K. J. SOMAIYA COLLEGE OF SCIENCE AND COMMERCE, AUTONOMOUS

DIPLOMA IN ADVANCED INSTRUMENTAL ANALYSIS

Course Details

Department of Chemistry
2019

Science graduates and post graduates do not get job in industry easily. Industry finds fresh graduates inadequately prepared to work in industrial scenario. Students lack knowledge and practical training in the use of high end instruments.

Diploma in Advanced Instrumental Analysis is a full year part time course designed to bridge this gap between industry and academics. The program aims to impart in depth knowledge with hands on training of different instruments like GC, HPLC, and HPTLC etc. along with theoretical background. Industrial training will be given to students with small project.

The course is designed to train students in use of advanced high end instruments like GC, HPLC, and HPTLC etc for chemical, biochemical analysis of real samples.

Course Details

- **Course type** : Diploma course

- **Course Title** : DIPLOMA IN ADVANCED INSTRUMENTAL ANALYSIS

- **Preamble**: Science graduates and post graduates do not get job in industry easily. Industry finds fresh graduates inadequately prepared to work in industrial scenario. Students lack knowledge and practical training in the use of high end instruments. Diploma in Advanced Instrumental Analysis is a full year part time course designed to bridge this gap between industry and academics. The program aims to impart in depth knowledge with hands on training of different instruments like GC, HPLC, and HPTLC etc. along with theoretical background. Industrial training will be given to students with small project.

  The course is designed to train students in use of advanced high end instruments like GC, HPLC, and HPTLC etc for chemical, biochemical analysis of real samples.

- **Objectives of course** :

1. To impart basic practical skills in advanced instrumental analysis.

2. Actual sample analysis and hands on training of different instruments like GC, HPLC, and HPTLC etc.

3. To train students regarding calibration, assay and maintenance of the instruments.

4. To equip students with professional skills required to work in industry.

- **EXPECTED LEARNING OUTCOME / SKILLS**

1. Students are expected to demonstrate actual analysis using high end instruments.

2. They should able to prepare the specialised solutions like buffers, indicators etc.

3. They should able to do real sample analysis on instruments using SOPs. They should demonstrate troubleshooting abilities during actual analysis.

4. They should able prepare protocols for analysis and SOP for various instruments.

- **Prerequisites** : Science Graduate with Chemistry as one of the subjects

- **Intake capacity**: 20

- DURATION : one year (part time) 14 credits
- **Fees** :Rs. 25,000/-
- Course co-ordinator : Dr. Yogesh V Ghalsasi, Department of Chemistry, KJSSC
  Email: yogesh@somiya.edu
- **Career opportunities:** The course is tailor made for pursuing a career in chemical industries like Food, petrochemicals, paints, fine chemicals, cosmetics, oil and especially pharmaceutical industry as well as Analytical testing laboratory.
- COURSE STRUCTURE:

Course/Module	**Contact hrs.**	**Marks allotted**	**Credits allocated**
Theory paper 1	30	80	02
Theory paper 2	30	80	02
Theory paper 3	30	80	02
Practical paper 1	30	100	2.5
Practical paper 2	30	100	2.5
Internal evaluation of paper 1, paper 2 and paper 3	15	20 marks each Total 20 X 3 = 60	01
Industrial training and visit	30	100	02
Total	**195**	**500**	**14**

- **Syllabus**

Paper I : Fundamentals of Chemical analysis

Module	**description**	**Teaching hours**
1.1		
Introduction to chemical analysis	Chemical analysis, types, classifications, introduction to instrumental analysis	02
1.2		
Chemical stoichiometry	Chemical calculations for various concentration units, types of reactions and calculations	06
1.3		
Statistical treatment of data	Evaluation of statistical parameters, control charts, regression analysis, development and validation of analytical method.	06
1.4		
Quality in analysis	Quality control and quality assurance, different quality systems, SOP , cGLP and cGMP concepts.	06
1.5		
Basic electronics	Electronic circuits, transistors, amplifiers, digital electronics, logic gates, flip-flops, registers and integrated circuits, operational amplifiers.	06
1.6		
Introduction to instrumental methods	Optical methods, general instrumentation, various components of optical spectrophotometers, single and dual beam instruments.	04
		30 L

Paper II : Instrumental methods of analysis

Module	description	Teaching hours
2.1	**Spectral methods**	
2.1.1:UV-VIS spectroscopy	UV-VIS spectroscopy- Basic theory, Beers law, Instrumentation, applications of UV-VIS to qualitative and Quantitative analysis	04
2.1.2		
IR and Raman spectroscopy	Basic theory, Instrumentation, applications	06
2.1.3		
Molecular fluorescence spectroscopy	Basic theory, fluorescence, phosphorescence, chemiluminescence, optical methods based on fluorescence techniques.	05
2.1.4		
Atomic absorbtion spectroscopy	Basic theory, Instrumentation and applications of AAS	05

