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**CLUSTER UNIVERSITY SRINAGAR**  
**SYLLABUS – SEMESTER 3<sup>RD</sup> (CBCS) – B.Sc. GEOLOGY**  
**(CORE COURSE - THEORY)**  
**(Lectures-60)**

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**TITLE:** Sedimentary and Metamorphic Petrology and Economic Geology

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**Course Code:** GL-T3

**CREDITS: 04** (Total: 60 Marks)

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**Sedimentary Petrology**

**Unit-I (Lectures-18)**

- 1.1 Sedimentary rocks: Definition and types and description of common sedimentary rocks (sandstone, shale, conglomerate, limestone, dolomite, laterite).
- 1.2 Processes involved in formation of sedimentary rocks: erosion, transportation, deposition, diagenesis and lithification.
- 1.3 Texture: Clastic (Size, Shape, Sphericity, Packing, Fabric and Roundness) and Non-clastic (Crystalline texture and Non-crystalline texture).
- 1.4 Surface texture: polish, microrelief, striations, percussion marks, indentation, slickenside.
- 1.5 Fabric in sedimentary rocks: Porosity and permeability.
- 1.6 Grain size: Wentworth grade scale and method of grain size analysis by sieving.
- 1.7 Use of textural properties.
- 1.8 Structures of sedimentary rocks: Primary structure (bedding or stratification, cross-bedding, cross-lamination, graded bedding, sole marks, load structures, ripple marks and dunes, mud cracks/desiccation cracks, rain imprints), secondary structures (concretions, solution structures, oolitic structures, pisolitic structures and deformation structures) and biogenic structures (tracks, trails, burrows, borings, fecal pellets, stromatolites).
- 1.9 Classification of clastic sedimentary rocks (rudaceous, arenaceous, argillaceous) and non-clastic sedimentary rocks (chemically formed and organically formed rocks).
- 1.10 Folk's classification of sandstone.

**Metamorphic Petrology**

**Unit-II (Lectures-16)**

- 2.1. Definition of metamorphism
- 2.2. Types of metamorphism–Contact, cataclastic, regional, dynamic, plutonic and retrograde metamorphism.
- 2.3. Control of bulk chemical composition on metamorphism
- 2.4. Agents of metamorphism-heat, pressure and chemically active fluids.
- 2.6. Processes of Metamorphism: anataxis, palingenesis, migmatization, granulation, plastic deformation, recrystallization and metasomatism.
- 2.7. Texture of metamorphic rocks: Crystalloblastic, Porphyroblastic and Granoblastic texture.
- 2.8. Structures of metamorphic rocks: Cataclastic, maculose, slaty, granulose, schistose, hornfelsic, gneissose and augen structures
- 2.9. Classification and types of metamorphic rocks. Description of common metamorphic rocks (Slate, phyllite, schist, Gneiss, quartzite, marble, Migmatite, amphibolite, eclogite, and granulite).

**Economic geology**

**Unit-III (Lectures-14)**

- 3.1. Concept of ore and ore deposits, ore minerals and gangue minerals; Tenor of ore.

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M.A. Khan

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August 14, 2020



- 3.2. Concept of metallogenic epochs and provinces.
- 3.3. Classification of ore deposits – genetic classifications.
- 3.4. Magmatic ore forming processes: Early and Late magmatic ore deposits
- 3.5. Hydrothermal solution with reference to: a) Porphyry copper deposit b) Vein deposits of tin and tungsten.
- 3.6. Classification of hydrothermal deposits
- 3.7. Ores formed by metamorphic processes

#### **Unit-IV (Lectures-12)**

- 4.1. Formation of pegmatite and pegmatite deposits
- 4.2. Oceanic mineral resources (manganese nodules)
- 4.3. Oxidation and Supergene enrichment ore forming process.
- 4.4. Placer deposits/mechanically formed deposits
- 4.5. Evaporites and ore formation (residual deposits).
- 4.6. Mode of occurrence of following minerals deposits in India: Banded iron formation, Gold, Thorium, Mica, Bauxite and Tungsten deposits.
- 4.7. Mineral resources status of Jammu and Kashmir.

