## STUDY AND EVALUATION SCHEME

<b>B.Sc. INDUSTRIAL CHEMISTRY</b>	, 1 <sup>st</sup> year/ 1 <sup>st</sup> Semester
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S. N.	Course code	Course Title	Type of Paper	Pe hr/1	eriod P week/s	er sem P	СТ	Evaluat TA	ion Schen Total	ne ESE	Subject Total	Credit	Total Credit
					Tł	neories	5						
1.	LN104	Essential Professional Communication	Foundation Course	03	01	00	40	20	60	40	100	3:1:0	4
2.	MT108	Elementary Mathematics	Foundation Course	03	01	00	40	20	60	40	100	3:1:0	4
3.	CH103	Physical Chemistry- I	Core	03	01	00	40	20	60	40	100	3:1:0	4
4.	CH104	Inorganic Chemistry –I	Core	03	01	00	40	20	60	40	100	3:1:0	4
5.	CH105	Organic Chemistry-I	Core	03	01	00	40	20	60	40	100	3:1:0	4
					Pr	actical							
6.	CH106	Industrial Chemistry Lab-1	Core	00	00	08	40	20	60	40	100	0:0:4	4
Total	otal			15	05	08	240	120	360	240	600	24	24

# B.Sc. INDUSTRIAL CHEMISTRY, 1<sup>st</sup> year/ 2<sup>nd</sup> Semester

S. N.	Course code	Course Title	Type of Paper	Pe hr/	eriod P week/s	er sem		Evalua	tion Schei	me	Subjec t Total	Credit	Total Credit
				L	Т	Р	C T	T A	Total	ESE			
					T	neories	5						
1.	CS110	Basics of Computer	Foundation Course	03	01	00	40	20	60	40	100	3:1:0	4
2.	CH107	Environmental Pollution	Foundation Course	03	01	00	40	20	60	40	100	3:1:0	4
3.	CH108	Physical Chemistry-II	Core	03	01	00	40	20	60	40	100	3:1:0	4
4.	CH109	Inorganic Chemistry-II	Core	03	01	00	40	20	60	40	100	3:1:0	4
5.	CH110	Organic Chemistry- II	Core	03	01	00	40	20	60	40	100	3:1:0	4
					Pr	actical	1						
6.	CH111	Industrial Chemistry Lab-2	Core	00	00	08	40	20	60	40	100	0:0:4	4
Total				15	05	08	240	120	360	240	600	24	24

# B.Sc. INDUSTRIAL CHEMISTRY, 2<sup>nd</sup> year/ 3<sup>rd</sup> Semester

S. N.	Course code	Course Title	Type of Paper	Po hr/	eriod P /week/s	er sem	]	Evaluat	tion Scher	ne	Subjec t Total	Credit	Total Credit
				L	Т	Р	СТ	ТА	Total	ESE			
					T	heories	:						
1.	CH201	Industrial Aspects of Physical Chemistry	Core	03	01	00	40	20	60	40	100	3:1:0	4
2.	CH202	Industrial Aspects of Inorganic Chemistry	Core	03	01	00	40	20	60	40	100	3:1:0	4
3.	CH203	Industrial Aspects of Organic Chemistry	Core	03	01	00	40	20	60	40	100	3:1:0	4
4.	CH204	Materials & Energy Balance	Core	03	01	00	40	20	60	40	100	3:1:0	4
5.	CH205	Industrial Aspects of Microbiology	Elective	03	01	00	40	20	60	40	100	3:1:0	4
	CH206	Biochemistry	Elective										
					Pr	actical	l						
6.	CH207	Industrial Chemistry Lab-3	Core	00	00	08	40	20	60	40	100	0:0:4	4
Total				15	05	08	240	120	360	240	600	24	24

## B.Sc. INDUSTRIAL CHEMISTRY, 2<sup>nd</sup> year/4<sup>th</sup> Semester

S. N.	Course code	Course Title	Type of Paper	Period Per hr/week/sem			1	Evalua	tion Scher	me	Subjec t Total	Credit	Total Credit
				L	Т	Р	СТ	T A	Total	ESE			
					Tl	heories	5						
1.	CH208	Polymer Science	Core	03	01	00	40	20	60	40	100	3:1:0	4
2.	CH209	Medicinal Drugs Chemistry	Core	03	01	00	40	20	60	40	100	3:1:0	4
3.	CH210	Petro-chemicals	Core	03	01	00	40	20	60	40	100	3:1:0	4
4.	CH211	Agro-chemicals	Core	03	01	00	40	20	60	40	100	3:1:0	4
5	CH212	Industrial Waste Treatment	Elective	03	01	00	40	20	60	40	100	2.1.0	4
5.	CH213	Water treatment and analysis	Elective	03	01	00	40	20	00	40	100	5.1.0	t
					Pr	actica							
6.	CH214	Industrial Chemistry Lab-4	Core	00	00	08	40	20	60	40	100	0:0:4	4
Total				15	05	08	240	120	360	240	600	24	24

# B.Sc. INDUSTRIAL CHEMISTRY, 3<sup>rd</sup> year/ 5<sup>th</sup> Semester

S. N.	Course code	Course Title	Type of Paper	Pe hr/	eriod P week/s	er em		Evaluat	ion Scher	ne	Subjec t Total	Credit	Total Credit
				L		r	U	IA	Total	ESE			
	r			-	11	ieories					r		
1.	CH301	Chromatographic Techniques	Core	03	01	00	40	20	60	40	100	3:1:0	4
2.	CH302	Process in Organic Chemicals Manufacture	Core	03	01	00	40	20	60	40	100	3:1:0	4
3.	CH303	Phytochemistry	Core	03	01	00	40	20	60	40	100	3:1:0	4
4.	CH304	Unit Operations in Chemical Industry	Core	03	01	00	40	20	60	40	100	3:1:0	4
5.	CH305	Pulp, Paper, Leather and Textile Industry	Elective	03	01	00	40	20	60	40	100	3:1:0	4
-	CH306	Dyes	Elective										
					Pr	actical	1						
6.	CH307	Industrial Chemistry Lab-5	Core	00	00	08	40	20	60	40	100	0:0:4	4
Total				15	05	08	240	120	360	240	600	24	24

# B.Sc. INDUSTRIAL CHEMISTRY, 3<sup>rd</sup> year/6<sup>th</sup> Semester

S. N.	Course code	Course Title Type of Paper		Period Per hr/week/sem Evaluation Scheme							Subjec t Total	Credit	Total Credit
				L	Т	Р	C T	T A	Total	ESE			
					T	heories	5						
1.	CH308	Spectroscopic Techniques	Core	03	01	00	40	20	60	40	100	3:1:0	4
2.	CH309	Chemical Process Industry	Core	03	01	00	40	20	60	40	100	3:1:0	4
3.	CH310	Fundamentals of Food Chemistry	Elective	03	01	00	40	20	60	40	100	3:1:0	4
	CH311	Dairy Chemistry	Elective										
4.	CH312	Project Training (3 months)	Core	00	00	00	00	00	00	300	300	10	10
5.	CH313	Oral Presentation	Core	00	00	08	00	00	00	100	100	0:0:4	4
Total				09	03	08	120	60	180	520	700	26	26

CT= Class Test, TA= Teacher's Assessment, ESE= End Semester Examination; Sessional=CT+TA; Subject Total=Sessional+ESE; Total Credit=24+24+24+24+26= 146

#### \* The Evaluation scheme for the Industrial Training:

	Course Code	Dissertation	Presentation	Viva/Discussion	Total
Project & Training	CH312	200	50	50	300

# <u>SEMESTER-I</u>

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1. Name	of the Department: Mathematics										
2. Cours	e Name ELEMENTRY MATH	EMATICS		L			Т			P	
3. Cours	e Code MT108			3			1			0	
4. Type	of Course (use tick mark)			Core (	√)		DE ()		F	0	
5. Pre-re	equisite (ifany) +2 with Mathem	atics 6. Frequency (use tickmarks)	Even ()	Odd	(√)	Ei	ther Se	em ( )	E Se	very em ()	
7. Total	Number of Lectures, Tutorials, Practicals										
	Lectures = 30	Tutorials = 10				Praction	cal = Ni	il			
8. COUI topics ir	SE OBJECTIVES: The course is aimed to a troduced will serve as basic tools for spece	evelop the skills in mathematics, which is ialized studies in science field.	necessary for gro	ooming ther	n into s	succes	sful sci	ence gi	raduat	e. The	
9. COU After the	SE OUTCOMES (CO): successful course completion, learners w	ill develop following attributes:									
COURS (CO)		ATTE	RIBUTES								
(/	CO1 Apply Numerical ana	ysis which has enormous application in the	field of Science	and some fi	elds of l	Engine	ering.				
	CO2 Familiar with numer	cal solutions of nonlinear equations in a sing	gle variable.								
	CO3 Familiar with finite d	fference and different type interpolation te	chnique.								
	CO4 Familiar with calcula	ion and interpretation of errors in numerica	al method.								
	CO5 Familiar with statisti	al analysis.									
10. Unit	wise detailed content										
Unit-1	Number of lecture	s 08	and including fu	action of a	function	n diff	orontio	tion of	- noror	notria	
form sim	Limits and functions, demittion of differentiation		ons including ful	iction of a	runctio	n, anne	erentia	tion of	parar	netric	
Unit-2	Number of lecture	08									
Integratio	n: Integration as inverse of differentiatio	n, Indefinite integrals of standard form, Inte	eqration by parts	, substitutio	n meth	od and	d partia	al fract	ion me	thod.	
Evaluatio	of definite integrals.		5 51								
Unit-3	Number of lecture	08									
Statistics	Statistics:         Basic concepts of simple random sampling and atartified random sampling, measures of central tendency (mean, median and mode), measures of										
variation	variation (mean deviation and standard deviation). Covariance, Karl Pearson's Coefficient of Correlation. Regression, method of least squares.										
Unit-4 Number of lectures 08											
Permutat	on, Combination and Binomial Theorem	n: Fundamental principle of counting, Per	mutations, perm	nutations ur	nder cei	rtain c	onditio	ons. Co	mbina	tions,	
Combinat	orial identities. Binomial theorem (withou	t proof), some applications of Binomial the	orem.								
Unit-5 Probabili	Number of lecture	3 08	ility algobra of	overts ad	dition a	nd m	ultiplic	ution t	hooron	05.00	
probabili	(without proof) Binomial Poisson and	lormal distributions analysis	inty, algebra or	events, au	annon a		Intiplica		lieuren		
11 CO-P	) manning	iormal distributions dilarysis.									
COs		Attributes		Р	Р	Р	Р	Р	Р	Р	
				0	0	0	0	0	0	0	
	Apply Numerical analysis which has eno	mous application in the field of Science and	some fields of	1	2	3	4	5	6	/	
CO1	Engineering.			3	2	2	1	1	3	1	
CO2	Familiar with numerical solutions of nor	linear equations in a single variable.		2	2	2	1	1	2	2	
CO3	Familiar with finite difference and differ	ent type interpolation technique.		3	2	3	1	1	2	1	
CO4	Familiar with statistical analysis	ion of errors in numerical method.		3	2	3	1	1	3	2	
CO5	2 Strong contribution 2 Avor	age contribution 1 low contribution		3	2	1	1	1	2	1	
12 Brio	description of self-learning / E-learning	component									
1 httr	s://nptel.ac.in/content/storage2/nptel.d	ata3/html/mbrd/ict/text/111107105/lec6.n	df								
2. http	s://nptel.ac.in/content/storage2/courses	/122104018/node114.html									
3. http	s://nptel.ac.in/courses/111107062/										
4. http 5. http	s://www.yumpu.com/en/document/view	/8662778/derivation-of-runge-kutta-metho	od-nptel								
13. Book	s recommended: CO1, PO2, BT2										
1. Mur	ray R. Spiegel, 1980, Probability and Stati	tics, Schaum's (Outline Series) McGraw-Hill	Book Co.								
2. Q.S	Ahmad, V. Ismail and S. A. Khan: Biostati	stics, Laxmi Publications Pvt. Ltd.									
3. E.K	eyszig, "Advanced Engineering Mathema	ics", 5th Edition, Wiley Eastern, 1985.									
4. iviat 5. Hint	er Engineering Mathematics, B. V. Ramar	a. Tata McGraw Hill Publishers									
	5. Higher Engineering Mathematics, B. V. Ramana. Tata McGraw Hill Publishers										

1. Name of the	Department: Che	emistry									
2. Course Name	е	PHYSICAL CHEMISTRY-I				L		Т		F	P
3. Course Code		CH103				3		1		(	0
4. Type of Cour	se (use tick mark)	)				Core (√)	DE	0		FC ()	
5. Pre-requisite	;	10+2 with Chemistry	6. Frequency (use	Even (	0	Odd (v)	Eith	her Sem	0	Every Sen	n ()
(If any)	flasturos Tul	teriale Drestiaala	tick marks)								
7. Total Numbe	Y OF Lectures, rut	loriais, practicais	Tutoriale - 10		D	ractical -					
e course object		so of this undergraduate cour	$\frac{10001005 = 10}{10000000000000000000000000000000000$	ov know	To anhali	nhysical c	hamistry	Rv using	the nrine	inal of nh	veice and
mathematics to object into their re	otain quantitative espective dimensi	relations which are very implices.	portant for higher studies.	After s	successfu	lly comple	etion of c	ourse, th	ne studen	t will able	explore
9. COURSE OUT CO After the successfu	OMES (CO): Il course completi	ion learners will develop follo	owing attributes;								
COURSE OUTCOMI	E (CO)	ATTRIBUTES									
	CO1	Students would get insid temperature, pressure, a	de the sound knowledge ( amount, and volume.	of gas a	nd their	properties	s and exa	mine the	e relations	ships betv	veen gas
	<u>CO2</u>	Students would able to u	inderstand the interfacial	ohenom	ena and	behaviour	of colloid	lal system	ns.	·	
	03	Students would able to	ate definition of system, su	rrounau	ng, close	d and ope	n system,	extensiv	e and inte	ensive pro	perties.
	CO4	Enthalpy.	apply first law or thermot	Jynanic	Sanume	SS Idw Ui	neat sum	Mation c	inu perce	Ive the co	incept or
(	CO5	Students would able to u field of chemistry and inc	understand the basic defin dustry.	itions an	nd terms	in a phase	diagram	and imp	ortance o	f phase di	agram in
10. Unit wise deta	ailed content										
Unit-1	Num	iber of lectures = 08	Title of the unit: G	aseous	States						
Postulates of kinet State. PV isotherm constants, the law Joule Thompson ef	ic theory of gases is of ideal gases, of corresponding fect).	s and derivation of equation continuity of states, the isot states, reduced equation of s	for kinetic molecular theory therms of vander Waals estates. Root mean square,	ory of ga equation average	ases, dev ns, relations and mo	viation from onship bet ost probab	m ideal b tween cri le velocit	ehavior, itical con ies. Liqui	vander W stants an fication of	Taals equa d van der f gases (ba	ation of r Waals ased on
Unit-2	Num	ber of lectures =08	Title of the unit: Co	olloidal S	State						
Dispersion systems colloids, Emulsions	, Types and classi	fication of colloidal systems, P	reparation and purificatio	n of coll	oidal solu	utions, Pro	perties o	f colloida	al solution	s, Applica	tions of
Unit-3	Num	iber of lectures = 08	Title of the unit: Th	ermody	ynamics-	1					
Thermodynamic pr capacities at const expansion of ideal <b>Unit-4</b> Standard state, sta Enthalpy of neutral	rocess. Concept c ant volume and gases under isothe Num ndard enthalpy o lization. Bond diss	of heat and work. First Law of pressure and their relationsh ermal and adiabatic conditions iber of lectures = 08 If formation - Hess's Law of he sociation energy and its calcula	of Thermodynamics: State hip, Joule-Thomson effect s for reversible process. Title of the unit: The eat summation and its app ation from thermo-chemic	ment, de and inv iermoch lications al data,	efinition version t nemistry s. Heat o temperat	of interna emperaturna f reaction ture deper	al energy re. Calcul at constandence of	and ent ation of int pressi	halpy. He W, q, dL ure and at y.	at capacil J and dH	ty, heat for the
Unit-5	Nun	nber of lectures = 08	Title of the unit: Pr	ase Equ	uilibrium	-			<u></u>		
Gibbs phase rule, S system.	itatement and me	aning of the terms - phase, co	omponent and degree of f	reedom,	, phase e	quilibria o	f one cor	nponent	system - v	water, and	d sulphur
11. CO-PO mappi	ng			r		T					
COs	Churd a mha su a sul d s	Attributes			P01	PO2	PO3	PO4	P05	PO6	P07
CO1	examine the relation volume.	ationships between gas temp	je of gas and their propert perature, pressure, amour	nt, and	3		I		2	1	
CO2	Students would a colloidal systems	able to understand the interfa	acial phenomena and beha	ivior of	3	1	2		2	1	
CO3	Students would t system, extensive	the restate definition of system e and intensive properties.	m, surrounding, closed an	d open	3	1	2		2	1	
CO4	Students would a summation and p	able to apply First law of thern perceive the concept of Enthal	nodynamics and Hess law lpy.	of heat	3	1	1		3	2	
CO5	Students would a diagram and imp They also unders chemistry.	able to understand the basic cortance of phase diagram in stand how the temperature co	definitions and terms in a field of chemistry and in ould play pivotal role in the	) phase dustry. 9 phase	3	1	1		3	2	
12. Brief descripti https://www.fullor https://www.docsi https://medium.co https://www.youtu 13. Books recomn 1. Chemical Therm	on of self learning istudy.com/bsc-1s ty.com/en/bsc-1s m/@itsharishjosh ibe.com/watch?v nended: odynamics by R.P	3 Strong contribu <b>q / E-learning component</b> st-year-chemistry-notes-pdf t-year-notes-chemistry/41944 hi/bsc-1st-year-chemistry-note =UVaHSegCPzE	ution, 2 Average contributi	on , 1 Lc	ow contri	ibution 40					
<ol> <li>Principles of phy</li> <li>Essentials of Phy</li> <li>Principles of Phy</li> <li>Simplified course</li> </ol>	sical chemistry by sical Chemistry, B sical Chemistry, P e in Physical Chem	/ Puri Sharma and Pathan Jahl & Tuli, S. Chand & Co. Ltd. Puri, Sharma & Pathania, Vishal nistry, Madan & Tuli, S. Chand	l Publishing Co. & Co. Ltd.								

