FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF CHEMISTRY COURSE CURRICULUM

P	ADT -		E CURRICULUM		
P	ART- A:	ntroductio	n		
(C	ogram: Bachelor in ertificate / Diploma / De	n Science	Semester - II	Session: 2024-2	2025
1	Course Code	CHSC-02T			
2	Course Title	FUN	NDAMENTAL CHEMIS	STRY-II	
3	Course Type		DSC		
4	Pre-requisite (if, any)		As per P.	rogram	
5	Course Learning. Outcomes (CLO)	> To under. > To learn is bonded company of their in the interval in	stand different acid-base the preparation, bonding ompounds stand the concept and ch reactions the basic concepts of vari	theories und solvent system, and reactions of C-C o- emistry of aromatic complous states of matter & understry and chemical kinetic	ounds derstand
6	Credit Value	3 Credits	Credit = 15 Hour	s - learning & Observa	tion
7	Total Marks	Max. Marks:	100		40
ΡΔ	RT -B: Conter	nt of the Co			
				D (5 D :- 1- (45 He	
	10tal No. 01 1eac	ching-learning b	Periods (01 Hr. per peri	od) - 45 Periods (45 Ho	
Un		Тор	oics (Course contents	5)	No. of Period
T	Theories of acids an relative strengths of a of acids and bases. HSAB concept: Clas Borderline, Soft). Ap Selectivity, Redox Re Non-aqueous solvent general characteristic	nd bases: Arrhening acids and bases, the sification of Acid plications of HSA eactions s: .Physical propers, Liquid ammoni	us, Bronsted-Lowry, conjue Lux-flood, solvent system is and Bases According to AB Theory in Inorganic Reprises of a solvent, types of a as a solvent. Acid-base, as of alkali and alkaline ear	em and Lewis concepts HSAB Theory (Hard, eactions - Solubility, f solvents and their	11
11	Alkanes: Preparation method). Reactions (r. Cycloalkanes: Preparation hydrocarbons), Reactions (stability of cycloalkanes) Conformational structions (CHEMISTRY OF CAlkenes: Preparation of Hoffmann and Saytze)	(Wurtz reaction, mechanisms): halo ation (Dieckmann ions (mechanisms nes -Baeyer's strutures of ethane, re-Cπ-BONDING methods (dehydra ff rules, cis and tradical addition (lease the control of the con	reduction/hydrogenation of ogenation, free radical sult's ring closure, reduction is: substitution and ring-orain theory, Sachse and Man-butane and cyclohexand ition, dehydrohalogenationans eliminations). Reaction, dydrogen, halogen, hydrogen, hydrogen, halogen, hydrogen, halogen, hydrogen, halogen, hydrogen, halogen, hydrogen, hydrogen, halogen, hydrogen, hydrogen, halogen, hydrogen, hydrog	of aromatic pening reactions. Iohr predictions, e. in, dehydrogenation, ions (mechanisms): gen halide, hydrogen	12

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	ozonolysis, hydroboration/oxidation.	
	Aromatic Hydrocarbons	-
	Aromatic hydrocarbons: Aromaticity: Hückel's rule, aromatic character of	
	arenes, cyclic carbocations/ carbanions and heterocyclic compounds with	
	suitable examples. Electrophilic aromatic substitution: halogenation,	
	nitration, sulphonation and Friedel-Craft's alkylation/acylation with their	
	mechanism. Directive effects of the groups.	
III	Behaviour of ideal gases: Kinetic theory of gases – postulates and derivation of the	
	equation, PV = 1/3 mnc ² and derivation of the gas laws- Maxwell's distribution of	
	molecular velocities-effect of temperature-types of molecular velocities-degrees of	
	freedom-Principle of equipartition of energy.	
	Behaviour of Real gases: Deviation from ideal behaviour, derivation of van der Waals,	
	equation of state and critical constants.	11
	Liquid state chemistry: structure of liquids(Eyring Theory), Properties of liquids, viscosity and	
	surface tension.	
	Solid state chemistry: Nature of the solid state, law of constancy of interfacial angles, law of	
	rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law,	
	Crystal defects.	
IV	A. Colloids and surface chemistry: Classification, Optical, Kinetic and Electrical	
	Properties of colloids, Coagulation, Hardy Schulze law, flocculation value, Protection,	
	Gold number, Emulsion, micelles and types, Gel, Syneresis and thixotropy, Physical	
	adsorption, chemisorption,	
	B. Chemical kinetics: Rate of reaction, Factors influencing rate of reaction, rate law,	
	rate constant, Order and molecularity of reactions, rate determining step, Zero, First and	
	Second order reactions, Rate and Rate Law, methods of determining order of reaction,	11
	Chain reactions. Temperature dependence of reaction rate, Arrhenius theory, Physical	
	significance of Activation energy, collision theory, demerits of collision theory, non-	
	mathematical concept of transition state theory.	
	C. Catalysis: Homogeneous and Heterogeneous Catalysis, types of catalyst,	
	characteristics of catalyst, Enzyme catalyzed reactions, Industrial applications of	
	catalysis.	

Signature of Convener & Members (CBoS):

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PART-C: Learning Resources

Text Books, Reference Books and Others

Textbooks Recommended:

1. Bahl, A., & Bahl, B. S. (2014). Organic Chemistry (22nd Ed.). S. Chand & Sons.

- 2. Ahluwalia, V. K., & Goyal, M. (2001). A Textbook of Organic Chemistry. Narosa Publishing House.
- 3. Jain, M. K., & Sharma, S. C. (2017). Modern Organic Chemistry. Vishal Publishing Company.
- 4. Puri, B. R., Sharma, L. R., & Pathania, M. S. (2013). Principles of Physical Chemistry (46th Ed.). Shoban Lal Nagin Chand And Co.
- 5. Bahl, B. S. A., & Tuli, G. D. (2009). Essentials of Physical Chemistry (Multicolour Ed.). S. Chand & Company Pvt Ltd.
- 6. Puri, B. R., Sharma, L. R., & Kalia, K. C. (2018). Principles of Inorganic Chemistry. Nagin Chand and Co., New Delhi.

