SHIVAJI UNIVERSITY, KOLHAPUR

Department of Chemistry

Certificate Course in Analytical Instrumentation

Starting Form 2010

Syllabus

The Syllabus of one year **"Certificate course in Analytical Instrumentation"** has been prepared as per annual system, which will be implemented from June 2009 for M. Sc. Part –II. It has been prepared taking into consideration its importance in getting jobs in the industries as well as the guidelines of the syllabi of other Universities.

The Theory and Practical syllabus of the certificate course in Analytical Instrumentation in Chemistry is as follow:

1) Duration of course: One year (Annual pattern) June to April

2) Eligibility to course: students studying in M. Sc. Part-II only.

Admission: on M. Sc. Part I merit; **Maximum No. of students: 40* (Deserves revision)**

3) Total fees: Rs-1800/-per year(Deserves revision)**

4) Theory papers: Two papers of 100 mark each

5) Practical: One practical of 100 marks.

6) Nature of question paper

Each theory paper: Total no. of questions: **6**

a) **Q-1** is of objective type and compulsory, containing **10 bits. (20 marks)**

b) From **Q-2 to Q-6** (to be divided into sub questions A, B & / C) **any four** questions to be solved **(80 marks)**

Practical: 100 marks (Division)

Physical chemistry -	30
Organic chemistry-	30
Inorganic Chemistry-	30
Industrial Tour/Project/Seminar-	10
Total marks:	100

Paper – I [Total periods: 80]

Fundamentals in Analytical Chemistry and Separation Techniques

1) General Introduction: (20)
   a) Sampling of solids, liquids and gases: Definition, types of samples, sampling plan, quality of sample, sub-sampling, sample registration and storage, acceptance sampling,etc.
   b) Instrumental methods of analysis, their classification and advantages of instrumental methods, the limitations, sensitivity and detection limits, precision and accuracy, Calibration of glassware, etc.
   c) Preparation of indicators, reagents and standard solutions
2) Theory and applications of following techniques of analysis; (20)
   a) pH metry
   b) Colorimetry
   c) Spectrofluorimetry, Analysis of Biological samples
   d) Redoximetric methods
   e) Amperometry
   f) Electrogravimetry
3) Thermal methods of analysis: (20)
   Introduction, theory, and applications of DTA, TGA, DSC, etc.
4) Chromatographic methods: (20)
   Liquid chromatography, Partition, Ion exchange, Paper, Thin layer, Column, Gel chromatography, GC, GC-MS, HPLC, HPLC-MS & HPTLC.
5) a) Supercritical fluid extraction: concept of critical state of matter and super critical state, super critical fluids, apparatus, and applications;
   b) Membrane separation process: Operating principles and applications, microfiltration, ultrafiltration, reverse osmosis, dialysis and electrodialysis

Reference books:

1) Analytical Chemistry (J.W) G. D. Christian
2) Introduction to Chromatography: Bobbit
3) Instrumental Methods of Analysis (CBS) H. H. Willard; L.L Merit; J. A. Dean & F. A. Settle
4) Instrumental Methods of Analysis: Chatwal and Anand
5) Instrumental Methods of Inorganic Analysis (ELBS): A.I. Vpge;
6) Chemical Instrumentation, A Systematic approach; H. S. Strobel

7) Physical Chemistry ; P.W.Atkins.
8) Principles of Instrumental Analysis- D. Skoog and D. West
9) Treatise on Analytical Chemistry; Vol. I to VII I, .M. Kolthoff.
10) Computer' Fundamentals: P. K. Sinha.
11) Programming in BASICS: Balaguruswamy.
12) Computer Programming made simple: I Maynard.

Paper- II [Total periods: 80]

Instrumental Methods in Analytical Chemistry

1) Spectroscopic Methods of analysis:
   a) UV, IR, NMR and MS spectroscopic analysis (20)
   b) AAS, Flame emission, fluorescence, XRD, Nephelometry, and related techniques (20)

2. Electro analytical techniques (20)

a) Polarography, Cyclic voltametry:

Theory, Apparatus; derivative, polarography, modified polarographic techniques, and their application in qualitative and quantitative analysis.

b) Coulometry:

Principles technique, coulometry at constant current and controlled potential, coulometry applications.

c) High frequency titrations:

Theory and instrumentation &, applications,

d) Ion selective electrodes:

Terminology types and construction of electrodes, glass electrode, solid state and precipitate electrodes, liquid membrane electrodes enzyme and gas electrodes, and applications.

e) Electrophoresis:

Zone electrophoresis, factors affecting migrating rates, factors affecting migration of ions, supporting media, technique of electrophoresis: low and high voltage, capillary electrophoresis, electro osmotic flow techniques, instrumentation, detection, applications, zone electrophoresis and applications.

3) Magnetic Susceptibility, Neutron activation analysis (10)
4) Applications of computers in Chemistry (10)

General introduction to micro-computer, different components and their functions, programme writing in BASIC language, application of ready made software packages, microprocessor controlled analytical instruments, advantages and practical applications.

References Books:

1. Introduction to Instrumental Analysis; R. D. Braun,
2. Instrumental Methods of Analysis; Willard, Merritt, Dean and Settle
3. Standard Methods of Chemical AnalysisVol.3, Part A & B F. J. Welcher:
4. Instrumental Methods of Analysis, 4^{th} &5^{th} editions; G. W. Ewing,.
5. Instrumental Methods of Analysis; Chatwal and Anand.
6. Electroanalytical Chemistry, Ed. H. W. Nurnberg.
7. A Textbook\k of Electrochemistry, Kortum and Bockris,
8. Principles of Electrochemistry; D. A. Maclines,
9. Analytical Chemistry – G. D. Christain
10. Introduction to Chromatography, Bobbit.
11. Instrumental Methods of Analysis. Chatawal and Anand
12. Instrumental Methods of Inorganic Analysis (ELBS): A.I.Vogel
13. Chemical Instrumentation: A Systematic Approach, H.A. Strobel
14. The Principles of ion-selective electrodes membrane transport, W.E. Morf.
15. Physical Chemistry, P. W. Atkins.
16. Principles of Instrumental Analysis, D. Skoog & D. West
17. Treatise on Analytical Chemistry, Vol. I to VII- I. M. Kolthof

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Practicals:

A) Organic Chemistry

1. Estimation of Dyes
2. Drugs
3. Agrochemicals
4. Polyphenols
5. Chlorophyll

B) Inorganic Chemistry

1. Fertilizer analysis
2. Soil

3. Environmental samples BOD, COD, DO etc.

C) Physical Chemistry:

1. pH Metry
2. Turbidometery
3. Fe- Hemoglobin
4. Analysis of biological samples

Other experiments based on various instrumental analytical methods can be framed.

Reference books:

1) Text book of Quantitative Inorganic Analysis by A. I. Vogel.
2) A Text book of Practical Organic Chemistry by A. I. Vogel
3) Practical Organic Chemistry by Mann and Saunders.