2         Course Name         INORGANIC CHEMISTRY-I         L         T         P           3.         Course Code         GH104         3         1         0           4.         Type of Course (are tick mark)         Course (are tick mark)         Course (are tick mark)         Even 0         Cdd (v)         Ether Sam 0         Every
3.         Course Code         PH104         Image: Code Course Code Code Sea State Sta
4. Type of Course (use lick mark)         Early reparation (0 mark)         Early reparatis (0 mark)         Early reparation (0 mark)
5.       Precequisite (if any)       10:2 with Chemistry       6.       Frequency (use bit its marks)       Out (i)       Either Sm (i)       Every Sm (i)         7.       Total Number of Lectures, Tutorials, Practicals       Tutorials = 1       Practical = Nil       Practical = Nil         8.       COURSE OUTCOMES (CO):       Attender Sandbard (Sandbard
Total Number of Lectures, Tutorials, Practicals         Totorials = 10         Practical = Nill           Lectures = 30         Totorials = 10         Practical = Nill           8. COURSE OBJECTIVES: To Introduce and explain various properties of atomic structure, periodic table and nuclear chemistry: de Broglie matter waves, helesenberg uncertainty, atomic orbitals, quantum numbers, Authau's, Paulis and Hund's multiplicity rules along with VSER (Valence Shell Electron Pair Repuision) and Molecular Orbital theory:           9. COURSE OUTCOMES (CO)         ATTRIBUTES           COURSE OUTCOMES (CO)           After the successful course completion.         ATTRIBUTES           COURSE OUTCOMES (CO)           After the successful course completion.         ATTRIBUTES           COURSE OUTCOME (CO)           A TRIBUTES         Students are taught principles. types and strengths of various chemical combinations for effective application of bonding.           CO2         Understanding of various periodic properties and their variation spikes about the daing and radiotracer techniques along with nuclear decay, nuclear fission and nuclear fusion.           OL Unit Wise detailed content         Intel of the unit: Atomic Structure           Unit-1         Number of lectures = 08         Ttle of the unit: Atomic Structure.           Unit-2         Number of lectures = 08         Ttle of the unit: Atomic and inoir radii. Ionataton energy, electron Affinity, electronegativity, electron equivity, electron equivity
Interview       Tutorials = 10       Practical = NI         E. COURSE OBERTIVES: To introduce and explain various properties of atomic traduer, periodic table and nuclear chemistry: de Brogle matter waves.       R. COURSE OUTCOME (Co):         A. COURSE OUTCOMES (CO):       Attraners will develop following attributes:       Secondary Counce (Co):         After the successful course completion, learners will develop following attributes:       Secondary Counce (Co):       Attraneutry and their variations gives an idea of elemental nature.         COOL       Students are able to evaluate the atomic structure and their properties along with principles, shapes and electronic configurations.       COOL       Attraneutry and their variations gives an idea of elemental nature.         COO2       Understanding of various periodic properties and their variations gives an idea of elemental nature.       COOL         COO3       Students are able to evaluate the atomic structure end their variations gives an idea of elemental nature.       COOL         COO3       The study of nuclear chemistry and its application crate knowledge about the dating and radiotracer techniques along with mulciar decay, nuclear fission and nuclear fusion.         10. Unit wise detailed content       Title of the unit: Atomic Structure         Unit 2       Number of lectures = 08       Title of the unit: Atomic Structure         Unit 3       Number of lectures = 08       Title of the unit: Chemical Bonding-I         Unit 4       Number of lectures =
8. COURSE OBJECTIVES: To introduce and explain various properties of atomic structure, periodic table and nuclear chemistry: de Broglie matter waves, fullismory uncertainty, atomic orbitals, quantum numbers, Aufbau's, Pauli's and Hund's multiplicity rules along with VSEPR (Valence Shell Electron Pair Repulsion) and Molecular Orbital theory. 9. COURSE OUTCOMES (CO) ATTRIBUTES COURSE OUTCOMES (CO) ATTRIBUTES COURSE OUTCOMES (CO) ATTRIBUTES COURSE OUTCOMES (CO) ATTRIBUTES COURSE OUTCOME (CO) CO2 Understanding of various periodic properties and their variations gives an idea of elemental nature. CO3 Students are taught principles, types and strengths of various chemical combinations for effective application of bonding. CO4 Analysis and evaluation of hybridization and geometry of molecular system helpful to identify the structure and their application create knowledge about the dating and radiotracer techniques along with nuclear decay, nuclear fission and nuclear fusion. 10. Unit waves, Heisenberg uncertainty principles, tarmic for effective application of bonding. Unit 1 Number of lectures = 08 Title of the unit: Periodic Properties An Introduction no molecular system helpful to identify the structure and their elements. Unit 2 Number of lectures = 08 Title of the unit: Periodic Properties An Introduction, causes of chemical combination, electronic theory of valency, general characteristics of: electronalent bond, covalent bond, covalent bond, covalent bond, ecordinate bond, metallic bonding and hydrogen bonding. Unit 1 Number of lectures = 08 Title of the unit: Chemical Bonding-1 Hindraduction, causes of chemical combination, electronic theory of valency, general characteristics of: electrovalent bond, covalent bond, covalent bond, covalent bond, ecordinate bond, metallic bonding and hydrogen bonding. Unit 1 Number of lectures = 08 Title of the unit: Nuclear Chemistry Nuclear Chemistry Bon
COURSE OUTCOME (CO)         ATTRIBUTES           CO1         Students are able to evaluate the atomic structure and their properties along with principles, shapes and electronic configurations.           CO2         Understanding of various periodic properties and their variations gives an idea of elemental nature.           CO3         Students are taught principles, types and strengths of various chemical combinations for effective application of bonding.           CO4         Analysis and evaluation of hybridization and geometry of molecular system helpful to identify the structure and their reactivity.           CO5         The study of nuclear chemistry and its application create knowledge about the dating and radiotracer techniques along with nuclear decay, nuclear fission and nuclear fusion.           10. Unit wise detailed content         Unit-1         Number of lectures = 08         Title of the unit: Atomic Structure           Unit-2         Number of lectures = 08         Title of the unit: Periodic Properties         Analysis and Pauli exclusion principles, Hund's multiplicity rules, Electronic configurations of the elements.         Aumber of lectures = 08         Title of the unit: Periodic Properties           An introduction to modern periodic table, periodicity in properties of elements. Atomic and ionic radii, ionization energy, electron Affinity, electronegativity, effective nuclear charac, shelding effect.         Unit-3         Number of lectures = 08         Title of the unit: Chemical Bonding-1           Unit-3         Number of lectures = 08         Title of the unit
C01       Students are able to evaluate the atomic structure and their properties along with principles, shapes and electronic configurations.         C02       Understanding of various periodic properties and their variations gives an idea of elemental nature.         C03       Students are taught principles, types and strengths of various chemical combinations for effective application of bonding.         C04       Analysis and evaluation of hybridization and geometry of molecular system helpful to identify the structure and their reactivity.         C05       The study of nuclear chemistry and its application create knowledge about the dating and radiotracer techniques along with nuclear deay, nuclear fusion and nuclear fusion.         10. Unit wise detailed content       Number of lectures = 08       Title of the unit: Atomic Structure         Unit-1       Number of lectures = 08       Title of the unit: Periodic Properties         An introduction to modern periodic table, periodicity in properties of elements: Atomic and ionic radii, ionization energy, electron Affinity, electronegativity, effective nuclear chares, shelighting affect.         Unit-1       Number of lectures = 08       Title of the unit: Chemical Bonding-1         Unit-2       Number of lectures = 08       Title of the unit: Chemical Bonding-1         Unit-3       Number of lectures = 08       Title of the unit: Chemical Bonding-1         Unit-4       Number of lectures = 08       Title of the unit: Netwise flexibis (Clexibis (Clexibis (Clexibis)) <t< td=""></t<>
CO2       Understanding of various periodic properties and their variations gives an idea of elemental nature.         CO3       Students are taught principles, types and strengths of various chemical combinations for effective application of bonding.         CO4       Analysis and evaluation of hybridization and geometry of molecular system helpful to identify the structure and their reactivity.         CO5       The study of nuclear chemistry and its application create knowledge about the dating and radiotracer techniques along with nuclear decay, nuclear fusion and nuclear fusion.         10. Unit wise detailed content       With nuclear decay, nuclear chemistry and its application create knowledge about the dating and radiotracer techniques along with nuclear decay, nuclear fusion and nuclear fusion.         10. Unit wise detailed content       Number of lectures = 08       Title of the unit: Atomic Structure       Intel or bitals. Aufbau and Pauli exclusion principle. Heads multiplicity rules. Electronic configurations of the elements.         Unit 2       Number of lectures = 08       Title of the unit: Periodic Properties       Aufbau and Pauli exclusion principle. Aufbau and pauli exclusion principle. Hund's multiplicity rules. Electronic configurations of the elements.       Number of lectures = 08       Title of the unit: Chemical Bonding-I         Unit 3       Number of lectures = 08       Title of the unit: Chemical Bonding-I       Vertical exclusion principle. Heads and bond energy, resonance.         Unit 4       Number of lectures = 08       Title of the unit: Nuclear Chemistry Bonding-I <th< td=""></th<>
C03       Students are taught principles, types and strengths of various chemical combinations for effective application of bonding.         C04       Analysis and evaluation of hybridization and geometry of molecular system helpful to identify the structure and their reactivity.         C05       The study of nuclear chemistry and its application create knowledge about the dating and radiotracer techniques along with nuclear decay, nuclear fission and nuclear fusion.         10. Unit wise detailed content       Number of lectures = 08       Title of the unit: Atomic Structure         Unit-1       Number of lectures = 08       Title of the unit: Periodic Properties         Unit-2       Number of lectures = 08       Title of the unit: Periodic Properties         An introduction to modern periodic table, periodicity in properties of elements: Atomic and ionic radii, ionization energy, electron Affinity, electronegativity, effective nuclear charge, shielding affect.         Unit-3       Number of lectures = 08       Title of the unit: Chemical Bonding-I         Unit-3       Number of lectures = 08       Title of the unit: Chemical Bonding-I         Unit-4       Number of lectures = 08       Title of the unit: Chemical Bonding-I         Unit-4       Number of lectures = 08       Title of the unit: Chemistry Bonding-I         Hybridization and shapes of simple molecules and ions. Valence Shell Electron Pair Repulsion (VSEPR) theory to NH <sub>3</sub> , SF <sub>4</sub> , ClF <sub>3</sub> , ICl <sub>4</sub> - and H <sub>2</sub> O. Molecular Orbital theory for homonuclear and heteronuclear diatomic molecules, bo
CO4       Analysis and evaluation of hybridization and geometry of molecular system helpful to identify the structure and their reactivity.         CO5       The study of nuclear chemistry and its application create knowledge about the dating and radiotracer techniques along with nuclear decay, nuclear fission and nuclear fusion.         10. Unit wise detailed content       Number of lectures = 08       Title of the unit: Atomic Structure         Unit-1       Number of lectures = 08       Title of the unit: Periodic Properties         An introduction to modern periodic table, periodicity in properties of elements. Atomic and ionic radii, ionization energy, electron Affinity, electronegativity, effective nuclear charae, shielding effect.       Title of the unit: Chemical Bonding-I         Introduction to modern periodic table, periodicity in properties of elements. Atomic and ionic radii, ionization energy, electron Affinity, electronegativity, effective nuclear charae, shielding effect.       Title of the unit: Chemical Bonding-I         Introduction, causes of chemical combination, electronic theory of valency, general characteristics of: electrovalent bond, covalent bond, covalent bond, metallic bonding and hydrogen bonding.       Title of the unit: Nuclear Chemistry         Number of lectures = 08       Title of the unit: Nuclear Chemistry       Nuclear and heteronuclear diatomic molecules, bond length, bond angle and bond energy, resonance.       Introduction, suce of chemistry         Natural and heteronuclear diatomic molecules, bond length, bond angle and bond energy, resonance.       Inte of the unit: Nuclear Chemistry         N
COS       The study of nuclear chemistry and its application create knowledge about the dating and radiotracer techniques along with nuclear decay, nuclear fission and nuclear fusion.         10. Unit wise detailed content         Unit-1       Number of lectures = 08       Title of the unit: Atomic Structure         Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, quantum numbers, shapes of s, p, and d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rules. Electronic configurations of the elements.       Title of the unit: Periodic Properties         An introduction to modern periodic table, periodicity in properties of elements: Atomic and ionic radii, ionization energy, electron Affinity, electronegativity, effective nuclear charage, shielding effect.       Introduction, causes of chemical combination, electronic theory of valency, general characteristics of: electrovalent bond, covalent bond, coordinate bond, metallic bonding and hydrogen bonding.         Unit-4       Number of lectures = 08       Title of the unit: Chemistry Bonding-I         Hybridization and shapes of simple molecules and ions. Valence Shell Electron Pair Repulsion (VSEPR) theory to NH <sub>3</sub> , SF <sub>4</sub> , CIF <sub>3</sub> , ICI <sub>4</sub> and H <sub>2</sub> O. Molecular Orbital theory for homonuclear and heteron-uclear diatomic molecules, bond length, bond angle and bond energy, resonance.         Unit-5       Number of lectures = 08       Title of the unit: Nuclear Chemistry         Natural and artificial radioactivity, binding energy, rate equation for nuclear decay, nuclear fission and nuclear fusion and their applications, group displacement law, isotopes and isobars,
10. Unit wise detailed content         Unit1       Number of lectures = 08       Title of the unit: Atomic Structure         dea of de Broglie matter waves. Heisenberg uncertainty principle, atomic orbitals, quantum numbers, shapes of s, p, and d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rules. Electronic configurations of the elements.         Unit2       Number of lectures = 08       Title of the unit: Periodic Properties         An introduction to modern periodic table, periodicity in properties of elements: Atomic and ionic radii, ionization energy, electron Affinity, electronegativity, effective nuclear charge, shielding effect.         Unit3       Number of lectures = 08       Title of the unit: Chemical Bonding-I         Introduction, causes of chemical combination, electronic theory of value, general characteristics of: electrovalent bond, coordinate bond, metallic bonding and hydrogen bonding.         Unit4       Number of lectures = 08       Title of the unit: Chemistry Bonding-I         Hybridization and shapes of simple molecules and ions. Valence Shell Electron Pair Repulsion (VSEPR) theory to NH <sub>3</sub> , SF <sub>4</sub> , ClF <sub>3</sub> , ICl <sub>4</sub> - and H <sub>2</sub> O. Molecular Orbital theory for homonuclear and heteronuclear diatomic molecules, bond length. bond angle and bond energy, resonance.         Unit5       Number of lectures = 08       Title of the unit: Nuclear Chemistry         11. Co-Po mapping       -       -       2       -       -       2       -       -       2       -       -       2       -
Unit-1         Number of rectures = 08         Title of the unit: Administructure           Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, quantum numbers, shapes of s, p, and d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rules. Electronic configurations of the elements.           Unit 2         Number of lectures = 08         Title of the unit: Periodic Properties           An introduction to modern periodic table, periodicity in properties of elements: Atomic and ionic radii, ionization energy, electron Affinity, electronegativity, effective nuclear charge, shielding effect.           Unit-3         Number of lectures = 08         Title of the unit: Chemical Bonding-I           Introduction, causes of chemical combination, electronic theory of valency, general characteristics of: electrovalent bond, coordinate bond, metallic bonding and hydrogen bonding.         Unit-4           Unit-4         Number of lectures = 08         Title of the unit: Chemistry Bonding-I           Hybridization and shapes of simple molecules and ions. Valence Shell Electron Pair Repulsion (VSEPR) theory to NH <sub>3</sub> , SF4, CIF <sub>3</sub> , ICI <sub>4</sub> - and H <sub>2</sub> O. Molecular Orbital theory for homonuclear and heteronuclear diatomic molecules, bond length, bond angle and bond energy, resonance.           Unit-5         Number of lectures = 08         Title of the unit: Nuclear Chemistry           Natural and artificial radioactivity, binding energy, rate equation for nuclear decay, nuclear fission and nuclear fusion and their applications, group displacement law, isotopes and isobars, applicatiors of radioactivity: radiocarbon dating and radio t
Unit2       Productor of exclutes 200       Protection of events and solution of events and solutions and events and solutions of events and solutions and events and solutions of events and solutions and events and solutions and events and solutions and event events and events and events and events and event event events and event
effective nuclear charge, shielding effect.       Unit-3       Number of lectures = 08       Title of the unit: Chemical Bonding-I         Introduction, causes of chemical combination, electronic theory of valency, general characteristics of: electrovalent bond, covalent bond, coordinate bond, metallic bonding and hydrogen bonding.       Introduction, causes of chemical combination, electronic theory of valency, general characteristics of: electrovalent bond, covalent bond, covalent bond, covalent bond, covalent bond, covalent bond, metallic bonding and hydrogen bonding.         Unit-4       Number of lectures = 08       Title of the unit: Chemistry Bonding-II         Hybridization and shapes of simple molecules and ions. Valence Shell Electron Pair Repulsion (VSEPR) theory to NH <sub>3</sub> , SF <sub>4</sub> , CIF <sub>3</sub> , ICI <sub>4</sub> - and H <sub>2</sub> O. Molecular Orbital theory for homonuclear and heteronuclear diatomic molecules, bond length, bond angle and bond energy, resonance.         Unit-5       Number of lectures = 08       Title of the unit: Nuclear Chemistry         Natural and artificial radioactivity, binding energy, rate equation for nuclear decay, nuclear fission and nuclear fusion and their applications, group displacement law, isotopes and isobars, applications of radioactivity: radioactabon dating and radio tracer techniques.         11. CO-PO mapping       CO1       Students are able to evaluate the atomic structure and their properties along 2       1       -       2       -       2         CO2       Understanding of various periodic properties and their variations gives an idea 1       1       -       3       -       1 <td< td=""></td<>
Unit-3       Number of lectures = 08       Title of the unit: Chemical Bonding-I         Introduction, causes of chemical combination, electronic theory of valency, general characteristics of: electrovalent bond, covalent bond, covalentent bond, covalent bond, covalent bond, covalent bond,
Dending and hydrogen bonding.         Unit-4       Number of lectures = 08       Title of the unit: Chemistry Bonding-II         Hybridization and shapes of simple molecules and ions. Valence Shell Electron Pair Repulsion (VSEPR) theory to NH <sub>3</sub> , SF <sub>4</sub> , CIF <sub>3</sub> , ICI <sub>4</sub> - and H <sub>2</sub> O. Molecular Orbital theory for homonuclear and heteronuclear diatomic molecules, bond length, bond angle and bond energy, resonance.         Unit-5       Number of lectures = 08       Title of the unit: Nuclear Chemistry         Natural and artificial radioactivity, binding energy, rate equation for nuclear decay, nuclear fission and nuclear fusion and their applications, group displacement law, isotopes and isobars, applications of radioactivity: radiocarbon dating and radio tracer techniques.       PO1       PO2       PO3       PO4       PO5       PO6       PO7         C0s       Attributes       PO1       PO2       PO3       PO4       PO5       PO6       PO7         C01       Students are able to evaluate the atomic structure and their properties along of various periodic properties and their variations gives an idea of elemental nature.       1       1       -       2       -       -       2         C03       Students are taught principles, types and strengths of various chemical 2       1       -       2       -       -       3         C03       Students are taught principles, types and strengths of various chemical 2       1       -       1       -
Unit-4       Number of lectures = 08       Inte of the unit: Chemistry Bonding-II         Hybridization and shapes of simple molecules and ions. Valence Shell Electron Pair Repulsion (VSEPR) theory to NH <sub>3</sub> , SF <sub>4</sub> , CIF <sub>3</sub> , ICI <sub>4</sub> - and H <sub>2</sub> O. Molecular Orbital theory for homonuclear and heteronuclear diatomic molecules, bond length, bond angle and bond energy, resonance.         Unit-5       Number of lectures = 08       Title of the unit: Nuclear Chemistry         Number of radioactivity, binding energy, rate equation for nuclear decay, nuclear fission and nuclear fusion and their applications, group displacement law, isotopes and isobars, applications of radioactivity: radiocarbon dating and radio tracer techniques.         11. CO-PO mapping       COs       Attributes       PO1       PO2       PO3       PO4       PO5       PO6       PO7         CO1       Students are able to evaluate the atomic structure and their properties along of elemental nature.       1       -       3       -       1       2       -       -       2       -       -       2       -       -       2       -       -       2       -       -       2       -       -       2       -       -       2       -       -       2       -       -       2       -       -       2       -       -       2       -       -       2       -       -       2       -
Instruction and strages of shiftple molecules and folds. Valence shell electron rain Reputsion (VSERK) theory to KH3, Sr4, CH3, Hear and H2O. Molecular Orbital theory for homonuclear and heteronuclear diatomic molecules, bond length, bond angle and bond energy, resonance.Unit-5Number of lectures = 08Title of the unit: Nuclear ChemistryNatural and artificial radioactivity, binding energy, rate equation for nuclear decay, nuclear fission and nuclear fusion and their applications, group displacement law, isotopes and isobars, applications of radioactivity: radiocarbon dating and radio tracer techniques.11. CO-PO mappingCOsAttributesPO1PO2PO3PO4PO5PO6PO7C01Students are able to evaluate the atomic structure and their properties along 21-22C02Understanding of various periodic properties and their variations gives an idea11-3-12C03Students are taught principles, types and strengths of various chemical21-23C04Analysis and evaluation of hybridization and geometry of molecular system11-1-1-1
Unit-5Number of lectures = 08Title of the unit: Nuclear ChemistryNatural and artificial radioactivity, binding energy, rate equation for nuclear decay, nuclear fission and nuclear fusion and their applications, group displacement law, isotopes and isobars, applications of radioactivity: radiocarbon dating and radio tracer techniques.III. CO-PO mappingCOsAttributesPO1PO2PO3PO4PO5PO6PO7CO1Students are able to evaluate the atomic structure and their properties along with principles, shapes and electronic configurations.21-2-2CO2Understanding of various periodic properties and their variations gives an idea of elemental nature.11-2-321-2-3-12CO3Students are taught principles, types and strengths of various chemical combinations for effective application of bonding.Students are taught principles, types and geometry of molecular system in the intervence of
Natural and artificial radioactivity, binding energy, rate equation for nuclear decay, nuclear fission and nuclear fusion and their applications, group displacement law, isotopes and isobars, applications of radioactivity: radiocarbon dating and radio tracer techniques.11. CO-PO mappingCOsAttributesPO1PO2PO3PO4PO5PO6PO7CO1Students are able to evaluate the atomic structure and their properties along with principles, shapes and electronic configurations.PO1PO2PO3PO4PO5PO6PO7CO2Understanding of various periodic properties and their variations gives an idea of elemental nature.11-3-12CO3Students are taught principles, types and strengths of various chemical combinations for effective application of bonding.CO3Students are taught principles, types and geometry of molecular system11-1-1-1CO4Analysis and evaluation of hybridization and geometry of molecular system111-1-1-1
Institution solution of radioactivity. Fadioactivity and radio tracer techniques.11. CO-PO mappingCOsAttributesPO1PO2PO3PO4PO5PO6PO7CO1Students are able to evaluate the atomic structure and their properties along with principles, shapes and electronic configurations.21-22CO2Understanding of various periodic properties and their variations gives an idea of elemental nature.11-3-12CO3Students are taught principles, types and strengths of various chemical 21-23CO4Analysis and evaluation of hybridization and geometry of molecular system helpful to identify the structure and their reactivity.11-1-1
COsAttributesPO1PO2PO3PO4PO5PO6PO7C01Students are able to evaluate the atomic structure and their properties along with principles, shapes and electronic configurations.21-22C02Understanding of various periodic properties and their variations gives an idea of elemental nature.11-3-12C03Students are taught principles, types and strengths of various chemical combinations for effective application of bonding.21-23C04Analysis and evaluation of hybridization and geometry of molecular system helpful to identify the structure and their reactivity.11-1-1-1
CO1Students are able to evaluate the atomic structure and their properties along with principles, shapes and electronic configurations.21-2-2CO2Understanding of various periodic properties and their variations gives an idea of elemental nature.11-3-12CO3Students are taught principles, types and strengths of various chemical combinations for effective application of bonding.21-2-3-12CO4Analysis and evaluation of hybridization and geometry of molecular system helpful to identify the structure and their reactivity.11-1-1-1
CO2Understanding of various periodic properties and their variations gives an idea11-3-12CO3Students are taught principles, types and strengths of various chemical combinations for effective application of bonding.21-23CO4Analysis and evaluation of hybridization and geometry of molecular system helpful to identify the structure and their reactivity.11-1-1-1
CO3Students are taught principles, types and strengths of various chemical combinations for effective application of bonding.21-2-3CO4Analysis and evaluation of hybridization and geometry of molecular system helpful to identify the structure and their reactivity.11-1-1
CO4Analysis and evaluation of hybridization and geometry of molecular system11-1-1helpful to identify the structure and their reactivity.
CO5 The study of nuclear chemistry and its application create knowledge about the dating and radiotracer techniques along with nuclear decay, nuclear fission and 2 1 - 1 - 1 2
nuclear fusion.
3 Strong contribution, 2 Average contribution, 1 Low contribution
https://www.youtube.com/watch?v=0ofu2inFF0k
https://www.youtube.com/watch?v=MCYRhCA7j1s
https://www.wiley.com/en-in/Basic+Inorganic+Chemistry,+3rd+Edition-p-9780471505327
13. Books recommended: 1. Advanced Inorganic Chemistry Vol-I & II, Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan, S. Chand & Co. Ltd.
2. Test book of Inorganic Chemistry, P.L. Soni, Sultan Chand & Sons
12 Simplified Course in Inorganic Chemistry Medan & Tuli S. Chend & Co. 1td
o. Simplined Course in morganic Chemistry, Iviadan & Tuil, S. Chand & CO. Ltd. A Consise Inorganic Chemistry, J.D. Lee, Plack Well Sciences

1. Name of the	Department: Cher	nistry							
2. Course Name	9	ORGANIC CHEMISTRY-I			L	Т		I	P
3. Course Code		CH105			3	1		(	0
4. Type of Cour	se (use tick mark)				Core (v)	DE ()		FC ()	
5. Pre-requisite (if any)		10+2 with Chemistry	6. Frequency (use tick marks)	Even ()	Odd (v)	Either Sem	0	Every Ser	n ()
7. Total Numbe	r of Lectures, Tuto	rials, Practicals	-						
Lectures = 30			Tutorials = 10		Practical = N	lil			
8. COURSE OBJEC	TIVES: The main of	bjective of this course is to stud	y the nomenclature of or	rganic compo	unds, structu	re and bonding o	of organic	molecules	
9 COURSE OUTCO	MES (CO)	njugation, mesomeric effects, ny	drogen bonding etc., and	d mechanism	i of various ty	pes of organic re	eactions.		
After the successfu	l course completio	n, learners will develop followi	ng attributes:						
COURSE OUTCOME	(CO)	ATTRIBUTES							
(	01	Analyze structure and bond hyperconjugation, mesome	ing of organic molecules ric effects, hydrogen bon	considering v nding etc.	various types	of effects such a	s inductive	e effect,	
(	02	Evaluate the different types	of organic reactions and	d their mecha	ınism.				
	03	Understand IUPAC nomenc	lature of Alkane, Alkenes	s, Alkynes, fu	nctional grou	ps, bifunctional a	and polyfu	nctional o	rganic
(	04	Analyze Isomerism and its t	ypes.						
(	05	Understand and evaluate th	ne mechanism of Hoffma	nn eliminatio	on, Markownil	koff's rule, Saytz	eff rule, oz	onolysis a	nd
10 Unitarios dat	allad contant	epoxidation.							
10. Unit wise deta	Numh	er of lectures - 08	Title of the unit: Str	ructure and F	Ronding of Or	nanic Molecules			
Hybridizations: sp3	sn2 and sn hyb	ridization of carbon. Bond len	aths bond angles bon	nd energy re	esonance hvi	perconjugation	inductive	electome	ric and
mesomeric effects, Unit-2	hydrogen bonding	er of lectures =08	Title of the unit: Org	janic reaction	n, mechanism	and their interr	nediates		
Types of organic re carbanions, free rae	actions and mecha	anism: Addition, Substitution ar trenes and benzynes.	nd Elimination reaction.	Electrophiles	and nucleop	hiles, Reactive in	ntermediat	tes- carbo	cations,
Unit-3	Numb	er of lectures = 08	Title of the unit: IUP	AC nomencla	ature				
Classification of org	ganic compounds, aldebydes keto	Functional group, Homologous	series, IUPAC nomencla ers, anhydrides), bifuncti	ature of orga	anic compour	ds (alkanes, alko	enes, alkyr Is	nes, cycloa	alkanes,
Unit-4	Numb	er of lectures = 08	Title of the unit: Ste	reochemistry	/	game compound			
Concept of isomeri	sm, types of isome	erism: structural and stereoisor	nerism, E and Z nomenc	lature. Geon	, netrical isome	erism in alicyclic	compound	ds. Confor	mational
isomerism of n-but	ane and cyclohexa	nes, axial and equatorial bonds,	Newman, Saw horse and	d Fischer proj	iections.				
Unit-5	Numl	per of lectures = 08	Title of the unit: Alka	anes and Alk	enes				
Preparation of alk Mechanisms of de	anes by hydroger hydration of alco	nation of alkenes/alkynes, Red hols and dehydrohalogenation	luction of alkyl halides, of alkyl halides, Saytz	eff rule, Hof	eagent, Wurt ffmann elimir	z reaction. Cheination, Markowi	mical prop nikoff's ru	berties of lle, hydrol	alkanes. boration-
oxidation, oxymerc	uration-demecural	tion, Epoxidation, ozonolysis, hy	dration, hydroxylation a	nd oxidation	with KMnO4.				
11. CO-PO mappir	ng I	Attributes		PO1	PO2	PO3 PO4	PO5	PO6	P07
	Analyze structure	and bonding of organic molecul	es considering various ty	vpes 3	2		1		3
CO1	of effects such as i	nductive effect, hyperconjugati	on, mesomeric effects,						
CO2	nydrogen bonding Evaluate the differ	elc.	nd their mechanism	3	2	1	1		3
	Understand IUPA	C nomenclature of Alkane. Alken	es, Alkynes, functional	3	3		1		3
CO3	groups, bifunction	al and polyfunctional organic co	ompounds.						
CO4	Analyze Isomerism	n and its types.		3	2	l	1		3
CO5	Understand and a Markownikoff's ru	nalyze the mechanism of Hoffm le, Saytzeff rule, ozonolysis and	ann elimination, epoxidation.	2	2	1	1		3
12 Priof doscripti	on of solf loarning	3 Strong contributio	on, 2 Average contributio	on , 1 Low cor	ntribution				
https://www.khana	academy.org/scien	ce/organic-chemistrv							
https://chem.libret	exts.org/Bookshelv	ves/Organic_Chemistry/Map%3	A_Organic_Chemistry_(S	Smith)/Chapt	er_06%3A_U	nderstanding_Or	ganic_Rea	ctions	
https://www.dumn	nies.com/educatio	n/science/biology/the-basics-of	organic-chemistry/						
https://www.toppr	.com/guides/chem	histry/organic-chemistry/							
1. Advanced Organ	n <b>enaed:</b> ic Chemistry, Bahla	& Bahl, S. Chand & Co. Ltd.							
2. Organic Chemisti	ry Vol.I & II, I.L. Fin	ar							
3. Fundamentals of	Organic Chemistry	y, Nafis Haider, S. Chand & Co. L Rahl & Bahl S. Chand & Co. Ltd	td.						
5. Organic Chemisti	ry Vol.I, II & III, Dr.	Jagdamba Singh, L.D.S. Yadav, P	ragati Prakashan.						
-		- 0	~						

1. Name of the	Department: Chem	histry									
2. Course Name	9	INDUSTRIAL CHEMISTRY LAB	1			L		т		Р	
3. Course Code		CH106				0		0		8	
4. Type of Cour	se (use tick mark)				Core	(v)	DE ()		F	c 0	
5. Pre-requisite (if any)	;	10+2 with Chemistry	6. Frequency (use tick marks)	Even ()	Odd	(V)	Either	Sem ()	E	ivery Sem	0
7. Total Numbe	er of Lectures, Tutor	rials, Practicals	1				1				
Lectures = 00			Tutorials = 00		Practic	al =08					
8. COURSE OBJEC	CTIVES: The purpose	e of the undergraduate chemis	try Lab program at the	Integral Univ	ersity is	to provi	de the ke	y knowle	dge bas	e and lab	ooratory
resources to prepa	re students for care	ers as professionals in the field	of chemistry, and vario	us other indu	ustries.						
9. COURSE OUTCO After the successfu	DMES (CO): Il course completion	n, learners will develop followi	ng attributes:								
COURSE OUTCOM	E (CO)	ATTRIBUTES									
	CO1	Understand the basic analy	tical and technical skills	and technica	l skills to	work ef	ectively i	n the vari	ious fie	ds of che	mistry
	02	Understand the basic titrati	on methods and techni	cal skills to w	ork in the	e differe	nt fields o	f chemist	ry.		
	CO3	Able to detect presence of e	elements and functiona	l group in org	anic com	pounds.					
	CO4	Remember to keep records	of all performed experi	ments in the	manner	which is	required	in laborat	tory		
	CO5	Analyze the importance of	personal safety and care	e of equipme	nt's and c	hemical	S.				
<ol> <li>A: Oxidation-redused solution by using</li> <li>5. To determine t</li> <li>6. To determine t</li> <li>7. Complexometr</li> <li>8. Detection of el</li> <li>9. Detection of fu</li> </ol>	ction (redox) titration external indicator. he strength of potas he strength of given ic titrations. a) To est ement present in the nctional group present	ons. a) To determine the streng ssium permanganate solution to a copper sulphate solution by u stimate the concentration of ca le given organic compounds. ent in the given organic compo	gth of oxalic acid. b) To o by using sodium thiosul ising sodium thiosulpha alcium ions with EDTA. b punds. a) Carboxylic b) P	determine the ohate solution te solution. Ic o) To estimate chenolic c) Alc	e strengt n. lodome odometric e the con coholic d)	h of ferr etrically. cally. centratio Aldehyo	ous amm on of mag dic e) Keto	onium su jnesium ie onic f) Est	Iphate ons wit :er g) Ai	(Mohr's s h EDTA. mine h) A	alt) mide
11. CO-PO mappi	ng	Attributoo			DO1	002	002	<b>DO4</b>	DOF	<b>DO</b> (	007
cos	Understand the bas	sic analytical and technical skill	s and technical skills to	work	3	2	1 1	1	PU5	PUo	3
CO1	effectively in the va	arious fields of chemistry		Work							
CO2	Understand the bas fields of chemistry.	sic titration methods and techr	nical skills to work in the	different	3	2	1	1			3
CO3	Able to detect pres	ence of elements and function	al group in organic com	pounds.	3	3	1	1			3
CO4	Remember to keep required in laborate	records of all performed expe ory	riments in the manner v	which is	3	2	1	1			3
CO5	Analyze the import	ance of personal safety and ca	re of equipment's and c	hemicals.	2	2	1	1			3
		3 Strong contributio	on, 2 Average contributi	on , 1 Low co	ntributio	n					
12. Brief descripti	on of self learning /	/ E-learning component									
https://www.fandr	n.edu/uploads/files	/79645701812579729-gencher	m-reference-for-web.pc	lf							
http://file.akfarma	hadhika.ac.id/E-BOC	JK/12-1213-akfarmahad-16-1-	vogelqu-d.pdf	سا ما سما ه							
https://faculty.psa	u.edu.sa/filedownio	ad/doc-6-pdf-f06110ef2e1e1a	e119cbact/1dd1//32-o	riginal.pdf							
12 Poolo roce	nondad.	onection/3939/practical-chemi	зиу								
1. Advance Practical	al Chemistry: Jagdan	nba Singh, L.D.S Yadav, Jaya Sir	ngh, I.R. Siddiqui, Pragat	iEdition.							
3. Practical Physica	l Chemistry: B. Visw	anathan and P.S.Raghavan.									
4. Experimental Inc	organic Chemistry –\	W.G.Palmer.									