Reference Books Recommended:

- 1. Paula, B. Y. (2014). Organic Chemistry (7th Ed.). Pearson Education, Inc. (Singapore).
- 2. Solomons, T. W. G. (2017). Organic Chemistry (Global Ed.). John Wiley & Sons.
- 3. Morrison, R. T., & Boyd, R. N. (2010). Organic Chemistry (7th Ed.). Prentice-Hall Of India
- 4. Laidler, K. J., & Meiser, J. H. (2006). Physical Chemistry (2nd Indian Ed.). CBS Publishers.
- 5. Atkins, P. W., & De Paula, J. (2006). Physical Chemistry (8th Ed.). Oxford University Press.
- 6. Dogra, S., & Dogra, S. (2006). Physical Chemistry through Problems (2nd Ed.). New Age International.
- 7. Sangaranarayanan, M. V., & Mahadevan, V. (2011). Textbook of Physical Chemistry. University

Online Resources-

- https://bit.ly/3Gb99iy
- https://www.organic-chemistry.org/
- https://bit.ly/3GduvMi
- https://bit.ly/30TXm8d
- https://application.wiley-vch.de/books/sample/3527316728 c01.pdf
- https://www.ncbi.nlm.nih.gov/books/NBK547716/

Online Resources-

> e-Resources / e-books and e-learning portals

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:

100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE):

70 Marks

10

Continuous Internal Internal Test / Quiz-(2): 20 #20

Assessment (CIA): (By Course Teacher)

Assignment / Seminar -

Total Marks -30

Better marks out of the two Test / Quiz + obtained marks in Assignment shall be

considered against 30 Marks

End Semester Exam (ESE):

Two section - A & B

Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 = 20 Marks Section B: Descriptive answer type qts., lout of 2 from each unit-4x10=40 Marks

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF CHEMISTRY COURSE CURRICULUM

