

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

PART-A: Introduction			
Program: Bachelor in Science (Degree/Honors)		Semester V	Session: 2024-2025
1	Course Code	ICSE-03T	
2	Course Title	DATA ANALYSIS AND SEPARATION TECHNIQUES	
3	Course Type	DSE	
4	Pre-requisite(if,any)	<i>As per program</i>	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ To learn the data analysis, significant figure and error. ➤ To learn Chromatographic separation techniques. ➤ To learn the purification technique of chemical compound. ➤ To learn the computer program useful in industrial chemistry 	
6	Credit Value	3 Credits	Credit = 15 Hours -learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks:40
PART -B: Content of the Course			
Total No. of Teaching-learning Periods(01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics(Course contents)		No.of Period
I	Data analysis, theory of errors, idea of significant figures and its importance with examples, precision, accuracy, methods of expressing accuracy. Error analysis, minimizing errors, method of expressing precision, average deviation, standard deviation and confidence limit.		12
II	Purification of solid organic compounds : extraction, use of immiscible solvents, soxhlet extraction, crystallization, use of miscible solvents, fractional crystallization, sublimation. Purification of liquids, experimental techniques of distillation, fractional distillation, vacuum distillation, steam distillation, tests for purity.		11
III	Chromatography- principles and techniques of column, paper and thin layer chromatography-R _f value- applications. Ion exchange chromatography-principle-experimental techniques and applications. HPLC and GC-Principle, instrumentation and applications GC-MS and LC-MS-Principle, instrumentation and applications		11
IV	Introduction to computer and its application in chemistry – characteristics of a computer – types of computer – block diagram of a digital computer – the art of programming – general features of a programming language – algorithm and flow charts. Introduction to C, structure of a C program, character set of C data types , identifiers, reserved words, variables, constants, keywords, escape sequence, type conversion C operation (basic aspects only). Application of computer in chemistry, determination of molarity, normality and molality of solutions, calculation of pH.		11
Keywords	<i>Accuracy, precession, mean deviation standard deviation, chromatography, Computer C-Programming, HPLC, GCMS.</i>		

Signature of Convener & Members (CBoS):

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Gopalan, R., Subramanian, P. S., & Rengarajan, K. (1997). *Elements of analytical chemistry*. New Delhi, India: S. Chand and Sons.
2. Chatwal, A. (2000). *Instrumental methods of chemical analysis*. New Delhi, India: Anand-Himalaya Publishing House.
3. Raman, K. V. (1993). *Computers in chemistry*. New Delhi, India: Tata McGraw-Hill Ltd.
4. Srivastava, V. K., & Srivastava, K. K. (1991). *Introduction to chromatography*. S. Chand and Sons.

Reference Books Recommended –

1. de la Vie, R. (1997). *A spreadsheet workbook for quantitative chemical analysis*. New Delhi, India: McGraw-Hill, Inc.
2. Leonard, J, Lygo, B & Procter, G. (2013). *Advanced Organic Practical Chemistry*, CRC Press.
3. Shobha, R., & Banani, M. (2017). *Essentials of Analytical Chemistry*. Pearson.

Online Resources–

- <https://www.khanacademy.org/math/statistics-probability>
- <https://www.nist.gov/document/glp-9-rounding-20190506docx>
- <https://www.physics.purdue.edu/academic-programs/lab-materials/Physics%20220%20lab%20files/experimental-errors-and-significant-figures.pdf>
- <https://www.masterorganicchemistry.com/>

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

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 / 20 Assignment/Seminar- 10 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 =20Marks Section B: Descriptive answer type qts., 1out of 2 from each unit- 4x10=40Marks	

Name and Signature of Convener & Members of CBoS:

Indira

Ravi

Arjun

Balu

Arjun

Arjun

Arjun

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PART-A: Introduction			
Program: Bachelor in Science (Degree/Honors)		Semester V	Session: 2024-2025
1	CourseCode	ICSE-03P	
2	CourseTitle	DATA ANALYSIS AND SEPARATION TECHNIQUES LAB COURSE	
3	CourseType	DSE	
4	Pre-requisite(if,any)	As per program	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ To learn the data analysis, significant figure and error. ➤ To learn Chromatographic separation techniques. ➤ To learn the purification technique of chemical compound. ➤ To learn the computer program useful in industrial chemistry. 	
6	CreditValue	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	TotalMarks	Max.Marks:50	Min Passing Marks:20
PART -B: Content of theCourse			
TotalNo.of learning-Training/performancePeriods:30 Periods (30 Hours)			
Module	Topics(Coursecontents)		No.ofP eriod
Lab./Field Training/ Experiment Contents of Course	Gravimetric estimation a. Estimation of sulphate as barium sulphate. b. Estimation of barium as barium sulphate. c. Estimation of barium as barium chromate. d. Estimation of lead as lead chromate. Principles involved in chromatographic separation: Paper Chromatography, Column Chromatography TLC: Separation of following metal ions: (i) Ni(II), and Co(II), (ii) Fe(III) And Al(III). Volumetric analysis: (i) Determination of commercial vinegar in acetic acid. (ii) Estimation of ferrous and ferric by dichromate method. (iii) Estimation of Copper using thiosulphate. Programming :making and running the program.		30
Keywords	Gravimetric estimation, Volumetric analysis, Chromatographic experiment paper and column, TLC, C-Programming.		

Signature of Convener & Members (CBoS):

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Singh, A. K., & Singh, A. K. (2009). *Computer "C" programming: Concepts, principles, and programs*
2. Shobha, R., & Banani, M. (2017). *Essentials of Analytical Chemistry*. Pearson.

Reference Books Recommended –

1. Rattenbury, E. M. (1966). *Introductory titrimetric and gravimetric analysis*. Pergamon Press.
2. Vogel, A. I. (1976). *A textbook of qualitative inorganic analysis (3rd ed.)*. Longman.
3. Scott, P. W. (Year). *Techniques and practice of chromatography*. Publisher (if available).

Online Resources:

- <https://www.nist.gov/video/gravimetric-and-volumetric-based-quantitation> <https://acsanalytical.org/>
- <https://www.khanacademy.org/science/hs-chemistry/x2613d8165d88df5e:stoichiometry-and-the-mole/x2613d8165d88df5e:mole-calculations/v/worked-example-calculating-molar-mass-and-number-of-moles>
- <https://www.britannica.com/science/chromatography>
- <https://edu.rsc.org/resources/chromatography/11333.article>

PART-D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment(CIA):15 Marks

End Semester Exam(ESE):35Marks

Continuous Internal Assessment(CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 &10 Assignment/Seminar +Attendance- 05 Total Marks - 15	Better marks out of the two Test / Quiz +obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment G. Performed the Task based on lab. work - 20 Marks H. Spotting based on tools & technology (written) – 10 Marks I. Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of CBoS:

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Pratik

Dr. K. S. Sh

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