## <u>SEMESTER-II</u>

1.	Name of the De	partment:	: Chemi	stry											
2.	Course Name			BASICS OF COMPUTER						L		т		I	Р
3.	Course Code			CS110						3		1			0
4.	Type of Course (	use tick m	nark)							Core (√)	DE	0		FC (√)	
5.	Pre-requisite (if any)			10+2 with Chemistry		6. Frequency ( tick marks)	use	Even (v)		Odd ()	Eit	her Sem	0	Every Ser	m ()
7.	Total Number of	Lectures	, Tutori	als, Practicals											
Lect	tures = 30					Tutorials = 10				Practical = I	Vil				
8. C	OURSE OBJECTIV	ES: Study	of com	puter history and componer	ents c	of computer syste	m, ι	inderstand	ing o	f computer	periphe	ral and st	orage dev	rices, basic	s of OS
		owledge	or comp	buter networking and intern	netw	orking devices an	aru	ndamentai	cond	cepts of inte	ernet and	a web tec	nnologies	i.	
9. C	the successful co	urse com	pletion,	learners will develop follow	owind	g attributes:									
COUF	RSE OUTCOME (C	) Attri	BUTES	· · ·											
	CO1	Have	a stronę	foundation of knowledge a	abou	ut the structure of	f cor	nputer syst	tem.						
	CO2	Utilize	e and co	nfigure computer periphera	ral de	evices, install and	ope	rate systen	n and	lapplicatior	n softwa	re.			
	CO3	Work	on MS	office(word, power point an	nd ex	xcel) and OS.									
	CO4	Establ	lish a sn	nall computer network and	lutiliz	ze resource sharii	ng.								
	CO5	Desigi	n and d	evelop a website with limite	ed fe	eatures.									
10.	Unit wise detaile	d content	l I												
Uni	t-1	ſ	Numbe	r of lectures = 08		Title of the un	it: Ir	ntroduction	n to (	Computers					
Defin	e Computer, Cha	racteristic	s featu	res of Computer, Hardware	e and	d Software of Cor	nput	ter, langua	ges c	of Compute	rs, Appli	cations, B	lock Diag	ram of Co	mputer
Uni	m, and computer <b>t-2</b>	General	ons. Numbei	r of lectures =08		Title of the unit	t: Ba	asic Compu	iter C	Organization	1				
Essen	tials of computer	operatio	on, Inpu	t-Process- Output Basic Ord	rgani	ization of Compu	ter S	System in E	Detail	I- I/O Devic	es and i	ts functio	ns, Mem	ory manad	gement,
Booti	ng process (BIOS)	, Memory	/ Manag	ement-RAM, ROM etc. Stor	orage	devices - Hard di	sc, F	loppy disc,	CD-F	ROM.				, . ,	,
Uni	t-3	I	Numbe	r of lectures = 08		Title of the unit	t: Oj	perating de	evice	s and Opera	ating env	vironmen	t		
Featu	ires, Advantages a	and Draw	backs, [	OOS, WINDOWS & UNIX; Int	itrodu	uction to Data Pro	oces	sing and Fl	owch	nart, Operat	ing envi	ronment,	MS Offic	e in Detail	(Word,
Excel	& Power Point), s	hort cut k	keys use	ed in Word, Excel & Power P	Point	t.									
Uni	t-4	ſ	Numbe	r of lectures = 08		Title of the unit	t: Co	omputer No	etwo	rking					
Intro	duction to netwo	king, Mo	dem, N	etwork topology concepts a	and	types with advan	tage	s and draw	vback	s of each, o	compone	ents of LA	N, WAN	and MAN,	Medium
usea Uni	IN NETWORKS.		Numbe	r of lectures = 08	·	Title of the unit	· In	ternet and	Weh	Technolog	ies				
Histo	ry and concept A	rchitectur	re Annl	ication Hypertext Markup I	Lang	uage DHTML W		Gopher F	TP T	elnet Web	Browse	rs. Net Su	rfing Sea	rch Engin	es Email
Digita	al Signatures, Netv	vork, Seci	urity, Fi	rewall.	Lang	Judgo, 2		, eepiioi, i	, .		2.01100	,	g, eee	in on Englin	56, 2man,
11. (	CO-PO mapping		-												
	COs			Attributes			-	F	P01	PO2	PO3	PO4	PO5	PO6	P07
	CO1	/e a stro	ong fou	ndation of knowledge abo	out	the structure of	CO	mputer							3
	co2 Uti	lize and c	onfigur	e computer peripheral dev	vices	install and oper	ate	system				1	2		2
	CO3 Wo	rk on MS		vord nower point and excel	-l) an		uto	5,510111				- '	2		2
	CO4 Est	ablish a sr	mall cor	nputer network and utilize r	reso	urce sharing.							2	1	2
	CO5 Dev	ion and d	levelon	a website with limited featu	ures								2	'	2
	000 200	ign and a	lovolop	3 Strong contribut	ution	2 Average contr	ibuti	on 11ow	cont	ribution			Z		
12.1	Brief description	of self lea	rnina /	F-learning component		, 2 Monage conti	buti		cont	insution					
https	://edu.gcfglobal.c	rg/en/co	mputer	basics/what-is-a-computer/	/1/										
http:/	//vfu.bg/en/e-Lea	rning/Cor	- mputer-	Basicscomputer_basics2.p	pdf										
https	://www.toppr.com	n/guides/	/compu	ter-aptitude-and-knowledge	je/ba	sics-of-computer	s/ba	sic-comput	ter-te	erminology/					
https	://www.geeksfor	geeks.org/	/basics-	of-computer-and-its-operat	tions	s/									
<b>13</b> .	Books recommen	ded:	anu Dro	aking Nower TMU											
1. Cu 2. Rai	a Raman, V. "Intr	oduction	јуу: вге to Com	aking ivews", TIVIH. puters".											
3. Ne	lson, "Data Comp	ression",	BPB	p											
4. Baj	pai, Kushwaha &	Yadav, "Ir	ntroduc	tion To Computer & C Progr	Iramr	ming" , New Age									
5. Le 6. Chi	anchal Mittal "Fo	undation (	uision W of Infor	resiey. mation Technology" Pragati	ti.										
7. Co	mputer Fundame	ntals- by S	<u>Sinha</u> . P	K and Sinha P. BPB (Publishe	ner)										

1. Name of the	ne Department: Che	mistry									
2. Course Na	me	ENVIRONMENTAL POLLUTIO	N			L		Т			Р
3. Course Coo	le	CH107				3		1			0
4. Type of Co	urse (use tick mark)					Core ()	DE	0		FC (√)	
5. Pre-requis (if any)	ite	10+2 with Chemistry	6. Frequency (use tick marks)	Even (v)		Odd ()	Eit	her Sem	0	Every Sei	m ()
7. Total Num	ber of Lectures, Tute	orials, Practicals							I		
Lectures = 30		· · · · · · · · · · · · · · · · · · ·	Tutorials = 10		Pi	ractical =	Nil				
8. COURSE OBJ	ECTIVES: The main c	bjective of this course is to stud	y various types of pollut	tants, their s	source	es, contro	l and the	ir harmfu	ul effects	on living s	pecies
After the success	ful course completio	on, learners will develop followi	ng attributes:								
COURSE OUTCO	ME (CO) ATTRIBUTI	ES									
CO1	Evaluate d	ifferent types of air pollutants, th	neir harmful effects on l	living and no	on livi	ng specie	s; Study (	of Global	Warminç	g, Green H	ouse
CO2	Analyze th	e various factors of water quality	y assessment parameter	rs, water pol	llutar	nts and W	aste wate	er treatm	ent proce	esses.	
CO3	Understan	d the soil composition, soil pollu	tants, their control, Nat	tional and In	terna	tional Sta	ndards.				
CO4	Evaluate th	ne various types waste and their	toxicity aspects and ma	nagement.							
CO5	Understan	d the sources of heavy metals ar	nd their related toxicity	•							
10. Unit wise d	etailed content										
Unit-1	Numl	ber of lectures = 08	Title of the unit: A	ir Pollutants	S						
CO, CO2, ozone, quality standard,	CFC; ozone depletic Bhopal gas tragedy,	on; global warming & NOx; Harm Chernobyl disaster.	nful effects of pollutant	ts on living a	and n	on-living	species;	Oxygen, I	nitrogen a	and CO2 c	ycle, Air
Unit-2	Numl	ber of lectures =08	Title of the unit: W	ater Quality	Para	meters a	nd Wate	r Pollutic	'n		
Water quality pa sampling technig	arameters; internation	onal and national standards; W	later quality assessme	nt. Water p	olluti	on and i	ts contro	l; water	pollutant	ts; toxicity	. Water
Unit-3	Numl	ber of lectures = 08	Title of the unit: Ag	gricultural Po	olluta	ants					
Fertilizers, insect	icides, pesticides, pla	astics, toxic metals, dyes, surfact	ants and their toxicity;	internationa	l and	national	standard	s; contro	J.		
Unit-4	Numl	ber of lectures = 08	Title of the unit: In	dustrial Was	ste						
Industrial waste:	toxic aspects, manag	gement and disposal. Radioactiv	e, municipal, and biome	edical waste	– tox	icity haza	rds, man	agement	and disp	osal.	
Unit-5	Num	ber of lectures = 08	Title of the unit: Ch	emical Toxi	colog	y		-			
Toxic chemicals i	n the Environment,	biochemical effects of Mercury	and Lead, Carcinogens,	Vector-borr	ne dis	sease, wa	ter-borne	e disease	, Pollutio	n and Pub	lic Health
issues.		,									
11. CO-PO map	ping										
COs		Attributes		PC	D1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Evaluate different	t types of air pollutants, their har	mful effects on living a	nd non 3		2	3	3	3	3	2
CO2	Analyze the vario	us factors of water quality assess	sment narameters wate	ayei or 3		2	3	3	3	3	2
CO2	Understand the se	al composition soil pollutants t	hoir control National a	nd 2		2	2	2	2	2	2
CO4		on composition, son ponutarits, t		11u J		2	5 2	2	2	2	2
005	Evaluate the vario	bus types waste and their toxicity	aspects and managem	ient. S		2	ິ	5	3	<u> </u>	2
05	Understand the so	ources of neavy metals and their	related toxicity.		ontril	2 bution	3	3	2	3	2
12 Brief descrip	tion of self learning	/ E-learning component	n, z Average contributi		Untin	button					
https://www.brit	annica com/science										
https://www.bin	science com/22728-	-nollution-facts html									
https://www.hin	dawi.com/iournals/i	eph/2012/341637/									
https://www.cor	serve-energy-future	e.com/causes-and-effects-of-envi	ironmental-pollution.ph	ar							
13. Books recor	nmended:		<u> </u>	T							
1. Environmental	Chemistry Manahar	n, Stanley E, 2004, Taylor & Fran	cis Ltd								
2. Basic Concepts	of Environmental C	hemistry, Desley W. Connell, 1 e	dition, CRC-Press	1   Jacks Do. (C. 1)							
3. Environmental	Chemistry: A Global	rerspective, Gary W. Vanioon S mistry Reid Rrian I Riackwoll S	otepnen J. Duffy, Oxford Science I to	i Univ Pr (Sd)	)						
5. Chemistry of t	he Environment. The	omas G. Spiro, William M. Stidliar	ni, 2nd Edition. Prentice	Hall publica	tion						
6. Environmental	Chemistry, Vanloon	, Gary W Duffy, Stephen J., Oxfo	rd Higher Education pu	blication							

1. Name of the	Department: Chen	nistry									
2. Course Name	е	PHYSICAL CHEMISTRY-II				L		Т			P
3. Course Code		CH108				3		1		(	0
4. Type of Cour	se (use tick mark)				Co	ore (√)	DE (	0		FC ()	
5. Pre-requisite (if any)	9	10+2 with Chemistry	6. Frequency (use tick marks)	Even (v)	00	dd ()	Eith	er Sem	0	Every Ser	n ()
7. Total Numbe	er of Lectures, Tuto	rials, Practicals									
Lectures = 30			Tutorials = 10		Prac	tical = N	il				
8. COURSE OBJEC mathematics to ob subject into their re 9. COURSE OUTCO After the successfu	CTIVES: The purpose tain quantitative re espective dimension DMES (CO): Il course completion	e of this undergraduate course i lations which are very importar ns. <b>n, learners will develop followi</b>	s to impart basic and ke ht for higher studies. Aft ng attributes:	y knowled er successf	ge of phy ully com	ysical che pletion c	emistry. of course	By using e, the stu	the prine udent wil	cipal of phy I able explo	ysics and pre
COURSE OUTCOM	E (CO) ATTRIBUTES	S									
CO1	Students go reaction.	ot insight knowledge of order c	of reaction and their de	terminatio	n and u	nderstan	d the fa	ctors w	hich coul	d affect th	e rate of
CO2	Students wo	ould develop the concept of ent	ropy; explore the relation	on how ent	tropy wo	uld be va	arying w	ith respe	ect to P, 1	∑& V.	
CO3	Students wo process.	ould perceive the sound knowle	edge of Gibbs free energ	jy and Heln	nholtz fu	inctions;	how the	ey would	decide t	he spontai	neity of a
CO4	Students wo got insight Clausius-Cla	ould able to difference betwee sound knowledge of LeChâteli apeyron Equation.	n "completions" for irre er's Principle, how the	eversible ch equilibriur	nemical i n quant	reactions ities of r	and for eactants	reversi and pr	ble chem roducts a	ical reaction re shifted	ons. They by using
CO5	Students ev	aluate fundamentals of electro	chemistry and understa	nd the cond	cept of p	H, solub	ility and	its appli	cation.		
10. Unit wise det	ailed content	er of lectures - 08	Title of the unit: C	nomical Kir	natics						
Chemical kinetics	and its scope rate	e of a reaction factors influe	ncing the rate of a re		contrati	on tem	nerature	nrassi	ire solve	ont light	catalyst
concentration dep	endence of rates,	mathematical characteristics	of simple chemical rea	ctions- zer	o, First,	second	& pseu	do orde	er, half li	fe and me	ean life.
Unit-2	Numb	er of lectures =08	Title of the unit: Th	ermodynai	mics-II						
Second Law of The function of V&T, e	rmodynamics : nee ntropy as a functio	d for the law, different stateme on of P&T, entropy change in p	nts of the law. Thermoon hysical change, entropy	lynamic sca / as a crite	ale of ter ria of sp	mperatu ontaneit	re. Entro y and eo	py as a s quilibriu	state funo m, Entroj	ction, entro py change	opy as a in ideal
Unit-3	Numb	er of lectures = 08	Title of the unit: Fre	ee Energy							
Gibbs free energy Unit-4	(G) and Helmholt	z free energy (A) as thermody er of lectures = 08	namic quantities, A & Title of the unit: Ch	G as crite emical Equ	eria for t I <b>ilibrium</b>	thermod	ynamic (	equilibri	um and	spontaneit	y, their
Equilibrium consta	nt and free energy.	Thermodynamic derivation of	law of mass action. Le (	Chateliers p	orinciple	. Reactio	n isothe	rm and	reaction	isochor - C	lapeyron
Unit-5	Numb	per of lectures = 08	Title of the unit: Ele	ctrochemis	stry						. ,
Galvanic cells, stan	dard electrode pote	ential, types of electrodes, mea	surement of pH; Solubil	ity and solu	ibility pro	oduct an	d its app	lication	S.		
COs		Attributes		Р	01	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Students got insigh and understand th	nt knowledge of order of reactic e factors which could affect the	on and their determinati rate of reaction.	on <b>3</b>	1	1			2	1	
CO2	Students would d	levelop the concept of entrop varying with respect to P, T & V	by; explore the relatio	n how <b>3</b>	1	2			2	1	
CO3	Students would p Helmholtz functior	perceive the sound knowledg ns; how they would decide the s	e of Gibbs free energ pontaneity of a process	y and <b>3</b>	1	2			2	1	
	Students would a	able to difference between "	completions" for irrev	ersible 3	1	1			3	2	
	chemical reactions	and for reversible chemical rea	ctions. They got insight	sound							
CO4	knowledge of Le	Châtelier's Principle, how th fucts are shifted by using Clausi	e equilibrium quantit	ies of							
CO5	Students evaluate	fundamentals of electrochemis	try and understand the	3	1	1			3	2	
	concept of pri, set	3 Strong contributio	n. 2 Average contributi	on.11ow.	contribu	tion					
12. Brief descripti	on of self learning	/ E-learning component	,								
https://www.youtu	ube.com/watch?v=l	JVaHSegCPzE									
https://stuvera.cor	m/bsc-1st-year-cher	mistry-notes-pdf/									
http://www.freebo	ookcentre.net/Chen	nistry/Physical-Chemistry-Books	s.html								
https://www.mobi	.3atn.com/upiode/t	2008/0008-00839.001									
13. Books recom	mended:										
1. Physical Chemist	ry, P.WE. Atkins, EL	BS	lichorc								
3. Chemical Therm	odynamics by R.P.R	astogi et al	11311613.								
4. Principles of phy	sical chemistry by P	Puri Sharma and Pathan									
<ul> <li>b. Essentials of Phy</li> <li>6. Principles of Phy</li> </ul>	sical Chemistry, Bal sical Chemistry, Pu	ni & Tull, S. Chand & Co. Ltd. ri, Sharma & Pathania-Vishal Pi	Iblishing Co								
7. Simplified course	e in Physical Chemis	stry, Madan & Tuli, S. Chand & C	Co. Ltd.								
8. Atkin's Physical (	Chemistry, Atkin, Ox	xford Press.									

1. Nam	ne of the Depar	tment: Chem	histry										
2. Cou	rse Name		INORGANIC CHEMISTRY-II				L		Т		F	D	
3. Cou	rse Code		CH109				3		1		(	)	
4. Тур	e of Course (use	tick mark)	1				Core (√)	DE	0		FC ()		
5. Pre- (if	requisite any)		10+2 with Chemistry	6. Frequency (use tick marks)	Even (v)	)	Odd ()	Eith	ner Sem	0	Every Ser	n ()	
7. Tota	al Number of Le	ctures, Tuto	rials, Practicals										
Lectures	= 30			Tutorials = 10			Practical = I	Nil					
8. COUR and prope higher ino	SE OBJECTIVES erties of s, p an rganic moieties	: Interest am d d block ele will be done	ong students for general Ino ements will be made. Introdu	rganic Chemistry will be ction coordination chem	inculcate istry, nom	d and nencla	introductio ature of coo	n of pe rdination	riodic tal I compou	ble in ter unds in or	ms of clas der to un	sification derstand	
9. COURS	SE OUTCOMES (	CO):											
After the s	SUCCESSFUL COURS		n, learners will develop follov s	ving attributes:									
	CO1		unding is developed for the sig	inificance of systematic c	lassificatio	on of a	elements in	neriodic	tahlo				
	<u> </u>	Evaluation of	and the second sec	monts can be with prope	rooconi	011011	elenients in	periodic	table.				
	CO2		of coordination chemistry or	entents can be with prope	ng ability	to de	al with com	nlev inorc	anic mo	iatias			
	CO4	How the sta	bility of coordination complex	vos can bo prodictod thro	ugh tho a					nolo rulos			
	CO4	A keen inter	rest is created in students to r	oursue inorganic chemistr	v in highe	er clas		nemoral		ipie i uies			
10. Unit	wise detailed c	ontent		area o morganio orienneti	<u>)</u>	0. 0.40							
Unit-1		Numbe	er of lectures = 08	Title of the unit: s-	Block Ele	ment	s (Group 1 &	2 Eleme	ents)				
General in (such as io	neral introduction, Electronic configuration, Anomalous properties of the first element of each group, diagonal relationship, Trends in the variation of properties ich as ionization potential, atomic and ionic radii etc.)												
Unit-2	the desident floor	Numbe	er of lectures =08	Title of the unit: p-	Block Eler	ments	s (Group 13-	17 Eleme	ents)		Charles	6	
General Ir important	compounds (Si	ich as boron	guration, variation of prope hydrides, fluorocarbons silica	tes and interhalogen com	nomalous	s prop gases.	Derties of TI	rst eieme	ents of e	acn grou	p. study c	or some	
Unit-3		Numbe	er of lectures = 08	Title of the unit: d-	Block Eler	ments	5						
Characteri Sulphides.	stic properties	of d-block e	elements. Properties of the	elements of the first tra	insition se	eries	their Binary	compou	inds suc	h as Cark	oides, Oxic	des and	
Unit-4		Numbe	er of lectures = 08	Title of the unit: Ch	emistry o	of Not	ole gases						
Physical & XeF2, XeF4	chemical prop 4 and XeF6). equ	erties noble uation and Cl	gases, special properties of h ausius -Clapeyron equation, a	nelium, Clathrate compou applications.	unds, Che	emistry	y of Xe (Stru	ucture an	d bondir	ng in Xe c	ompound	s such as	
Unit-5	lte Morporis co	Numb	er of lectures = 08	Ittle of the unit: Co		on Con	npounds	utor orbi	tal comp	lovos			
11. CO-P	O mapping		ieory, for Ac nomenciature of	r coor a mation compound	s, Discuss				tarcomp	IEXES.			
CO	)s		Attributes			P01	PO2	PO3	PO4	P05	PO6	P07	
со	An un of elei	derstanding i nents in peri	s developed for the significan odic table.	ice of systematic classifica	ation	2		1				2	
CO	<b>2</b> Evalua	tion of anom	halous behaviour of elements	can be with proper reaso	oning.	2							
со	03 Introd deal w	uction of coo rith complex	ordination chemistry creates h inorganic moieties.	nigher order thinking abili	ty to	3			1				
со	4 How applic	the stability ation and rer	of coordination complexes nembrance of simple rules.	can be predicted throu	gh the	3							
co	A kee classe	n interest is s	2		1			1	2				
			3 Strong contribut	ion, 2 Average contributi	on , 1 Lov	v cont	ribution						
12. Brief	description of s	elf learning /	/ E-learning component										
https://ww http://ww	ww.wiley.com/e w.t.soka.ac.jp/o	n-in/Basic+Ir hem/iwanar	norganic+Chemistry,+3rd+Edi ni/inorg/INO_0001.PDF. /od073pA14.2	tion-p-9780471505327									
13. Book	s recommende	d:	500/ JPA 14.2										
1. Advance 2. Test boo 3. Simplifie	ed Inorganic Ch ok of Inorganic ed Course in Inc	emistry Vol-I Chemistry, P. Irganic Chem	& II, Satya Prakash, G.D. Tuli, L. Soni, Sultan Chand & Sons istry, Madan & Tuli, S. Chand	S.K. Basu, R.D. Madan, S. & Co. Ltd.	Chand &	Co. Li	td.						
4. Concise	Inorganic Cher	nistry, J.D. Le	e, Black Well Sciences.										

1. Name of the	Department: Chen	histry									
2. Course Name	e	ORGANIC CHEMISTRY-II				L		Т			Р
3. Course Code		CH110				3		1			0
4. Type of Cour	se (use tick mark)					Core (v)	DE	0		FC ()	
5. Pre-requisite	;	10+2 with Chemistry	6. Frequency (use	Even (v	V)	Odd ()	Eith	er Sem	0	Every Sei	m ()
(if any)			tick marks)						-	-	
7. Total Numbe	er of Lectures, Tuto	rials, Practicals									
Lectures = 30			Tutorials = 10		Р	ractical = I	Vil				
8. COURSE OBJE	CTIVES: Students w	vill be able to understand the	e about arenes and Aror	naticity,	Huckel	rule of are	omaticity	, Aroma	tic electro	ophilic sul	ostitution
reactions, Alkyl and	d Aryl Halides, Mech	nanism of nucleophilic substit	ution reaction of alkyl hal	ides SN	<sup>1</sup> and SN	<sup>2</sup> reactions	s, Acidic n	ature, R	eactions of	of alcohols	s,dihydric
alcohols,trihydric a	Icoholsaldehydes a	nd ketones, chemical reaction	s of aldehydes and keton	es.							
9. COURSE OUTCO	DMES (CO):	n laarmara will davalan fallaw	ving attributes.								
			ning attributes.								
		)		الم مر الم م					+:		
CO1	mechanism	of Aromatic electrophilic subs	stitution.	na iengi	.ns, reso	nance, Huc				micai rea	
CO2	Comprehen reaction of a	sion of classification, method alkyl halides (SN <sup>1</sup> and SN <sup>2</sup> read	is of formation and chen ctions) with energy profile	nical rea e diagrar	ns.	of alkyl hal	ides, Me	chanism	of nucleo	ophilic sul	ostitution
CO3	To create l Hydrogen b rearrangem	basic knowledge of nomencl onding. Acidic nature, React ent.	ature, methods of form ions of alcohols, Dihydric	ation, r alcohol	eduction Is, chem	n of alder iical reacti	nydes, ke ons of vi	tones, c cinal gly	arboxylic cols and	acids an pinacol-pi	d esters. nacolone
CO4	Able to eva Tiemann rea	luate different types Synthesi action, gattermann-koch reac	s of aliphatic aldehydes a tion and aromatic ketones	and ketc s by Frie	ones, alc del craft	ohols, cart acylation.	ooxylic ac	ids and i	named re	actions as	s Reimer-
CO5	Analyze and Villiger oxid	I compare the mechanism of ation, Meerwine Pondorof Ve	nucleophilic additions to rlay reduction, Clemmens	carbony sen redu	yl group: iction an	s with aldo d Wolff-Ki	ol conder shner red	sation, ( luction.	Cannizzaro	o reaction	ı, Baeyer-
10. Unit wise det	ailed content										
Unit-1	Numb	er of lectures = 08	Title of the unit: A	renes an	nd Arom	aticity					
Nomenclature of b	enzene derivatives	. Kekule structure of benzene	e, Stability and carbon-ca	rbon bo	nd lengt	ths of benz	zene, res	onance,	Huckel ru	le of aror	naticity,
Aromatic electropr Unit-2	Numb	er of lectures =08	Title of the unit: All	n, haloge <b>cyl and <i>l</i></b>	enation. Aryl Hali	Sulphonat des	ion and F	riedel-Ci	rafts reac	lion.	
Nomenclature, clas	sification, methods	of formation and chemical r	eactions of alkyl halides.	Mechar	nims of I	nucleophili	ic substit	ution rea	action of	alkyl halic	les (SN1
and SN2 reactions)	with energy prome	or of locturos - 09	Title of the unit: Alc	ohols							
		er of lectures = 00	vetion of oldebudge, last	,011013				Lludrana		a Asidia	
Reactions of alcoh	ols- nomenciature, ols: Dihydric alcoh	indis - nomenclature method	s of formation chemica	ones, ca E reactio	arboxylic ons of v	icinal alvo	a esters. ols and a	Hydroge binacol-n	inacolone	ig. Acidic e rearran	nature, dement
Trihydric alcohols -	- nomenclature, me	thods of formation and chem	ical reactions of glycerol.	i i odotite	5115 01 1	ioniai giyo				, rounding	gomont.
Unit-4	Numb	er of lectures = 08	Title of the unit: Ald	lehydes	and Ket	tones					
Synthesis of alipha	tic aldehydes and	ketones with particular refer	ence to acid chlorides, a	alcohols,	carbox	ylic acids,	Grignard	reagent	, alkenes	and 1,3-0	dithianes.
Synthesis of aroma	tic aldehydes by ox	idation of alkyl benzene, Reim	ner-Tiemann reaction, gat	termanr	n-koch re	eaction and	d aromati	c ketone	s by Fried	lal craft ad	cylation.
Unit-5	Numb	er of lectures = 08	Title of the unit: Ch	emical r	eactions	of Aldehy	des and	Ketones			
Mechanism of nucl	eophilic additions t	o carbonyl group with particu	lar reference: aldol cond	ensatior	n, Canniz	zaro react	ion. Perki	n reactio	on, Wittig	reaction,	Mannich
reaction. Baeyer-Vi	lliger oxidation, Me	erwine Pondorof Verlay reduce	ction, Clemmensen reduc	tion and	Wolff-K	lishner red	uction.				
11. CO-PO mappi	ng	Attributoo			DO1	DOD	<b>DO</b> 2	DO4	DOF	<b>DO</b> (	007
COS	Understanding of	Kekule structure Stability an	d carbon-carbon bond le	naths 3		1	P03 1	P04	P05	P06	2
CO1	resonance, Huckel	rule of aromaticity, chemic	al reaction and mechan	ism of			•		-		-
	Aromatic electroph	nilic substitution.									
CO2	Comprehension o	f the classification, method	s of formation and ch	emical 3	6	1	1		2		2
	reactions of alkyl alkyl alkyl alkyl	nalides, iviecnanism of nucle	opnilic substitution react	tion of							
	To create basic kn	owledge of nomenclature, m	ethods of formation, red	luction 3	}	1	1		2		2
CO3	of aldehydes, keto	ones, carboxylic acids and es	ters. Hydrogen bonding.	Acidic			-				Γ
	nature, Reactions	of alcohols, Dihydric alcohol	s, chemical reactions of	vicinal							
	glycols and pinacol	-pinacolone rearrangement.									
01	Able to evaluate d	lifferent types Synthesis of al	iphatic aldehydes and ke	tones, 3	;	1	1		2		2
004	alcohols, carboxyli	c acids and named reaction	s as Reimer-Tiemann rea	action,							
	gattermann-koch r	eaction and aromatic ketones	by Friedel craft acylation			_			-		<u></u>
205	Analyze and comp	bare the mechanism of nucl	eophilic additions to ca	rbonyl 3	i	p j	1		2		2
005	yroups with aldol	condensation, Cannizzaro rea	CUON, Baeyer-VIIIIger Oxid								
	Kishner reduction	or verialy reduction, clemme	nensen reduction and	vv0111-							
		3 Strong contribut	ion. 2 Average contributio	on 110	w contri	bution			1	1	<u> </u>
12 Brief descripti	on of self learning	/ F-learning component		, 1 20		241011					
https://chem_libret	exts ora/Bookshelv	es/Organic Chemistry/Man%	3A Organic Chemistry (	Smith)/(	Chanter	06%34 11	nderstan	dina Ora	ianic Rea	ctions	
https://www.dumr	nies.com/education	1/science/biology/the-basics-r	of-organic-chemistry/		- unaprol				,ao	510113	
https://www.toppr	.com/quides/chem	istry/organic-chemistry/	у. <u>.</u>								
· · · · · · · · · · · · · · · · · · ·	•	j.									