Program: Bachelor in Science (Certificate / Diploma / Degree/Honors) 1				Cours	E CURRIC	CULUM		
Course Code CHSC-02P	P	ART	- A: Ir	ntroductio	n			
Course Title CHEMISTRY LAB. COURSE-II Course Type DSC Pre-requisite (if, any) Course Learning. Outcomes (CLO) Course Learning. Outcomes (CLO) Course Learning. Course Learning and using common glassware for accurate measurementy learning hermoned establish boiling points. Course Learning melting points to assess compound purity and employing distillation and sublimation techniques. Cordit Value 1 Credits Credit =30 Hours Laboratory or Field learning/Training/ PART -B: Content of the Course Total No. of learning-Training/performance Periods: 30 Periods (30 Hours) No. of Period Course Course Course. Contents Thermometer: 80-82°C (Naphthalene), 113.5°-114°C (Acetanilide), 132.5°C - 133°C (Urea), 100°C (Distilled Water) Functional group Analysis of Organic Compounds, Detection of elements (N, S, and halogens) and functional groups Physical chemistry Surface tension measurements: Determine the surface tension by (i) drop number (ii) drop weight method. Surface tension composition curve for a binary liquid mixture. Viscosity measurement using Ostwald's viscometer, Determination of viscosity of aqueous solutions of (i		_			Semest	ter- II	Session: 2024-2	.025
Course Type DSC	-	_						
Course Type DSC	2	Cour	se Title	CH	EMISTRY LA	B. COUR	SE-II	
No. of Partial Basic Laboratory Techniques Topics (Course contents) Demonstration of Laboratory Glassware and Equipment, Calibration of Course of Course of Course (Did Did Puscial chemistry Surface tension and surface tension and surface tension and subjimation techniques to establish boiling points Solution viscosity Partial Marks Max. Marks 50 Min Passing Marks 20 Partial Move Topics (Course contents) Partial Move Partial Partial Partial Partial Partial Partial Partial Partial Partia	3	Cour	se Type					
Course Learning Course C	4	Pre-	requisite (if, any)		As per Pro	gram		
Total Marks Max. Marks: 50 Min Passing Marks: 20	5		rse Learning. comes (CLO)	measurement Studying the j Determining distillation an Equipping wi	s functional grou melting points d sublimation th essential ski	up analysi to assess technique ills in mea	s organic compounds compound purity and em s to establish boiling poin suring liquid surface tens	ion and
Total Marks Max. Marks: 50 Min Passing Marks: 20 PART -B: Content of the Course Total No. of learning-Training/performance Periods: 30 Periods (30 Hours) Module Topics (Course contents) No. of Period Training/ Demonstration of Laboratory Glassware and Equipment, Calibration of Experiment Thermometer: 80-82°C (Naphthalene), 113.5°-114°C (Acetanilide), 132.5°C - 133°C (Urea), 100°C (Distilled Water) Functional group Analysis of Organic Compounds, Detection of elements (N, S, and halogens) and functional groups Physical chemistry Surface tension measurements: Determine the surface tension by (i) drop number (ii) drop weight method. Surface tension composition curve for a binary liquid mixture. Viscosity measurement using Ostwald's viscometer, Determination of viscosity of aqueous solutions of (i) sugar (ii) ethanol at room temperature. Study of the variation of viscosity of sucrose solution with the concentration of solute. Viscosity Composition curve for a binary liquid mixture Basic laboratory techniques, Equipments, Calibration, Melting points, Qualitative analysis,	6	Cros	lit Value		Credit =30 H	ours Labo	ratory or Field learning/I	raining
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours) Module Topics (Course contents) Basic Laboratory Techniques Demonstration of Laboratory Glassware and Equipment, Calibration of Experiment Contents Of Course Contents Functional group Analysis of Organic Compounds, Detection of elements (N, S, and halogens) and functional groups Physical chemistry Surface tension measurements: Determine the surface tension by (i) drop number (ii) drop weight method. Surface tension composition curve for a binary liquid mixture. Viscosity measurement using Ostwald's viscometer, Determination of viscosity of aqueous solutions of (i) sugar (ii) ethanol at room temperature. Study of the variation of viscosity of sucrose solution with the concentration of solute. Viscosity Composition curve for a binary liquid mixture Basic laboratory techniques, Equipments, Calibration, Melting points, Qualitative analysis,	_			Max. Marks:			Min Passing Marks:	20
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours) Module Topics (Course contents) No. of Period Training/ Experiment Contents of Course Course Thermometer: 80-82°C (Naphthalene), 113.5°-114°C (Acetanilide), 132.5°C - 133°C (Urea), 100°C (Distilled Water) Functional group Analysis of Organic Compounds, Detection of elements (N, S, and halogens) and functional groups Physical chemistry Surface tension measurements: Determine the surface tension by (i) drop number (ii) drop weight method. Surface tension composition curve for a binary liquid mixture. Viscosity measurement using Ostwald's viscometer, Determination of viscosity of aqueous solutions of (i) sugar (ii) ethanol at room temperature. Study of the variation of viscosity of sucrose solution with the concentration of solute. Viscosity Composition curve for a binary liquid mixture Basic laboratory techniques, Equipments, Calibration, Melting points, Qualitative analysis,	<u> </u>		R: Conte	at of the Co	ourse			
Module Topics (Course contents) Period Lab./Field Training/ Experiment Contents of Course Course Thermometer: 80-82°C (Naphthalene), 113.5°-114°C (Acetanilide), 132.5°C - 133°C (Urea), 100°C (Distilled Water) Functional group Analysis of Organic Compounds, Detection of elements (N, S, and halogens) and functional groups Physical chemistry Surface tension measurements: Determine the surface tension by (i) drop number (ii) drop weight method. Surface tension composition curve for a binary liquid mixture. Viscosity measurement using Ostwald's viscometer, Determination of viscosity of aqueous solutions of (i) sugar (ii) ethanol at room temperature. Study of the variation of viscosity of sucrose solution with the concentration of solute. Viscosity Composition curve for a binary liquid mixture Basic laboratory techniques, Equipments, Calibration, Melting points, Qualitative analysis,			Total No. o	f learning-Train	ing/performa	nce Perio	ds: 30 Periods (30 Hours)	No of
Training/ Experiment Contents of Course Demonstration of Laboratory Glassware and Equipment, Calibration of Thermometer: 80-82°C (Naphthalene), 113.5°-114°C (Acetanilide), 132.5°C - 133°C (Urea), 100°C (Distilled Water) Functional group Analysis of Organic Compounds, Detection of elements (N, S, and halogens) and functional groups Physical chemistry Surface tension measurements: Determine the surface tension by (i) drop number (ii) drop weight method. Surface tension composition curve for a binary liquid mixture. Viscosity measurement using Ostwald's viscometer, Determination of viscosity of aqueous solutions of (i) sugar (ii) ethanol at room temperature. Study of the variation of viscosity of sucrose solution with the concentration of solute. Viscosity Composition curve for a binary liquid mixture Basic laboratory techniques, Equipments, Calibration, Melting points, Qualitative analysis,	Mo	odule						Period
Basic laboratory techniques, Equipments, Calibration, Melting points, Qualitative analysis,	Tra Expe Cor	nining/ eriment ntents Course	Demonstration of Thermometer: 81 133°C (Urea), 10 Functional groups, and halogens) Physical chemis Surface tension in (ii) drop weight mixture. Viscosity measure of aqueous solutions of the variable of the Viscosity was soluted.	f Laboratory Glas 0-82°C (Naphtha 00°C (Distilled V p Analysis of Or and functional gr try neasurements: D method. Surface rement using Ost ions of (i) sugar ation of viscosity Composition cu	vater) rganic Compose etermine the secton compose wald's viscome (ii) ethanol at record of sucrose so	unds, Determined temposition contemporal temporal tempora	ection of elements (N, sion by (i) drop number urve for a binary liquid rmination of viscosity erature.	
	Key	words	Basic laboratory te	chniques, Equipn	ents, Calibratio	n, Melting	points, Qualitative analysis,	

Signature of Convener & Members (CBoS):

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PART-C: Learning Resources

Text Books, Reference Books and Others

Textbooks Recommended:

- 1. Ahluwalia, V. K., Dhingra, S., & Gulati, A. (N.D.). College Practical Chemistry. University Press.
- 2. Khosla, B. D., Garg, V. C., & Gulati, A. (2011). Senior Practical Physical Chemistry. S. Chand & Co.

Reference Books Recommended:

- 3. Garland, C. W., Nibler, J. W., & Shoemaker, D. P. (2003). Experiments in Physical Chemistry (8th Ed.). Mcgraw-Hill.
- 4. Mendham, J. (2009). Vogel's Quantitative Chemical Analysis (6th Ed.). Pearson Education.
- 5. Mann, F. G., & Saunders, B. C. (2009). Practical Organic Chemistry. Pearson Education.
- 6. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (2012). Practical Organic Chemistry (5th Ed.). Pearson Education.

