

5115 – ANALYTICAL INSTRUMENTATION

Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)				
Lectures	Practical	Credits			Theory		Practical Ex.	Total	
3	2	5	25	25	3 Hrs	100	-	150	
Pre-requisite		Source	Semester	Theory	Test	Total	TW	PR	Gr Total
4218		INC							
				75	25	100	25	-	125

Rationale: The increasing use of Industrial Process Instrumentation has created the need for more people trained in the use of modern measuring instruments. Not only are certain physical properties desired but also often times correct chemical composition is necessary as well, if the desired end result are to be achieved. This course covers the analysis of the unknown samples with sophisticated equipment used in today's laboratories.

COURSE CONTENT	Hrs.	Mks.
1. CHEMICAL ANALYSERS	15	35
Gas Chromatograph: Principles of operation, control section, analysis section, thermal conductivity detector, peak picker. Liquid Chromatograph: Comparison with gas chromatograph, components, flame ionisation detector, conductivity measurement. pH measurement: Principles, devices, pH meter, redox measurements, applications for industrial process. Oxygen Analysers: Need for oxygen content analysis, combustion type, paramagnetic type, dissolved oxygen analyser probes.		
2. OPTICAL ANALYZERS	10	20
Colorimeter: -Beer's law, Spectrophotometric Analysers, UV- visible Spectrophotometry, Non-dispersive IR Spectrophotometry, IR dispersive Spectrophotometry, Flame Photometry.		
3. MISCELLANEOUS MEASUREMENTS	12	25
Industrial measurement with radioisotopes, radioactivity. Types of Radiations: Radioisotopic Detectors, Ionisation Counter, Geiger Muller Counter, Liquid Scintillation Counter; Thickness measurement techniques. Liquid level gauges: Humidity and moisture content measurements, principles, devices, methods.		
4. PROCESS INSTRUMENTS & AUTOMATIC ANALYSIS	08	15
Automation strategy. Industrial process analyzers, On-line Potentiometric analyzers, difference between process & laboratory chromatographs. Discrete Analysers, sampling systems, operating conditions. Continuous Analyzers. Automatic Analyzers (In situ or via sampling devices).		
5. MAINTENANCE OF ANALYTICAL INSTRUMENTS	03	05
General maintenance schedules. Maintaining logbook. Record for failure rate. Managing spare parts.		
Total	48	100

PRACTICALS: (Minimum 8)

- To study the working of a gas chromatographs and understand reading of chromatogram.
- To study the working of the Thermal conductivity Detector
- Using a pH meter, find out the pH of different acidic and basic solvents.
- To study the Optical path of UV/VIS/IR Spectrophotometer and identify its various Components (2 Turns)
- To determine the scanning wavelength of a given sample by peak absorbance method.
- To determine the concentration of the unknown sample using UV-visible spectrophotometer
- To find out the concentration to ppm level, using flame Photometer
- To study the working of the any one type of dissolved oxygen analyser.
- To study the various methods used for maintenance of Analytical Instruments.
- To calibrate a digital pH meter.
- Industrial visits to study the gas chromatograph and the chromatogram.
- Industrial visit to study the working of any one type of detector used in chromatography.

TEXT BOOKS:

Industrial Instrumentation Fundamentals by Austin Fribance

REFERENCE BOOKS:

- Instrument Engineer's Handbook (Vol.I) by Bela Liptak
- Control System Technology by C. J. Chesmond.
- Instrumental Methods of Analysis by Willard, Merritt, Dean, Settle

