

ASC Course: 01

Vidya Prasarak Mandal's



Advanced Study Center



Syllabus for

Programme: P. G. Programme Specific Programme : Applied Analytical Chemistry

[Initiated in 2016 – 2017; 1st updated in 2017 – 2018; 2nd
updated in 2019]

3rd updated with effect from
academic year 2020 - 2021

Course will be conducted on hybrid mode
Theory online practical offline

Preamble

APPLIED ANALYTICAL CHEMISTRY

Chemistry was and is the subject in demand for all those years and will remain in demand further too. Though lot of changes have taken place in University syllabi of graduation there always remain a gap between requirement of industry and university education

Many talented graduates wish to pursue higher education. However, their aspirations are stifled due to limited number of openings available. Even for the sake of employment they are not adequately equipped or suitably oriented to meet the demands of the industry.

With the increase in quality awareness and development of sophisticated instruments, there is growing need of properly trained Analytical Chemists in the chemical industries. The said course is designed in consultation with the experts in the industry, as per their expectations from analytical chemist, thus ensuring good employment potential for the course.

Similarly, those who are already employed in chemical industry or pharma industry and in recent years even Biotechnological industry the understanding of instruments and handling them becomes very important. The course is also important for them as it includes project writing, Industry visits and visits to sophisticated laboratories.

The course includes modules like Fundamentals of Analytical Chemistry, Quality Control, Quality Assurance, ISO 9000, ISO 14000, Kaizen, Sampling, Flame Photometry, NMR, Electro Analytical Techniques, Thermal-TGA & DSC, Viscosity, GC, HPTLC, FTIR, Atomic Absorption Spectroscopy (AS), Ion Exchange, Classification of Pollution and Pollutants, Sampling Methods, Significance & Analytical Determination of BOD / COD, Monitoring of ETP, Hazards in handling of laboratory chemicals, Fire Triangle, Preventive Measures, Personal Protective Equipment etc.

A very important component of the syllabus is ancient history of Chemistry in India. All of us are aware that our Pharma, Ayurveda, Alloy making is based on the research in this field from our ancient time. Hence, we thought it to be appropriate to include in our syllabus the history of Chemistry in the olden days of India.

Eligibility: Graduate with Chemistry at least in one year of graduation.

Duration: 9 Months (Three days/seven hours a week)

Specific Programme will be conducted in Hybrid mode. 80% on line and Practical offline

Programme Outcome

- The programme will fill the gap of knowledge as per requirement of industry.
- The programme will provide global level advanced and skill oriented deep knowledge to the learners for survival in global competition.
- The knowledge will improve the employability of the learner which can fetch good job opportunity.
- For those who are already in service will provide a good platform to upgrade their skills.
- The learner will get practical experience and will be updated about recent knowledge in the field.
- The programme is also designed for making the learner capable for self-employment or startups and own consultancy.

Programme Specific Outcome

- Understanding the basics of Applications of Analytical Chemistry.
- Developing the basic skills of operating different types of instruments.
- Understanding the issues of Environmental science.
- Developing the skills and knowledge of laboratory safety.
- Developing the skills of establishing and maintaining nursery

Syllabus and Question Paper Pattern of Course: Applied Analytical Chemistry

Course Code	Course Title	No. of lectures	Credits
ASCAACT1	Fundamentals concepts of Analytical Chemistry	45	4
ASCAACT2	Chromatographic techniques	45	4
ASCAACT3	Instrumental Methods of Chemical Analysis	45	4
ASCAACT4	Environmental Science, Electro analytical methods and Laboratory Safety	45	4
ASCAACP1	Practical Training, I	60	4
ASCAACP2	Practical Training II	60	4
ASCAACP3	Dissertation	40	4
ASCAACP4	Industrial Visits	40	4
Total		380	32

Course Code ASCAACT1	Course Title Fundamental Concepts of Analytical Chemistry	Credits 4	No. of lectures
Course outcome:			
<ul style="list-style-type: none"> • Learner will understand the basic concept of Analytical Chemistry. • Learner can understand Stoichiometry, Concentration units, Sampling in Analytical Chemistry and Statistical treatment of analytical data • Learner will get knowledge of volumetric analysis, gravimetric analysis and separation technique. • Learner will gain knowledge of Quality control in Analytical Chemistry and Quality analysis. • Learner will be able to understand the International rules of Quality control, IPR and Patent rules. 			
Unit I: Introduction to Analytical Chemistry			15
Unit II: Classical techniques and Classical separation methods			15
Unit III: Quality in Analytical Chemistry			15