Online Resources-

- http://heecontent.upsdc.gov.in/Home.aspx
- https://nptel.ac.in/courses/104/106/104106096/
- http://heecontent.upsdc.gov.in/Home.aspx
- https://nptel.ac.in/courses/104/106/104106096/
- https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtml/introl.htm
- https://nptel.ac.in/courses/104/103/104103071/W

Online Resources-

> c-Resources / e-books and e-learning portals

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PART -D: Asses	sment and	Evaluation	1.7	
Suggested Continuous	Evaluation Metho	ods:		
Maximum Marks:		50 Marks		
Continuous Internal A	ssessment (CIA):	15 Marks		
End Semester Exam (F	ESE):	35 Marks		
Continuous Internal	Internal Test / Qui	z-(2): 10 & 10	Better marks out of the	two Test / Ouiz
Assessment (CIA):	Assignment/Semina	r +Attendance - 05	+ obtained marks in Ass	
(By Course Teacher)	Total Marks -	15	considered against	
End Semester	Laboratory / Fiel	d Skill Performan	ce: On spot Assessment	Managed by
Exam (ESE):	D. Performed th	ie Task based on lab	. work - 20 Marks	Course teacher
(====)	E. Spotting base	ed on tools & techno	logy (written) - 10 Marks	as per lab.
	F. Viva-voce (ba	ased on principle/tec	chnology) - 05 Marks	status

Name and Signature of Convener & Members of CBoS:

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF CHEMISTRY COURSE CURRICULUM

