

CHEMISTRY (CY) – R2021 - CBCS



U21CYX01	AIR POLLUTION AND CONTROL	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

**PRE-REQUISITES:**

- Higher secondary Chemistry

**COURSE OBJECTIVES:**

- To acquire knowledge on atmosphere, classification of air pollutants and their effects on environment
- To understand the principle of control methods of various air pollutants
- To study automobile air pollutants emission and its control methods

**COURSE OUTCOMES:**

Upon completion of the course, the student will be able to

- CO1:** Describe the importance of atmosphere and the adverse effects of air pollutants (Understand)  
**CO2:** Discuss the working principle of various types of control equipment for particulate contaminants (Understand)  
**CO3:** Apply the control equipment for pollution prevention in industries (Apply)  
**CO4:** Outline the sources, types and control methods of indoor air pollutants (Understand)  
**CO5:** Explain the formation and control methods of automobile pollutants (Understand)

**CO-PO MAPPING:**

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2		1	2	3					1		
CO2	3	2	2		1	2	3					1		
CO3	3	2	2		1	2	3					1		
CO4	3	2	2		1	2	3					1		
CO5	3	2	2		1	2	3					1		
CO	3	2	2		1	2	3					1		

Correlation levels:      1: Slight (Low)      2: Moderate (Medium)      3: Substantial (High)

*Msk*  
29/4/23  
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**SYLLABUS:**

<b>UNIT I INTRODUCTION</b>	<b>7</b>
Structure and composition of atmosphere – Definition, Scope and Scales of air pollution – Sources and classification of air pollutants and their effect on human health, Vegetation, animals, property, aesthetic value and visibility – Ambient air quality (standards only).	
<b>UNIT II CONTROL OF PARTICULATE CONTAMINANTS</b>	<b>11</b>
Factors affecting selection of control equipment – Gas particle interaction – Working principle – Gravity separators, Centrifugal separators, Fabric filters, Particulate scrubbers, Electrostatic precipitators.	
<b>UNIT III CONTROL OF GASEOUS CONTAMINANTS</b>	<b>11</b>
Factors affecting selection of control equipment – working principle – Absorption, adsorption, condensation, incineration, biofilters – Process control and monitoring (theory only).	
<b>UNIT IV INDOOR AIR QUALITY MANAGEMENT</b>	<b>10</b>
Sources, types and control of indoor air pollutants, Sick building syndrome and building related illness – Sources and effects of noise pollution – Measurement standards – Control and preventive measures.	
<b>UNIT V AIR POLLUTANTS FROM AUTOMOBILES</b>	<b>6</b>
Air pollution due to gasoline driven and diesel driven engines – Formation of CO, HC, NO, effects, direct and indirect control methods.	

**Contact Periods:**

Lecture:	45 Periods	Tutorial:	– Periods	Practical:	–Periods	Project	– Periods
						Total	45 Periods

**TEXT BOOKS:**

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, Springer science media LLC,2004.
2. Noel de Nevers, "Air Pollution Control Engineering", Waveland press, Inc 2017.

**REFERENCES:**

1. Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers (P) Ltd., India 2002.
2. Arthur C. Stern, "Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
3. S. Ganeshaguru, "Air Pollution Management", ARS Publications, 2017.
4. M.N Rao and HVN Rao, "Air Pollution", Tata Mcgraw Hill Publishing Company limited, 2007.
5. C.S. Rao, "Environmental Pollution Control Engineering", New Age International (P) Limited Publishers,2006.

  
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## EVALUATION PATTERN:

Continuous Internal Assessments				Total Internal Assessments	End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)			
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

\*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Designer can choose any one / two components based on the nature of the course.

  
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U21CYX02	INTRODUCTION TO APPLIED ORGANIC CHEMISTRY	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

**PRE-REQUISITES:**

- Higher secondary Chemistry

**COURSE OBJECTIVES:**

- To understand the classification, preparation and properties of heterocycles
- To emphasise about the classification, theories, and synthesis of different types of dyes
- To acquire the fundamentals knowledge about paints, enamels, cosmetics, perfumes, food additives and beverages

**COURSE OUTCOMES:**

Upon completion of the course, the student will be able to

- CO1:** Discuss the various types of heterocycles and their preparation (Remember)
- CO2:** Explain about the classification, structure and properties of various dyes (Understand)
- CO3:** Outline the classification paints, varnishes and their mechanism of drying (Understand)
- CO4:** Synthesis shampoos, toothpaste, creams and gain knowledge about perfumes and essential oils (Apply)
- CO5:** Explain the role and ill effects of food additives and beverages (Understand)