#### **Books Recommended:**

- Bateman and Jensen, 1990. Economic mineral deposits. John Wiley.
- Brown, C. and Dey, A.K. 1955. Indian Mineral Wealth. Oxford Univ.
- Collinson, J. D, 1999: Sedimentary Structures. Springer Verlag.
- Deb, S., 1980. Industrial minerals and Rocks of India. Allied Publishers Pvt. Ltd
- Gokhale, K.V.G.K. and Rao, T.C., 1983. Ore Deposits of India. East West Press Pvt. Ltd.
- Jensen, M.L. and Bateman A.M., 1981. Economic Mineral Deposits. John Wiley and Sons.
- Krishnaswamy, S., 1979. India's Minerals Resources. Oxford and IBH Publ.
- Miall, A. D., 1999: Principles of Sedimentary Basin Analysis. Springer-Verlag.
- Pettijohn, F. J., Potter, P.E. and Siever, R, 1990: Sand and Sandstone. Springer Verlag.
- Reading, J. G. 1996: Sedimentary Environment and Facies. Black well.
- Selley, R. C., 1976: Introduction of Sedimentology. Academic Press, London.
- Sengupta, S., 1997: Introduction to Sedimentology. Oxford-IBH.
- Sharma, N.L. and Ram, K.V.S., 1972. Introduction to India's Economic Minerals, Dhanbad.
- Ehlers and Blatt, 1999: Petrology, (Igneous, Sedimentary and Metamorphic). CBS Pub.
- Miyashiro, A., 1994: Metamorphic Petrology. UCL Press Ltd., London.
- Umeshwar Prasad, 2003. Economic Geology. CBS Publishers and distributors.
- Turner & 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.
- Yardley, B. W., 1989: An Introduction to Metamorphic Petrology. Longman, New York.

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CLUSTER UNIVERSITY SRINAGAR  
SYLLABUS – SEMESTER 3<sup>RD</sup> (CBCS) – B.Sc. GEOLOGY  
(CORE COURSE - PRACTICAL)

TITLE: PRACTICAL

Course Code: GL-P3

CREDITS: 02 (Total: 30 Marks)

**A. SEDIMENTARY AND METAMORPHIC PETROLOGY**

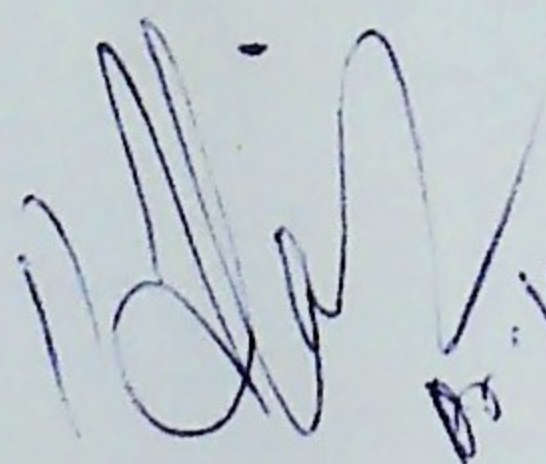
Identification of sedimentary and metamorphic rocks both in hand specimen and under microscope as included in theory paper.