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(C	erti	ram: Bachelor in	Science	Samastar II	G ' 2021	2025
1	C	ficate / Diploma / De ourse Code	gree/Honors)	Semester - II	Session: 2024- 2	2025
2	_		CHGE-02T			
3	_	ourse Title	FUI	NDAMENTAL CHEMIS	TDV II	
4		ourse Type		GE	1 K Y - 11	
*	P	re-requisite (if, any)				
				As per Pr	ogram	
		,	> To learn	stand different acid-base t	heories and solvent syst	em.
5	C	ourse Learning.	bonded c	the preparation, bonding, ompounds	and reactions of C-C σ-	& π-
J	О	utcomes (CLO)	To under	stand the concept and che	mistry of aromatic com-	nounds
			***************************************	reactions		
		ř	> To learn	the basic concepts of vario	ous states of matter &un	derstand
6	C	redit Value	3 Credits	concepts of surface chemi	stry and chemical kinet	ics
7	T	otal Marks	Max. Marks:	Credit = 15 Hours	- learning & Observa	tion
A				100	Min Passing Marks:	40
			nt of the Co	ourse	Α	
**		Total No. of Teac	hing-learning	Periods (01 Hr. per perio	d) - 45 Periods (45 Ho	urs)
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		relative strengths of a	icids and bases, t	ius, Bronsted-Lowry, conju he Lux-flood, solvent syste	gate acids and bases,	1-
		of acids and bases		··· > > un-11000. Suivent evera	m and I arrise	
		TTC A D		solvent syste	and Lewis concepts	
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		HSAB concept: Clas Borderline, Soft). An	sification of Acid	d		
		HSAB concept: Clas Borderline, Soft). Ap Selectivity, Redox Re	sification of Acid	ds and Bases According to AB Theory in Inorganic Re	HSAB Theory (Hard, actions - Solubility.	11
		HSAB concept: Clas Borderline, Soft). Ap Selectivity, Redox Ro Non-aqueous solvent general characteristic	sification of Acid plications of HSZ eactions s: .Physical prope	ds and Bases According to AB Theory in Inorganic Re erties of a solvent, types of	HSAB Theory (Hard, actions - Solubility, solvents and their	11
		HSAB concept: Clas Borderline, Soft). Ap Selectivity, Redox Ro Non-aqueous solvent general characteristic	sification of Acid plications of HSZ eactions s: .Physical prope	ds and Bases According to AB Theory in Inorganic Re erties of a solvent, types of	HSAB Theory (Hard, actions - Solubility, solvents and their	11
		HSAB concept: Clas Borderline, Soft). Ap Selectivity, Redox Re Non-aqueous solvent general characteristic complex, formation reapplication)	sification of Acid plications of HSZ cactions s: .Physical prope s, Liquid ammon cactions. Solution	ds and Bases According to AB Theory in Inorganic Re erties of a solvent, types of ia as a solvent. Acid-base, ns of alkali and alkaline ear	HSAB Theory (Hard, actions - Solubility, solvents and their	11
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II	31	HSAB concept: Class Borderline, Soft). Ap Selectivity, Redox Re Non-aqueous solvent general characteristic complex, formation reapplication) CHEMISTRY OF CAlkanes: Preparation method). Reactions (r Cycloalkanes: Preparation hydrocarbons), React Stability of cycloalkate Conformational struct CHEMISTRY OF CAlkenes: Preparation Alkenes: Preparation	sification of Acid plications of HSA cactions: s: Physical propers, Liquid ammone eactions. Solution (C-C σ-BONDIN (Wurtz reaction, mechanisms): half ation (Dieckman ions (mechanism ions mechanism ions (mechanism ions (me	ds and Bases According to AB Theory in Inorganic Re erties of a solvent, types of it as a solvent. Acid-base, as of alkali and alkaline ear of alkali and al	HSAB Theory (Hard, actions - Solubility, solvents and their precipitation and the metals in ammoniath metals in ammoniath metals in corey-House stitution. Of aromatic pening reactions, ohr predictions,	11
Ш	31	HSAB concept: Class Borderline, Soft). Ap Selectivity, Redox Re Non-aqueous solvent general characteristic complex, formation reapplication) CHEMISTRY OF CAlkanes: Preparation method). Reactions (r Cycloalkanes: Preparations), React Stability of cycloalka Conformational structure CHEMISTRY OF CAlkenes: Preparation Hoffmann and Sautzon Hoffmann and Sautzon Hoffmann and Sautzon CHEMISTRY OF CAlkenes: Preparation Hoffmann and Sautzon CHEMISTRY OF CAlkenes: Preparation Hoffmann and Sautzon CHEMISTRY OF CAlkenes: Preparation CHEMISTRY OF CAlkenes: Preparation CHEMISTRY OF CAlkenes: Preparation CHEMISTRY OF CALLED CHEMISTRY	sification of Acid plications of HS cactions s: Physical propers, Liquid ammon eactions. Solution C-C σ-BONDIN (Wurtz reaction, mechanisms): half ation (Dieckman in the catter of ethane, c-C π-BONDING methods (dehydref femblods)	ds and Bases According to AB Theory in Inorganic Reserties of a solvent, types of the as a solvent. Acid-base, as of alkali and alkaline ear and alkaline ear and alkaline for reduction/hydrogenation of logenation, free radical substitution and ring-op rain theory, Sachse and Mon-butane and cyclohexane	HSAB Theory (Hard, actions - Solubility, solvents and their precipitation and the metals in ammoniath metals in ammoniath metals in corey-House stitution. Of aromatic pening reactions, ohr predictions,	11
Ш		HSAB concept: Class Borderline, Soft). Ap Selectivity, Redox Re Non-aqueous solvent general characteristic complex, formation reapplication) CHEMISTRY OF CAlkanes: Preparation method). Reactions (regular conformations), Reactions of Cycloalkanes: Preparation to Cycloalkanes: Preparation of Cycloalkanes: Preparation of Cycloalkanes: Preparation of CHEMISTRY OF CAlkenes: PREPARATION OF CALKENES: PREP	sification of Acid plications of HS actions seactions seactions. Physical property is a Liquid ammon eactions. Solution C-C σ-BONDIN (Wurtz reaction, mechanisms): half ation (Dieckman innes -Baeyer's statures of ethane, c-C π-BONDING methods (dehydraff rules, cis and taradical additional radical radica	ds and Bases According to AB Theory in Inorganic Reserties of a solvent, types of the as a solvent. Acid-base, and alkaline ear a solvent and alkaline ear a	HSAB Theory (Hard, actions - Solubility, solvents and their precipitation and the metals in ammoniath metals in ammoniath metals in ammoniate stitution. of aromatic sening reactions, ohr predictions, ohr predictions, and the metals in ammoniate sening reactions.	
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Ш	9.1	HSAB concept: Class Borderline, Soft). Ap Selectivity, Redox Re Non-aqueous solvent: general characteristic complex, formation reapplication) CHEMISTRY OF CAlkanes: Preparation method). Reactions (regular Cycloalkanes: Preparation hydrocarbons), React Stability of cycloalka Conformational structure CHEMISTRY OF CAlkenes: Preparation Hoffmann and Saytze electrophilic and free bromide, water, hydrocarbons: 1.2- and 1.4 celectrophilics: 1.2- and 1.4 celectrophilics.	sification of Acid plications of HS actions seactions: Physical property is a Liquid ammone actions. Solution (Party is a Liquid ammone actions. Solution (Party is a Liquid ammone actions): half ation (Dieckman and the Liquid actions) (Marty is a Liquid actions) (Marty is a Liquid action)	ds and Bases According to AB Theory in Inorganic Reserties of a solvent, types of the as a solvent. Acid-base, as a solvent. Acid-base, as of alkali and alkaline ear G reduction/hydrogenation of logenation, free radical substitution and ring-operain theory, Sachse and Mon-butane and cyclohexane G ration, dehydrohalogenation rans eliminations). Reactio (hydrogen, halogen, hydroglysis, dihydroxylation with	HSAB Theory (Hard, actions - Solubility, solvents and their precipitation and the metals in ammoniath metals in ammoniath metals in ammoniath alkenes, Corey-House stitution. Of aromatic pening reactions, ohr predictions, ohr predictions, ohr predictions, as (mechanisms): gen halide, hydrogen KMnO()	
ĪĪ		HSAB concept: Class Borderline, Soft). Ap Selectivity, Redox Re Non-aqueous solvent general characteristic complex, formation reapplication) CHEMISTRY OF CAlkanes: Preparation method). Reactions (recycloalkanes: Preparation flags of cycloalkanes: Preparation of cycloalkanes: 1,2- and 1,4-and 1	sification of Acid plications of HSA cactions s: Physical propers, Liquid ammon eactions. Solution (C-C σ-BONDIN (Wurtz reaction, mechanisms): half ation (Dieckman ions (mechanism ions ions ions (dehydrations, cis and tradical addition ions ions ions ions ions ions ions i	ds and Bases According to AB Theory in Inorganic Reserties of a solvent, types of the sia as a solvent. Acid-base, and of alkali and alkaline ear and alkaline ear and colored and solvent and ring-operation of the sia and solvent and ring-operation theory, Sachse and Months and cyclohexane and cyclohex	HSAB Theory (Hard, actions - Solubility, solvents and their precipitation and the metals in ammoniath metals in ammoniath metals in ammoniath alkenes, Corey-House stitution. Of aromatic pening reactions, ohr predictions, ohr predictions, on (mechanisms): gen halide, hydrogen KMnO ₄).	
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		Aromatica	
		Aromatic Hydrocarbons	
		1 - Contained II VOITO Contains	1
		arenes, cyclic carbocations/ carbanions and heterocyclic compounds with	
		Saltable examples Districtions and neterocyclic compounds with	
-		antiation, sulphonetics and another substitution, halogenation,	
-	***	inechanism. Directive offers and chart's ankylation/acylation with their	
	\mathbf{III}	Behaviour of ideal gassa Missississississississississississississ	-
		equation, $PV = 1/3 \text{ mnc}^2$ and derivation of the gas laws- Maxwell's distribution of molecular velocities-effect of temperature types of solutions and the solution of the gas laws- Maxwell's distribution of	
1		molecular velocities-effect of temperature-types of molecular velocities-degrees of freedom-Principle of equipartition of energy	
		freedom-Principle of assistant transfer of temperature-types of molecular velocities-degrees of	1 -
		freedom-Principle of equipartition of energy. Behaviour of Pool and Pool a	
		Behaviour of Real gases: Deviation from ideal behaviour, derivation of van der Waals, equation of state and critical constants	
		equation of state and critical constants.	11
		Liquid state chemistry: structure of liquids(Eyring Theory), Properties of liquids, viscosity and	
		Solid state chemistry: Network Cit	
1		Solid state chemistry: Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of support of the solid state.	
		rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, seven crystal systems and fourteen Brayais lattices.	
_		Crystal defects.	
	IV	A. Colloids and surface chamistana Classics	
1		Properties of colloids, Coagulation, Hardy Schulze law, flocculation value, Protection, Gold number, Emulsion, micelles and types Col. Server in the control of the control	
		Gold number. Emulsion migetter and the second secon	
		Gold number, Emulsion, micelles and types, Gel, Syncresis and thixotropy, Physical adsorption, chemisorption,	
1		B. Chemical kinetics, Details	
-		B. Chemical kinetics: Rate of reaction, Factors influencing rate of reaction, rate law, rate constant, Order and molecularity of reactions, rate day.	7.7
		rate constant, Order and molecularity of reactions, rate determining step, Zero, First and Second order reactions. Rate and Rate Law, mothed as 6 days.	
		Second order reactions, Rate and Rate Law, methods of determining order of reaction, Chain reactions. Temperature dependence of reaction,	11
		Chain reactions. Temperature dependence of reaction rate, Arrhenius theory, Physical significance of Activation energy, collision theory.	
1		significance of Activation energy, collision theory, demerits of collision theory, non-	
12	- 10	mathematical concept of transition state theory.	
. '		C. Catalysis: Homogeneous and Heterogeneous Catalysis, types of catalyst,	-
		characteristics of catalyst, Enzyme catalyzed reactions, Industrial applications of	
-			
Key	words	Acid & Bases, Alkanes, Cycloalkanes, Alkenes, Dienes, Alkynes, Aromatic Hydrocarbons. Kine	rtic