**CO-PO MAPPING:**

COs \ POs	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	1	-	-	2	-	1	1	-	3	-	-
CO2	3	2	-	1	-	-	2	-	1	1	-	3	-	-
CO3	3	2	-	1	-	-	2	-	1	1	-	3	-	-
CO4	3	2	-	1	-	-	2	-	1	1	-	3	-	-
CO5	3	2	-	1	-	-	2	-	1	1	-	3	-	-
CO	3	2	-	1	-	-	2	-	1	1	-	3	-	-
Correlation levels:		1: Slight (Low)			2: Moderate (Medium)			3: Substantial (High)						

*M.S.K.*  
25/11/23  
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**SYLLABUS:****UNIT I HETEROCYCLES** 9

Classification of heterocyclic compounds, preparation, properties and uses – Furan, Thiophene, Pyrrole, Pyridine, Quinoline, Isoquinoline & Indole

**UNIT II DYE AND COLORANTS** 9

Dyes - classification based on structure, mode of dyeing and application methods, relation between colour and chemical constitution, theory of colours – Witt's and Modern theory – chromogen, chromophore and auxochrome, synthesis of some important azo dyes (Methyl orange), triphenylmethane dye (Malachite green), phthalein dyes (Phenolphthalein), Anthraquinone dyes (Alizarin)

**UNIT III PAINTS, VARNISHES, ENAMELS AND LACQUERS** 9

Paints – characteristics of a good paint, composition and related properties – Oil paint, Vehicle, modified oils, pigments, Fillers, Thinners, emulsifying agents, Mechanism of Drying, Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint) – Varnish – Definition – preparation of oil varnish – Differences between paint and varnish. Enamels, Lacquers- types, advantages and disadvantages

**UNIT IV COSMETICS, PERFUMES AND FLAVORS** 9

Cosmetics – Introduction, Classification, Shampoos: Ingredients and functions – Different kinds of shampoos (Antidandruff, anti-lice, herbal and baby shampoos) – Tooth paste: Composition and health effects – Cleansing creams: Cold creams, vanishing creams and bleach creams, Harmful effects of cosmetics

Perfume – Classification of perfumes – Perfume ingredients listed as allergens – Deodorants, antiperspirants and artificial flavors – General methods of obtaining volatile oils and their importance in cosmetic industries – sandalwood oil, eucalyptus, Lemon peel, Lemon grass – Mentha and Musk

**UNIT V FOOD ADDITIVES AND BEVERAGES** 9

Food additives: Antioxidants and food preservatives – Commonly used permitted and nonpermitted food colours – Artificial sweeteners – Taste enhancers – Monosodium glutamate – Vinegar – Artificial ripening of fruits and its health effects – Food pigments Natural food colours – chlorophylls, carotenoids, caramel, Artificial food colours – Permitted level of colourants – Restricted use of spurious colours

Beverages Definition and examples – Classification of beverages – fruit beverages – milk based beverages – malted beverages – alcoholic and non-alcoholic beverages – Examples – Appetizers: Definition – classification – examples – Addiction to alcohol – Cirrhosis of liver and social problems

**Contact Periods:**

Lecture: 45 Periods      Tutorial: – Periods      Practical: – Periods      Project: – Periods  
Total 45 Periods

**TEXT BOOKS:**

1. Bhal, B.S., and Arun Bhal, "A Text Book of Organic Chemistry", 17<sup>th</sup> Edition, S. Chand & Co. New Delhi, 2005.
2. Sharma B.K., "Industrial chemistry", 19<sup>th</sup> Edition, Krishna Prakashan Media Pvt. Ltd., Meerut, 2016.


**REFERENCES:**

1. Srilakshmi, B., "Food Science", 7<sup>th</sup> Edition, New Age Publishers, New Delhi, 2020.
2. Chatwal, G. R., and Gurudeep, "Synthetic Dyes", 2<sup>nd</sup> Edition, Himalaya Publishers, 2009.
3. Lillian Hoagland Meyer, "Food Chemistry", CBS Publishers & Distributors, New Delhi, 2004.
4. Siva Sankar, B., "Food Processing and Preservation", Prentice Hall of India Pvt. Ltd., New Delhi, 2002.

