S-23	SLO-1	atomic hydrogen and isotopes of hydrogen	producer gas		isotherms	to different kinds of half-cells
	SLO-2	Preparation and structure of borazole		VB Theory		
S-24	SLO-1	Preparation and structure of borazole	LPG gas			

	Learning Module	Learning Module	Learning Module	Learning Module	Learning Module
Duration (hour)	24	2	24	24	24
SLO-2	SiO ₂ , SiC and SiCl ₄		Crystal field theories of octahedral, tetrahedral and square planar complexes	Principles of chromatography (Paper, TLC and column).	Application of EMF measurements in determining (i) free energy, enthalpy and entropy of a cell reaction, (ii) equilibrium constants

Learning Resources	1. 2. 3.	 R. Gopalan, Text Book of Inorganic Chemistry, 2nd edition, Hyderabad, Universities Press, (India), 2012. R.T. Morrison and R.N. Boyd, S. K. Bhattacharjee, Organic Chemistry, 7th edition, Pearson India, 2011. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, 35th edition, New Delhi ShobanLalNagin Chand and Co, 2013. 	1. 2.	 V.Venkateswaran, R.Veeraswamy, A.R.Kulandaivelu, Basic Principles of Practical Chemistry, 2nd edition, Sultan Chand and Sons, 1997. B.S. Furniss, A.J. Hannaford, P.W. G. Smith, A.R. Tatchell, Vogel's Text Book of Practical Organic Chemistry, 5th edition, Pearson Education, 2005.
-----------------------	----------------	---	----------	--

Learning A	ssessment												
			Cor	ntinuous Lear	ning Assessme	nt (50% weig	htage)			Einal Examinati	(E0%) (weightage)		
	Bloom'sLevel of Thinking	CLA – 1 (10	%)	CLA –	CLA – 2 (10%)		CLA – 3 (20%)		4 (5%)#		on (50 % weightage)		
	_	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
	Remember	200/	200/	150/	150/	150/	150/	150/	150/	150/	150/		
Level I	Understand	2076	20%	1376	1370	1576	1576	1370	1376	1370	1576		
	Apply	200/	200/	20%	20%	200/	20%	200/	20%	200/	200/		
Level 2	Analyze	2076	20%	20%	2076	20%	20%	20%	20%	2076	2078		
	Evaluate	100/	100/	150/	150/	150/	150/	150/	150/	150/	150/		
Level 5	Create	1070	10%	1370	1370	1370	1570	1370	1370	1370	15%		
	Total	100 %		10	00 %	10	0 %	10	0 %	100 %			

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. SudarshanMahapatra, EncubeEthicals Pvt. Ltd,sudarshan.m@encubeethicals.com	1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in	1. Dr.S.Rajeswari, SRMIST
2. Dr. ShanmukhaprasadGopi, Dr. Reddy' s Laboratories,	2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in	2. Dr. T.Pushpamalini, SRMIST
shanmukhaprasadg@drreddys.com		