Name of Programme: M. Sc. Applied Geology
Course Code: GEO-500
Title of the Course: Principles of Mineralogy and Geochemistry
No of Credits: 03
Effective from AY: 2022-23

Prerequisites for the course:	Degree of Bachelor of Science in Geology from any UGC recognized University or an equivalent examination.	
Objective:	This course addresses the concepts of crystal chemistry, mineralogy, geochemistry and isotope geology. Further it also provides an insight on the origin of the earth, distribution of elements, evolution of minerals and also to understand geological processes that are necessarily inaccessible to observe directly.	
Content:	**Module 1: Crystal chemistry:** Ionic radii, co-ordination of ions, Pauling's Rules, different types of chemical bonding, crystal growth, crystal defects, external and internal symmetry, XRD: powder and single crystal diffraction. Twinning, Polymorphism and pseudomorphism. Mineral stability and phase diagram, two component eutectic systems, incongruent melting, solid solution system, exsolution. **Module 2: Mineralogy:** Mineral evolution, Biological-mineralogical interactions, Medical mineralogy. Composition, structure, Chemistry and paragenesis of the mineral groups: Olivine, Pyroxene, Amphibole, Mica, Feldspar, Garnet, Sulphide, Sulphate, Carbonate and Oxides. Optical mineralogy: Study of isotropic and anisotropic minerals under convergent light. Working principles of XRD, ICPMS, Spectroscopy, SEM, X-ray tomography. **Module 3: Geochemistry:** Introduction and scope of geochemistry, geochemical classification of elements, distribution and behavior of major, trace elements and REE in igneous, sedimentary and metamorphic processes and products. Introduction to isotope geochemistry: Elements of nuclear systematics, introduction to isotopes and their properties. Introduction to Meteorites, origin, composition, classification and mineral constituents of meteorites.	15 hours 15 hours 15 hours
Pedagogy:	Lectures/ tutorials/assignments/field study/discussion	
References/Readings	1. Deer, W. A., Howie, R. A., and Zussman, J. (1992). *An introduction to the rock-forming minerals.* 2nd ed. Harlow, Essex, England. New York, NY. Longman Scientific and Technical.	

	2. Klein, C., Hurlbut, C. S., and Dana, J. D. (1999). *Manual of mineralogy: (after James D. Dana)*. New York: J. Wiley. 3. Winchell, A. N. (1991). *Elements of optical mineralogy: An introduction to microscopic petrography*. New York. Wiley. 4. Nesse W. (2012*). Introduction to Optical Mineralogy.4th ed.* Oxford University Press 5. Kerr, P. F. (1977). *Optical mineralogy*. New York. McGraw-Hill Book Co. 6. Mason B., and Moore C.B. (1982). *Principles of geochemistry*. 4th ed. Chichester John Wiley 7. Krauskopf, K. B., and Bird, D. K. (1995). *Introduction to geochemistry*. New York. McGraw-Hill 8. Klein, C., and Dutrow, B. (2007). *Manual of mineral science*. New York. John Wiley and sons ltd 9. Mason, B., and Moore, C. B. (1982). *Principles of geochemistry*. New York. Wiley. 10. Walther, J. V. (2009). *Essentials of geochemistry*. Sudbury, Mass. Jones and Bartlett Publishers. 11. White, W. M. (2014). *Isotope Geochemistry*. Hoboken. Wiley. 12. Faure, G. (1986). *Principles of isotope geology. Second edition*. John Wiley and Sons Inc., New York, NY 13. Dyar, M. D., and Gunter, M. E. (2008). *Mineralogy and optical mineralogy*. Chantilly. Mineralogical Society of America.	
Course outcomes	1. Students will able to understand about earth as a whole with detail emphasis on elemental distribution. 2. students will able to do thorough study on crystal chemistry 3. students will acquire indepth knowledge about mantle processes 4. Students will able to learn about mineral evolution in detail.	