Subject Code : P8AG6

ADVANCED CRYSTALLOGRAPHY AND MINERALOGY

UNIT 1

Advanced crystallography:– **Shoenflion** notation. Derivation of 32 Crystal classes and their symmetry projections – Spherical, Stereographic and Gnomonic projections of crystals belonging to normal classes. Calculation of crystal elements using inharmonic ratio- tangent relation, Napier's theorem and equation to normal.
Twinning in crystals – irregularities of crystals – X-rays Derivation of Bragg's law and its application. 14 Bravais space lattices.Powder diffraction method.

UNIT 2 Optical mineralogy: Polarisation – Optical properties of crystals – optical ellipsoids – polarizing Microscopes and accessories – Quartz wedge – Mica plate – Gypsum plate – Berek compensator – Micrometer ocular.
Determination of Refractive indices of minerals by immersion method.
Uniaxial minerals – double refraction in calcite – Nicol prism – optic axis – Primary and secondary optic axes; Ray velocity surface – Uniaxial indicatrix – optic sign; interference colour – interference figure – crystal orientation – extinction – Extinction angle - - Sign of elongation - Pleochroism – Birefringence.

UNIT 3

Biaxial minerals – Biaxial indicatrix – optical directions – Primary and secondary optic axes – optic axial angle – Mallard's formula – optic sign – crystallographic orientation – interference figures – Sign of elongation – Extinction – Extinction angle – Pleochroic scheme- Birefringence optical anomalies – Dispersion. U stage techniques for determination of Anorthite content and twin laws in Plagioclase – optic orientation.

UNIT 4

Descriptive Mineralogy: Structural classification of silicate minerals – Isomorphism – Exsolution – Order, disorder relations – Polymorphism = Pseudomorphism- Fluorescence in minerals – Metamict state – Staining techniques and micro chemical tests.
Description of chemistry, optical and physical properties, and paragenesis of the following: ortho and ring silicates; olivine group, Garnet Group, Aluminosilicates, Epidote group, Zircon, Sphene, Topax, Staurolite, Beryl, Cordierite and Tourmaline. Chain silicates – Pyroxene group, Amphibole group and Wollastonite.

UNIT 5

Sheet silicates – Mica group, chlorite group and clay minerals. Tekto silicates – Quartz group, feldspar group, feldspathoids and zeolites. Description of chemistry, optical and physical properties and paragenesis of the following: Apatite, Fluorite, Corundum, Spinet and Calcite.

TEXT BOOKS

1. Dana, E.S. – 1955 – Text Book of mineralogy, wiley
2. Wade, F.a. and mattox, R.E – 1960 – Elements of crystallography and Mineralogy, Harmer and brods.
3. Philips, P.C. – 1956 – An introduction to Crystallography, Longmans Green & co.
4. Winchell, A.N. – 1968 – Elements of optical Minerology, parts, I & II Eiley Eastern
5. Wahiatrom, E.E, - 1960 – Optical Crystallography, Wiley.
6. Berry, L.G. and Mason Brain, W.HY. – 1961-Mineralogy, Freern
7. Deer, W.A. Howie, R.A. and Zussman, J- 1966 – An introduction to the Rock forming minerals, Longmans.

REFERENCE BOOKS:

1. Burerger, M.J. – 1956 – Elementary Crystallography, Wiley
2. Naidu, P.R.J. – 1958 – 4-Axes universal stage, commercial printing and publishing house
3. Heinrich, E.W. – 1965 – Microscopic identification of Minerals McGraw Hill
4. Naidu, P.R.J. C.S. – 1971 – Johansen's optical mineralogy, Allied
5. Haribury, C.S. – 1971 - Dana's Manual of Mineralogy, Wiley.
6. Deer, W.A. Howie, R.A. & Zussman, J-1962 – Rock forming Mineralogy Vols. 1 to 5, Longmans.
7. Grim, R.N. – 1953 – Glay Mineralogy, McGraw Hill
8. Goger, R.G and kerr, P.F. – 1942 – optical Mineralogy, McGraw Hill.
9. Brain Mason – 1952 – Principles of Geo-Chemistry, Wiley.