2.1.5		
Atomic emission methods	Flame photometry, Atomic emission methods with arc and spark techniques. Instrumentation and applications	04
2.1.6		
NMR spectroscopy	Basic principle, instrumentation and applications of NMR in qualitative analysis	06
		30L

Paper III : Chromatographic methods

Module	description	Teaching hours
3.1	**Chromatographic methods**	
3.1.1:Introduction to chromatography	Basic theory of chromatography, types of chromatographic methods	04
3.1.2		
TLC and HPTLC	Basic theory, Instrumentation, applications of HPTLC to quantitative analysis	04
2.1.3		
Gas Chromatography	Basic theory, instrumental parts, type of columns and their applications, qualitative and quantitative analysis	06
3.1.4		
HPLC	Basic theory, Instrumentation and applications	06
3.1.5		
SFC and related techniques	Basic theory, Instrumentation and applications	04
3.1.6		
Hyphenated techniques	Need for hyphenation, GC-MS and its applications, LC-MS and its applications.	06
		30L

Paper II and paper III will have minimum 8 hrs of practical sessions for each module per week and sub modules.

Practicals:

1) Separation of mixture of alcohols and percentage purity of ethyl alcohol using GC
2) Analysis of commercial oil by GC
3) Determination of column performance characteristics and resolution of mixtue of benzene and toluene using HPLC
4) Qntitative assay of Caffine using HPLC.
5) To determine the amount of Mn (VI) and Cr (VII) in the given solution by simultaneous respectrophotometric method.

6) To determine the acetic acid contents in the given Vinegar solution using pH- meter.
7) To determine the concentration of the dye in given solution by using Spectrophotometer.
8) Tests for food adulteration
9) To determine % acetyl salicylic acid content in Disprin dispersible tablets.
10) To analyse the given sample of Brass Alloy for its Cu content by iodometry.
11) Estimation of Halides potentiometrically.
12) To test bore well water for Chloride, Sulphate, Arsenic, Heavy metals and Iron.
13) To determine amount of Fe (III) present in the given solution using Photometric titration.
14) To analyse Na^+ and K^+ in electral powder using Flame photometer.
15) To estimate amount of Glucose by Folin Wu method.
16) To determine the moisture contents present in the given sample of organic compound by using Karl Fischer reagents.
17) To isolate and determine purity of pharmaceutical formulation using High performance Thin Layer Chromatography [HPTLC].
18) Soil Analysis.
19) To determine percentage assay of Mebendazole IP tablets with non-aqueous titration.
20) Simultaneous determination of Fe (II) & Fe (III) by Spectrophotometric method.

Total 20 Practicals each of 3 hour duration.

Total practical duration is 60 Hrs.

Lab requirements:

1. A good wet laboratory comprising the working strength of 20 students per batch.
2. Instrumental laboratory with instruments like UV-VIS spectrophotometers, IR spectrophotometer equipped with computer for data analysis, GC with dedicated computer, HPLC unit with gradient system and dedicated computer, HPTLC system with accessories.
3. High end instruments like Atomic absorption spectrophotometer (AAS), GC-MS and NMR system with dedicated computers.

Industrial Visit: One industrial visit is mandatory (Pharma industry, effluent treatment plant, forensic lab.).: 6 Hrs per visit

Industrial training: Students will send ti industry for actual industrial training at least for 4 days, i.e. total 24 Hrs.

- Students have to prepare a brief report on industrial visit with inputs from industrial personnel. The report will be assessed for internal evaluation

- **Evaluation Pattern :**
- The total examination marks are as follows
- Theory Paper I 80M, paper II 80 M, Paper III 80M **Total 240 M-Theory**
- Practicals : Paper II 100 M (2 x 50 M), Paper III 100 M **Total 200 M - Practical**
- Internal evaluation: Each paper 20 /20/20 M **Total 60 M- Internals**
- Industrial visit and training report: 100M **100 M- Industrial project**

Grand total 600 Marks

- **Venue**: K J Somaiya College of Science and Commerce, sixth floor instrumental lab

- **Reference Books**

1. Inorganic quantitative analysis by Vogel.
2. Practical HPLC analysis by Veronica Meyer
3. Instrumental methods of Analysis by Skoog, Holler and Nieman.