Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Science College
Semester-1(M.Sc.)

**Subject:** Instrumentation-MSCIN11502

**Type of course:** Major

**Prerequisite:** Students should have a basic knowledge of advanced analytical technique and instruments used in industries.

**Rationale:** The Prerequisite provides the foundation for understanding the concepts of basic instrumental technique.

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Credits | Examination Marks | | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Theory Marks | | Practical Marks | | CA | |
| CI | T | P | C | ESE | MSE | V | P | ALA | |
| 4 | 0 | 0 | 4 | 60 | 30 | 10 | 00 | 50 | 150 |

*Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.*

## Course Content:

| Unit No. | Course content | Hrs | % Weightage |
|---|---|---|---|
| 1 | Principles, Construction and working of the followingmeasuring equipment.<br>**Temperature**: - Glass Thermometer, Bimetallic thermometer, Pressure spring thermometer, Vapor filled, thermometer, Resistance thermometer.<br>**Viscosity**: - Capillary tube Viscometer, falling sphere viscometer, Rotating cylinder viscometer, viscosity sensitive rotameter.<br>**Density & Specific gravity**: - Pycnometer, Hydrometer, Specific gravity balance.<br>**Liquid Level**: - Direct & indirect liquid level methods | 15 | 25 |
| 2 | **Colorimetry**:- General discussion, Theory of Colorimetry, Colorimetric methods and apparatus.<br>**pH metry**:- Measuring systems, Methods and apparatus. | 15 | 25 |
| 3 | **Analytical and testing instrumentation**: - Ultra-Violet and Visible Spectrometers, Infra-Red Spectrometers and analyzers, Mass Spectrometers, Conductimetry:- Measuring systems, Methods and apparatus.<br>**Potentiometry**:- Measuring systems, Methods and apparatus. | 15 | 25 |
| 4. | **Chromatographic techniques**:- Gas chromatography, Liquid chromatography, Paper chromatography, Ion-exchange chromatography. | 15 | 25 |

## Continuous Assessment:

| Sr. No | Active Learning Activities | Marks |
|---|---|---|
| 1. | **Thermo Tool Match-Up :**<br>Ask students match names, diagrams, and working principles of different thermometers (glass, bimetallic, pressure spring, vapour-filled, resistance). Upload it on GMIU Web portal | 10 |
| 2. | **Colorimetry Concept Map :**<br>Ask Students draw and complete a concept map linking theory, apparatus, and applications of colorimetry.. Prepare and upload it on GMIU Web portal. | 10 |
| 3. | **Chromatography Strip Race:**<br>Perform' quick paper chromatography with food colors or dyes and compare results. Explain other chromatography types and upload it on GMIU Web portal. | 10 |
| 4. | **Molecule identification from IR Graph:** | 10 |

| | | |
|---|---|---|
| | Assign student 5 IR graphs and ask them to systematically identify the molecule. | |
| 5. | **Literature Review:** Provide atleast 2 research papers to students and tell them to prepare a short note from the papers and upload it on GMIU Web portal. | 10 |
| | **Total** | **50** |

## Suggested Specification table with Marks (Theory):60

| Distribution of Theory Marks (Revised Bloom's Taxonomy) | | | | | | |
|---|---|---|---|---|---|---|
| Level | Remembrance (R) | Understanding (U) | Application (A) | Analyze (N) | Evaluate (E) | Create (C) |
| Weightage | 30% | 30% | 30% | 10% | 00 | 00 |

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.

## Course Outcome:

| After learning the course the students should be able to: | |
|---|---|
| CO1 | Explain the fundamental principles of heat transfer and their relevance to temperature measurement. |
| CO2 | Analyzethe fundamental principles of pH measurement, including the Nernst equation, the function of the glass electrode, reference electrode |
| CO3 | Gain the basics of spectroscopic technique |
| CO4 | Comprehend the fundamental principles of chromatographic separation and their application in various scientific and industrial fields. |

## Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment
Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

## Reference Books:

1. Chemical engineering kinetics by J.M.Smith, McGraw hill book Co.

2. Chemical kinetics by S.K.Jain, Vishal publication.

3. Industrial analysis by B.K.Sharma, Gael publication.

4. Principles of analytical chemistry by R.K. Shah, J.C. Vora, K. P. Vora and R. S. Shah.

5. Physico-chemical exercise by P. H. Parsani