Books recommended:
 Advanced Organic Chemistry, Bahl & Bahl, S. Chand & Co. Ltd.
 Organic Chemistry Vol.I & II, I.L. Finar
 Fundamentals of Organic Chemistry, Nafis Haider, S. Chand & Co. Ltd.
 Organic Chemistry Vol.I, II & III, Dr. Jagdamba Singh, L.D.S. Yadav, Pragati Prakashan

1. Name of the	Department: Chemi	stry									
2. Course Name		INDUSTRIAL CHEMISTRY LAB	11			L		Т			Р
3. Course Code		CH111				0		0			8
4. Type of Cours	e (use tick mark)					Core (√)	DE	0		FC ()	
5. Pre-requisite (if any)		10+2 with Chemistry	6. Frequency (use tick marks)	Even	(v)	Odd ()	Eitł	ner Sem	0	Every Se	m ()
7. Total Number	r of Lectures, Tutori	als, Practicals							÷		
Lectures = 00			Tutorials = 00			Practical =0	8				
8. COURSE OBJEC	TIVES: Student will b	be able to work effectively and	safely in a laboratory e	nviron	ment, p	ractical/tech	nnical/ co	mmunica	ation skill:	s, concep	ts to
solve qualitative and	d quantitative probl	ems,transferable skills like abil	lity to work in teams as	well as	s indepe	ndently.					
9. COURSE OUTCO	MES (CO):	loornors will douglon followir	na attributos								
Aller the succession	course completion		iy attributes.								
COURSE OUTCOME	(CO)	ATTRIBUTES									
C	01	Remember to keep records	of all performed experir	nents	in them	anner which	ı is requir	ed in lab	oratory.		
C	02	Able to Evaluate water quali	ity parameters like chloi	ride co	ontent a	nd alkalinity					
C	03	Understand the basic titration	on methods and technic	al skill	s to wo	rk in the diff	erent fiel	ds of che	mistry.		
C	04	Know about the principles o	f qualitative and quanti	tative	analysis	of inorganio	mixtures	5.			
C	05	Analyze the importance of p	ersonal safety and care	of equ	uipment	's and chem	icals.				
1. To determine chlu 2. To determine the 3. To determine Alk 4. Qualitative analys Cations: NH <sub>4</sub> <sup>+</sup> Pb <sup>2+</sup> , <i>I</i> Anions: CO <sub>3</sub> <sup>2-</sup> , S <sup>2-</sup> , S	pride content in the percentage of avail alinity in the given v sis of inorganic mixt $Ag^+$ , $Bi^{3+}$ , $Cu^{2+}$ , $Cd^{2+}$ , $J^{3-}$ , $O_3^{-2-}$ , $SO_4^{-2-}$ , $NO^{3-}$ ,	given water sample. able chlorine in the given blead vater sample. ure Sn <sup>2+</sup> , Fe <sup>3+</sup> , Al <sup>3+</sup> , Co <sup>2+</sup> , Cr <sup>3+</sup> , Ni <sup>2+</sup> , <sup>N</sup> NO <sup>2-</sup> , CH <sub>3</sub> COO <sup>-</sup> , F <sup>-</sup> , Cl <sup>-</sup> , Br <sup>-</sup> , I <sup>-</sup> ,	ching powder sample. $^{An2+}$ , $Zn^{2+}$ , $Ba^{2+}$ , $Sr^{2+}$ , $Ca^{2+}$ , , $PO_4^{-3-}$ , $BO_3^{-3-}$ , $C_2O_4^{-2-}$ ,	, <b>K</b> <sup>+</sup>							
11. CO-PO mappin	g							r			
COs		Attributes			P01	PO2	PO3	PO4	PO5	PO6	P07
CO1	Remember to keep required in laborato	records of all performed exper iry.	iments in themanner w	nich is	3	1	1		2		2
CO2	Able to Evaluate wa	ter quality parameters like chlo	oride content and alkali	nity.	3	1	1		1	2	2
CO3	Understand the ba different fields of ch	sic titration methods and tene tene tene tene tene tene tene te	chnical skills to work	in the	3	1	1		1		2
CO4	Know about the pri	nciples of qualitative and qua	ntitative analysis of inc	organic	3	1	1		1		2
CO5	Analyze the impor chemicals.	tance of personal safety an	d care of equipment	's and	3	1	1		1	2	2
		3 Strong contributio	n, 2 Average contributio	on , 1 L	low con	tribution			•		•
12. Brief description	on of self learning /	E-learning component									
https://www.fandm http://file.akfarmah https://faculty.psau https://www.stem.c http://pioneer.netsc	n.edu/uploads/files/ adhika.ac.id/E-BOO .edu.sa/filedownloa org.uk/resources/cc erv.chula.ac.th/~sar	79645701812579729-genchen K/12-1213-akfarmahad-16-1-v id/doc-6-pdf-f06110ef2e1e1ae illection/3959/practical-chemis nongn1/processing.pdf	n-reference-for-web.pd rogelqu-d.pdf e119cbacf71dd17732-or stry	f iginal.	pdf						
<b>13.</b> Books recomm 1. Advanced Organi 2. Organic Chemistr 3. Practical Physical 4. Experimental Inou 5. Organic Chemistr	nended: c Chemistry, Bahl & y Vol.I & II, I.L. Finar Chemistry: B. Viswa rganic Chemistry –V y Vol.I, II & III, Dr. Ja	Bahl, S. Chand & Co. Ltd. anathan and P.S.Raghavan. V.G.Palmer. Igdamba Singh, L.D.S. Yadav, Pi	ragati Prakashan.								

## SEMESTER-III

1. Name of the	Department: Chem	histry									
2. Course Name	3	INDUSTRIAL ASPECTS OF PH	IYSICAL CHEMISTRY			L		Т		I	Р
3. Course Code		CH201				3		1			0
4. Type of Cour	se (use tick mark)					Core (√)	DE	0		FC ()	
5. Pre-requisite	<u>ě</u>	10+2 with Chemistry	6. Frequency (use	Even	0	Odd (v)	Eitł	ner Sem	0	Every Ser	n ()
(if any)			tick marks)								
7. Total Numbe	r of Lectures, Tutor	rials, Practicals									
Lectures = 30			Tutorials = 10	·	H III	Practical = I	Nil		·		
8. COURSE OBJE	CTIVES: The purpor mamics and adsorption	se of this course is to study	y the use of simple model and to develop deep under	ls tor standi	predictiv	e understa	anding o radation	f physica	al phenor	mena asso materials i	ciated to n various
environments and	to present existing r	protection strategies for prev	ention of corrosion in diffe	erent co	ontexts	vith kinetic	S.	una 55.			
9. COURSE OUTCO After the successfu	)MES (CO): Il course completioi	n, learners will develop follo	wing attributes:								
COURSE OUTCOME	(CO) ATTRIBUTES	S									
CO1	Students wi and how so	II gain an understanding of t on products are formed.	he thermodynamic and kin	netic fo	orces inv	olved in ch	emical re	eactions	which de	etermine h	ow much
CO2	Students wi chemical kir	Il be able to evaluate the che netics in studying enzyme me	emical kinetics, how reactio chanisms.	on rate	s are me	asured and	l represe	nted in r	ate laws,	and applic	ations of
CO3	Students wil	Il gain an understanding of m	ethods for determining mo	olecula	r mass b	ased upon	colligativ	e proper	ties.		
CO4	Students wi graph.	Il create the own understand	ling approaches to the findi	ing of u	unknowr	i compositi	on of ana	alyte fror	n critical	solute tem	perature
CO5	Students wil	Il gain an understanding of ap	pproaches to the developm	nent of	dry & w	et corrosio	n and its	preventi	on.		
Unit-1		er of lectures = 08	Title of the unit: Ad	Isorpti	on						
Physisorption and	Chemisorptions, Ap	oplications of adsorption, Ads	sorption of gases by solids,	Freund	dlich ads	orption iso	therm, La	angmuir	s theory	of adsorpti	on, BET
Unit-2		er of lectures =08	Title of the unit: Cat	alysis	- Lind	the of one		' ro		1 dishealia	A - 10 - 10 - 10
General characteri equation, Effect of	stics of catalytic re temperature on en:	eactions Acid-base catalysis, zyme catalysis, Heterogeneon	Enzyme catalysis, Mechar us catalysis, Surface reactio	nism a ons, Kir	nd kiner	tics of enzy surface rea	yme cata ctions.	ilyzed re	eactions,	Michaelis-	Menten
Unit-3	Numbe	er of lectures = 08	Title of the unit: Coll	ligative	e proper	ties					
between elevation freezing point, Rela freezing point, Osm Unit-4	of boiling point ar ation between dep nosis and osmotic p	nd lowering of vapour pressi ression of freezing point and ressure, van't Hoff's equation er of lectures = 08	ure, Determination of mol d lowering of vapour press n. Title of the unit: Aze	sure, E	mass of Determin	solute fro ation of m	om eleva polecular	tion of b mass of	poiling po	int, Depre	ssion of
Distillation of immi-	scible liquids, Solub	ility of partially miscible liqui	ds, Phenol water system, C	ST and	l effect o	f impuritie	s on CST.				
Unit-5	Numb	er of lectures = 08	Title of the unit: Corro	sion ar	nd its co	ntrol					
Introduction, Econo from corrosion.	omic aspects of co	rrosion, Dry or Chemical Cor	rrosion, Wet or electroche	mical	corrosio	n, Mechan	ism of El	ectroche	emical Co	rrosion, Pr	revention
11. CO-PO mappir	ng	<b>A M-</b> : <b>b</b> · · <b>A -</b>			001	<b>D</b> 00	001	<b>DO4</b>	DOF	<b>DO</b> (	007
COS	Students will gain	Attributes	ermodynamic and kinetic f	forces	3	P02	P03 1	P04	2 PO5	P06	P07
CO1	involved in chemi products are forme	ical reactions which determ ed.	nine how much and how	soon	•						
CO2	Students will be at measured and repr studying enzyme m	ole to evaluate the chemical resented in rate laws, and ap nechanisms.	kinetics, how reaction rate plications of chemical kine	es are <sup>;</sup> tics in	3	1	2		3	1	
CO3	Students will gain mass based upon c	an understanding of meth colligative properties.	nods for determining mole	ecular	3	1	2		3	1	
CO4	Students will crea unknown composit	ate the own understanding tion of analyte from critical so	approaches to the findi olute temperature graph.	ng of	3	1	1		2	1	
CO5	Students will gain a wet corrosion and	an understanding of approacl its prevention.	hes to the development of	dry &	3	1	1		2	1	
		3 Strong contribu	tion, 2 Average contributio	n , 1 Lo	ow contr	ibution					
12. Brief descripti	on of self learning /	/ E-learning component									
http://nsdl.niscair.r	es.in/jspui/handle/	1234567897351 /io50157a002									
https://www.omics	sonline.org/industri	al-chemistry.php									
http://nsdl.niscair.u	res.in/jspui/handle/	/123456789/351?mode=full_									
13. Books recomm	nended:	f Surfaces Ath adition Duba	loba Wiely & Cone New Y	ork 10	00						
2. Austin H. T., Shre	eve's Chemical Proc	ess Industries, Pubs: McGrav	v Hill Book Company, New Y	York(19	782. 984).						
3. Kent James A. (e	d.), Reigel's Handbo	ook of Industrial Chemistry, P	ubs: Van Nostrand inhold C	Compa	ny, Lond	on (1983).					
4. Pandey C.N., Tex	t Book of Chemical	Technology, Vol. I & II, Pubs:	Vikas Publishing House, Pv	/t. Ltd.,	, New De	lhi (1999). w Vork (10	000)				
5. DUCITIEL V., 3011	CUST., WIITELO. &	. Ducher N.H., muustriar mory	anic chemistry, rubs. V. Ch		211CI 2, IV		107).				

1. Name of the	Departm	ent: Chem	histry											
2. Course Name	•		INDUSTRIAL ASPECTS O	F INOR	RGAI	NIC CHEMISTRY			L		Т			Р
3. Course Code			CH202						3		1			0
4. Type of Cours	se (use ti	ick mark)	I						Core (v)	DE	0		FC ()	
5. Pre-requisite (if any)			10+2 with Chemistry		6.	Frequency (use tick marks)	Even	0	Odd (v)	Eitl	her Sem	0	Every Se	em ()
7. Total Numbe	r of Lecti	ures, Tutor	ials, Practicals											
Lectures = 30					Tu	utorials = 10		F	ractical =	Nil				
<ol> <li>8. COURSE OBJEC applications and ex</li> <li>9. COURSE OUTCO After the successful</li> </ol>	TIVES: To traction ( OMES (CC I course (	o acquaint of importan <b>)):</b> completior	the students with basi nt metals from their ore: n, learners will develop t	c meta s. <b>followi</b>	illurç İng a	gical processes and	their	applicatio	ons in indu	ustries ald	ong with	an overv	view of al	loys, thei
COURSE OUTCOME	(CO) A	TTRIBUTES	5											
CO1	Ba	asic unders	standing of important as	pects c	ofino	organic chemistry a	pplicat	ion such a	as metallu	rgical pro	cesses is	created a	among stu	idents.
CO2	Н	ow inorgar	nic materials are importa	int for	indu	ustrial chemistry is e	valuat	ed throug	h suitable	example	S.			
CO3	E١	valuation o	f Commercial preparatio	ons of a	alloy	s, their merits and	demeri	ts and ho	w they ca	n be appli	ed in ind	lustrial ch	emistry is	done.
CO4	In	nportance	and application of metal	lurgica	al pro	ocesses in industria	l chemi	istry is lea	rnt.				5	
CO5	In	nportant a	pplications of inorganic	nateria	als li	ke zeolites, alumina	etc. a	re evaluat	ed by the	ir reaction	ns and pr	operties.		
10. Unit wise deta	ailed con	tent												
Unit-1		Numbe	er of lectures = 08		T	itle of the unit: N	letallu	rgy						
Basic metallurgical	operatio	ns- crushir	ng and pulverization, cor	icentra	tion	, calcinations, roast	ing, ty	pes of roa	sting, red	uction and	drefining	<b>j</b> .		
Unit-2		Numbe	er of lectures =08		Tit	tle of the unit: Ph	ysico (	Chemical	Principles	of Extrac	tion	<i>.</i>		
Methods of extract	on and r	efining of (	Copper, lead, aluminium	and Zi	nc fr	rom their ores.	-							
Unit-3		Numbe	er of lectures = 08		Tit	tle of the unit: In	organio	c materia	ls of Indus	strial Imp	ortance			
Availability, forms, s	structure	and modi	fication. Alumina, silica,	silicate	es, ze	eolites.								
Unit-4		Numbe	er of lectures = 08		Tit	tle of the unit: M	etals a	nd Alloys						
Important metals a	nd alloys	, iron, copp	per, aluminium, lead, nic	kel, tita	aniu	m and their alloys,	mecha	nical and	chemical	properties	s and the	eir applica	tions.	
Unit-5	,	Numb	er of lectures = 08		Tit	tle of the unit: Ad	hesive							
Introduction, Classi	fication	of adhesive	s, adhesives action, dev	elopme	ent o	of adhesive strength	chem	nical facto	rs influen	cing adhe	sive actio	on from (	corrosion	
11 CO-PO mappin	a			orope		autoorro ott origit	,			ung aano				
COs	9		Attribut	es				P01	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Basic un such as r	derstandin netallurgic	g of important aspects o al processes is created a	f inorg mong s	janic stud	chemistry applicat lents.	on	2		1		1	1	2
CO2	How inoi through	rganic mat suitable ex	erials are important for i camples.	ndustr	ial c	hemistry is evaluat	ed	2	1				1	2
CO3	Evaluation how the	on of Comr y can be ap	nercial preparations of a oplied in industrial chem	lloys, t istry is	heir don	merits and demeri e.	ts and	1						1
CO4	Importar learnt.	nce and ap	plication of metallurgica	al proce	esse	s in industrial chem	istry is	32	1	1		1	1	2
CO5	Importar	nt applicat	ions of inorganic mate	rials li	ike z	zeolites, alumina e	tc. are	2					1	2
	evaluate	d by their i	reactions and properties											
			3 Strong cont	ributio	on, 2	Average contributi	on , 1 L	ow contr	ibution	•			•	
12. Brief description	on of self	f learning /	E-learning component											
https://www.degru	yter.com	n/view/title	2/304228											
https://books.goog	le.com/b	ooks/abou	it/Industrial_inorganic_c	hemist	try.h	ntml?id=y43xAAAAA	/IAAJ							
https://oer.avu.org	/bitstrea	m/handle/	123456789/743/CHE%2	012_EI	N%2	0Inorganic%20Che	nistry.	pdf?sequ	ence=1&is	Allowed=	У			
https://organic-che	mistry.ch	nemistryco	nferences.org/events-lis	t/indu	stria	Il-inorganic-chemist	ry							
13. Books recomn 1. Austin H. T., Shre 2. Kent James A. (eo	<b>tended:</b> ve′s Che d.), Reige	mical Proce	ess Industries, Pubs: Mc ook of Industrial Chemist	Graw H rv, Pub	lill B s: Va	ook Company, New an Nostrand Hold C	York ( ompar	1984). iv. Londo	n (1983).					
3. Pandey C.N., Tex	t Book of	Chemical	Technology, Vol. I & II Pu	ubs: Vil	kas F	Publishing House, P	/t. Ltd.	, New Del	hi (1999).					
4. Buchner V., Sohli	ebs P., W	/inter G. &	Buchel K.H., Industrial I	norgan	ic Cł	hemistry, Pubs: V. C	h. Publ	lishers, N	ew York (1	989).				
5. Fumer I.E. and Za	Itsev V.N Bancher	I., General	Chemical Engineering, P Juction to Chemical Engine	ubs: M	ir Pu יי Dיי	ublishers, Moscow	(1961). 	1026						
o. Dauger W.L. allu	Control	C Unit Or	perations in Chemical Engli	ninoori	y, nu ina l	Pubs: McGraw-Hill	., U.S.F Book C	ompany	New York	1984 8	Perry I H	Chemic	al Engine	erina

Handbook, Pubs: McGraw-Hill Book Company, New York, 1993.

1. Name o	f the Departme	nt: Chen	nistry									
2. Course	Name		INDUSTRIAL ASPECTS OF OR	GANIC CHEMISTRY			L		Т		l	P
3. Course	Code		CH203				3		1			0
4. Type of	Course (use ticl	(mark)					Core (√)	DE	0		FC ()	
5. Pre-req	uisite		10+2 with Chemistry	6. Frequency (use	Even (	0	Odd (v)	Eit	her Sem	0	Every Ser	n ()
(if any	()			tick marks)								
7. Total Nu	umber of Lectur	es, Tuto	rials, Practicals	Televiste 40								
		atudu the	a various properties and role		onto in i	P the synth			mnoundo	auah aa	Crianard	roogonto
organo-lithiun Organo-pallad and applicatio 9. COURSE O After the succ	n, Zinc, Copper, lium and Lithiur ns. UTCOMES (CO): essful course co	Palladiu n organo	n, learners will develop follow	introduce the carbon nan	dium bo otubes:	orohydric synthesi	le, Alkoxic s, structu	les, Boro re, chara	n alumin cterizatio	um hydri n, mecha	de, Orgar nism, mo	dification
	COME (CO) AT	RIBUTE	S									
CO	1 The	study o	f various techniques used in	the organic synthesis give	es additi	ional stre	ngth and	understa	nding rec	jarding bi	o-transfo	rmations,
CO	<b>2</b> To	create th	ne capability of the synthesis	and applications of differ	ent org	anometa	lic reagen	ts such a	is Grignai	d reagen	ts, Organo	o-lithium,
CO	3 Stu	dents ca	n analyze the synthesis and a	pplications of organo-silic	on, Org	ano-palla	dium and	lithium c	organo-cu	prates co	mpounds	
CO	<b>4</b> Eva	luation a	and analysis of various chem	ical reactions: reduction	with Lit	hium alu	minum hy	dride, So	odium bo	rohydride	e, Alkoxide	es, Boron
CO	5 Syn	thesis, s	tructure, characterization, me	echanism, modification an	nd appli	cations ca	rbon nan	otubes gi	ve additi	onal supp	ort to the	students
10. Unit wise	e detailed conte	ent										
Unit-1 Bio-tranforma	atons – Enzyme	Numb catalyse	<b>er of lectures = 08</b> d reactions, Microwave induc	Title of the unit: To ed reactions-Principle, co	echniqu nditions	<b>ies in Org</b> s, advanta	<b>anic Synt</b> l ages over	<b>nesis</b> conventi	onal heat	ing meth	ods- Appli	cations,
Unit-2		Numb	er of lectures =08	Title of the unit: Or	ganom	etallic rea	agents					
Synthesis and reactionshydro	l applications of ogenation, hydr	of Grign oformyla	ard reagents-organolithium, ation.	Zinc, Copper, Palladiun	n, Nick	el compo	ounds in	organic	synthesis	s- Homoç	jeneous (	catalytic
Unit-3		Numb	er of lectures = 08	Title of the unit: Me	ethods	in Organi	c synthes	s-l				
Organosilicon Sonogashira c	Compounds: P oupling, Heck re	reparati action, F	on and applications in organ Preparation and applications of	nic synthesis; Applicatior of lithium organocuparate	ns of Po es.	d (0) and	I Pd (II) o	omplexe	es in orga	anic syntl	nesis- Suz	uki and
Unit-4		Numb	er of lectures = 08	Title of the unit: M	ethods	in Organi	c synthes	is-II				
Reduction wit	h lithium alumir mation dissoluir	nium hyd	Iride, sodium borohydride, all	koxides, bismethoxyetho	xyalumi	nium hyd	ride, bord obiel rodu	n alumin	ium hydr	ide and c	lerivatives	s-catalytic
Inetal Hydroge		Numb	ver of lectures = 08	Title of the unit: Car	rhon na	notubes		CUUIIS				
Synthesis, Sind	ale walled carbo	n nanot	ubes. Structure and character	rization. Mechanism of for	rmation	. chemic:	ally modifi	ed carbo	n nanotu	bes. Dop	ina. Funct	ionalizing
nanotubes, Ap	plications of ca	rbon nar	notubes.			.,				500, 50p	ing, i anot	ionanzing
11. CO-PO m	apping										-	
COs	The states		Attributes			P01	PO2	PO3	PO4	P05	PO6	P07
CO1	strength a and micro	of vario ind unde wave-ind	us techniques used in the or erstanding regarding bio-trar luced reactions.	ganic synthesis gives add hsformations, enzyme-cat	talyzed	1	1	1	1	-	1	3
CO2	To create organome Copper, P reactions	the ca tallic re alladium	apability of the synthesis agents such as Grignard r and Nickel compounds alor nation and hydroformylation	and applications of di eagents, Organo-lithium ng with homogeneous ca	fferent , Zinc, atalytic	2	1	2	1	-	1	2
CO3	Students of palladium	an analy and lithi	ize the synthesis and applica um organo-cuprates compou	tions of organo-silicon, O nds.	)rgano-	2	1	2	1	-	1	1
	Evaluation	and an	alysis of various chemical re	actions: reduction with L	ithium		<u> </u>		1	<u> </u>		-
CO4	aluminum creates a	hydride new din	, Sodium borohydride, Alkov nension in the study. Dissolv	kides, Boron aluminum h ving metal reductions an	nydride d non-	1	1	2	1	-	1	2
	metallic re	ducing r	eactions also an additional be	enefit.								
CO5	Synthesis, applicatio	struct ns carbo	ure, characterization, me on nanotubes give additiona	echanism, modification al support to the stude	and and ents to	1	1	2	2	-	1	2
	understan	d the ca	bon nanotubes. 3 Strong contribut	tion 2 Average contributi	on 11	w contri	bution					
12 Brief des	cription of solf l	oarning	/ F-learning component	tion, 2 Average contribution			button					
https://www.c	chem ubc.ca/ch	emistry-	412-industrial-organic-chemis	strv								
https://www.l	pritannica.com/	technolo	gy/chemical-industry/Organie	c-chemicals.								
http://www.u	ab.cat/guiesdoc	ents/20 <sup>-</sup>	19-20/g102495a2019-20iENG	.pdf								
13. Books re	commended:											
1. McCabe W. 2 Perry I H C	L. and Smith J.C	., Unit O ering Ha	perations in Chemical Enginee ndbook_Pubs: McGraw-Hill Br	ering, Pubs:McGraw-Hill B	300k Coi 199२	mpany, N	ew York,1	984.				
3. Rao, C. N. R	, Muller, A and C	heetam	, A.K. (Eds) (2004): The Chemi	stry of Nanomaterials, Vo	1773. I.1, and	2, Wiley	– VCH, W	einheim.				
4. Poole,C. P a	nd Owens, Jr: F.	J (2003)	Introduction to Nanotechno	logy Wiley Interscience, N	lew Jers	sey.	, -					
5. Kenneth J. k	Klabunde (Ed) (2 od Sundberg P	001), Na	noscale materials in Chemistr	ry, WileyInterscience, Nev	v York.	nor						
7. Smith, M. B.	(2005): Organic	Synthes	sis, 2nd Edition, McGraw-Hill:	New York.	r, əprini	yoı .						

