Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NGLC512	Sample Preparation and Analytical Techniques in Geosciences	3	0	0	3

Course Objective
Through this course, the students will learn the fundamental aspects of geological sample preparation and different analytical techniques commonly used in the field of geosciences.
Learning Outcomes
Upon successful completion of this course, students will be able to: • Learn the methods and rationales behind wet and dry sample preparation in geology • Understand the working principles of different analytical techniques in geosciences. • Apply the knowledge investigate different analytical techniques based on the user requirement i.e., which technique for what type of samples and which element

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Basic concepts in analytical geochemistry, Detection limits, Sampling strategy: inhomogeneity effects, contamination effects, Calibration, Geological Reference Materials, Internal and External Standards, Wet and dry sample preparation methods	7	This will help the student to understand the basic concepts of analytical geochemistry and related terminologies.
2	Ion exchange preconcentration procedures: Ion exchange Techniques, Characteristics of ion exchange resins, Optimizing column separations, Application of ion exchange chromatography to rare-earth element separations, other preconcentration procedures	6	The topic covers the theoretical and practical aspects of ion exchange and its application in geochemistry to separate selective elements.
3	Classical and rapid methods of analysis – Flame photometry, EDTA, determination of ferrous ions	4	This will help the student to get familiarized with easier and rapid methods of element analysis.
4	Optical Spectrometry: Principles and instrumentation - AAS, ICP-OES, Arc and Spark source OES, Ion-selective electrodes	5	The topic will cover the fundamentals of optical spectrometry and related analytical techniques along with its application in different fields of geosciences.
5	Mass spectrometry: Principles and instrumentation - QICP-MS, LA-ICP-MS, MC-ICP-MS, TIMS, SIMS, GC-MS	8	The topic will cover the fundamentals of mass spectrometry and related analytical techniques along with its application in different fields of geosciences.
6	Principle and instrumentation of– XRF, SEM-EDA, EPMA, INAA, CHNS, TC-TOC analyzer	7	The topic will cover the fundamentals of in situ and/or dry analytical techniques along with its application in different fields of geosciences.
7	Heavy mineral separation techniques, Gold and platinum group element analysis, nuclear techniques for the determination of uranium and thorium and their decay products	5	The topic will cover the fundamentals of PGE group and radioactive element analysis useful for strategic mineral exploration and thermochronological studies.
	Total	**42**	

Textbooks:

1. Potts, P.J., 1992. A Handbook of Silicate rock analysis, Springer Science + Business Media, LLC, 631 p.
2. Harland, C.E. 1994. Ion exchange: Theory and Practice, 2nd Edition, Royal Society of Chemistry, 306 p.

Reference Books:

1. Goldstein, J. I., Newbury, D. E., Michael, J. R., Ritchie, N. W.M., Scott, J. H. J., Joy, D. C., 2018. Scanning Electron Microscopy and X-Ray Microanalysis, Springer New York, NY, 550 p.