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Total				40	60
				100	

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CHEMISTRY (CY) – R2021 - CBCS



U21CYX03	INSTRUMENTAL ANALYSIS AND METHODS	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

**PRE-REQUISITES:**

- Higher secondary Chemistry

**COURSE OBJECTIVES:**

- To gain knowledge of electromagnetic radiation, types of spectra, AAS and AES
- To understand basics of UV-Visible, Infra-Red spectroscopic techniques in the engineering field
- To acquire knowledge of chromatography and thermal analysis techniques

**COURSE OUTCOMES:**

Upon completion of the course, the student will be able to

- CO1:** Apply the knowledge of the instrumentation, theory and application of atomic spectroscopic techniques (Apply)
- CO2:** Utilize the fundamental knowledge on the instrumentation and theory of UV-Visible spectroscopy (Understand)
- CO3:** Explain the importance of Infra-red spectroscopy and its applications (Understand)
- CO4:** Outline the various techniques involved in separation and purification using chromatographic techniques (Understand)
- CO5:** Discuss the theory, instrumentation and applications of TGA, DTA and DSC (Understand)

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CO3	3	2	1	-	-	-	2	-	-	-	-	1	-	-
CO4	3	2	1	-	-	-	2	-	-	-	-	1	-	-
CO5	3	2	1	-	-	-	2	-	-	-	-	1	-	-
CO	3	2	1	-	-	-	2	-	-	-	-	1	-	-
Correlation levels:		1: Slight (Low)			2: Moderate (Medium)			3: Substantial (High)						

*mike 28/4/23*  
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**SYLLABUS:****UNIT I ATOMIC SPECTROSCOPY****8**

Electromagnetic radiation – Characteristics of electromagnetic radiation, types of energy, representation of spectrum, types of spectra, differences between molecular and atomic spectrum. Atomic Absorption Spectroscopy (AAS) – Principle, instrumentation, applications, Atomic Emission Spectroscopy (AES) – Theory, flame photometry – Principle, instrumentation, applications

**UNIT II UV-VISIBLE SPECTROSCOPY****11**

Introduction, characteristics of UV-Visible spectra, chromophore and auxochrome, electronic excitation – Intensity of bands – Selection rules – Laws of photometry – Correlation of electronic absorption with molecular structure – Conjugated systems – Systems of extended conjugation – Aromatic systems – Woodward-Fieser rules for dienes (butadiene) and  $\alpha,\beta$ - Unsaturated ketones

**UNIT III IR-SPECTROSCOPY****9**

Introduction, selection rules, molecular vibrations – Force constant – Band assignments, finger print region – Instrumentation – Applications – Interpretation of IR spectra in identification of common functional groups.

**UNIT IV CHROMATOGRAPHY****10**

Introduction, definition, principles of chromatography, sorption mechanisms – Differential migration, partition and adsorption\*phenomena, classification of different chromatographic methods.

Column chromatography: Principle, general aspects, chromatographic media, nature of forces between adsorbent and solutes, eluents, (mobile phase) and applications.

Thin Layer Chromatography: Principle, chromatographic media – Coating materials, applications, activation of adsorbent, sample development, solvent systems, development of chromatoplate, types of development, visualization methods, documentation, applications.

Gas and High-Performance Liquid Chromatography: Theory, instrumentation and its applications

**UNIT V THERMAL ANALYSIS TECHNIQUES****7**

Introduction - Thermo Gravimetric Analysis (TGA) – Principle – Instrumentation – Applications – Thermal dehydration and decomposition of calcium oxalate, Differential Scanning Colorimetry (DSC) – Principle – Instrumentation – Applications – Finger print of pure compound and phase transition, Differential Thermal Analysis (DTA) – Principle – Instrumentation – Applications – Decomposition of calcium oxalate.

**Contact Periods:**

Lecture: 45 Periods Tutorial: - Periods Practical: – Periods Project – Periods  
 Total 45 Periods

**TEXT BOOKS:**

1. P. C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Company. Pvt. Ltd., New Delhi, 2015.
2. P.S. Kalsi, "Spectroscopy of Organic Compounds", New age international Pvt. Ltd., 6<sup>th</sup> Edition, 2007.

**REFERENCES:**

1. William Kemp, Organic Spectroscopy, Macmillan, 1991.
2. O.G. Palanna, Engineering Chemistry, McGraw Hill Education India Pvt. Ltd., Chennai, 2<sup>nd</sup> Edition, 2017.
3. S. Vairam, P. Kalyani and Suba Ramesh, Engineering Chemistry, Wiley India Pvt. Ltd., New Delhi, 2<sup>nd</sup> Edition, 2014.
4. B.K. Sharma, Instrumental methods of chemical analysis, Goel Publishers 28<sup>th</sup> Edition, 2012.

  
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