theory of gases, Real gases, Intermolecular forces, Crystal structure, Chemical kinetics Dienes, Alkynes, Aromatic Hydrocarbons, Kinetic

Signature of Convener & Members (CBoS):

PART-C: **Learning Resources**

Text Books, Reference Books and Others

Textbooks Recommended:

Bahl, A., & Bahl, B. S. (2014). Organic Chemistry (22nd Ed.). S. Chand & Sons.

2. Ahluwalia, V. K., & Goyal, M. (2001). A Textbook of Organic Chemistry. Narosa Publishing

3. Jain, M. K., & Sharma, S. C. (2017). Modern Organic Chemistry. Vishal Publishing Company.

4. Puri, B. R., Sharma, L. R., & Pathania, M. S. (2013). Principles of Physical Chemistry (46th Ed.). Shoban Lal Nagin Chand And Co.

5. Bahl, B. S. A., & Tuli, G. D. (2009). Essentials of Physical Chemistry (Multicolour Ed.). S. Chand

Puri, B. R., Sharma, L. R., & Kalia, K. C. (2018). Principles of Inorganic Chemistry. Nagin Chand

Reference Books Recommended:

Indira

Paula, B. Y. (2014). Organic Chemistry (7th Ed.). Pearson Education, Inc. (Singapore).

Solomons, T. W. G. (2017). Qrganic Chemistry (Global Ed.). John Wiley & Sons.

- Morrison, R. T., & Boyd, R. N. (2010). Organic Chemistry (7th Ed.). Prentice-Hall Of India
- 4. Laidler, K. J., & Meiser, J. H. (2006). Physical Chemistry (2nd Indian Ed.). CBS Publishers.
- 5. Atkins, P. W., & De Paula, J. (2006). Physical Chemistry (8th Ed.). Oxford University Press.
- 6. Dogra, S., & Dogra, S. (2006). Physical Chemistry through Problems (2nd Ed.). New Age International.
- 7. Sangaranarayanan, M. V., & Mahadevan, V. (2011). Textbook of Physical Chemistry. University Press.

Online Resources-

- Online Resources—
- https://bit.ly/3Gb99iy
- https://www.organic-chemistry.org/
- https://bit.ly/3GduvMi
- https://bit.ly/30TXm8d
- ➤ Web Resources
- https://application.wiley-vch.de/books/sample/3527316728 c01.pdf
- https://www.ncbi.nlm.nih.gov/books/NBK547716/

Online Resources-

> e-Resources / e-books and e-learning portals

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:

100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE):

Assessment (CIA):

Continuous Internal | Internal Test / Quiz-(2): 20 #20

Better marks out of the two Test / Quiz

(By Course Teacher)

Assignment / Seminar -10 Total Marks -30

+ obtained marks in Assignment shall be considered against 30 Marks

End Semester Exam Two section - A & B

(ESE):

Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 = 20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit-4x10=40 Marks