Course Code ASCAACT2	Course Title Chromatographic techniques	Credits 4	No. of lectures
Course outcome:			
<ul style="list-style-type: none"> • Learner will understand the basic concept of Chromatography • Learner can understand basic principles of column chromatography, column efficiency, and control parameters. • Learner will get knowledge of gas chromatography. • Learner will gain knowledge of high-pressure liquid chromatography HPLC. • Learner will be able to understand other methods of chromatography like fluid chromatography, ion exchange chromatography. 			
Unit I: Basic theory of chromatography			15
Unit II: Gas Chromatography and HPLC			15
Unit III: Other techniques of Chromatography			15

Course Code	Course Title	Credits	No. of lectures
ASCAACT3	Instrumental Methods of Chemical Analysis	4	15
Course outcome:			
<ul style="list-style-type: none"> • Learner will understand the basic concept of spectroscopy • Learner can understand basic principles of Ultraviolet and Visible Spectroscopy • Learner will get knowledge of infrared absorption spectroscopy. • Learner will gain knowledge of NMR and Mass spectroscopy. • Learner will be able to understand Atomic absorption spectroscopy. • Learner will be able to understand concept of Flame photometry. 			
Unit I: UV Visible and IR spectroscopy			15
Unit II: NMR and Mass spectroscopy			15
Unit III: Atomic spectroscopy			15

Course Code	Course Title	Credits	No. of lectures
ASCAACT4	Environmental Science, Electro analytical methods and Laboratory Safety	4	15
Course outcome:			
<ul style="list-style-type: none"> • Learner will get the basic knowledge of environmental science. • Learner can understand water pollution and water analysis. • Learner will get knowledge of air pollution and the analysis methods of same. • Learner will gain knowledge of soil pollution and its analysis. • Learner will be able to understand Electro analytical methods and Thermal methods • Learner will get Introduced to Regulatory Aspects, Limit test and safety in laboratory, 			
Unit I: A) Water pollution and theoretical aspects of Water Analysis			15
B) Air			
C) Soil pollution and theoretical aspects of Soil Analysis			
Unit II: Electro analytical methods and Thermal methods			15
Unit III: Introduction to Regulatory Aspects, Limit test and safety in laboratory			15

Course Code	Course Title	Credits
ASCAACP1	Practical Training, I- Non-instrumental	
<ul style="list-style-type: none"> • To determine strength of commercial Hydrochloric acid. • Tests for food adulteration. • To determine % acetyl salicylic acid content in Disprin dispersible tablets 350 mgs. • To analyse the given sample of Brass Alloy for its Cu content by iodometry. • To determine the Viscosity of the given liquid using Oswald's Viscometer. • To determine Surface Tension of the given liquid using Stalagmometer (Drop Number method). • To test bore well water for Chloride, Sulphate, Arsenic, Heavy metals and Iron. • To determine the % of available Chlorine present in the given sample of bleaching powder. • To estimate amount of Glucose by Folin Wu method. • Determination of hydrogen peroxide in terms of (I) volume strength (ii) gm/dm³. • To determine the moisture contents present in the given sample of organic compound by using Karl Fischer reagents. • To analyse the given sample using Thin Layer Chromatography [TLC]. • Dissolve Oxygen [Titrimetric Method (Winkler Method)]. • Hardness of Water. • Soil Analysis. • To determine percentage assay of Mebendazole IP tablets with non-aqueous titration. • To determine Ion Exchange capacity of Ion Exchange Resin. 		

Course Code	Course Title	Credits
ASCAACP2	Practical Training II- Instrumental	4
<ul style="list-style-type: none"> • To determine the amount of Mn (VI) and Cr (VII) in the given solution by simultaneous spectrophotometric method. • To determine the acetic acid contents in the given Vinegar solution using pH- meter. • To determine the concentration of the dye in given solution by using Spectrophotometer. • To determine the concentration of an optically active compound using Polarimeter. • Estimation of Halides potentiometrically. • To determine amount of Fe (III) present in the given solution using Photometric titration. • To analyse Na⁺ and K⁺ in electral powder using Flame photometer. • Simultaneous determination of Fe (II) & Fe (III) by Spectrophotometric method. • Demonstration of Gas Chromatography (GC) instrument. • To determine refractive index of given liquid from Abbe's Refractometer. 		

All practicals should be entered in the journal. Only candidates with certified journal will be allowed for examination.

Course Code	Course Title	Credits
ASCAACP3	Dissertation	4

Duration: 3 months

Based on any subtopic from the syllabus or related to Applied Analytical Chemistry under the guidance of expertise from within or outside the institution.