8. Bansal R K(1999): Heterocyclic Chemistry, New Age International 9. Acheson R H, (1976): An introduction to the chemistry of Heterocyclic compounds, Wiley

1.	Name of the D	epartment: Chen	nistry									
2.	Course Name		MATERIALS AND ENERGY			L		Т			Р	
3.	Course Code		CH204				3		1		(	0
4.	Type of Course	e (use tick mark)					Core (√)	DE	0		FC ()	
5.	Pre-requisite (if any)	<u>, , , , , , , , , , , , , , , , , , , </u>	10+2 with Chemistry	6. Frequency (use tick marks)	Even	0	Odd (v)	Eitł	ner Sem	0	Every Ser	n ()
7.	Total Number	of Lectures, Tuto	rials, Practicals		1	1		1				
Lect	ures = 30			Tutorials = 10		I	Practical = N	il				
8. CO solvin indus	DURSE OBJECTI g problems on tries unit opera	VES: The purpose molarity, normali tions.	of this course is to study the ty mole fraction concept etc.	basic concepts of mole, s Thereafter apply the mat	ignifica erials b	int figure balance 8	s, solution c energy bala	hemistry ance cor	y and und ncept and	derstand d its calcu	ing the prir ulations to	nciples of chemical
9.00 After	the successful	course completio	n, learners will develop follo	wing attributes:								
COUR	SE OUTCOME (	CO) ATTRIBUTE	S									
	CO1	Students with them.	ill be able to analyze the ma	thematical interdisciplina	ry num	erical pr	oblem and o	hemica	l reactior	ns and st	rategies to	balance
	CO2	Students wi	Il be able to evaluate the solu	ition chemistry numerical	for titr	imetric a	nalysis.					
	CO3	Students w chemical re	ill have a firm foundation in actions.	the fundamentals and a	applicat	tion of C	hoice of sys	tem an	d basis c	of molecu	ular proces	sses with
	CO4	Students wi	ill have a firm foundation in	the fundamentals & appli	cations	s materia	Is and energ	jy balan	ice for th	e particu	Ilar reactio	n and its
	CO5	Students w evaporatior	ill be able to clearly comm n, absorption and crystallization	unicate the results of so on.	cientific	: work ii	n chemical	enginee	ring ope	rations s	such as di	stillation,
10.	Unit wise detai	led content	(1 ) 00									
Unit	-1	Numb	er of lectures = 08	litle of the unit: U	nits an	d Dimen	sions					
Intro	duction, Dimen	sions & Systems o	of Units, Fundamental quantil	ties, Derived Quantities, C	onvers	ions & Pr	oblems.					
Uni	t- <b>2</b>	Numb	er of lectures =08	litle of the unit: Ba	isic Che	emical ca	Iculation					
introc equiv <b>Uni</b> t	luction, Concej alent weight, ni t- <b>3</b>	of of atom, Mole ormality, molarity <b>Numb</b>	e and mole fraction, Method v, molality. er of lectures = 08	Title of the unit: M	aterial	n of mix Balance	tures (mass	percer	it, volum	e percer	nt, mole p	ercent),
Proce and b	ss classificatior ypass.	, Choice of syste	m and basis of molecular pro	ocesses with chemical rea	ictions,	Materia	I balance ca	lculatio	ns, multij	ple unit p	processes,	Recycle
Unit	-4	Numb	er of lectures = 08	Title of the unit: En	ergy Ba	alance						
Energ	y balance: Forn	ns of energy, Ener	gy balance, Energy changes i	n physical processes, Ener	gy char	nges in re	eactions, Ene	ergy bala	ance Calc	ulations.		
Uni	-5	Numb	per of lectures = 08	Title of the unit: Ma	iterial E	Balances	without Che	emical r	eactions			
Mate	rial Balance wi	thout chemical r	eactions: Flow diagram for r	naterial balance, simple	materia	al balanc	e without r	ecycles	or bypa	ss for ch	iemical en	gineering
opera	C PO manning	sultation, evapor	ation, absorption and crystall									
11.0	COs		Attributes			P01	PO2	PO3	PO4	PO5	PO6	PO7
	CO1 S	tudents will be a	ble to analyze the mathema	itical interdisciplinary nur	merical	3	1 1			2	1	
	CO2	tudents will be trimetric analysis	able to evaluate the solu	ution chemistry numerio	cal for	3	1 2			2	1	
	<b>CO3</b> S	tudents will have	e a firm foundation in the function of the fun	undamentals and applica	tion of	3	1 2			2	1	
	CO4 S	tudents will hav	e a firm foundation in the	e fundamentals & appli-	cations	3	1 1			3	2	
	CO5 C	tudents will be a hemical engineer	ble to clearly communicate ing operations such as disti	the results of scientific v llation, evaporation, abso	vork in orption	3	1 1			3	2	
	a		3 Strong contribu	tion, 2 Average contributi	on.1L	ow contr	ibution					
12. E	Brief description	n of self learning	/ E-learning component									
https:	//onlinelibrary	wiley.com/doi/bo	ook/10.1002/9781118237786	)								
https:	//beeindia.gov	.in/sites/default/f	files/1Ch4.pdf									
https:	//www.sanfou	ndry.com/best-re	ference-books-material-energ	gy-balance-calculations/								
https:	//books.google	.com/books/abo	ut/Handbook_on_Material_a	nd_Energy_Balance.html?	2012/2013	o1K2B26	QC					
<b>13</b> .	Books recomme	ended:	rd adition Dube: Tata Macro				100/					
т. Б.Т. 2. Вас	and vora s.W., Iger W.L. and B	ancher J.T., Intro	duction to Chemical Engineer	ing, Pubs: McGraw-Hill Co	, U.S.A	ew Deini , 1986.	, 1704.					
3. Mc	Cabe W.L.and S	mith J.C., Unit Op	perations in Chemical Enginee	ering, Pubs: McGraw-Hill E	look Co	mpany, I	New York, 19	984.				
4. Per	ry J.H., Chemic	al Engineering Ha	ndbook, Pubs: McGraw-Hill B	ook Company, New York,	1993. n. Duba	Droptic	Uall 2002					
6. For	st A.S., Wenzel	L.A., Clump C.W.,	Maus L., Andersen L.B., Princ	ciples of unit operations, 2	2nd edi	tion, Pub	is: John Wile	y and So	ons, 1994	ł.		

7. Chattopadhay P., Unit Operations of Chemicals Engineering, Vol I, Pubs: Khanna Publishers, Delhi, 1996.

1. Name of the	Department: Chem	histry									
2. Course Name	9	INDUSTRIAL ASPECTS OF MIC	CROBIOLOGY			L		Т		l	Р
3. Course Code		CH205				3		1			0
4. Type of Cour	se (use tick mark)	ł				Core ()	DE (v	/)		FC ()	
5. Pre-requisite (if any)	•	10+2 with Chemistry	6. Frequency (use tick marks)	Even ()		Odd (v)	Eithe	er Sem ()		Every Ser	m ()
7. Total Numbe	er of Lectures, Tuto	rials, Practicals			1						
Lectures = 30			Tutorials = 10		F	Practical = Ni	I				
8. COURSE OBJECT	TIVES: The main ob	jective of this course is to study	the classification and no	menclat	ure of	microorgani	sms, cult	uring an	d preser	vation of	
		on, industrial contamination pro	oblems and production m	nechanis	moli	ndustriai me	labolites	•			
After the successfu	l course completion	n, learners will develop followi	ng attributes:								
	E (CO) ATTRIBUTES	<b>)</b>    h = = h = t=		lessifierd	+!						
(0)	of Viruses, E	Bacteria, <i>Actinomycetes</i> , algae a	and fungi and their applic Growth kinetics of microl	ations in	tion an ferme	entation indu	iure, gen istry. ervation	techniqu			
CO2	Students wi	If be introduced to fermentation	n: which includes genera	Istructu	re of a	fermenter a	nd its tyr	nes Build	d the firr	m foundat	ion of
	USP & DSP a	and its purification methods.	n. which hickdes genera	i sti uctu			nu no typ	JCS. Duit		moundat	1011 01
CO4	Evaluate me Organic Acid	chanisms and process for the indexed and the second s	ndustrial production of m	netabolit	ies suc	h as Antibiot	ics, Enzyr	mes, Solv	vents, Vi	itamins an	d
CO5	Introduction	n to the concept of industrial co	ontamination problems: n	nicrobiol	logical	examinatior	n of conta	aminants	and the	eir control	through
10 Unit wise det	sterilization	techniques.									
Unit-1	Numbe	er of lectures = 08	Title of the unit: Cla	ssificatio	on and	Nomenclat	ure of Mi	icroorga	nisms		
Concept of kingdo Actinomycetes, alga	om-protista, prokar ae and fungi. Use of	yotes and eukaryotes, Introd f microorganisms in fermentation	uction to Microbial Dive on industry.	ersity: G	ieneral	characteris	tics and	importa	ince of	Viruses, E	Bacteria,
Unit-2	Numbe	er of lectures =08	Title of the unit: Pur	e Culture	e and I	Preservation	of Micol	bes			
Growth phases –	kinetics, asynchror	ious, synchronous, batch and	continuous culture. Fa	ctors aff	fecting	growth. Ba	acterial N	Nutrition	& Ferr	nentation	media:
Unit-3	Numbe	er of lectures = 08	Title of the unit: Basi	ic conce	pts of	Fermentatio	n				
Types of fermentat Disintegration of ce	ion. General Struct ells, Separation, Extr	ure of a Fermenter. Introductic raction, Concentration and puri	on to upstream and dowr ification of products.	nstream	proces	sing. Unit o	perations	in Dowr	nstream	processin	g (DSP):
Unit-4	Numbe	er of lectures = 08	Title of the unit: Indu	ustrial Pi	roduct	ion					
Production of antil	biotics- Penicillin a	nd semi-synthetic penicillins. I	Production of enzymes-	Amylase.	. Immo	obilization o	f enzyme	es and a	pplicatio	ons of imi	mobilized
Acid.					yanıc i	Acius- Acelic	ACIU. FI	ouuction		no Acius-	Giutannic
<b>Unit-5</b> Microbiological exa Minimum inhibitory	Numb amination of wate y concentration.	<b>er of lectures = 08</b> r and common contaminant.	Title of the unit: Cont Food poisoning. Contro	t <b>aminati</b> I of mic	on pro croorga	<b>blem in Fer</b> i anisms, Ster	nentatio ilization,	<b>n</b> inhibitir	ng subst	tances- Ar	ntibiotics,
11. CO-PO mappir	- 1g 	Attributes			PO1	PO2	PO3	PO4	PO5	PO6	PO7
<u> </u>	Students will be ab	le to understand the concept o	f microorganism classific	ation 3		2 1		1			2
COT	and nomenclature,	general characteristics and imp	portance of Viruses, Bact	eria,							
	Actinomycetes, alg	ae and fungi and their applicati	ons in fermentation indu	stry							4
CO2	Students will be ab culturing and their growth	le to grasp the concept Growth preservation techniques as we	n kinetics of microbes II as factors affecting the	3		2 1		1			1
	Students will be int	roduced to fermentation: whic	h includes general struct	ure 3		3 1		1			2
CO3	of a fermenter and purification metho	its types. Build the firm founda	ation of USP & DSP and its	s							
CO4	Evaluate mechanis	ms and process for the industri	al production of metabol	ites 3		2 1		1			1
	such as Antibiotics,	Enzymes, Solvents, Vitamins a	nd Organic Acids.								
CO5	Introduction to the	concept of industrial contamir	nation problems:	2		2 2		1			1
	microbiological exa	imination of contaminants and	their control through								
	sterilization technic	ques. 3 Strona contributic	on, 2 Average contribution	n.1Low	/ contr	ibution					I
12. Brief descripti	on of self learning <i>i</i>	/ E-learning component									
https://www.youtu	ibe.com/watch?v=V	/OBzQQCCwgo									
https://www.youtu	ibe.com/watch?v=li	m/6h4h1K6k /Microbiology/Boole%2A Micro	biology (Doundless) /47	0/21	lucte! - !	Microbiel	<b>a</b> u				
https://bio.libretex	is.org/BOOKShelves	viviicropiology/BOOK%3A_Micro	/industrial-microbiology/175	‰3A_INd	iustrial	0101001011	уу				
13. Books recomm	nended:	analoss microbiology/chapter	, maastrial-microbiology/								
1. Medical Microbio	ology, Vol. 1: Micro	bial Infection, Vol. 2 : Practical I	Medical Microbiology, Au	uthors- N	/lackie	and McCarti	ney.				
2. Epidemiology and	d Infections, Author	r-Smith									
4. Diagnostic Micro	biology, Authors- B	aron, Peterson and Finegold.									
5. Textbook of Indu	strial Microbiology	, Author- A. H. Patel.									

Industrial Microbiology, Author- L. E. Cassida
 Industrial Microbiology, Author- G. Reed.

1.	Name of the	Department: Chem	histry									
2.	Course Name	•			L		T			Р		
3.	Course Code		CH207				0		0			8
4.	Type of Cours	se (use tick mark)					Core (v)	DE	0		FC ()	
5.	Pre-requisite (if any)		10+2 with Chemistry	6. Frequency (use tick marks)	Even	0	Odd (v)	Eith	ner Sem	0	Every Ser	m ()
7.	Total Numbe	r of Lectures, Tutor	rials, Practicals									
Lect	ures = 00			Tutorials = 00			Practical =	08				
8. CO	OURSE OBJEC	TIVES: Student will	be able to work effectively and	l safely in a laboratory e	nviron	ment, p	practical/tec	hnical/ co	mmunica	ation skills	s, concept	s to
solve	qualitative an	d quantitative prob	lems, transferable skills like abi	lity to work in teams as	well as	indepe	endently.					
After	the successful	l course completion	n, learners will develop followii	ng attributes:								
COUR	SE OUTCOME	(CO)	ATTRIBUTES									
	(	:01	Remember to keep records	of all performed experi	ments i	in them	anner whicl	h is requir	ed in lab	oratory.		
	(	:02	Able to Evaluate water qual	ity parameters like chlo	ride co	ntent a	nd alkalinity	1.				
	(	:03	Understand the basic titration	on methods and technic	cal skills	s to wo	rk in the dif	ferent fiel	ds of che	mistry.		
	(	:04	Know about the principles o	of qualitative and quanti	itative a	analysis	of inorgani	c mixtures	ò.			
10	(	:05	Analyze the importance of p	personal safety and care	e of equ	ipment	t's and chem	nicals.				
1. To ( 2. To ( 3. Cor 4. Pre 5. Pre 6. Esti 7. To 8. To ( Micro 9. Qua 10. Qua 10. Qua 11. M 12. Ida 13. Fir 14. Pr 15. En 16. Pu <b>11. C</b>	determine the determine the ductometric i paration of ch paration of co mation of Ca study the abs determine the biology and B alitative test o Julitative test o Julitative test Ausic acid tess ethods of ster entification of nd out the iso- otein separati jumeration of crification tech O-PO mappin COs	e density or specific e water equivalent of titration. rome alum. orax/ boric acid. lcium in Chalk by pe orption of acid an a e pH of given HCl so iochemistry: f protein & amino a of carbohydrate by t, Bail's test, Nelson ilisation and prepar i solated bacteria, C electric point of pro- ion by polyacrylami- microorganism froi nniques serial dilution g	gravity of an unknown liquid. of calorimeter. activated charcoal. lution by using pH meter. acid by any two methods (Millo v any two methods (Molish test, n Somogy's method). ration of various culture media. Gram staining and gram staining otein. de gel electrophoresis. m water/soil sample, colony pu on, pour plate and streak plate Attributes	n's test, Biuret test, Nin , Fehling's test, Benedic , g method. irification. method	hydrin t's test,	test, Xa , Barfoe PO1	anthoprotei ed's test, Phr PO2	n's test, ho enyl Hydra	opkin'sco azine tes	ole test). t, iodine t <b>P05</b>	est, Seliwa	anoff's
	CO1	Remember to keep	records of all performed exper	riments in themanner w	hich is	3	1	1		2	1	2
		required in laborate	ory.									
	CO2	Able to Evaluate wa	ater quality parameters like chl	oride content and alkali	nity.	3	1	1		1	2	2
	CO3	Understand the ba	asic titration methods and te	chnical skills to work	in the	3	1	1		1		2
	CO4	Know about the pr	rinciples of gualitative and gua	intitative analysis of inc	organic	3	1	1		1		2
	COF	Analyze the impo	rtance of nersonal safety or	d care of equipment	's and	3	1	1	<u> </u>	1	2	2
	05	chemicals.	italice of personal safety at	id care of equipment	3 0110	-				-		
			3 Strong contributio	n. 2 Average contributi	on 11	ow con	tribution					
12. B	rief descripti	on of self learning /	/ E-learning component	, <u>2</u>	011712	011 0011						
https:	//www.fandn	n.edu/uploads/files	/79645701812579729-genchen	m-reference-for-web.pd	f							
http:/	/file.akfarmał	nadhika.ac.id/E-BOC	DK/12-1213-akfarmahad-16-1-v	/ogelqu-d.pdf								
https:	//faculty.psau	i.edu.sa/filedownlo	ad/doc-6-pdf-f06110ef2e1e1ae	e119cbacf71dd17732-o	riginal.	pdf						
http:/	//www.stem./	org.uk/resources/co erv.chula.ac.th/co	ulection/3959/practical-chemi:	stry								
12 D		ondod.	nongini processing.pui									
1. Adv	ance Practica	I Chemistry: Jagdan	nba Singh, L.D.S Yadav, Jaya Sin	igh, I.R. Siddiqui, Praqat	iEditior	۱.						
2. Pra	ctical Organic	Chemistry, A.I.Voge	el.									
3. Pra 4. Exn	ctical Physical erimental Inc	unemistry: B. Visw rganic Chemistry –V	vanathan and P.S.Raghavan. W.G.Palmer									
<u>-</u> p		<u></u>										

### SEMESTER-IV

1.	Name of the	Department: Cher	nistry									
2.	Course Name	e	POLYMER CHEMISTRY				L		Т			Р
3.	Course Code	!	CH208				3		1			0
4.	Type of Cour	se (use tick mark)					Core (v)	DE	0		FC ()	
5.	Pre-requisite (if any)	9	10+2 with Chemistry	6. Frequency (use tick marks)	Even	(v)	Odd ()	Eit	her Sem	0	Every Se	m ()
7.	Total Numbe	er of Lectures, Tuto	rials, Practicals									
Lect	ures = 30			Tutorials = 10		F	Practical =	Nil				
8. CC	OURSE OBJEC	TIVES: Students wi	Il able to understand the hist	ory of macromolecular scie	ence, p	olymer, t	ypes and	physical s	tate of p	olymers,	polymer p	processing
techni 9. COL After i	ques, mecha JRSE OUTCO the successfu	nism of polymeriza MES (CO): Il course completio	tion, synthesis and application	ins of polymers.								
COUR	SE OUTCOMI	E (CO)	ATTRIBUTES									
		CO1	Remember the history of	macromolecular science a	and bas	sic definit	ion of poly	ymer, pol	ymerizati	ion and fu	unctionali	ty.
		CO2	To know the Classification	on of polymers, cross-link	ed cor	oolymers,	tacticity,	Physical	state of	polymer;	; crystallii	nity, Glass
		CO3	To create basic Knowledg	je of the mechanism of ad	dition,	condensa	ation, cop	olymeriza	tion, initi	ators, inh	nibitors an	d living
		CO4	Able to evaluate differen	t types of polymer process	ing tec	chniques a	as mouldir	ng, spinni	ng, calen	daring, ca	asting.	
		CO5	Analyze the importance of	of synthesis and application	ns of cr	ross-linke	d copolyn	ners, addi	tion poly	mers, cop	olymers.	
10. l	Jnit wise det	ailed content										
Unit	Unit-1         Number of lectures = 08         Title of the unit: Introduction           rief history of macromlecular science, general characteristics of polymers, some basic definitions (functionality, polymer, polymerization, Homo and hetero chain polymers, copolymer).         File of the unit: Introduction											
Brief h polym	history of ma ers, copolym	cromlecular science er).	e, general characteristics of p	oolymers, some basic defir	nitions	(function	ality, poly	mer, poly	merizatio	on, Homo	o and hete	ro chain
Unit	-2	Numb	er of lectures =08	Title of the unit: Cla	assifica	tion of p	olymers					
Natura	al, synthetic,	inorganic, organic	, thermoplastics, thermosets	, elastomers, fibres, spec	iality, I	linear, bra	anched, ci	ross-linke	d copoly	mers (rar	ndom, alt	ernative,
block a	and graft), ta ?	cticity (isotactic, an	id atactic polymers), Physical	state of polymer; crystallin	nity, Gl	ass Trans	ition Tem	perature				
	-J	Numb	of free redicel onionic and	A actionic nolumorization	pesor	tore inhi	Lation liv	ing poly		ndonostio	n nolum	rization
copoly	/merization, d	coordination polym	erization (bulk, suspension, e	emulsion, solution).	, minua			ning polyi		luensatio	n polyme	<i>п</i> илин,
Unit	-4	Numb	er of lectures = 08	Title of the unit: Po	lymer	processir	ng					
Comp therm	ounding, vulo oforming, foa	canization reinforce aming, melt spinnir	ement, calendering, die-cast ng.	ing, filmcasting, compress	ion mo	oulding, i	njection n	noulding,	blow mo	oulding, e	extrusion	moulding,
Unit	-5	Numl	per of lectures = 08	Title of the unit: Sy	nthesis	, propert	ies and a	oplication	S			
Synthe	esis, propert	ies and application	ons of polythelene, polypro	pylene, polytetrafluroeth	ylene	pyolystyr	ene, poly	vinyl chl	oride, p	olyisopre	ne, polyk	outadiene,
neopr	ene, buna-N,	buna-s, phenolforr	mal dehyde ureaformaldehyd	le, polyurethanes.	-				·	5		
11. C	O-PO mappii	ng										
	COs		Attributes			P01	PO2	PO3	PO4	PO5	PO6	P07
	CO1	Remember the h polymer, polymeri	istory of macromolecular s zation and functionality.	science and basic definit	ion of	3	1	1	1	2	1	2
	CO2	To know the Cla Physical state of p	ssification of polymers, cro olymer; crystallinity, Glass Tra	oss-linked copolymers, ta ansition Temperature.	cticity,	,3	1	1	1	2	1	2
	CO3	To create basic copolymerization,	Knowledge of the mechan initiators, inhibitors and livin	ism of addition, conden g polymers.	sation,	,3	1	1	1	2	1	2
	CO4	Able to evaluate d	ifferent types of polymer pro	ocessing techniques as mo	ulding,	3	1	1	1	2	1	2
	CO5	Analyze the imp	portance of synthesis and	d applications of cross	-linked	3	1	1	1	2	1	2
	copolymers, addition polymers, copolymers.											
12 B	rief descripti	on of self learning	3 Strong contribu	tion, 2 Average contribution	on , 1 L	.ow contr	ibution					
http://	/chemistry-cl	nemists.com/chem	ister/Polimers/polymer-scien	ce-and-technology.pdf								
https:/	//byjus.com/	jee/polymers/	ister/rolliners/polymer scien	ee and teenhology.put								
.//	/chemed.che	m.purdue.edu/gen	chem/topicreview/bp/1poly	mer/types.html								
https:/	//www.britar	nnica.com/science/	polymer									
<b>13</b> . B	ooks recomr	mended:					-	-	-		-	
1. Che	mical Therm	odynamics by R.P.R	lastogi et al									
2. PHF 3. Esse	entials of Phv	sical Chemistry, Ba	hl & Tuli, S. Chand & Co. Ltd.									
4. Prin	ciples of Phy	sical Chemistry, Pu	ri, Sharma & Pathania, Vishal	Publishing Co.								
5. Sim	plified course	e in Physical Chemis	stry, Madan & Tuli, S. Chand xford Press	& Co. Ltd.								
υ. ΑΙΚ	in a r riysical (	anomisti y, Atkin, U										

1. Name of the	Department: Chem	istry									
2. Course Nam	e	MEDICINAL DRUG CHEMIST	RY			L		Т		I	p
3. Course Code	;	CH209				3		1		(	0
4. Type of Cou	rse (use tick mark)					Core (√)	DE	0		FC ()	
5. Pre-requisite (if any)	e	10+2 with Chemistry	6. Frequency (use tick marks)	Even (v	/)	Odd ()	Eith	ner Sem	0	Every Ser	n ()
7. Total Numb	er of Lectures, Tutor	ials, Practicals	· · · · · · · · · · · · · · · · · · ·				1				
Lectures = 30			Tutorials = 10		Р	ractical = N	lil				
8. COURSE OBJEC and newer drugs for	<b>TIVES:</b> To study the or the newer disease	basic fundamentals of availabl	le drugs in various fields	such as	antibio	tics, antipy	retics, ar	nalgesics,	antimala	arial, cardio	ovascular
9. COURSE OUTCO After the successfu	MES (CO): ul course completion	, learners will develop followi	ng attributes:								
COURSE OUTCOM	E (CO)	ATTRIBUTES									
	CO1	Evaluation and study of in Chloramphenicol provided a	troduction, examples a a better understanding o	nd uses of the an	of vario	ous antibio	tics such	n as β-La	ictam, Ar	ninoglycos	ides and
	CO2	Study of introduction, class	ification, synthesis and ι	uses of a	ntipyret	ics and ana	algesics I	ike Parac	etamol, <i>I</i>	Aspirin, Ph	enazone,
	CO3	Overview, structure and us	ses of antimalarial drug	gs like C	hloroqu	ine phospl	nate, Pri	maquine	phospha	ate, Isoper	ntaquine,
	CO4	Introduction, classification Antihypertensive drugs: Los	, structure and uses sartan and Methyldopa;	of card Antiarrh	iovascul iythmic	ar drugs Agents: Lo	such as rcainide	Cardiac HCI and V	: glycosio Verapam	des and [ il HCI gives	Digitoxin; a better
	CO5	Knowledge regarding newe	er available drugs such	as Miso	prostol,	probucol,	Tamoxif	en Citrat	e, Flutan	nide, Meth	nimazole,
10. Unit wise det	ailed content	Ethambutol Hydrochloride,	, Isoniazid, Rifampicin a	and Line	ezolid fo	or the new	ier disea	ise creat	e more	understan	ding and
Unit-1	Numbe	er of lectures = 08	Title of the unit: A	ntibiotic	s						
Introduction, exa Aminoglycosides a	mples and uses of nd Chloramphenicol	β-Lactam Antibiotics; Introd	uction, examples and	uses of	first, s	econd, thi	rd and	fourth g	eneration	n Cephalo:	sporins,
Unit-2	Numbe	er of lectures =08	Title of the unit: An	tipyretic	s and A	nalgesics					
Introduction and uses of Morphine a	classification of Anti and Codeine.	pyretics and Analgesics. Synth	esis and uses; paraceta	mol, Asp	oirin, ph	enazone, p	henylbu	tazone. I	ntroduct	ion, structi	ure and
Unit-3	Numbe	er of lectures = 08	Title of the unit: An	timalari	als						
Introduction, struc Antimalarial Drugs	ture and uses of ant	imalarial drugs; Chloroquine pl efloquine Hydrochloride.	hosphate, Primaquine pl	hosphate	e, Isoper	ntaquine, P	roguanil	Hydroch	lloride, Ti	imethopri	m. New
Unit-4	Numbe	er of lectures = 08	Title of the unit: Ca	rdiovasc	ular Dru	ıgs					
Introduction and ( Hydrochloride, Me	Classification of Carc thyldopa. Antiarrhyt	liovascular Drugs. Structure ai hmic Agents; Lorcainide Hydro	nd uses: Cardiac glycosi ochloride, Propranolol H	des; dig ydrochlo	oxin and oride, Bre	d digitoxin. etylium tos	Antihyp sylate, Ve	oertensive erapamil	e drugs; Hydrochl	Losartan, ( oride.	Clonidine
Unit-5	Numb	er of lectures = 08	Title of the unit: An	tiarrhyth	nmic Ag	ents					
Lorcainide Hydroc	hloride, Propranolol	Hydrochloride, Bretylium tos	ylate, Verapamil Hydro	chloride.	Newer	Drugs for	Newer	Disease:	Introduc	tion, Struc	ture and
uses: Misoprostol,	probucol, Tamoxifer	n Citrate, Ethambutol Hydrochl	oride, Isoniazid,								
11. CO-PO mappi COs	ng	Attributes			P01	PO2	PO3	PO4	PO5	PO6	PO7
	Evaluation and stud	dy of introduction, examples a	and uses of various anti	biotics	2	1	2	2	_	2	3
CO1	such as β-Lactam, understanding of th	Aminoglycosides and Chlora ne antibiotics.	mphenicol provided a	better	-		-	-		_	Ĵ
CO2	Study of introduct analgesics like Par	ion, classification, synthesis a acetamol, Aspirin, Phenazone	and uses of antipyretic e, Phenylbutazone alone	cs and g with	2	1	1	2	-	2	3
CO3	Overview, structure Primaquine phosph	e and uses of antimalarial drug nate, Isopentaquine, Proguanil	is like Chloroquine phos HCI, Trimethoprim as v	phate, well as	2	1	2	1	-	2	3
CO4	Introduction, classi Cardiac glycosides	fication, structure and uses of and Digitoxin; Antihyperte	f cardiovascular drugs s ensive drugs: Losartar	uch as n and	2	1	1	2	-	2	3
	Knowledge regardi	ng newer available drugs su	ch as Misoprostol, pro	bucol,				1			
CO5	Tamoxifen Citrate	, Flutamide, Methimazole,	Ethambutol Hydroch	loride,	2	1	1	2	-	2	3
	Isoniazid, Rifampio	cin and Linezolid for the interview of modern	newer disease create	more							
		3 Strong contributio	on, 2 Average contributio	on , 1 Lov	w contri	bution		1	I		1
12. Brief descript	ion of self learning /	E-learning component									
https://www.ysmu	ibooks.am/uploads/	Ph_Chtextbook.pdf	fightion of drugs bind								
https://www.pnar	r.com/guides/chemi	stry/chemistry-in-evervday-life	e/drugs-and-their-classif	ication/							
13. Books recom	mended:	<u>, secondary in ovoryady inc</u>									
1. Chemical Therm 2. Principles of phy	odynamics by R.P.Ra	astogi et al uri Sharma and Pathan									
3. Essentials of Phy	sical Chemistry, Bah	I & Tuli, S. Chand & Co. Ltd.									
4. Principles of Phy 5. Simplified course	sical Chemistry, Puri	i, Sharma & Pathania, Vishal Pu try, Madan & Tuli, S. Chand & C	ublishing Co. Co. Ltd								
6. Atkin's Physical	Chemistry, Atkin, Ox	ford Press.	55. LIU.								

1. Name of the	Department: Chem	istry									
2. Course Name	9	Petrochemicals				L		Т			P
3. Course Code		CH210				3		1		(	0
4. Type of Cour	se (use tick mark)					Core (√)	DE	0		FC ()	
5. Pre-requisite (if any)		10+2 with Chemistry	6. Frequency (use tick marks)	Even (√)	)	Odd ()	Eitł	ner Sem	0	Every Ser	n ()
7. Total Numbe	r of Lectures, Tutor	ials, Practicals									
Lectures = 30			Tutorials = 10		P	Practical = N	lil				
8. COURSE OBJEC and methods of dis	TIVES: To provide the tillation. Also, introd	he fundamental knowledge of duce refining and cracking proc	origin, composition, exp cesses of petroleum. Sim	bloration hilarly, stu	and de udy the	esalting of c preparatio	rude oil ns of dif	with res ferent ch	pect to it emicals f	s essential rom petro	s, profile Ieum.
9. COURSE OUTCO After the successfu	MES (CO): I course completion	, learners will develop followi	ng attributes:								
COURSE OUTCOME	(CO)	ATTRIBUTES									
(	01	Introduction of crude oil, ex natural gas create and enha	xploratory methods, oil ince the understanding c	reservoirs of the pet	s, trans trocher	sportation ( micals.	of crude	oil, the c	constituti	on of crud	e oil and
(	02	Study of the distillation of	f crude oil, separation	of natura	al gas	along with	the me	eaning of	f terms s	such as-po	our point
	203	Discussion of the different	operations such as cat	alytic cra	icking,	hydrocrack	ing, isoi	merizatio	n, reform	ning and a	lkylation
(	204	The study of various hydro and propylene with their re	carbon fuels and their cl actions and process diag	haracteri: Jrams pro	stics co ovide no	oncerning t ew dimensi	he manı ons to tl	ufacturino ne analys	g of the e is.	ethylene, a	icetylene
(	05	Preparation of ethylene, et	hanol, acetaldehyde, ac	etic acid,	, vinyl a	acetate, eth	nanolam	ines, and	l vinyl ch	loride enh	ance the
10. Unit wise det	ailed content	knowledge to analyze these	chemicals, its chemistry	y and app	licatio	ns.					
Unit-1	Unit-1 Number of lectures = 08 Title of the unit:										
htroduction to crude oil, exploratory methods, oil reservoirs, transportation of crude oil, Constitution of crude oil and Natural gas.											
Unit-2	Jnit-2 Number of lectures =08 Title of the unit:										
Distillation of crude as-Pour point depre	e oil, Separation of r essants, drag reduce	natural gas and different fracti rs, viscocity reducers, flash po	ions based on relative vo int, octane number.	olatilities,	, Comp	ositions of	differen	t distillat	es. Mean	ing of terr	ms such
Unit-3	Numbe	r of lectures = 08	Title of the unit:								
Detailed discussion Isomerization, Refo	of the following op rming, Alkylation.	perations with respect to proc	cess, mechanism, catalys	sts used a	and ap	plications,	Cracking	j: Catalyt	ic crackin	ng, Hydroc	racking,
Unit-4	Numbe	r of lectures = 08	Title of the unit:								
Types of hydrocarb	on fuels and their cl	naracteristics. Manufacture of	the following compound	ls: ethyle	ne, ace	etylene, Pro	pylene v	vith react	tions and	process d	iagram.
Unit-5	Numbe	er of lectures = 08	Title of the unit:								
Preparation of the t	following compound	ls from ethylene: ethanol, acet	taldehyde, acetic acid, vi	nyl aceta	te, eth	anolamines	, and vir	nyl chlorio	de.		
11. CO-PO mappir	ıg										
COs	later destine of our	Attributes	- 11		P01	PO2	PO3	PO4	P05	PO6	PO7
CO1	introduction of cru crude oil, the consi understanding of th	de oil, exploratory methods, ( titution of crude oil and natur le petrochemicals.	ral gas create and enha	nce the	2	1	2	1	-	2	3
CO2	Study of the distill meaning of terms	ation of crude oil, separation such as-pour point depress	of natural gas along w sants, drag reducers, v	vith the viscosity	2	1	1	1	-	2	3
CO3	Discussion of the d isomerization, refor	ifferent operations such as ca ming and alkylation concernii	talytic cracking, hydrocing the process, mechani	racking, ism and	2	1	2	1	-	2	3
CO4	The study of variou manufacturing of th	is hydrocarbon fuels and their the ethylene, acetylene and pro-	r characteristics concern	ning the ons and	2	1	1	1	-	2	3
CO5	Preparation of etl ethanolamines, an	nylene, ethanol, acetaldehyd d vinyl chloride enhance the	le, acetic acid, vinyl a e knowledge to analyze	acetate, e these	2	1	2	1	-	2	3
	chemicals, its chem	istry and applications.									
		3 Strong contributio	on, 2 Average contributio	on,1Low	v contri	ibution					
12. Brief descripti	on of self learning /	E-learning component									
https://energyeduc	ation.ca/encyclope	dia/Petrochemical									
https://www.youtu	be.com/watch?v=N	JbNg3GlkY4									
https://ihsmarkit.co	om/products/petroc	hemical-industry-chemical-eco	onomics-handbook.html								
<b>13.</b> Books recomm 1. Chemical Thermo 2. Principles of phy 3. Essentials of Phy 4. Principles of Phy 5. Simplified course 6. Atkin's Physical C	nended: odynamics by R.P.Ra sical chemistry by Po sical Chemistry, Bah sical Chemistry, Puri e in Physical Chemist Chemistry, Atkin, Ox	istogi et al uri Sharma and Pathan I & Tuli, S. Chand & Co. Ltd. , Sharma & Pathania, Vishal Pu ry, Madan & Tuli, S. Chand & G ford Press.	ublishing Co. Co. Ltd.								

1. Name of the	Department: Chem	istry								
2. Course Nam	e	Agrochemicals			L		Т		I	p
3. Course Code	!	CH211			3		1		(	0
4. Type of Cou	se (use tick mark)				Core (√)	DE	0		FC ()	
5. Pre-requisite	; ;	10+2 with Chemistry	6. Frequency (use E	ven (v)	Odd ()	Eit	her Sem	0	Every Ser	n ()
(if any)		,	tick marks)					· ·	,	Ŭ
7. Total Numbe	er of Lectures, Tutor	ials, Practicals								
Lectures = 30			Tutorials = 10		Practical =	Nil				
8. COURSE OBJEC	TIVES: To understar	nd about Organochlorines, org	anophosphate and carbama	ates Insect	cides natura	al organic	insecticio	lesand th	eir mode (	of action,
classification and c	hemistry of Fungicio	des, synthesis, mode of action	and their applicationsof ar	omatic aci	d derivatives	s like 2,4-	D & 2,4,5	-T, conce	ots of forn	nulations
(dry and wet)in pe	sticide and growth r	egulating hormones.								
9. COURSE OUTCO After the successfu	MES (CO): Il course completion	n, learners will develop follow	ving attributes:							
COURSE OUTCOM	E (CO)	ATTRIBUTES								
	001	Remembergeneral introdu	ction, chemical classification	n of Insect	cides and n	atural org	janic inse	cticides li	ke pyrethi	oids and
	.01	pyrethrins.								
	CO2	Comprehension of concept	ts of formulations (dry and v	wet)in pest	icide and sy	nthesis, a	pplicatior	ns of rode	nticides	
	CO3	Understanding of chemistr	y of fungicides and different	t classes of	fungicides a	and dithio	carbamat	tes as pot	ent fungic	ides.
	CO4	Able toevaluatedifferent phosphides, Warfarin, sodi	types of commercial synth ium monofluoroacetate.	hetic meth	nodologies o	of 2,4-D	& 2,4,5-1	Γ and ro	denticides	likeZinc
	005	Analyze and compare Orga	anophosphate insecticides o	ver Organo	chlorines In	secticides	s, Synthes	sis, mode	of action,	uses and
		formulation of Organochlo	rines. Organophosphates ar	nd carbama	ates insectic	ides.				
10. Unit wise det	ailed content	<u> </u>	<b>-</b> ''' ( )							
Unit-1	Numbe	er of lectures = 08	litle of the unit:							
General introducti fungicides berbici	on, Types of pestic les rodenticides m	cides: stomach poisons, cont pluscicides acaricides pemat	act poisons, systemic pois icides. Natural organic insec	ons, fumiç ticides: pvr	ants. Chem	ical class	ification	of pestici	des: Insea	cticides,
Init 2	Numbe	or of loctures -09	Title of the unit:	ticiucs. pyi		аругенни	113.			
General introduction	n synthesis mode	of action and applications: (a)	Organochlorine Insecticide		C aldrin on	dosulfon	(b) Orga	nonhosnt	iorus inser	ticidos
Phosphamidon (Di	mecron), Malathion,	methyl parathion. (c) Carban	nate insecticides: Carbaryl, C	Carbofuran		uosunon.		порнозрі		cicides.
Unit-3	Numbe	er of lectures = 08	Title of the unit:							
General introducti oxychloride, Dithio	on, synthesis, mode carbamates: Ziram,	e of action and applications: thiram and Zineb.	(a) Inorganic fungicides: Si	ulphur, Lir	ne sulphur,	copper s	ulphate,	Burgundy	mixture,	copper
Unit-4	Numbe	er of lectures = 08	Title of the unit:							
General introduction	on, synthesis, structi	re and applications: Herbicid	es: 2, 4, dichloro phenoxy a	cetic acid (	2. 4-D), alac	hlor, sulpl	honvl ure		inds. Rode	enticides-
Zinc phosphides, W	/arfarin, sodium mo	nofluoroacetate.			2, 1 2, and	nor, ourp	lionji u o	a oompoe		
11-34 F	Numb		Title of the unit.							
Unit-5		er of lectures = 08	kining Formulation of nos	ticidos, Dr	v formulati	on Ducto	arapula	s wottal		ore cood
disinfectants liquid	formulation: Emuls	ing induce acetic actus, cyto	withins. For mulation or pes	liciues. Di	y ioimulati	UII. Dusts	, yranule	s, wella	ne homme	ers, seeu
11 CO-PO manni										
COs		Attributes		PO1	PO2	PO3	PO4	PO5	PO6	P07
	Domomborgonoral	introduction chamical class	stification of Insocticidos	and 3	1	1		2	2	2
CO1	natural organic inse	ecticides like pyrethroids and	pyrethrins.	anu						
CO2	Comprehension of synthesis, application	concepts of formulations ( ons of rodenticides	(dry and wet)in pesticide	and 3	1	1		2	2	2
CO3	Understanding of c dithiocarbamates a	hemistry of fungicides and dif s potent fungicides.	ferent classes of fungicides	and 3	1	1		2	2	2
CO4	Able toevaluatediff & 2,4,5-T and	erent types of commercial sy rodenticides likeZinc pho	nthetic methodologies of 2, osphides, Warfarin, sodi	4-D <b>3</b> ium	1	1		2	2	2
	Analyza and com		atiaidaa ayar Organaablari	3	1	1		2	2	2
005	Insecticides Synt	bale organophosphate inse	uses and formulation	of						
000	Organochlorines, O	rganophosphates and carbar	ates insecticides	01						
		2 Channe contributi		11						
1) Drief deserter	on of colf location -	3 Strong contributi	ion, 2 Average contribution ,	, I LOW COR	מטוועמו ווו					
12. Brief descript	ion of self learning /	E-learning component								
https://www.work	clonedia com/scienc	e/encyclopedias almanacs tr	anscripts and mans/agroche	micals						
https://www.ency	nica com/technolo	av/agrochemical	anscripts-and-maps/aground	filleais						
https://byjus.com/	biology/effects-of-a	grochemicals/								
13. Books recom	mended:	<b>~</b> <sup>→</sup>								
1. Chemical Therm	odynamics by R.P.Ra	astogi et al								
2. Principles of phy	sical chemistry by P	uri Sharma and Pathan								
4. Principles of Phy	sical Chemistry, Bar sical Chemistry, Pur	i, Sharma & Pathania. Vishal P	Publishing Co.							
5. Simplified cours	e in Physical Chemis	try, Madan & Tuli, S. Chand &	Co. Ltd.							

6. Atkin's Physical Chemistry, Atkin, Oxford Press.

1. N	lame of the	Department: Chem	istry									
2. C	Course Name	9	Industrial waste Treatment				L		Т		I	)
3. C	Course Code		CH212				3		1		(	)
4. T	ype of Cour	se (use tick mark)					Core ()	DE	(v)		FC ()	
5. P	Pre-requisite (if any)		10+2 with Chemistry	6. Frequency (use tick marks)	Even (	√)	Odd ()	Eitł	ner Sem	0	Every Ser	n ()
7. T	otal Numbe	r of Lectures, Tutor	ials, Practicals									
Lectu	res = 30			Tutorials = 10		F	Practical =	Nil				
8. COL	URSE OBJEC	TIVES: Basic knowle	edge of industrial waste mana	gement technologies, ac	quainta	nce with	n basic was	te treatm	nent tech	nologies	and enviro	onmental
legislat	ions to curb	hazardous wastes v	vill be taught to students.									
9. COU After th	he successfu	I course completion	n, learners will develop follow	ving attributes:								
COURS	E OUTCOME	(CO)	ATTRIBUTES									
	(	01	analysis working methodol	ogies of treatment techn	ologies	to tackle	e waste fro	om house	hold and	industrie	es is done	
	(	02	An evaluation of hazardou	s impacts of wastes on cl	imate a	nd huma	an health c	reate awa	areness a	mong stu	udents.	
	(	03	Evaluation of different rem	nedial measures to check	wastev	olume a	and streng	h develo	ps a sens	e of susta	ainable	
	(	204	Awareness about waste ge	eneration, its impact and	mitigat	ion strat	egies wou	ld be crea	ated to re	emove ha	izardous w	astes.
	(	205	Remembrance of importar	nt aspects of environmen	tal audi	ts would	l lead to its	applicati	ion in ind	ustries.		
10. U	nit wise det	ailed content	<u> </u>									
Unit-	1	Numbe	er of lectures = 08	litle of the unit: In	troduct	ion			6 !	- tu' - L - 60		
Types c	of industries land, sewag	and industrial polic	ation; Characteristics of Indus	trial wastes; Population ( ental legislations related t	equivale	ent; Bioa ention ar	issay studi nd control (	es; effect of industr	s of indu Tal efflue	strial effi	uents on s hazardous v	treams, wastes
Unit-2	<b>2</b>	Numbe	er of lectures =08	Title of the unit: Cle	eaner Pr	oductio	n					
Waste Applica	managemei itions.	nt Approach; Wast	e Audit; Volume and streng	th reduction; Material	and pr	ocess m	nodification	ns Recycl	e, reuse	and by	product re	covery;
Unit-3	3	Numbe	er of lectures = 08	Title of the unit: Po	llution	from Ma	aior Indust	ries				
Sources	s Character	istics waste treatm	ent flow sheets for selected	industries such as Texti	les Tan	norios	Pharmacel	iticals Di	airy Sug	ar Paner	distillaria	s Staal
plants,	thermal pov	ver plants; Waste wastewa	ater reclamation concepts.			nenes, i	marmacet	iticais, De	un y, Suga	n, raper	, distinctio	.3, 51001
Unit-4	4	Numbe	er of lectures = 08	Title of the unit: Tre	eatmen	t Techno	ologies					
Equalisa treatmo	ation; Neuti ent of indus	ralisation; Removal trial and municipal v	of suspended and dissolved vastes; Residue management;	d organic solids; Chemic ; Dewatering; Disposal.	cal oxid	ation, A	dsorption	Remova	of disso	olved inc	organics; C	ombined
Unit-	5	Numb	er of lectures = 08	Title of the unit: Ha	zardous	waster	manageme	nt				
Hazard	ous wastes -	Physico chemical tr	reatment, solidification, incine	eration, Secure land fills.								
11.00	) PO mannir											
11.00	COs		Attributes			P01	PO2	PO3	PO4	PO5	PO6	PO7
	CO1	analysis working m	ethodologies of treatment tec	hnologies to tackle wast	e from	2		2	2	2	3	1
	CO2	An evaluation of ha	zardous impacts of wastes on	climate and human heal	th	2		2			3	2
		create awareness a	mong students.		oncili	2	4	2			-	
	CO3	evaluation of differ	ent remedial measures to che f sustainable environmental m	eck waste volume and stronger	engtn	3		2	2	2	3	1
	CO4	Awareness about v be created to remo	waste generation, its impact a ve hazardous wastes.	and mitigation strategies	would	2		1	2		3	2
	CO5	Remembrance of in application in indus	mportant aspects of environr stries.	nental audits would lead	to its		3	2				3
		<u> </u>	3 Strong contributi	on, 2 Average contributio	on.11c	w contr	ibution				1	I
12. Br	ief descripti	on of self learning /	'E-learning component	<u>-</u>	, , 20							
https://	/condorcher	n.com/en/industria	I-wastewater-treatment/									
https:// https://	/www.chem /www.encyc	icalprocessing.com/ lopedia.com/envirc	/articles/2018/understand-inc onment/encyclopedias-almana	lustrial-wastewater-treat acs-transcripts-and-maps	:ment/ /industr	rial-wast	e-treatme	nt				
https://	/www.water	.wa.gov.au/data/	/assets/pdf_file/0008/4040/8	9343.pdf								
<b>13</b> . Bo	ooks recomn	nended:										
1. Chen	nical Thermo	odynamics by R.P.Ra	astogi et al									
2. Princ 3. Esser	ntials of Phy	sical Chemistry by P sical Chemistry, Bah	un sharma and Pathan Il & Tuli, S. Chand & Co. Ltd.									
4. Princ	ciples of Phy	sical Chemistry, Pur	i, Sharma & Pathania, Vishal P	Publishing Co.								
5. Simp 6. Atkir	n's Physical C	e in Physical Chemis Chemistry, Atkin, Ox	try, Madan & Tuli, S. Chand & ford Press.	Co. Ltd.								

e of the Department: Chem	istry									
se Name	INDUSTRIAL CHEMISTRY LAB	3-4			L		Т			Р
se Code	CH214				0		0			8
of Course (use tick mark)					Core (v)	DE	0		FC ()	
equisite any)	10+2 with Chemistry	6. Frequency (use tick marks)	Even	(v)	Odd ()	Eith	ner Sem	0	Every Sei	m ()
	Idis, Placticais	Tutorials - 00		D	Practical -(	18				
- 00 E OB IECTIVES: Student will	he able to work offectively an	d safely in a laboratory of	nviron	mont pro	nactical/too	bpical/co	mmunic	ation skill	concont	s to
ative and quantitative prob	lems transferable skills like ab	ility to work in teams as	well as	indepen	dently		mmunic		s, concept	5 10
E OUTCOMES (CO): accessful course completion	n, learners will develop follow	ing attributes:			uonny.					
JTCOME (CO)	ATTRIBUTES									
CO1	Remember to keep records	of all performed experir	nents i	n themar	nner which	n is requir	ed in lab	oratory.		
CO2	Able to Evaluate water qua	lity parameters like DO,E	OD,CC	D,TDS a	nd alkalini	ty				
CO3	Understand the basic titrat	ion methods and technic	al skills	s to work	in the diff	erent fiel	ds of che	mistry.		
CO4	Know the preparation of re	sins and acetanilide.								
CO5	Analyze the importance of	personal safety and care	of equ	ipment's	and chem	nicals.				
Experiments										
<ul> <li>2. Preparation of Phenol formaldehyde (Bakelite) resin.</li> <li>3. Preparation of Nylon 6, 6.</li> <li>4. Preparation of Acetyl Salicylic acid (Aspirin).</li> <li>5. Preparation of acetanilide.</li> <li>6. Preparation of Methyl salicylate (oil of winter).</li> <li>7. Determination of total hardness in the given water sample.</li> <li>8. Determination of Dissolved oxygen (DO) in the given water sample.</li> <li>9. Determination of Biological oxygen demand (BOD) in the given water sample.</li> <li>10. Determination of Total dissolved solid (TDS) in the given water sample.</li> <li>12. Determination of alkali content in antacid tablet using HCl.</li> <li>11. CO-PO mapping</li> <li>COs</li> <li>Attributes</li> <li>PO1</li> <li>PO2</li> <li>PO3</li> <li>PO4</li> <li>PO5</li> <li>PO6</li> <li>PO7</li> <li>CO1</li> <li>Remember to keep records of all performed experiments in themanner which is 3</li> <li>1</li> <li>1</li> <li>2</li> <li>1</li> </ul>										
Able to Evaluate wa	ater quality parameters like DC	D,BOD,COD,TDS and alka	linity.	3	1	1		1	2	2
Understand the bad	asic titration methods and to hemistry.	echnical skills to work	in the	3	1	1		1		2
Know the preparati	on of resins and acetanilide.			3	1	1		1		2
Analyze the impo chemicals.	rtance of personal safety a	nd care of equipment	s and	3	1	1		1	2	2
3 Strong contribution, 2 Average contribution, 1 Low contribution										
lescription of self learning /	'E-learning component									
w.fandm.edu/uploads/files, kfarmahadhika.ac.id/E-BOC ulty.psau.edu.sa/filedownlo w.stem.org.uk/resources/co eer.netserv.chula.ac.th/-sa recommended: Advanced Organic Chemistry Practical Organic Chemistry Practical Physical Chemistry	/79645701812579729-genche DK/12-1213-akfarmahad-16-1- ad/doc-6-pdf-f06110ef2e1e1a ollection/3959/practical-chem nongn1/processing.pdf y, Bahl & Bahl, S. Chand & Co. y: Jagdamba Singh, L.D.S Yadav A.I. Vogel. : B. Viswanathan and P.S. Ragl	m-reference-for-web.pd vogelqu-d.pdf ie119cbacf71dd17732-or istry Ltd. v, Jaya Singh, I.R. Siddiqu havan.	f iginal. <sub>l</sub> i, Praga	odf ati Editior	٦.					
	se Name se Code of Course (use tick mark) equisite inty) Number of Lectures, Tutor 00 E OBJECTIVES: Student will ative and quantitative prob COTCOMES (CO): ICCOMES (CO): ICCOMES (CO) CO1 CO2 CO3 CO4 CO5 Experiments on of urea formaldehyde re on of Phenol formaldehyde re on of Phenol formaldehyde re on of Phenol formaldehyde re on of Acetyl Salicylic acid (A on of Acetyl Salicylate (oil tation of Dissolved oxygen ( iation of Chemical oxygen ( iation of Chemical oxygen ( iation of Chemical oxygen ( iation of Chemical oxygen ( iation of Acetyl Salicylate (oil iation of Isological oxygen ( iation of Biological oxygen ( iation of Isological	INDUSTRIAL CHEMISTRY LAE           se Name         INDUSTRIAL CHEMISTRY LAE           se Code         CH214           of Course (use tick mark)         equisite           equisite         10+2 with Chemistry           my)         10+2 with Chemistry           Number of Lectures, Tutorials, Practicals         500           E OBJECTIVES: Student will be able to work effectively an ative and quantitative problems, transferable skills like ab           cOUTCOMES (CO):         attributes           recessful course completion, learners will develop follow           ITCOME (CO)         ATTRIBUTES           CO1         Remember to keep records           CO2         Able to Evaluate water qua           CO3         Understand the basic titrat           CO4         Know the preparation of records           CO5         Analyze the importance of           Experiments         on of net of salicylic acid (Aspirin).           on of Acetyl Salicylic acid (Aspirin).         on of Acetyl Salicylare (oil of winter).           ation of Disolved oxygen (DO) in the given water sample.         ation of Disolved oxygen demand (COD) in the given water sanation of Total dissolved solid (TDS) in the given water sanation of Total dissolved solid (TDS) in the given water sanation of Total dissolved solid (TDS) in the given water sanation of Total dissolved solid (TDS) in the given water sanation of Total dissolved sol	INDUSTRIAL CHEMISTRY LAB-4         ise Name       INDUSTRIAL CHEMISTRY LAB-4         ise Code       CH214         of Course (use tick mark)       10+2 with Chemistry       6. Frequency (use tick marks)         Number of Lectures, Tutorials, Practicals       00       Tutorials = 00         E00BJECTIVES: Student will be able to work effectively and safely in a laboratory enditive and quantitative problems, transferable skills like ability to work in teams as a coursesful course completion, learners will develop following attributes:         ITICOMES (CO):       accessful course completion, learners will develop following attributes:         ITICOME (CO)       ATTRIBUTES         C01       Remember to keep records of all performed experir         C02       Able to Evaluate water quality parameters like DO, E         C03       Understand the basic titration methods and technic         C04       Know the preparation of resins and acetanilide.         C05       Analyze the importance of personal safety and care         Experiments       on of Acettyl Salicylic acid (Aspirin).         on of Acettyl Salicylic acid (Aspirin).       on of Acettyl Salicylic acid (Aspirin).         on of Acettyl Salicylic acid (Aspirin).       on of Acettyl Salicylic acid (Aspirin).         on of Acettyl Salicylic acid (Aspirin).       on of Acettyl Salicylic acid (Aspirin).         on of Acettyl Salicylic acid (Aspirin).	in Nousseries (Construction)     in INDUSTRIAL CHEMISTRY LAB-4     is code         CH214         Ch21         Ch2         Ch21         Ch2         Ch21         Ch2         Ch21         Ch2         Ch21         Ch2         Ch2	is Name NINDUSTRIAL CHEMISTRY LAB-4 is Code CH214 CH21	Industriation       INDUSTRIAL CHEMISTRY LAB-4       L         se Code       CH214       0         of Course (use lick mark)       Core (v)         Requisite       10-2 with Chemistry       6. Frequency (use tick marks)       Even (v)       Od 0         Number of Lectures, Tutorials, Practicals       0       Practical =1       0         60       EOBECTIVES: Student will be able to work effectively and safely in a laboratory environment, practical/red tative and quantitative problems, transferable skills like ability to work in teams as well as independently.       OUTCOMES (CO):         COUTCOMES (CO)       ATTRIBUTES       Even (v)       COI         CO1       Remember to keep records of all performed experiments in themanner which CO2       Able to Evaluate water quality parameters like DO.BOD.COD,TDS and alkalini CO3       Understand the basic titration methods and technical skills to work in the diff         CO4       Know the preparation of resins and acetarilide.       of a catalitide.       of a catalitide.         on of Area formaldehyde resin.       on of Acetarilide.       of a catalitide.       of a catalitide.         on of Altributes       Weat formaldehyde resin.       on of Acetarilide.       a faiton of Disolved oxygen demand (BOD) in the given water sample.       a faiton of Disolved oxygen demand (BOD) in the given water sample.       a faiton of Disolved oxygen demand (BOD) in the given water sample.       a faiton of Disolve	Industry and state of the second state stat	Line and particulary       IUNUSTRIAL CHEMISTRY LAB-4       L       T         se Gode       CH214       0       0         of Course (use tick mark)       Core (r)       DE 0         e Gode       Ch214       0       0         of Course (use tick mark)       Even (r)       Odd 0       Either Sem tick marks)         Number of Lectures, Tutorials, Practicals       0       Practical =08         E OBJECTIVES: Student will be able to work effectively and safely in a laboratory environment, practical/technical/ communicalitie and quantitative problems, transferable skills like ability to work in teams as well as independently.         COURCOME (CCO):       course completion, learners will develop following attributes:       Transferable skills like ability to work in teams as well as independently.         CO1       Remember to keep records of all performed experiments in themanner which is required in lab       CO2         CO3       Understand the basic titration methods and technical skills to work in the different fields of che         CO4       Know the preparation or resins and actantilide.       CO5         Analyze the importance of personal safety and care of equipment's and chemicals.       Eperiments         on of maidehyde resin.       on of actantilde.       CO5         Analyze the importance of personal safety and care of equipment's and chemicals.       Eperimotis on of actantide.	Number of Lectures, Tutorials, Practicals         L         T           e Gode         CH214         0         0         0           of Course (use tick mark)         Core (c)         DE (0)         Etther Sem ()           Number of Lectures, Tutorials, Practicals         Tutorials = 00         Practical =03         Etther Sem ()           COBLECTVES: Student will be able to work effectively and safely in a laboratory environment, practical/technical/ communication skill ative and quantitive problems, transferable skills like ability to work in teams as well as independently.         COURDINES (CO):           COURCONES (CO):         Remember to keep records of all performed experiments in themanner which is required in laboratory.         CO2         Able to Evaluate water quality parameters like DO, DD, DD, CDD, DD San alkalinity           CO3         Understand the basic titration methods and technical skills to work in the different fields of chemistry.         CO3           CO4         Know the preparation of resins and actantilide.         CO5         Analyze the importance of personal safety and care of equipment's and chemicals.           Experiments         on of work of consultary to the given water sample.         Tration of Skill skilly like add (kspirin).         On of Active Skilly like add (kspirin).         On of Methy Sailcylate (oil of winter).           ation of Disoly do vagen (DO) in the given water sample.         Tration of Total disolved solid (DD) in the given water sample.         Tration of Tota	Non-Work Particle         L         T         I           ac Code         CH214         0         0         FC 0           of Course (use tick mark)         Exercised         Core (v)         DE 0         FC 0           of Course (use tick mark)         Exercised         Core (v)         DE 0         FC 0           Number of Lectures, Tutorists, Practicals         Exercised         Frequency (use tick marks)         Practical = 08           COBLECTIVES: Student will be able to work effectively and safely in a laboratory environment, practical/technical / communication skills, concept site and quantifactechnical will be oble to work effectively and safely in a laboratory environment, practical/technical / communication skills, concept site and quantifactechnical will be oble to work effectively and safely in a laboratory environment, practical response         FC 0           COIT COME (CO)         ATTRIBUTES         Exercised and actainition         FC 00           CO1         Remember to keep records of all performed experiments in themaner which is required in laboratory.         FC 00           CO2         Able to Evaluate water quality parameters like to BOB.DC.DO,TDS and alkalinity.         FC 04           CO3         Understand the basic titration methods and technical skills to work in the different fields of chemistry.         FC 04           CO4         Know the proparation of recisins and actainilide.         FC 04         Know the proparation of reci