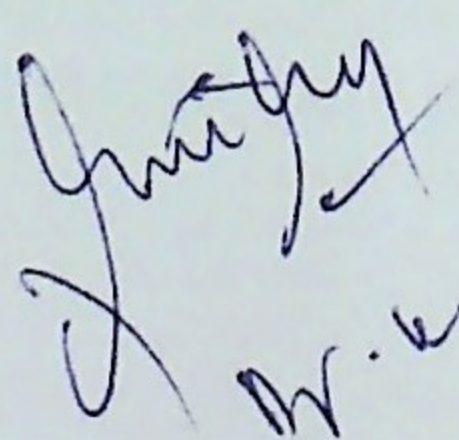
**B. ORE GEOLOGY**

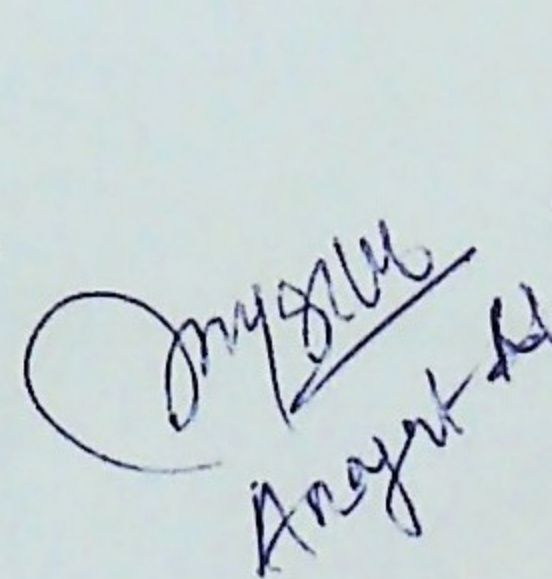
Megascopic study of ore minerals: Cu, Fe, Al, Mn, Pb and Zn.

**C. GEMOLOGY**

Megascopic study of precious and semi-precious stones: diamond, ruby, sapphire, emerald, opal, jasper, agate and garnet.

  
Dr. H. V. V. V.

  
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# CLUSTER UNIVERSITY SRINAGAR

## SYLLABUS – SEMESTER 3<sup>RD</sup> (CBCS) – B.Sc. GEOLOGY

### (CORE COURSE - SKILL ENHANCEMENT)

(Lectures-60)

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**TITLE:** Megascopic and microscopic techniques in identification of minerals

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Course Code: GL- SEC

CREDITS: 04 (Total: 60 Marks)

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#### **A. Megascopic techniques in identification of minerals**

##### **Unit-1 (Lectures-12)**

Crystalline and amorphous substances, structure, form, cleavage, colour, luster, transparency, streak, hardness, specific gravity, tenacity, feel, taste, odour. Electrical, Magnetic and Thermal Properties. Empirical and Structural formula of minerals. Isomorphism, polymorphism and pseudomorphism. Non-crystalline minerals. Fluorescence in minerals.

##### **Unit-2 (Lectures-18)**

Physical properties, chemical composition, Classification, Megascopic identification of Quartz group, Feldspar group. Pyroxene group, Amphibole group and important silicates: Tourmaline, Topaz, Beryl, Zircon, Rutile, Apatite. Calcite, Gypsum.

#### **B. Microscopic techniques in identification of minerals**

##### **Unit-1 (Lectures-12)**

Plane polarized light-Double refraction-Snells law. Optical properties of minerals: Colour, Form, Cleavage, Refractive Index, Relief, Alteration, inclusions, Zoning, Pleochroism, Isotropism and Anisotropism, Extinction, Interference colours, Birefringence, Twinning.

##### **Unit-2 (Lectures-18)**

Microscopic study of Quartz group, Feldspar group, Pyroxene group, Amphibole group and important silicates: Tourmaline, Topaz, Beryl, Zircon, Rutile, Apatite, Calcite, Gypsum.

#### **Suggested Readings:**

- W.A.Deer, R.A.Howie and J.Zussman, 1966, An Introduction to the Rock Forming minerals, Longmans.  
Alexander N.Winchell, 1968, Elements of Optical Mineralogy, Parts I and II, Wiley Eastern (P) Ltd.,  
Ernest, E.Walstrom, 1960, Optical Crystallography, John Wiley and Sons.  
E.S.Dana, 1935, A Text Book of Mineralogy, John Wiley & Sons.  
L.G.Berry Mason, 1961, Mineralogy, W.H.Freeman & Co.,  
Kerr,B.F., 1995, Optical Mineralogy 5th Ed. Mc Graw Hill, New York.  
S.Mitra, 1994, Fundamentals of Optical, Spectroscopic and X-ray Mineralogy, S.R.Technico Book House, Ashok Raj Path, Patna.

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