Guidelines for Dissertation:

1. Students have to select their topic in consultation with the guide, who can be any faculty teaching the course or expert in the subject. (If the expert is not a teaching faculty of the course, biodata of expert is to be submitted in Advanced Study Centre and approval to be taken from Head, Advanced Study Centre.)
2. The outline of the dissertation (about 2/3 pages – 400/600 words) signed by the student & guide to be submitted on or before 31st December to Advanced Study Centre.
3. The student has to collect the data, relevant information, photographs, references in consultation of guide.
4. The dissertation in the hard bound format based on this data has to be submitted on or before 31st March to Advanced Study Centre.
5. Dissertation book should have certificate page signed by their respective guides and coordinator of the course.
6. Final power point presentation should be given by students at the time of examination.
7. Dissertation will comprise 75 Marks

Format for submission of outline for dissertation

Front page

Title of the topic:

Place of work: VPM's Advanced Study Centre.

Name of the student:

Name of the guide:

Date of submission:

Signature of guide

Signature of student

Details: Introduction, Review of Literature, Material & methods, Hypothesis, Results & Discussions, Conclusions, References.

Course Code	Course Title	Credits
ASCAACP4	Industrial visits	4

Students will have to bear their own expenses for the Industrial visits.

Industrial visit: Note book -

Students have to maintain Industrial visit- note book along with the photos at places visited. The observations have to be noted in Industrial visit- note book/ register. Diagrams/ drawings can be drawn or photographs can be stuck. Industrial visit- note book has to be presented at the time of practical examination.

Examination based on which viva voce will be conducted. (25 marks)

Industrial Visits/ Training that can be taken from among following or such similar places:

1. Reliable Analytical Laboratories Pvt. Ltd. Bhiwandi, Thane.
2. Tata Institute of Fundamental Research, Mumbai.
3. Chemistry Laboratory of B. N. Bandodkar College of Science

Reference Books:

- I. Instrumental Analysis By Skoog, Holler, Nieman - Sixth edition
- II. Fundamentals of Analytical Chemistry by Skoog, West - Tenth edition
- III. Analytical Chemistry by Gary Christian- Sixth edition
- IV. Inorganic Quantitative Analysis by Vogel - sixth edition
- V. Environmental science by S.C. Santra - NCBA publication
- VI. Environmental Chemistry by A.K. De - New age international publishers
- VII. Chemical and biological methods for water pollution studies by Trivedi and Goel - Environmental Publications
- VIII. An introduction to Air pollution by Trivedi and Goel - ABD publishers
- IX. Handbook of Methods in Environmental Studies Vol.1 and 2 by S.K. Maiti

Evaluation Scheme

Evaluation will be based on External and Internal examination in the ratio of 60:40 (External 60% weightage and Internal 40% weightage)

External:

Theory Examination: Suggested Format of Question paper *

Duration: 3 Hours

Total Marks: 100

- All questions are compulsory

Q. 1	Based on Unit I	15
	OR	
Q. 1	Based on Unit I	15
Q. 2	Based on Unit II	15
	OR	
Q. 2	Based on Unit II	15
Q. 3	Based on Unit III	15
	OR	
Q. 3	Based on Unit III	15
Q. 4	Based on Unit I, II, III	15
	OR	
Q. 4	Based on Unit I, II, III	15

- The pattern may differ if we have to conduct on line examination depending on the situation

Each question may consist of sub-questions of following types

Full length question,	15 Marks
Short answer question	10 Marks
Short note questions	5 Marks
Objectives	2 Marks

Internal Examination: The internal examination will consist of various assignments which will include presentation of given topic, seminar on given topic, writing the given assignment, attending and reporting seminars and conferences, field experience. And many such types.

There will be one assignment on each unit of each course and need to be submitted in the given time limit. Each assignment will be of 10 marks and total marks of assignments will be converted to 40% marks.

Total marks of Theory Examination:

Course Code	Maximum marks
ASCAACT1	100
ASCAACT2	100
ASCAACT3	100
ASCAACT4	100
TOTAL	400

Practical Examination:

Course Code	Details	Practical	Journal	Viva	Total
ASCAACP1	Practical- I	80	10	10	100
ASCAACP2	Practical- II	80	10	10	100
ASCAACP3	Dissertation	-	-	-	75
ASCAACP4	Industrial visit: Note book	-	-	-	25
	TOTAL				300

Total of Theory Examination**400 Marks****Total of Practical Examination****300 Marks****Grand Total****700 Marks**

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