

HONOUR SUBJECT

PEI5D001 ANALYTICAL INSTRUMENTATION (3-1-0)

Module I: (12 Hours)

Fundamentals of Analytical Instruments: Elements of an Analytical Instrument, Intelligent Analytical Instrumentation Systems, PC-based Analytical Instruments. Spectrophotometers: Ultraviolet and Visible Absorption Spectroscopy, Calorimeters, Photometers, Different types of Spectrophotometers, Sources of Errors and Calibration, Infrared Spectrophotometers – Basic Components and Types, Sample Handling Techniques, Flame Photometers – Principle, Constructional Details, Types and accessories, Atomic Absorption Spectrophotometers and their instrumentation.

(1.1, 1.5, 1.6, 2.4, 2.5, 2.6, 2.7, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 4.5, 5.1 and 5.2)

Module II: (14 hours)

Chromatography: Gas Chromatograph – Basic Parts of a Gas Chromatograph, Methods of Measurement of Peak Areas, Liquid Chromatograph – Types, High Pressure Liquid Chromatograph.

pH meters and Ion Analyzers: Principle of pH Measurement, Electrodes for pH Measurement, pH Meters, Ion Analyzers, Blood pH Measurement.

Gas Analyzers: Measurement of Blood pCO₂ and pO₂, Industrial Gas Analyzers – Types, Paramagnetic Gas Analyzer, Infrared Gas Analyzers, Industrial gas Analyzers Based on Other Methods. (16.1, 16.3, 16.4, 16.5, 17.1, 17.2, 17.3, 21.2, 21.3, 21.4, 21.6, 22.2, 22.3, 22.4, 23.1, 23.2, 23.3, 23.5)

Module III: (12 Hours)

Principles of Nuclear Magnetic Resonance: Nuclear Magnetic Resonance (NMR) Spectroscopy – Principle, Types and Construction details of NMR Spectrometers.

Radiochemical Instruments: Fundamentals of Radiochemical Methods, Radiation Detectors, Liquid Scintillation Counters, Gamma Spectroscopy.

X-Ray Spectrometers: Instrumentation for X-Ray Spectrometry, X-Ray Diffractometers, X-Ray Absorption Meters, Electron Probe Micro analyzer.

(10.1, 10.2, 10.3, 10.4, 13.1, 13.2, 13.3, 13.5, 14.2, 14.3, 14.4, 14.6)

TEXT BOOK:

1. *Handbook of Analytical Instruments* – by R.S. Khandpur, TMH Education Pvt. Ltd.

REFERENCE BOOKS:

2. *Instrumental Methods of Analysis* – by Willard H.H., Merrit L.L., Dean J.A. and Seattle F.L., CBS Publishing and Distributors, 6/e, 1999
3. *Instrument Technology* – by Jones B.E., Butterworth Scientific Publ., London, 1987. *Mechanical and Industrial Measurements* by Jain R.K., Khanna Publishing, N Delhi, 2/e, 1992.
4. *Principles of Instrumental Analysis* – by Skoog D.A. and West D.M., Holt Sounder Publication, Philadelphia, 1985.
5. *Instrumental Analysis* – by Mann C.K., Vickerks T.J. & Gullick W.H., Harper and Row Publishers, New York, 1974.
7. *Jone's instrument Technology (vol. 2 and 3)* - B.E. Noltingk, Butterworth-Heinmann, N Delhi.
8. *Instrumental Methods of Chemical Analysis* - E.W. Ewing, McGraw-Hill.
9. *Instrumentation, Measurement and Analysis* - B.C. Nakra and K.K. Chowdhury, TMH.
10. *Measurement and Instrumentation: Trends and Applications* - M.K. Ghosh, S.Sen and S. Mukhopadhyay (ed.), Ane Books, New Delhi, 2008.