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM

			COUR	SE CURRI	CULUM		
F	PAR	T- A: I	ntroductio	n			
(0	rogr <i>Certifi</i>	am: Bachelor i cate/Diploma/De	n Science	Semest	er - II	Session: 2024-	2025
1	Co	urse Code	CHGE-02P			•	
2	Co	urse Title	Che	emistry Lab. C	ourse-II		
3	_	urse Type		GE			
4	Pre	e-requisite (if, any)		As per Prog	gram		
5	Co Ou	urse Learning. tcomes (CLO)	measurement Studying the Determining distillation an	ts functional grou melting points ad sublimation t th essential skil	up analysis to assess co techniques	ssware for accurate organic compounds ompound purity and em to establish boiling poin uring liquid surface tens	its
6		dit Value	1 Credits		ours Labora	atory or Field learning/	Training
7		al Marks	Max. Marks:	50		Min Passing Marks:	20
PA	RT .	B: Conter	nt of the Co	urse			
		Total No. of	f learning-Train	ing/performan	ce Periods	s: 30 Periods (30 Hours)	
	dule		To	pics (Course			No. of Period
Trai Exper Con	/Field ning/ riment tents ourse	Thermometer: 80 133°C (Urea), 10 Functional group S, and halogens) a Physical chemist	Laboratory Glas. 0-82°C (Naphthal 0°C (Distilled Wo Analysis of Orand functional group)	lene), 113.5°-1 'ater) ganic Compou oups	14°C (Acet	tanilide), 132.5°C - tion of elements (N,	
		mixture. Viscosity measure of aqueous solutio Study of the variat	ement using Ostvons of (i) sugar (i	vald's viscomet i) ethanol at ro	er, Determ	L	30
Коуно	ords ;	solute. Viscosity (Basic laboratory technical chamieter)	Maues, Fauinme	nte Calibration	Melting po	ture ints, Qualitative analysis,	
	μ	Physical chemistry, S	urjace tension, V	scosity			

Signature of Convener & Members (CBoS):

Bol

AKPhp

3/20/10)

PART-C: **Learning Resources**

Text Books, Reference Books and Others

Textbooks Recommended:

- 1. Ahluwalia, V. K., Dhingra, S., & Gulati, A. (N.D.). College Practical Chemistry. University
- 2. Khosla, B. D., Garg, V. C., & Gulati, A. (2011). Senior Practical Physical Chemistry. R. Chand

Reference Books Recommended:

- 1. Garland, C. W., Nibler, J. W., & Shoemaker, D. P. (2003). Experiments in Physical Chemistry (8th Ed.). Mcgraw-Hill.
- 2. Mendham, J. (2009). Vogel's Quantitative Chemical Analysis (6th Ed.). Pearson Education.
- 3. Mann, F. G., & Saunders, B. C. (2009). Practical Organic Chemistry. Pearson Education.
- 4. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (2012). Practical Organic Chemistry (5th Ed.). Pearson Education.

Online Resources-

- http://heecontent.upsdc.gov.in/Home.aspx
- https://nptel.ac.in/courses/104/106/104106096/
- http://heecontent.upsdc.gov.in/Home.aspx
- https://nptel.ac.in/courses/104/106/104106096/
- https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtml/introl.htm

https://nptel.ac.in/courses/104/103/104103071/W

Online Resources-

> e-Resources / e-books and e-learning portals

PART -D: Asses	smont and Fact at		* -
Suggested Continuous	sment and Evaluation		
Maximum Marks:			
	50 Marks		
End Compate R	ssessment (CIA): 15 Marks		
End Semester Exam (F			
Continuous Internal	Internal Test / Ouiz-(2): 10.8 10	Better medical Cit	
Assessment (CIA):	Assignment/Seminar +Attendance - 05	manus out of the	two Test / Quiz
(Dy Course Teacher)	Total Marks -	+ obtained marks in Ass	ignment shall be
End Semester	Laboratory / Field Skill Performan		15 Marks
Exam (ESE):	D. Performed the Task based on lab	ce: On spot Assessment	Managed by
LSE).	E. Spotting based on tools & tool	work - 20 Marks	
	E. Spotting based on tools & techno F. Viva-voce (based on principle/tec	10000	as per lab.
	to a see (Based on principle/tec	chnology) - 05 Marks	

