# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**
**Subject Code: 3163517**
**Semester – VI**
**Subject Name: Analytical Techniques**

**Type of course:** Open Elective

**Prerequisite:** Needs basic knowledge of Chemistry

**Rationale:** The main objective of this subject is to provide a strong basis of Analytical chemistry that will be applicable to other areas of the degree course such as chemical reaction engineering. It also helps for assurance of quality, safety and efficacy of drugs, pharmaceuticals and of any compound.

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Credits | Examination Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory Marks | | Practical Marks | | |
| L | T | P | C | ESE (E) | PA (M) | ESE (V) | PA (I) | |
| 2 | 0 | 2 | 3 | 70 | 30 | 30 | 20 | 150 |

**Content:**

| Sr. No. | Content | Total Hrs. |
|---|---|---|
| 1 | **Fundamentals of Analytical Chemistry**: Concept of quality: Definition of quality, Quality control & assurance, TQM. Correlation between quality & analysis, steps & types of chemical analysis, Stoichiometry & expression of concentration. | 04 |
| 2 | **Theory of errors**: Sources & classification of errors. Statistical treatment of analytical data & presentation of result. Sampling of solids, liquids & gases. Evaluation & validation of analytical methods. Good laboratory practices. | 04 |
| 3 | **Chromatographic methods**: Introduction & classification of chromatography. Theory, instrumentation & applications of the following chromatographic techniques: (i) Column chromatography (ii) TLC (iii) Paper chromatography (iv) GC (v) HPLC | 15 |
| 4 | **UV-Visible Spectroscopy**: Introduction, Theory of UV- Visible Spectroscopy & colourimetry, Beer Lambert law, Deviation from Beer Lambert law.<br>**Infrared Spectroscopy**: Introduction, Infrared radiation & its interaction with organic molecules, vibrational mode of bonds, instrumentation & applications, interpretation of IR spectra.<br>**Nuclear magnetic resonance spectroscopy**: | 15 |

# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3163517**

**Suggested Specification table with Marks (Theory):**

| Distribution of Theory Marks | | | | | |
|---|---|---|---|---|---|
| R Level | U Level | A Level | N Level | E Level | C Level |
| **60** | **13** | **9** | **9** | **9** | **0** |

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Reference Books:**


1. Instrumental Methods of Chemical Analysis, E. W. Ewing, McGraw Hill, New York. 4th Ed, 1975
2. Instrumental Methods of Analysis, B. K. Sharma, Goel Publishing house.
3. Elementary Organic Spectroscopy, Y.R. Sharma, S.Chand & company Ltd. New Delhi 2008


**Course Outcomes:** After learning this course students will be able to

| Sr. No. | CO statement | Marks % weightage |
|---|---|---|
| CO-1 | To express fundaments of Analytical Techniques. | 35 |
| CO-2 | To understand the working of instruments as well as for the development of new technologies. | 35 |
| CO-3 | It provides assurance of quality, safety and efficacy of drugs, pharmaceuticals and of any compound. | 30 |

**List of Practicals:**

1. Separation using Paper Chromatography
2. Separation using Thin Layer Chromatography
3. Volumetric Estimation of alloys
4. To find out concentration of unknown solution using Colourimeter
5. Separation using Column Chromatography
6. Working and principle of UV Spectrophotometer
7. Complexometric Titration by EDTA
8. Gravimetric Estimation
9. Potentiometric Titration of between BaCl2 and K2CrO4
10. Turbidity meter

# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**
**Subject Code: 3163517**