## SEMESTER-V

1. Name of the	Department: Chem	istry									
2. Course Name	9	Chromatographic Technique			L		Т			Р	
3. Course Code		CH301				3		1			0
4. Type of Cour	se (use tick mark)					Core (√)	DE	0		FC ()	
5. Pre-requisite	9	10+2 with Chemistry	6. Frequency (use	Even	0	Odd (v)	Eit	her Sem	0	Every Se	m ()
(if any)			tick marks)								
7. Total Numbe	er of Lectures, Tutor	ials, Practicals									
Lectures = 30			Tutorials = 10		F	Practical =	Nil				
8. COURSE OBJEC	TIVES: Students able	e to understand Separation te	echniques such as Thin lag	yer chr	omatogra	aphy, Pape	r chroma	atograph	y, Gas chi	romatogra	aphy, Higł
performance Liquid	d Chromatography a	nd Ion exchange chromatogra	aphy								
9. COURSE OUTCO After the successfu	OMES (CO): Il course completion	, learners will develop follow	ving attributes:								
COURSE OUTCOM	E (CO)	ATTRIBUTES									
	CO1	Understand the chromatog	graphic techniques and it	s classi	fication.						
	CO2	Evaluate Thin layer chrom	atography; principle and	its app	olications	Paper chr	omatogi	aphy an	d its appl	ications. S	eparatior
	CO3	Comprehension of Principl	les of gas-liquid chromato	ograph	y, Instrum	nentation a	ind its In	dustrial a	applicatio	ns.	
		Able to discuss Normal an	nd reverse phase HPLC, Is	socrati	c and gra	dient eluti	on, Instr	umentat	tion; mob	ile phase	reservoir
	CO4	column and detector and I	Industrial applications of I	HPLC.	5						
	CO5	Analyze the action of resi	ins, experimental techni	ques, a	applicatio	ns, separa	tion of n	netal ion	s, separat	tion of chl	oride and
10 Unit-mine dat	-11-11	Bromide ions - removal of	interfering radicals.								
10. Unit wise det	alled content	r of losturos 00	Title of the unit Co	norotic	an taahni						
Onit-1		r of lectures = 08	The of the unit: se	paratio		ques					
chromatography, c phase, mobile pha	assilication of Chro	Isorption and partition chro	om in column chromatogra omatography, column, ch	apny, c nromat	ography:	prams, dist principle.	noution adsorb	ents use	d. prepa	n time, st ration of	column.
adsorption, elution			sinatography, column or	li offici	.ogrupny,	principie,	445010	000	a, propu		ooranni,
Unit-2	Numbe	r of lectures =08	Title of the unit: Th	in laye	r chroma	tography					
principle, choice or applications. Separ	of adsorbent and s ation of amino acid	olvent, Rf value, applicatior mixture.	ns. Paper chromatograp	hy; sol	lvents us	ed, princij	ole, Rf v	value, fa	ctors infl	uencing F	Rf value,
Unit-3	Numbe	r of lectures = 08	Title of the unit: Ga	s chroi	matograr	hv					
Introduction Princ	inles of das-liquid	chromatography Instrumen	tation: Carrier das syste	em Sa	mple ini	ection Co	umns 🤇	tationar	v nhase	Detectors	(Flame
Ionization, Electror	capture and Therm	al conductivity) and Industria	al applications.	on, ou	inpic inj			in a norman	y phase,	Detector	
Unit-4	Numbe	r of lectures = 08	Title of the unit: Hig	gh perf	formance	Liquid Ch	omatog	raphy			
Introduction of HP	LC, Normal and rev	erse phase HPLC, Isocratic a	nd gradient elution, Inst	rumen	tation; m	obile phas	se reserv	oir, colu	mn and o	detector (	UV-visible
absorption, Electro	chemical) and Indus	trial applications of HPLC.	Title of the unit. Iou								
Unit-5		er of lectures = 08	tions constantion of moto	1 excna	inge chro		1y ido ond	Dromido	long rou	movel of i	ntorforin
principie, resins, ac radicals	ction of resins, expe	rimental techniques, applicat	tions, separation of meta	II IONS,	separatio		ide and	Bromide	ions - rei	noval of I	nterrering
11 CO-PO manni	20										
COs	lg	Attributes			P01	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Understand the chr	omatographic techniques and	d its classification.		3	1	1	2	2	1	2
	Evaluate Thin lave	er chromatography: principle	e and its applications.	Paper	3	1	1	2	2	1	2
CO2	chromatography ar	d its applications. Separation	of amino acid mixture.								
<u> </u>	Comprehension of	Principles of gas-liquid chr	omatography, Instrumer	ntation	3	1	1	2	2	1	2
.03	and its Industrial ap	plications.									
CO4	Able to discuss Nor	mal and reverse phase HPLC,	, Isocratic and gradient e	lution,	3	1	1	2	2	1	2
	Instrumentation; m	nobile phase reservoir, colum	nn and detector and Ind	lustrial							
	Analyze the action	of resins, experimental techi	niques, applications, sepa	aration	3	1	1	2	2	1	2
CO5	of metal ions, sepa	ration of chloride and Bromio	de ions - removal of inter	rfering							
	radicais.	2 Character to the th		11		11					
		3 Strong contributi	ion, 2 Average contributio	on, IL	.ow contr	noitudi					
12. Brief descript	on of self learning /	E-learning component	aliantinus (								
https://microbeno	tes.com/cnromatogr	apny-principle-types-and-app	plications/	raonio	ahamiatr	. como ho	la prinal				
techniques/vfbb6c	h8fc2bd00c8·in_in_m	e/class-11-chemistry-mula/xm	nanic-compounds/v/basic	s-of-ch	romator	y-sume-ba: ranhy	ыс-рі пісі	pies-ariu	-		
https://www.slides	hare net/nadeemak	hter7374/chromatography-3	2227223	.3-01-011	lionatog	арпу					
http://www.biolog	vdiscussion.com/bic	chemistry/chromatography-t	techniques/top-12-types-	of-chro	omatogra	phic-techn	iaues-bi	ochemist	rv/12730	)	
13. Books recomm	nended:					1	1.00 01		j <u>_</u> 700		
1. Chemical Therm	odynamics by R.P.Ra	istogi et al									
2. Principles of phy	sical chemistry by P	uri Sharma and Pathan									
3. Essentials of Phy	sical Chemistry, Bah	i & Tuli, S. Chand & Co. Ltd. Sharma & Pathania Michael D	Publishing Co								
5. Simplified course	e in Physical Chemist	ry, Madan & Tuli, S. Chand &	Co. Ltd.								
6. Atkin's Physical (	Chemistry, Atkin, Ox	ford Press.	=								

1.	Name of the	Department: Chem	istry								
2.	Course Nam	e	Process in Organic Chemical	s Manufacture		L		Т			p
3.	Course Code	•	CH302			3		1		(	0
4.	Type of Cou	rse (use tick mark)		TT		Core (√)	DE	0		FC ()	
5.	Pre-requisite (if any)	9	10+2 with Chemistry	6. Frequency (use Even tick marks)	0	Odd (v)	Eitł	ner Sem (	0	Every Ser	n ()
7.	Total Numbe	er of Lectures, Tutor	ials, Practicals	1							
Lect	ures = 30			Tutorials = 10	F	Practical = N	lil				
8. CO techn 9. CO	DURSE OBJEC	CTIVES: Interest will c reaction mechanis DMES (CO):	be developed among studen ms and their applications in in	ts for industrial organic chemi dustrial chemistry will be taugh	stry and nt.	introductio	n of bas	sic organi	ic chemic	als' manu	facturing
After	the successfu	Il course completion	ATTEIDUTES	ing attributes:							
COOK		co1	An understanding of the ha	zardous outcomes of certain o	ommercia	al procedure	es is and	the alter	natives a	re sunnest	ed
			Commercial proparations of	fimnortant organic substance				d for the	ir procod		ility
		CO2	Merits and demerits of vari		tch and c		prenarati	ons are a	nalvsed i	n context	with
		co4	How common organic read	ctions are applied in commerce	ial chemi	cals' manu	facture i	s done a	long with	n their me	chanistic
		604	action.								
		CO5	Interest for organic synthes	is in context with industrial ch	emistry is	created an	nong stu	dents.			
10.	Unit wise det	ailed content	r of loctures - 08	Title of the unit: Nitration							
Introc	uction - Nitra	ating agents and me	chanism of nitration process s	uch as nitration: i) Benzene to	nitroben:	zene and m	-dinitrob	enzene i	i) Chlorol	penzene to	o o- and
pnitro	chlorobenze	nes iii) Toluene. Con	tinuous vs batch nitration.	Title of the unit. Sulphone	tion						
Introc	- <b>Z</b> Juction sulph		er of lectures =08	ect sulphonation mechanism of	of sulphor	nation react	tions Co	mmercia	lsulnhon	ation of h	enzene
napht	halene, Tolue	ene, batch vs continu	uous sulphonation.	set sulphonation, meenanism e	n suiprioi	ation reac	10113, 00		supriori		chizene,
Unit	t- <b>3</b>	Numbe	er of lectures = 08	Title of the unit: Alkylatio	n						
Introc	luction, Type	s of alkylation, Alkyla	ating agents, mechanism of alk	ylation reactions, manufacture	e of alcoh	ol, N-alkyl a	inilines (	mono din	nethyl an	d ethyl an	ilines.).
Unit	-4	Numbe	er of lectures = 08	Title of the unit: Esterifica	ition					-	
Introc aceta	luction, Ester te. vinvl aceta	fication by organic ate. cellulose acetate	acids, by addition of unsatur	ated compounds, esterificatio	n of carb	oxyl acid d	erivative	s, comm	ercial ma	anufacture	of ethyl
Unit	t-5	Numb	er of lectures = 08	Title of the unit: Halogena	tion						
Introc	luction - Rea	agents for halogen	ations, mechanism of haloge	enation, , halogenation of a	romatics.	Commerci	al manu	factures	- chloro	benzenes	, chloral,
mono	chloracetic a	nd chloromethanes,	dichlorofluoromethane.								
11. 0	COs	ng	Attributes		PO1	PO2	PO3	PO4	PO5	PO6	PO7
	01	An understanding c	of the hazardous outcomes of o	certain commercial procedures	2	1	1	1	2	3	2
	01	is and the alternativ	ves are suggested.	whether and the statistic set and	-					2	1
	CO2	commercial prepar analyzed for their p	rocedural feasibility.	udstances of industrial use are	1				1	2	1
	CO3	Merits and demerit preparations are an	s of various organic procedure alysed in context with organic	s like batch and continuous chemicals' manufacture.	2	1			2	2	1
	CO4	How common or manufacture is don	ganic reactions are applie e along with their mechanistic	d in commercial chemicals <sup>,</sup> action.	2						1
	CO5	Interest for organiation	c synthesis in context with i	ndustrial chemistry is created	2	1	1		1	2	2
		g	3 Strong contribution	on, 2 Average contribution , 1 L	ow contr	ibution					
12. E	Brief descript	ion of self learning /	E-learning component								
https:	//www.brita	nnica.com/technolog	gy/chemical-industry/Organic-	chemicals							
https:	//www.acces	ssengineeringlibrary.	com/browse/handbook-of-ind	lustrial-chemistry-organic-cher	nicals/c9	780071410	373ch01				
http:/	/www.chemi	stryexplained.com/H	ły-Kr/Industrial-Chemistry-Org	janic.html							
<b>13</b> . E	Books recomi	mended:									
1. Che 2. Pri:	emical Therm	odynamics by R.P.Ra sical chemistry by P	istogi et al uri Sharma and Pathan								
3. Ess	entials of Phy	rsical Chemistry, Bah	I & Tuli, S. Chand & Co. Ltd.								
4. Prii 5. Sim	nciples of Phy	sical Chemistry, Puri	i, Sharma & Pathania, Vishal Pi try, Madan & Tuli, S. Chand &	ublishing Co. Co. Ltd							
6. Atk	in's Physical (	Chemistry, Atkin, Ox	ford Press.								

1. Name of the	Department: Che	mistry							
2. Course Nam	e	Phytochemistry			L	Т		I	Р
3. Course Code	)	CH303			3	1		(	0
4. Type of Cou	rse (use tick mark)	1			Core (√)	DE ()		FC ()	
5. Pre-requisit (if any)	e	10+2 with Chemistry	6. Frequency (use Even tick marks)	0	Odd (v)	Either Sem	n ()	Every Ser	n ()
7. Total Numb	er of Lectures, Tuto	orials, Practicals							
Lectures = 30			Tutorials = 10	<b>I</b>	Practical = Ni	 			
with industrial che	mistry. A special er	nphasis will be laid on plant bas	sed phytochemicals and their m	nedicinal	utility.	and structure	elucidatio	in is done ii	ncontext
9. COURSE OUTC After the successful	UMES (CO): ul course completio	on, learners will develop follow	ing attributes:						
COURSE OUTCOM	E (CO)	ATTRIBUTES							
	CO1	Isolation and separation pr	ocedures are understood to se	parate in	dividual com	ponents in natu	ural produ	ucts chemis	try.
	CO2	Structure elucidation of va	rious alkaloids, terpenoids is do	one to be	tter understa	ind the fundam	entals of	phytochem	nistry.
	CO3	Classification and structure	e of vitamins is understood and	utility of	vitamins is a	pplied in biolog	ical struct	tures.	
	CO4	Phytopharmaceuticals and	their utility is analysed in conte	ext with i	ndustrial che	mistry			
10 Unit wise de	CO5	Physiological action of imp	ortant steroids and hormones i	s evaluat	ed.				
Unit-1	Numb	per of lectures = 08	Title of the unit: Terpeno	ids:					
Introduction, nom	enclature, occurrer	nce, general properties, classific	cation, and isolation of terpend	oids, isopr	rene rule; sy	nthesis of Citra	l and Mer	nthol. Caro	tenoids:
Introduction, class	ification, and isolat	ion of carotenoids.							
Unit-2	Numb	per of lectures =08	Title of the unit: Alkaloids	5:					
Introduction occur Ephedrine, Adrene	rrence, functions, line or Epinephrine	nomenclature, chemical classi e, Nor adreneline or Nor epinep	fication, isolation, and genera hrine, Nicotine, atropine.	I propert	ies of alkalo	id. Introductio	n and ph	iysiological	action;
Unit-3	Numb	per of lectures = 08	Title of the unit: Steroids	and Horn	nones:				
Introduction, occu	rrence, structure a	nd physiological action; cholest	erol, Ergosterol. Steroidal horm	nones; Pro	ogesterone,	lestosterone, A	ndrogen,	Oestrogen	S.
Unit-4	Numb	per of lectures = 08	Title of the unit: Vitamins	:					
Introduction, Class B1, B2 B6, and Vit.	ification, Sources of C.	of vitamins and their deficiency	diseases. Physiological function	n of wate	r and fat sol	uble vitamins. S	structure a	and uses; V	'it. A, Vit.
Unit-5	Num	ber of lectures = 08	Title of the unit: Phytopha	armaceut	icals:				
Recent developme	nt and commercial	ization of plant derived natural	products. Structure and medic	inal uses	of caffeine, t	heophylline an	d theobro	omine.	
11. CO-PO mappi	ng								
COs		Attributes		P01	PO2	PO3 PO4	PO5	PO6	P07
CO1	Isolation and sepa components in na	ration procedures are understo tural products chemistry.	ood to separate individual	2			2	2	2
CO2	Structure elucidat understand the fu	ion of various alkaloids, terpen Indamentals of phytochemistry	oids is done to better	2			2	1	1
CO3	Classification and applied in biologic	structure of vitamins is underst cal structures.	cood and utility of vitamins is	2					2
CO4	Phytopharmaceut chemistry	icals and their utility is analy	sed in context with industrial	2	1	1	2	1	2
CO5	Physiological action	on of important steroids and ho	rmones is evaluated.	2			1		1
		3 Strong contributi	on, 2 Average contribution , 1 L	ow contr	ribution	ł	•		•
12. Brief descript	ion of self learning	/ E-learning component							
https://medlineplu	is.gov/vitamins.htr	nl ung boolthy/listing of vitaming	~						
https://medlineplu	us.gov/steroids.htm	ng-nearing/iisting_or_vitainin:	5 						
https://www.versu	usarthritis.org/abou	ut-arthritis/treatments/drugs/s	teroids/						
13. Books recom	mended:								
2. Principles of phy	iouynamics by R.P.I vsical chemistry by	rasiogi et al Puri Sharma and Pathan							
3. Essentials of Phy	/sical Chemistry, Ba	ahl & Tuli, S. Chand & Co. Ltd.							
4. Principles of Pl 5. Simplified cours	nysical Chemistry, F e in Physical Chemi	uri, Sharma & Pathania, Vishal istry, Madan & Tuli, S. Chand &	Publishing Co. Co. Ltd.						
6. Atkin's Physical	Chemistry, Atkin, C	Dxford Press.							

1.	Name of the	Departme	nt: Chemist	try									
2.	Course Name	;	I	Unit Operations in Chemical	Industry			L		Т		F	2
3.	Course Code		(	CH304				3		1		(	)
4.	Type of Cour	se (use tick	mark)					Core (√)	DE	0		FC ()	
5.	Pre-requisite (if any)	•		10+2 with Chemistry	6. Frequency (use tick marks)	Even (	)	Odd (v)	Eith	ner Sem (	0	Every Sen	n ()
7.	Total Numbe	r of Lectur	es, Tutoria	ls, Practicals	r								
Lec	tures = 30			<u> </u>	Tutorials = 10	6.11	F	Practical = I	Vil .				
8. C comp	orehend the fil	tration and	purpose o d drying of	mixed component in a binar	v/ ternary component v	of theo vith the	ry distilia e context	ation and s	ial separa	ation tech	parations	ncluding so	es and to olid state
chem	histry with nuc	leation, gro	wth and cr	rystallization mechanism of s	olid crystal for industrial	l perspe	ective.		I		•	5	
9. C After	OURSE OUTCO the successfu	OMES (CO): I course co	mpletion, l	learners will develop followi	ng attributes:								
COU	RSE OUTCOME	E (CO)		ATTRIBUTES									
	(	CO1		Students will create an und on experience in separation	erstanding of the desigr s techniques.	n and ap	oplicatio	n of an ana	Ilysis rela	ted to a	question	of relevan	ce based
	(	02		Students will create an u	nderstanding of the c	onnecti	ion betw	veen com	mon app	oroximati	on meth	nods and	standard
	(	03		Students will be able to und	lerstand about the ingre	dients o	of filterir	ng and dryi	ng of the	commer	cial prod	ucts.	
	(	04		Students will have a firm for	undation in the fundame	entals a	nd appli	cations of c	crystalliza	ation proc	cess.		
	(	05		Students will gain an unders	standing of extraction of	the co	mpound	s in mixtur	es.				
10. Uni	10. Unit wise detailed content         Unit-1       Number of lectures = 08       Title of the unit: Distribution, Bath and continuous distillation, Separation of azeotropes, Plates columns												
Intro colun	troduction, Bath and continuous distillation, Separation of azeotropes, Plates columns lumns spray Columns, bubble columns, packed bubble columns, mechanically agitated cont Jnit-2 Number of lectures =08 Title of the unit: Eva							olumns Abs	orption:	Introduc	tion: Eq	uipments-	packed
Uni	umms spray Columns, bubble columns, packed bubble columns, mechanically agitated contranit-2Number of lectures =08Title of the unit: Evapore						on:						
Intro (agita	duction, Equip ated) film evap	ments- sho orator.	ort tube (sta	andard) Evaporator forced ci	rculation evaporators, fa	alling fil	lm evapo	orators, clir	nbing filr	n (upwar	d flow) e	vaporators	, wiped
Uni	t-3		Number	of lectures = 08	Title of the unit: Fill	tration:							
Filtra centr	tion: Introduc ifuge Drying: I	tion, filter i Introductio	media and n, free mo	filter aids, equipments- plat isture, bound moisture dryir	e and frame filter press ng curve; equipments- ti	, nutch ray dry	filter, ro er, rotar	otary drum y dryer, fla	filter, sp sh dryer	arkler filt , fluid be	er, cand d dryer,	le filter, ba drum drye	g filter, r, spray
Uni	it-4		Number	of lectures = 08	Title of the unit: Cry	/stalliza	tion:						
Intro	duction: solub	ility, super-	saturation	nucleation, crystal growth; E	quipment- tank crystalli	izer, agi	tated cr	ystallizer, e	vaporato	or, crystal	lizer, dra	ft tube crys	stallizer.
Uni	t-5		Number	of lectures = 08	Title of the unit: Ext	raction	:						
Intro Solid	duction: select , liquid-solid sy	tion of solv /stems	ent; Equipi	ments- Spray column, packe	d column rotating disc c	olumn,	mixer-s	ettler. Mixi	ng- Intro	duction;	mixing c	f liquid-liqu	-bilos biu
11. (	CO-PO mappir	ng											
	COs	Students v	will create	Attributes	design and application	of an	PO1 3	PO2	PO3 1	PO4	PO5 1	PO6	P07
	CO1	analysis re	lated to a	question of relevance based	on experience in separ	ations	Ū		·		-		
	CO2	Students \ approxima	vill create tion metho	an understanding of the codes and standard chemical ac	onnection between co Isorption/absorption.	mmon	3	1	1		1	3	
	CO3	Students w of the com	vill be able mercial pro	to understand about the ing oducts.	redients of filtering and	drying	3	1	3		2	1	
	CO4	Students v crystallizat	vill have a	firm foundation in the func s.	lamentals and applicati	ons of	3	1	3		2	1	
			- p	-			3	1	1		2	1	
	<b>CO5</b> Students will gain an understanding of extraction of the compounds mixtures.												
				3 Strong contributio	n, 2 Average contributio	on , 1 Lo	ow contr	ibution					Ĺ
12.	Brief descripti	on of self le	earning / E	-learning component									
https	://sites.google	e.com/a/sd	senthil.com	n/chemical-technology/chem	nical-processing-unit-ope	eration							
https https	://ceng.tu.edu	i.iq/ched/ir	nages/lecti bing/cours	ures/chem-lec/st4/c5/lec%2	01.pdf :/2016/367440								
https	://www.youtu	ibe.com/wa	atch?v=H_N	Nc7SJwDco	/2010/30/440								
<b>13</b> .	Books recomm	nended:	hy R D Dact	toni et al									
2. Pri	inciples of physic	sical chemi	stry by Puri	i Sharma and Pathan									
3. Ess	sentials of Phy	sical Chemi	stry, Bahl &	& Tuli, S. Chand & Co. Ltd.	ubliching Co								
4. Pri 5. Sin	nciples of Phys	e in Physica	su y, Puri, S I Chemistry	y, Madan & Tuli, S. Chand & (	Co. Ltd.								
6. Atl	kin's Physical C	hemistry.	Atkin, Oxfo	rd Press.									

1.	Name of the	Department: Chem	istry								
2.	Course Name	e	Dyes			L		Т		I	Р
3.	Course Code	<u>}</u>			3		1		(	0	
4.	Type of Cour	rse (use tick mark)	т			Core ()	0	)E (√)		FC ()	
5.	Pre-requisite (if any)	er of Lectures Tutor	10+2 with Chemistry	6. Frequency (use tick marks)	Even ()	Odd (v)	E	ither Sem	0	Every Ser	n ()
Leci	tures = 30	ST OF Lectures, rutor	1815, F1 dulluais	Tutorials = 10		Practical -	= Nil				
8. C		CTIVES: Students wi	Il be able to understand era a	and history, color and ch	nemical cor	stitution De	velop ba	asic chemic	al reaction	on and syr	thesis of
azody	yes and applic	ations of some typic	ally used dye.				·				
9. CO After	OURSE OUTCO	OMES (CO): Il course completion	ı, learners will develop followi	ing attributes:							
COUR		E (CO)	ATTRIBUTES								
		CO1	Remember the era of dyes a	and synthesis of benzene	intermedia	ites.					
		CO2	Understand the chemistry	of the dyes with respec	ct to gener	al structural	feature	s, mode o	f applica	tion to fib	er, color
		CO3	Comprehension of types of	Anthraquinone Dyes like	Anthraquir	ione mordar	it dyes, A	Anthraquing	one vat d	yes,	
		CO4	Able to create basic Know substantive azodyes, Morda	/ledge of azodyes, Diazo ant azodyes	otization, D	iazo Couplir	ıg, Acidi	c azo dyes	, Basic a	izo dyes,	Direct or
	ſ	CO5	Analyze the importance of	applications of Phenolph	hthalein, flu	uorescein, Eo	osin, Ma	lachite gre	en, Meth	iylene blue	a, Indigo.
10.	Unit wise det	ailed content		noiet.							
Uni	it-1	Numbe	r of lectures = 08	Title of the unit: Che	mistry of l	ntermediate	s				
Intro	duction of th	e History of Dyes.	Landmarks in the historical o	iral to synt	thetic dyes.	Benzene	e intermed	iates-Chl	oronitrobe	nzenes,	
Uni	it-2	Numbe	er of lectures =08	ssification							
Introc dyes v	duction and cl with respect t	lassification of dyes of the second structural structura structura structural structura structura structura st	on the basis of structure and th features, mode of application	he mode of application to to fibre, colour shades, s	o the fibre. ynthesis of	Colour and c typical 4-5 d	hemical yes., use	constitutio	n of dyes	; Chemistr	y of the
Uni	it-3	 Numbe	er of lectures = 08	Title of the unit: Ant		e Dye	, 				
Anthr Anthr	raquinone mo	ordant dyes; Alizari perse dye.	n, Alizarin Orange, Alizarin R	l led S. Anthraquinone va	at dyes; In	danthrone b	lue, Pyr	anthrone.	Anthraqu	uinone aci	d dyes,
Uni		Numbe	er of lectures = 08	Title of the unit: Azo	dves						
Diazo	otization, Diaz	o Coupling, Types of	f Azo dves; Acidic azo dves (M	lethyl Orange, Tartrazine'	). Basic azo	dves; anilin	e, butter	r yellow. Di	rect or s	ubstantive	azodyes;
Congo	ored. Ingrain a	azodyes; para red.M	ordant azodyes; Eriochrome Bl	lack-T. synthetic fibre dye	es; red disp	erse dye.	0, 2	J - ··· 2			u
Uni	it-5	Numb	er of lectures = 08	Title of the unit: Mis	cellaneous	dyes					
Struct	ture and uses	; Phenolphthalein, fl	uorescein, Eosin, Malachite gre	een, Methylene blue, Ind	igo. Naphth	nol yellow-S,	Crystal v	violet.			
10. (	CO-PO mappi	na									
	COs	Ţ	Attributes		PO	1 PO2	PO3	PO4	P05	P06	P07
	CO1	Remember the era	of dyes and synthesis of benze	ene intermediates.	3	1	1	2	2	1	2
	CO2	Understand the cl	hemistry of the dyes with r	respect to general struct	ctural 3	1	1	2	2	1	2
	CO3	Able to evaluate c	Jifferent types of Anthraquine	one Dyes like Anthraqui	inone 3	1	1	2	2	1	2
		Able to create basic	c Knowledge of azodyes, Diazof	tization. Diazo Coupling, /	Acidic 3	1	1	2	2	1	2
	CO4	azo dyes, Basic azo	dyes, Direct or substantive azo	odyes, Mordant azodyes							
	CO5	Analyze the impor Malachite green, M	rtant applications of Phenol lethylene blue, Indigo. Naphthr	phthalein, fluorescein, E ol yellow-S, Crystal violet	Eosin,	1	1	2	2	1	2
		n , 1 Low co	ontribution					L			
12. F	Brief descripti	ion of self learning /	E-learning component								
https:	://www.britar	nnica.com/technolog	gy/dye								
https: https://	://www.ncbi.i	nlm.nin.gov/books/r dofchemicals.com/4(	VBK385442/ 07/chemistry-articles/colors-fa	amily-inks-dyes-and-pigm	ents html						
https:	://textilelearr	er.blogspot.com/20	15/01/different-types-of-dyes	-with-chemical. <u>html</u>							
13. [	Books recomr	mended:									
1. Che 2 Pri	emical Therme	odynamics by R.P.Ra vsical chemistry by Pr	istogi et al uri Sharma and Pathan								
3. Ess	sentials of Phy	sical Chemistry, Bah	Il & Tuli, S. Chand & Co. Ltd.								
4. Prii 5. Sin	nciples of Phy pulified cours	rsical Chemistry, Puri e in Physical Chemis	I, Sharma & Pathania, Vishal Pu try, Madan & Tuli, S. Chand & (	ublishing Co. Co. Ltd							
6. Atk	kin's Physical (	Chemistry, Atkin, Ox	ford Press.	70. Etd.							

1. Name of t	ne Department: Chem	iistry									
2. Course Na	e INDUSTRIAL CHEMISTRY LAB-5					L		Т			Р
3. Course Co	de	e CH307						0			8
4. Type of Co	urse (use tick mark)					Core (v)	DE	0		FC ()	
5. Pre-requis (if any)	ite	10+2 with Chemistry	6. Frequency (use tick marks)	Even ()		Odd (v)	Eitl	ner Sem	0	Every Se	m ()
7. Total Num	ber of Lectures, Tutor	ials, Practicals									
Lectures = 00			F	Practical =0	)8						
8. COURSE OB.	ECTIVES: Student will	be able to work effectively and	safely in a laboratory e	nvironme	nt, pra	actical/tech	nnical/ co	mmunic	ation skills	s, concept	ts to
solve qualitative	and quantitative prob	lems, transferable skills like abi	lity to work in teams as	well as inc	depen	dently.					
9. COURSE OUT After the succes	COMES (CO): aful course completion	n, learners will develop followi	ng attributes:								
COURSE OUTCO	VIE (CO)										
	CO1	Remember to keep records	of all performed experi	ments in t	hemai	nner which	n is requir	ed in lab	oratory.		
	CO2	Able to detect adulterants in	n the given food sample	<u>).</u>							
	CO3	Understand the basic titrati	on methods and technic	cal skills to	work	in the diff	erent fiel	ds of che	emistry.		
	CO4	Explain the principles of chr	omatographic techniqu	es.							
	CO5	Analyze the importance of p	personal safety and care	e of equipr	nent's	and chem	icals.				
<ol> <li>Isolation of lad</li> <li>Isolation of lyd</li> <li>Isolation of ca</li> <li>Isolation of eu</li> <li>Isolation of eu</li> <li>Isolation of ni</li> <li>Determination</li> </ol>	tose & casein. opene from tomato. ifeine from tea. perine from black pepp genol from cloves. otine from tobacco. n of protein content of n of fat content of foc n of acetic acid conten n of acid value of oil. of methyl orange.	per. of food. od. nt of vinegar.									
11. CO-PO map	ping	Attributos			DO1	002	DO2		DOF	DO4	DO7
COS CO1	Remember to keep	records of all performed exper	iments in themanner w	hich is	3	1	1 1	P04	2	1	2
	required in laborate	ory.									
CO2	Able to detect adul	terants in the given food samp	e.		3	1	1		1	2	2
CO3	Understand the bas	sic titration methods and techn	ical skills to work in the	different	3	1	1		1		2
	fields of chemistry.				_		-				-
CO4	Explain the principl	es of chromatographic techniq	ues.		3	1	1		1		2
CO5	CO5 Analyze the importance of personal safety and care of equipment's and chemicals. 3 1 1 1 2 2									2	
		3 Strong contributio	n, 2 Average contributi	on , 1 Low	contr	ibution					
12. Brief descri	ption of self learning /	' E-learning component									
https://www.yo	itube.com/watch?v=N	/Tsn1-ToKqQ 2. optopt/uploads/sites/140/201/	1/06/achirin tablata tit	ration ndf	2						
https://www.ben	ntiersin.org/articles/1	0.3389/fonc.2015.00196/full 4.	https://www.youtube.	com/watc	3. h?v=1:	tmgUVSVI	Po4 5.				
https://www.yo	utube.com/watch?v=K	Z35K05SA7g	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		-						
13. Books reco	nmended:	aba Singh I. D. S. Vaday, Java Sia	ab ID Siddiani Decast	Edition							
<ol> <li>Auvance Pract</li> <li>Practical Orga</li> </ol>	nical chemistry: Jagdan	nda singn, l.d.s Yadav, Jaya Sin Il	iyii, i.k. sidaiqul, Pragat	Euilion.							
3. Practical Phys	cal Chemistry : B. Visw	wanathan and P.S.Raghavan.									

4. Experimental Inorganic Chemistry –W.G.Palmer.

## SEMESTER-VI

1. Name of the	Department: Chem	istry											
2. Course Name	9	SPECTROSCOPIC TECHNIQU	JES	L		Т			Р				
3. Course Code		CH308		3		1			0				
4 Type of Cour	se (use tick mark)				Core (v)	DF	٥		FC ()	-			
5 Pre-requisite		10+2 with Chemistry	6 Frequency (use Eve	n (v)	Odd ()	Fith	v her Sem	0	Every Se	m ()			
(if any)	, 		tick marks)		ouu y			V					
7. Total Numbe	er of Lectures, Tutor	ials, Practicals	<b>T 1 1 1</b>										
Lectures = 30			Tutorials = 10		Practical =	Nil	<u> </u>						
8. COURSE OBJEC	IIVES: Students abl	e to understand the interact	ion of electromagnetic radiatio	on with th	ne materials	s, spectros	scopic te	chniques	like Ultra	violet, FI-			
		oscopy and mass spectrome	u y.										
After the successfu	Il course completion	n, learners will develop follo	wing attributes:										
COURSE OUTCOME	E (CO) ATTRIBUTES												
CO1	Understandi Woodward -	Understanding Wave-like propagation of light, electronic transitions, instrumentation, conjugated systems and transition energie Woodward – Fieser rules for calculation of wave length.											
CO2	Comprehens	sion of absorption in the ir	nfrared region, theory of infra	red spec	ctroscopy, i	nstrumen	tation, n	nolecular	vibration	is, factors			
CO3	To create ba vicinal coupl	asics of NMR spectroscopy, ling.	instrumentation, chemical shi	ft, equiv	alent and r	nonequiva	lent pro	tons, spir	1-spin spli	itting and			
CO4	Able to eva Applications	aluate the NMR spectra o	f some representative compo	ounds: H	lydrocarboi	ns, Aldeh	ydes, Ke	etones, A	cids and	Alcohols,			
CO5	Analyze the patterns of v	theory, instrumentation, im various functional groups (all	portant useful terms in mass s kanes, alkenes, alkynes, alcohol	pectrome s, ketone	etry; moleci s, aldehyde	ular ion pe s), Mclaffe	eak, met erty rear	astable p rangemer	eak, fragr its.	nentation			
10. Unit wise det	ailed content												
Unit-1 Wave-like propaga	tion of light, absor	er of lectures = 08 ption of electromagnetic ra	Title of the unit: UV Spe	allowed	<b>y</b> and forbide	den transi	itions, in	strument	ation, coi	njugated			
systems and transit	Number	ward – Fleser rules; unsatura	Title of the unit: IP Spect	ugated d	ienes and p	oryenes.							
Introduction, absor	rption in the infrare	ed region, theory of infrared	spectroscopy, instrumentation	n, moleci	ular vibratio	ons, factor	rs affecti	ng vibrati	ional frec	uencies,			
characteristic absor	rptions in common o	classes of compounds, chara	cteristic vibrational frequencies	of some	organic cor	mpounds.		5					
Unit-3	Numbe	er of lectures = 08	Title of the unit: NMR Sp	ectrosco	ру								
Introduction, theo	ry of NIVIR spectr MR spectra of some	oscopy, instrumentation, c	nemical snift, equivalent and	i nonequ	uvalent pr	otons, sp	in-spin s	splitting,	vicinal co	oupling,,			
Unit-4	Numbe	er of lectures = 08	Title of the unit: Mass So	ectrome	trv								
Introduction, basic	theory, instrument	ation, important useful terr	ns in mass spectrometry, fragr	nentatior	n patterns (	of various	functior	nal groups	s (alkanes	, alkenes,			
alkynes, alcohols,	ether, phenols and	amines, ketones, aldehyde	s, esters, acids, anhydrides), n	nolecular	ion peak,	metastab	le peak,	Mclaffer	ty rearrar	ngements,			
Nitrogen rule.	Numb	er of lectures = 08	Title of the unit Atomic A	hsorntio	n Spectron	hotometr	.v						
Introduction, Princi	ple, Instrumentatio	n, Sample preparation, Inter	nal standard and standard addit	tion, calib	pration and	applicatio	ns of AA	S.					
11. CO-PO mappir	ng												
COs		Attributes		PO1	PO2	PO3	PO4	PO5	PO6	PO7			
CO1	Understanding W instrumentation, c Fieser rules for calc	lave-like propagation of onjugated systems and tra ulation of wave length.	light, electronic transitions Insition energies, Woodward	<sub>S</sub> , <b>3</b> -	1	2		1		2			
	Comprehension of	absorption in the infrar	1	2		1		2					
CO2	spectroscopy, ins vibrational freque compounds	trumentation, molecular ncies, characteristic absor	vibrations, factors affectin ptions in common classes c	of									
CO3	To create basics	of NMR spectroscopy. in	strumentation, chemical shif	t, <b>3</b>	1	2		1	1	2			
	equivalent and non	equivalent protons, spin-spin	n splitting and vicinal coupling.		1	1		1		2			
CO4	Hydrocarbons, Aldessectroscopy.	ehydes, Ketones, Acids and	Alcohols, Applications of NM	R	ľ					2			
005	Analyze the theo	ory, instrumentation, impo	ortant useful terms in mas	SS <b>3</b>	1	1		1		2			
CO5	spectrometry; mole various functional	groups (alkanes, alkenes	peak, fragmentation patterns c s, alkynes, alcohols, ketones	of S,									
	aidenydes), Mclaffe	erty rearrangements.	tion 2 Average contribution 1		tribution				<u> </u>	1			
12. Brief descripti	on of self learning /	YapSoS0d1a	tion, 2 Average contribution, 1										
http://www.infoco	build.com/educatio	n/audio-video-courses/chem	nistry/ApplicationOfSpectroscor	bicMetho	ds-IIT-Madi	ras/lecture	e-25.htm	I					
https://scrippslabs.	.com/summary-of-s	pectroscopic-techniques/											
https://nptel.ac.in/	content/storage2/c	ourses/102103044/pdf/mod	l2.pdf										
13. Books recomm	nended:	· ·											
1. Introduction to s	pectroscopy: Pavia,	Lampman & Kriz, 3rd Ed, Bo	oks/cole.										
2. Spectroscopic mi	ethods in organic ch conv: William Kemr	emistry: H. Williams and lan	neminig, v Edition Tata Mc Gra	wnills									
4. Fundamentals of	Analytical chemistr	y, Douglas A. Skoog, Donald	M. West, F. James Holler, 7th e	dition, Ha	arcourt coll	ege public	ations.						
5. Principles and pr	actice of analytical	chemistry, F. W. Fifield, D. Ke	ealey, 5th edition, Blackwell pub	lication.		5,							
6. Analytical chemi	stry, Gary D. Christia	an, 6th edition, Wiley and so	ns publication.	deane									

Spectrometric identification of organic compounds, R. M. Silverstein, 6th edition, John Wiley and sons.
 Basic concepts of analytical chemistry, S. M. Kopper, New Age International Publishers.

1. Name of th	e Department	Chemi	stry										
2. Course Nar	ne		CHEMICAL PROCESS INDUSTRY				L		T			Р	
3. Course Coo	le		CH309				3		1			0	
4. Type of Co	urse (use tick n	nark)						Core (v)	DE	0		FC ()	
5. Pre-requisi (if any)	te		10+2 with Chemistry		6. Frequency (use tick marks)	Even	(v)	Odd ()	Eit	her Sem	0	Every Se	m ()
7. Total Num	per of Lectures	, Tutori	als, Practicals										
Lectures = 30					Practical =	Nil							
8. COURSE OBJE	CTIVES: The m	ain obje	ective of this course is to s	tudy	y the composition, prep	aration	, proper	ties and us	es of amn	nonia, nit	tric acid, j	ohosphoru	IS
chemical, glass, c	ement, ceramic	cs and r	efractories and their relate	ed to	toxic hazards on the hea	Ith of co	onsume	r.					
9. COURSE OUT	ful course com	pletion	, learners will develop foll	lowi	ing attributes:								
COURSE OUTCON	/IE (CO) ATTRI	BUTES											
CO1	Evalua their i	ate diff related	erent preparation process quality control, hazards, s	es fo afet	or the manufacture of a ty and effluent manager	immoni nent.	ia, nitric	acid, amm	onium nit	rate and	ammoni	um sulpha	te and
CO2	Evalua	ate diff	erent manufacturing meth	ods	s of caustic soda and pho	sphoru	ıs chemi	cals and th	eir prope	rties and	uses.		
CO3	Under	rstand	he composition of glass ar	nd th	their types, properties a	nd uses							
CO4	Analy	ze the o	composition, types, proper	rties	s and preparation of cer	nent an	d its set	ting time.					
CO5	Under	rstand	he classification, propertie	es ar	and uses of ceramics and	refract	oriness	and their r	espective	characte	eristics.		
10. Unit wise de	etailed content												
<b>Unit-1</b> Ammonia, nitric a Quality control, H	acid, ammoniu azards and safe	<b>Vumbe</b> m nitra ety and	<b>r of lectures = 08</b> te and ammonium sulpha Effluent management.	te th	Title of the unit: S heir manufacture with	<b>yntheti</b> eferend	<mark>c Nitroq</mark> ce to; cc	en product Insumptior	t <b>s</b> n Pattern,	Raw ma	terials, Pi	roduction	process,
Unit-2	I	Numbe	r of lectures =08		Title of the unit: Ch	lor-alka	ali Indus	trial produ	cts				
Caustic soda Chlo	rine. Phosphor	us chei	micals; Phosphorus, phosp	hori	ric acid, ammonium pho	sphate,	, superp	hosphate,	triple sup	erphosph	nate. Lime	e, gypsum	, Silicon,
calcium carbide.		Numbe	r of lectures = 08		Title of the unit. G	255							
Introduction, Clas	sification and (	Genera	Properties of Glass , Char	acte	eristics, raw Materials, C	hemica	I Reactio	ons, Metho	ds of Ma	nufacture	e and Use	S.	
Unit-4		Numbe	r of lectures = 08		Title of the unit: Ce	ment							
Introduction, Cor	nposition, Type	es of ce	ment, Portland cement; ra	w N	Materials, manufacture	of Cem	ent by w	et & Dry p	rocess, R	eaction ii	n the Kiln	, setting o	f cement,
Testing & Uses of	cement.				1								
Unit-5		Numbe	er of lectures = 08		Title of the unit: Ce	ramics	and Refr	actories					
of refractories. N	es of ceramics eutral refractor	materi ies; Sili	ais, properties and applica con carbide. Acid refracto	ries;	rs. Refractories, classific ; High Alumina refractor	ies.	or retract	ories, char	acteristic	s of refra	ictories m	nateriais, p	properties
COs	ning		Attributes				PO1	PO2	PO3	PO4	PO5	PO6	PO7
<u> </u>	Evaluate diff	erent p	preparation processes for the manufacture of ammonia,				3	2	3	3	2	3	2
	nitric acid, ar quality contr	mmonii ol, haza	um nitrate and ammonium ards, safety and effluent m	n sul nana	Iphate and their related agement.								
CO2	Evaluate diff chemicals an	erent n d their	nanufacturing methods of properties and uses.	caus	istic soda and phosphore	IS	3	2	3	3	1	3	2
CO3	Understand	the con	position of glass and their	r typ	pes, properties and uses	•	3	2	3	3	1	3	2
CO4	Analyze the one setting time.	compos	ition, types, properties an	d pr	reparation of cement ar	d its	3	2	3	3	1	3	2
CO5	Understand and their res	the class spective	sification, properties and e characteristics.	uses	s of ceramics and refrac	tories	3	2	3	3	1	3	2
			3 Strong contrib	outic	on, 2 Average contributi	on,1L	ow cont	ribution			1		1
12. Brief descrip https://encyclope	<b>tion of self lea</b> edia2.thefreedi	<b>rning /</b> ctionar	E-learning component y.com/chemical+process+	indu	ustry								
https://www.you	tube.com/wate	ch?v=Rj	ZJjneJ5fk										
https://www.che	micalprocessin	g.com/											
https://www.brit	annica.com/sci	ence/p	hosphorus-chemical-elem	ent		<u>.</u>							
13. Books recon	nmended:					-							
1. Shreve R.N. Bri	nk. J.A., Chemi	cal Prod	cess Industries, Internation	nal s	student edition, Pubs: N	cGraw	Hill Bool	k Co. New '	York, 196	U.	00		
<ol> <li>Groggins P.IVI.,</li> <li>Dryden's outlin</li> </ol>	Unit Process In les of Chemical	Techni	ic synthesis, 5th edition, If ploay, edited and revised b	nteri ov G	Gonala Rao M. and Mars	i, PUDS: hall S. P	ivicGrav Pubs: Fas	v-HIII BOOK st-West Pre	co., New I	тогк, 19 Delhi: 200	98. )4.		
4. Industrial Cher	nistry B.K.Sharr	na, goe	I publishing house.	., 5			5.601 Edd			, 200			
5. Chemical proce	ess industries N	I.R Nerr	is shreve.										
<ol><li>Chemical proce</li></ol>	ess principales:	part 1	& II – O.A / Hougen, K.M V	Vats	son RA Ragatz (CBS)								

7. Shrev's Chemical process Industries: 5th edition - George T. Austin, Mc Graw Hill.

1. N	lame of the Depa	rtment: Chem	nistry											
2. 0	Course Name		FUNDAMENTALS OF FOOD (	CHEMISTRY			L		T			Р		
3. C	Course Code		CH310				3		1			0		
4. T	ype of Course (u	se tick mark)					Core ()	DE	(v)		FC ()			
5. P	re-requisite (if any)		10+2 with Chemistry	6. Frequency (use tick marks)	Even (v	/)	Odd ()	Eitl	her Sem	0	Every Se	:m ()		
7. T	otal Number of I	ectures, Tuto	rials, Practicals											
Lectu	res = 30			Tutorials = 10		P	ractical =	Nil						
8. COL and sta	JRSE OBJECTIVES	: The course for students about (200)	ocuses on providing knowledget t quality and safety assurance	e of food constituents, f and food related hazarc	ood addit ls.	tives and	d food pro	cessing t	echnique	es. The st	udy of foo	d laws		
9. COC After tl	he successful cour	(CO): rse completion	n, learners will develop follow	ving attributes:										
COURS	E OUTCOME (CO)	ATTRIBUTES	TRIBUTES											
ļ	CO1	Understand	ing of Indian food law and foo	d standards, value of qu	ality assu	rance ai	nd safety a	assurance	Э.	. <u>.</u> .				
	CO2	Comprehen	sion of chemical structure, pro	perties and argue impo	rtance of	food co	mponents	s, includir	ig carbol	nydrates,	protein, lij	pids,		
	CO3	Describe th	e principles in food processing	j techniques and differe	ntiate too	od prese	ervation m	iethods II	ke heat j	preservat	ion and co	ld		
	CO4	Able to expl	ain different types of food add	litives with examples an	d judge it	s value	in real lite	arda						
10	cuu halisteb aziw tin	Analyze une	Importance or roou sarety and	11000 Telateu priysicai, i	nemicai a		Оунсан над	.di us.						
Unit-		Numb	er of lectures = 08	Title of the unit: (	overnme	ental Re	qulations							
Introdu Cortific	iction, Food laws	and standar	ds: Indian food safety laws	and standards; Quality	and sate	ety assu	irance in	food ind	ustry; B	IS Labora	itory Servi	ices and		
Unit-	2	Numb	er of lectures =08	Title of the unit: Co	onstituent	ts of For	od and the	eir Nutrit	ive Aspe	cts				
Carboh	ydrates, Proteins	, Fats and oils,	Vitamins and Minerals.											
Unit-:	3	Numb	er of lectures = 08	Title of the unit: Fo	ood Proce	essing Te	echniques							
Commo concen	on unit operation	is, Food deter ckaaing.	rioration and their control; H	leat preservation and p	rocessing	j, Cold	preservati	ion and p	processir	ng Food (	dehydratic	on, Food		
Unit-	4	Numb	er of lectures = 08	Title of the unit: Fo	od Addit	tives								
Preserv	atives, Antioxida	nts, Chelating	agents, Surface active agent	s, Stabilizing and Thick	ening age	ents, Bu	ffering ag	ents, Col	louring a	igents, Sv	veetening	agents &		
Flavorii	ng agents.	Numh	or of lasturas - 00	Title of the unit Fo	ad Cafatu	- Dieke	and Uazar	-40						
Food re	olated Hazards, M	licrobiological	Considerations in food safety	Fffects of processing a	nd storac	re on m	icrobial sa	as afetv. Che	-mical ha	azards ass	sociated w	ith foods		
Preven	tion methods from	n food born d	isease.	, Ellouis or proceeding -	nu storeg	je o	10,00.0.0	1003, 0	/////04/ 1.2	ILUI US US		1011002.		
11. CC	)-PO mapping									1				
<u> </u>	COs	the second second	Attributes	the section of quality	3	P01	PO2	PO3	PO4	PO5	PO6	P07		
	CO1	rstanding of in ance and safe	ndian food law and food stand ty assurance	lards, value of quality			2	3 	2	3	3	з 		
	CO2	orehension of conents, inclu	chemical structure, properties ding carbohydrates, protein, li	s and argue importance pids, vitamins and mine	of food <b>3</b> rals.		2	2	3	3	3	3		
	CO3 Desc prese pack	ribe the princ ervation methe aging	iples in food processing techni ods like heat preservation and	iques and differentiate cold preservation, food	rood <sup>3</sup>		2	2	2	3	3	3		
	CO4 Able value	to explain dif in real life.	ferent types of food additive	s with examples and ju	ıdge its 3		2	2	2	3	3	3		
	CO5 Analy	/ze the import gical hazards.	tance of food safety and food	related physical, chemi	cal and 3		2	3	3	3	3	3		
40 D.	. f. d. serietion of		3 Strong contributi	on, 2 Average contribut	ion, 1 Lov	w contri	ibution							
<u>12. в</u> http://v	www.basicknowle	seir learning / dge101.com/	/ E-learning component pdf/Food%20chemistry.pdf											
https://	/courses.foodcrui	nbles.com/co	urses/food-chemistry-basics/											
https://	/www.cabdirect.c	org/cabdirect/	abstract/19710406009											
<b>13.</b> Bo 1. Food 2. Princ 3. Food 4. Food 5. Intro	oks recommend I Chemistry, Belitz ciples of Human N I – The Chemistry I additives, Brana oduction to food s	ed: and Gosch, S Jutrition, Mart of its Compor n, Alfred Larry cience, Rick P:	pringer – Verlag Bertin Heiderl in Eastwood, Chapman and Ha tents, T.P. Coultate, Royal Soc. 7, Davidson P. Michae, Food Sci	berg, 2nd Edition, 1999 all, London, I Edition, 19 . Chemistry, 4th Edition, ience and Technology so	97. 2002. eries (35),	, Morcel	Dekker, Ir	nc, 1990.						

1. Name of the	Depart	ment: Chem	istry								
2. Course Name	;		PROJECT TRAINING				L	T			P
3. Course Code			CH312				0	0			0
4. Type of Cour	se (use	tick mark)				Core	() DI	E (V)		FC ()	
5. Pre-requisite (if any)	re-requisite 10+2 with Chemis (if any)			6. Frequency (use tick marks)	Even (v)	Odd	0 Ei	ther Sem	0	Every Sei	m ()
7. Total Number of Lectures, Tutorials, Practicals											
Lectures = 30				Tutorials = 10		Practic	al = Nil				
8. COURSE OBJECT	FIVES: `	The main obj	ective is to enhance the techni	cal skills and to provide	students in	dustrial ex	posure.				
9. COURSE OUTCO	OMES (	CO):									
After the successfu	l cours	e completion	, learners will develop followi	ng attributes:							
COURSE OUTCOME	(00)	ATTRIBUTES									
CO1		Hands on tra	lining								
CO2		Integrate cla	ss room theory with laboratory	y scale practice.							
CO3		Understandi	ng professional ethics of indust	try and code of conduct							
10. CO-PO mappir	ng										
COs			Attributes	PC	D1 PC	02 PO3	PO4	PO5	PO6	P07	
CO1	Hands	on training		3	2	3	2	3	3	3	
CO2	Integra	te classroom	theory with laboratory scale p	practice.	3	2	2	3	3	3	3
CO3	Unders	standing prof	essional ethics of industry and	code of conduct.	3	2	2	2	3	3	3
			3 Strong contributio	n 2 Average contributi	on 11 ow c	ontributio	n				