

Mineral Beneficiation

1.1. Course Number: GE 316

1.2. Contact Hours : 3-0-0 Credits: 9

1.3. Semester Offered: 3rd Year-Even

1.4. Prerequisite: Basic knowledge of Mathematics, Physics, Chemistry and Geology

1.5. Syllabus Committee Members: Dr. Alok Kumar Singh & Dr. Hemant Kumar Singh

2. Objective: The aim of mineral processing/ Mineral Beneficiation is to render mineral resources beneficial to the modern life of the humankind.

3. Course Content: Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-topics	Lectures
1	Introduction to mineral beneficiation	Definition, Scope and necessity of Mineral beneficiation, Historical developments, and Economics. Physical Properties of Ores and their importance in Mineral beneficiation, Sampling: Definition, purpose, types of sampling and measurements of accuracy of sampling. Definition– Concentrate, Tailing, Middling, Recovery and Ratio of concentration, Unit operations, Simple problems on estimation of recovery and ratio of concentration. Efficiency and Selectivity index Major unit operations involved, material balancing, Liberation- importance and determination of liberation size, Crushing- fundamentals, construction, and operational features of primary and secondary crushers. Grinding- theory and practice.	20
2	Laboratory mineral beneficiation	Laboratory sizing and industrial screening including screen efficiency, Movement of solids in liquids. Free, hindered, and equal Settling. Rake and Spiral classifiers including hydro cyclone.	10
3	Mineral Separation	Gravity concentration- Theory and practice of Jigging. Heavy media separation and flowing film concentration. Froth Flotation- Theory, Reagents, Machines and Practice. Magnetic and Electrical separations, Flow sheets for beneficiation of ferrous and non-ferrous ores, coal and selected industrial minerals. Bye-product recovery	10
Total			40

4. Readings:

4.1. Textbook:

- A.M. Gaudin, Principles of Mineral Dressing, Tata McGraw-Hill, 1974
- Barry Wills, Tim Napier-Munn, Mineral Processing Technology: An Introduction to the Practical Aspects of Ore Treatment and Mineral Recovery, 7th Ed., Butterworth-Heinmann, 2006

4.2. Reference Books:

- B.A. Wills, Mineral Processing Technology, 5th Ed., Pergamon Press, 1992
- M.C. Fuerstenau, Kenneth N. Han (Eds.) Principles of Mineral Processing, Society for Mining Metallurgy & Exploration, 2003

5. Outcome of the course:

On successful completion of this course, students will be able to:

- understand the various mineral separation techniques by which valuable constituents of an ore are extracted from minerals.
- understand an appreciation of how processes evolve from feed to products.
- Understand mineral separation techniques through gravity concentration.