GOVERNMENT COLLEGE KOTTAYAM

DEPARTMENT OF CHEMISTRY

Diploma Programme in Analytical Instrumentation

Programme Outcome

This programme is intended to impart basic theoretical and practical skills on various laboratory, industrial and sophisticated analytical instruments.

Programme Specific Outcomes

On completion of this course, the student will be able to:

1. describe the theory, instrumentation and applications of various analytical instruments.
2. operate a number of conventional and sophisticated analytical instruments.

Programme Structure

Programme	**CADPAI-ANALYTICAL INSRUMENTATION**	
Course	**Course Title**	**Hours**
CADPAI -101	Fundamentals of Laboratory Analytical Techniques	30
CADPAI -102	Quality analyses	30
CADPAI -103	Advanced Analytical Techniques	30
Courses: 03	Duration: 90 hrs	

* CADPAI – Chemistry Add-on Diploma Programme in Analytical Instrumentation

Admission and Assessment Criteria

- The duration of Chemistry Add-on Diploma Programme in Analytical Instrumentation is 6 months.
- The programme is offered once in every year.
- All students who completed first four semesters of undergraduate programme in B.Sc. Chemistry/ B.Sc. physics/ B.Sc. Geology/ B.Sc. Botany/ B.Sc. Zoology are eligible for admission for this add-on programme.

- The Diploma Completion Certificate may be awarded to those students who satisfy the following minimum requirement for each course.

Criterion	Minimum requirement
Attendance	75%
Written examination	50% marks
Practical Examination	50% marks

- Evaluation of each course is based on the total marks secured for the respective course which comprises the following components

Component	Marks
Attendance (>75%)	10
Assignment	10
Seminar	10
Written examination	30
Practical examination	30
Total	**100**

- Grade Card will be issued to all students based on the cumulative percentage of total marks obtained for all the three courses.

Total % of marks	Grade	Remarks
Above 90	A+	Outstanding
80-89	A	Excellent
70-79	B+	Very good
60-69	B	Good
50-59	C	Above average
40-49	D	Satisfactory
Below 40	E	Failed

- A department level grievance redress system will address the grievances of students if any, about the programme.
- Grade Card and Course Certificate are issued at college level, duly signed by the Head of the Institution.

Syllabus of Diploma Programme in Analytical Instrumentation

Duration of the programme : 6 months

Total time allotted for the programme : 90 hours

Course 1: Fundamentals of Laboratory Analytical Techniques (30 hrs)

Course Outcome

Student will be able to achieve a fundamental knowledge on various laboratory analytical techniques

Course Specific Outcomes

Students will be able to understand the theoretical and practical aspects of polarography, pH metry, potentiometry, conductometry, colourimetry, cyclovoltammetry

Module 1: Basic Laboratory Techniques (9 hr theory+ 6 hr practical)

- Theory, instrumentation and application of polarography, pH metry, potentiometry, conductometry, colourimetry, cyclovoltammetry
- Determination of pKa values of dibasic acid using pH Meter
- Determination of dissociation constant of dibasic acid by potentiometric method.
- Determination of critical micellar concentration by conductometry

Module 2: Chromatographic techniques (9 hr theory+ 6 hr practical)

- Theory and application of various chromatographic techniques.
- Liquid chromatography
- Ion exchange chromatography
- Paper chromatography
- Thin layer chromatography
- Column chromatography

Course 2: Quality analyses (30 hrs)

Course Outcome

Student will be able to attain a fundamental level of knowledge on soil and water analyses.

Course Specific Outcomes

Students will be able to understand the theoretical and practical aspects of soil and water quality parameters.

Module 1: Soil Analysis (9 hr theory+ 6 hr practical)

- Introduction to soil anlysis, types of soil, soil pollutants, uses of soil analysis.
- Determination of phosphate content of the given soil extract, fertilizer solution.
- Determination of total nitrogen content of soil, manure or a fertilizer.
- Determination of P^H of a given soil sample.
- Determination of nutrient content (NPK) a given soil sample.
- Determination of salinity of a given soil sample.

Module 2: Water Analysis (9 hr theory+ 6 hr practical)

- Introduction to water quality parameters, hardness of water, BOD and COD.
- Determination of the dissolved oxygen content from water sample.
- Determination of (a) acidity
  (b) alkalinity
  (c) carbonates
  (d) bicarbonates
  (e) total hardness
  (f) chemical and
  (g) biological oxygen demand of various water samples.

Course 3: Advanced Analytical Techniques (30 hrs)

Course Outcome

Student will get an exposure on a number of advanced and sophisticated analytical techniques.

Course Specific Outcomes

Students will be able to understand the theoretical and practical aspects of some important analytical techniques about thermal properties and material characterization.

Module 1

Thermal Analysis (9 hr theory+ 6 hr practical)

- Introduction, theory and instrumentation of (a) TGA (b) DSC (c) TMA (d) DMTA
- Sample preparation, testing and thermogravimetric analysis of simple molecules.
- Sample preparation, testing and differential scanning calorimetric analysis of simple molecules.

Module 2

Material Characterization (9 hr theory+ 6 hr practical)

- Introduction, theory and Instrumentation of (a) FTIR (b) UV visible spectrophotometer (c) Fluorescence spectrometer (d) X-ray diffractometer
- Sample preparation, testing and UV-VIS spectral interpretation of simple molecules
- Evaluation of Intermolecular hydrogen bonding in benzyl alcohol using infrared spectroscopy
- Sample preparation, testing and fluorescence spectral interpretation of simple molecules
- Determination of the amount of riboflavin in given B-complex tablet by fluorimetry
- Sample preparation, testing and XRD diffraction pattern analysis of simple molecules