FOUR YEAR UNDERGRADUATE PROGRAM (2024 - 28) DEPARTMENT OF CHEMISTRY

_ (-	ogr ertiti	am: Bachelor in	Science	Semester -		
1	7	cate / Diploma / De urse Code	gree)	II/IV/V/VI	Session: 2024-2	025
2	-	urse Code	CHSEC	11/14/4/41		
3	_	urse Title		GREEN CHEM	ПСТВУ	
.4	D	urse Type				
-	Fre	e-requisite(if, any)		SEC		
			> Understand ne	As per Progreeds, goals, and obstacles and application of twelves		
5	C ₀	urse Learning.	> Understand an	icus, goais, and obstacles ad application of twelve p solvents and green regation	in green chemistry.	
	O u	tcomes(CLO)	Design green s To interpret ar	to application of twelve p. solvents and green reaction and green reactions.	ons.	
6	Cre	edit Value	Chemistry.	ia execute case study, sui	ons. rvey, and projects on Gred	en
_		value	2 Credits	Credit = 15 Hours	Thomasia	
7	Tot	al Marks	(1C + 1C) Max.Marks:50		ory or Field learning/Trai	nd inina
PA	RT	-B: Content	of the Cour		Min Passing Marks:20	ning
Mod	dule	1 neory-15 Perio	ods (15 Hrs.) and I	of Teaching–learning Pe	riods: ning 30Periods (30 Hours)	
			To	pics (Course contents	ning 30Periods (30 Hours)	
Con	tents	Interes)		eres (Course contente	c)	No of
	·	What is Green Ch	nemistry? Need for	or Green Charles		Period
		Principles - 5 G	cles in the pursuit	or Green Chemistry. Gos of the goals of Green Che Designing a Chemistry.	als of Green Chemistry.	R
	= -	Twelve principles	n Chemistry and	of the goals of Green Che Designing a Chemical s istry with their course	mistry.	
	=	brucibies	Of Circon Ch.			
		special emphasis or	the follow:	istry with their explanat	ynthesis:	
		• Designing a C	n the following:	then explanat	tions and examples and	
		• Designing a Gr	n the following: een Synthesis us	sing these principles.	tions and examples and	
		• Designing a Gr products; maximum	n the following: een Synthesis us m incorporation o	sing these principles; P	revention of Waste/ by	
	¥ =	• Designing a Gr products; maximum products, Atom Ecc • Prevention/ mining	n the following: The following: The Synthesis us The incorporation of the sound incorporation, sound incorporation, so the sound incorporation of the sound incorporation incorpo	sing these principles; Post the materials used in the substitution, and elimination dous/ toxic products.	revention of Waste/ by he process into the final on reactions.	
	Vik =	• Designing a Gr products; maximum products, Atom Ecc • Prevention/ mining (hazard × exposure)	n the following: teen Synthesis us in incorporation of conomy, addition, s mization of hazar); waste or pollution	sing these principles; Professional fine the materials used in the substitution, and elimination dous/ toxic products red on prevention bieroest.	revention of Waste/ by he process into the final on reactions. ucing toxicity, and risks	15
	Vik =	• Designing a Gr products; maximum products, Atom Ecc • Prevention/ mining (hazard × exposure)	n the following: teen Synthesis us in incorporation of conomy, addition, s mization of hazar); waste or pollution	sing these principles; Professional fine the materials used in the substitution, and elimination dous/ toxic products red on prevention bieroest.	revention of Waste/ by he process into the final on reactions. ucing toxicity, and risks	15
		• Designing a Gr products; maximum products, Atom Eco • Prevention/ mining (hazard × exposure) • Green solvents— liquids, fluorous bi and how to compare	the following: seen Synthesis us n incorporation o nonomy, addition, s mization of hazar); waste or pollution supercritical fluid iphasic solvent, p	sing these principles; Particles of the materials used in the substitution, and elimination dous/ toxic products red on prevention hierarchy. Its, water as a solvent for EG, solventless processes	revention of Waste/ by he process into the final on reactions. ucing toxicity, and risks	15
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		• Designing a Gr products; maximum products, Atom Ecc • Prevention/ mining (hazard × exposure) • Green solvents— liquids, fluorous bit and how to compare Future Trends in (the following: seen Synthesis us n incorporation o conomy, addition, s mization of hazar); waste or pollutio supercritical fluic iphasic solvent, p e greenness of sol- Green Chemistry	sing these principles; Particles of the materials used in the substitution, and elimination dous/ toxic products red on prevention hierarchy. Its, water as a solvent for EG, solventless processed to the solventless proc	revention of Waste/ by he process into the final on reactions. ucing toxicity, and risks organic reactions, ionices, immobilized solvents	15
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Case study/Project

Case study/Project on Green chemistry, Role of green chemistry in lab safety, and implications of green chemistry.

Green chemistry, Green synthesis, Green solvents, Green reactions, principles of Green chemistry, Hofmann elimination, Diels-Alder reaction, oxidation, and reduction.

Signature of Convener & Members (CBoS):

PART-C:Learning Resources

Text Books, Reference Books and Others

Textbooks Recommended-

- 1. Ahluwalia, V.K. (2013). Green chemistry: A textbook Alpha Science International.
- 2. Shukla, S., Gulati, S., & Batra, S.K. (2020). A textbook of green chemistry: benign by design. Shree kala Prakashan.
- 3. Kumar, V. (2013). An introduction to green chemistry. Vishal publishing Co.
- 4. Lancaster, M. (2020). Green chemistry: an introductory text. Royal society of chemistry.

Reference books Recommended:

- 1. Perosa, A., & Zecchini, F. (2007). Methods and reagents for green chemistry: an introduction.
- 2. Clark, J. H., & Macquarrie, D. J. (Eds.). (2008). Handbook of green chemistry and technology.
- 3. Ameta, S. C., & Ameta, R. (Eds.). (2023). Green Chemistry: Fundamentals and Applications.
- 4. Anastas, P. T. (Ed.). (2013). Handbook of green chemistry (Vol. 1). Wiley-VCH.

Online Resources - e-Resources / e-books and e-learning portals

- https://www.mygreenlab.org/uploads/2/1/9/4/21945752/gc green chem guidebeyond benign my green lab.pdf
- https://www.organic-chemistry.org/topics/green-chemistry.shtm
- https://royalsocietypublishing.org/doi/10.1098/rsos.191378
- https://www.gvsu.edu/labsafety/green-chemistry-99.htm

PART-D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:

50 Marks

Continuous Internal Assessment(CIA):15 Marks End Semester Exam(ESE):

Continuous Internal | Internal Test / Quiz-(2): 10 & 10

35Marks

Assessment(CIA):

Exam (ESE):

Assignment/Seminar +Attendance- 05

Better marks out of the two Test / Quiz +obtained marks in Assignment shall be

(By Course Coordinator) otal Marks -15 **End Semester**

considered against 15 Marks Laboratory / Field Skill Performance: On spot Assessment

A. Performed the Task based on learned skill - 20 Marks B. Spotting based on tools (written)

C. Viva-voce (based on principle/technology) - 05 Marks -10 Marks

Managed by Coordinator as per skilling