GUJARAT TECHNOLOGICAL UNIVERSITY

SUBJECT NAME: Mineral Processing
SUBJECT CODE: 2132103
B.E. 3RD SEMESTER

Type of course: Engineering Science

Prerequisite: None

Rationale:
The Mineral Processing program is offered to prepare students for careers in engineering where Mineral Processing can be applied to the advancement of technology. This education at the intersection of engineering and Mineral Processing will enable students to seek employment in engineering upon graduation while, at the same time, provide a firm foundation for the pursuit of graduate studies in engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning;

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Introduction and scope of Mineral processing**: Introduction and scope of mineral processing in extractive metallurgy. Ores, Mineral resources in India and worldwide for basic metals like Iron, Copper ,Aluminium, lead, Zinc. Physical and chemical characteristics of industrial minerals . Terminology in mineral processing. Economics of ore processing.	**12**	20%
2	**Liberation , Comminution, Sizing and classification** : Liberation and its significance, Comminution and sizing, Laws of Comminution, Crushing and Grinding- types and equipment. Washing, Sorting and hand-picking; Laboratory and industrial screening- equipment, screen efficiency; Classifier- mechanical and hydraulic, sizing and sorting classifiers.	**10**	15
3	**Minerals Separation Processes :** Gravity concentration methods, Tabling, Jigging, Heavy media separation, Separation in vertical and streaming currents, Sedimentation, Dewatering techniques, Thickener, Filtration and Drying.	**12**	20
4	**Froth flotation**:- Physico-Chemical principles, reagents like collectors, modifiers and frothers. Process variables in floatation, Study of flow sheet for flotation of sulphide ores .	**8**	15

5	**Magnetic and Electrostatic separation** : principles, wet and dry separators, High tension separation, Motion of solid in fluid, Strokes and Newton's law, Free and hindered settling, Thickening, Batch and continuous settling chambers.	**8**	10
6	**Simplified beneficiation Flow Sheets of coal and ores of metals** : Beneficiation flow sheets of coal and simple ores of copper, lead, zinc, Iron and with reference to Indian deposits.	**10**	15

Reference Books:

1. Principles of Mineral Dressing, A. M. Gaudin, Tata McGraw Hill
2. Mineral Processing Technology, S K Jain, CBS Publisher
3. Extraction of Non-ferrous Metals, H. S. Ray and K. P. Abraham, East West Press
4. Experiments in Mineral Processing, S. Venkatachalam
5. Mineral Processing, E. J. Pryor, Pergamon Press

Course Outcome:

After learning the course the students should be able to:

1. The student will demonstrate the ability to think in core concept of their engineering application by studying various topics involved in branch specific applications.
2. The student will demonstrate the ability to use appropriate Minerals for appropriate metals extractions for Engineering use.
3. Understand the relevance and importance of the Minerals.
4. Identify different processing of Minerals.

List of Experiments:

1. Identification of different ores and minerals.
2. To Study Jaw crusher.
3. To Study Roll crusher.
4. Study of grinding Ball mill.
5. Study of sieve analysis of weighed powder samples.
6. To study Air classifier.
7. Study of Jigging machine.
8. Study magnetic separator and determine its efficiency by varying magnetic field strength.
9. Study of lab size froth floatation cell.

Major Equipments:

Roll crusher, Jaw crusher, Sieve shaker, Air classifier, Ball mill, Jigging machine , Froth floatation machine, Magnetic seperator

List of Open Source Software/learning website:

I. http://nptel.iitm.ac.in/
II. http://ocw.mit.edu/
III. http://wikipedia.com/minerals

IV. http://www2.estrellamountain.edu/faculty/farabee/biobk/biobookener1.html
V. VI. https://www3.nd.edu/~powers/ame.20231/planckdover.pdf

Active learning Assignments (AL) : Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The
Power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU