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Geology

2nd Semester
Course GL-T2 Petrology(Theory=4 Credits)

Unit-I
Introduction to igneous petrology: Nature and scope of petrology, Rock Cycle. Definition of Magma, composition of Magma,types of magma, Physio-chemical constitution of Magma, primary magma, Bowen reaction series, Processes resulting in diversity of igneous rocks; fractionation and differentiation, gravity settling, filter press differentiation, flow diffusion and gasses transfer with in magma, liquid immiscibility, mixing of magma, assimilation.

Unit-II
Texture and structure of Igneous rocks: Textural elements- grain-size and shape; Type of texture: On the basis of degree of crystallinity, granularity shape, mutual relationship of crystals, directive and intergrowth textures, reaction textures. Structures: Pillow structures, ropy structures, blocky structures, flow structures, sheet and platy structures, prismatic and columnar structures.Classification of igneous rocks: principles of classifications. CIPW classification, IUGS classification and tabular classification. Nomenclature and description of common igneous rocks.

Unit-III
Crystallography: Introduction to crystallography, geometrical nature of the order of crystals. Translation vectors, planner and space lattices. Normal class of crystal systems.
Morphology of crystals: face, edge and sold angle, interfacial angle and law of constancy of interfacial angles. Axial system and axial ratios. Parameter system of Weiss, Miller indices. law of rationality of indices.
Crystal growth and twinning: growth of crystals from solutions and from a melt melt under controlled conditions, crystal growth in open fractures, solution cavities and vesicles.
Twinning in crystals:Types, causes and laws.
Crystal forms: Crystallized, crystallite, cryptocrystalline and amorphous. Crystal habit: elongated, tabular, flattened equant. Form of crystalline and cryptocrystalline aggregates- types, examples and using mineral identification. Crystal chemistry: Dimorphism, polymorphism pseudomorph, Isomorphism and solid solution.

Unit-IV
Mineralogy: definition, scope and classification of silicate minerals and ore forming oxides/ sulphides) minerals. Scaler and vector properties of minerals: Moho's scale of hardness.
Physical properties and the mode of occurrence of the fallowing groups of minerals: Quartz, feldspar, mica, amphibole, pyroxene, olivine, garnet, chlorite and carbonate.
Mineral optics: elements of optics. Optics of isotropic medium- refractive index, Snell's law of critical angle, anisotropic media.
Polarization and interference of light. Polarizing microscope- construction and use. Use of accessory plates. Pleaochroism and Birefringence.
Optical indicatrix: isotropic, uniaxial and biaxial indicatrix.
Optical properties of minerals under plane-polarized and cross-polarized light: forms, cleavage, fractures and parting, refractive index and relief, Becke line and its use.

Practical: GL-P2(Practical=2 Credits)

Igneous petrology: Study in hand specimen and under microscope of the mineral composition. textures and structures of important igneous rocks as included in theory paper.
Crystallography and mineralogy: Demonstration of space lattice, model- Galena, Fluorite, Sphalerite, Pyrite and Calcite. Clinographic projections of the fallowing crystal forms: Cube, Octahedron, Zircon, Beryl, Calcite and Gypsum.Study of the physical and optical properties of important rock forming minerals as included in the theory paper.

Suggested Readings:

Best, M. G., 1986: Igneous Petrology, CBS Pub.
Bose, M. K.,1997: Igneous Petrology, World Press.
Ehlers and Blatt, 1999: Petrology, (igneous, sedimentary and metamorphic), CBS Pub.
Turner and Verhoogen, 1999: Igneous and metamorphic petrology, CBS Pub.
Tyrrell, G.W.,1987: Principles of Petrology. CBS Pub.
Winter, J. D. 2010. Igneous and Metamorphic petrology.
Gribble, D. D., 1998 Rutley's Elements of mineralogy, DBS publications.
Phillips, Wm, R. and Griffen, D. T., 1986: Optical Mineralogy. CBS Edition.
Putins,A., 2001: Introduction to mineral science. Cambridge University Press.
Richard, V. g., 1997: Dana's new Mineralogy. John willy.

Unit-III
Sedimentary rocks: Process involved in the formation of sedimentary rocks: Erosion, transportation and deposition, diagenesis and lithification. Texture: Size, roundness, sphericity Surface texture, fabric, porosity, permeability grain-size, grade-scale, methods of grain size analysis by sieving. Use of textural properties. Structures: Primary, secondary and biogenic structures