# GUJARAT TECHNOLOGICAL UNIVERSITY

**BRANCH NAME: Mining Engineering**
**SUBJECT NAME: Mineral Processing**
**SUBJECT CODE: 2172204**
**B.E. 7th SEMESTER**

**Type of course: Mining**

**Rationale:**
The course is designed to help the student in understanding the different approaches to design a suitable flow path for mineral concentration/beneficiation depending upon different properties of minerals as well as the medium of concentration. They can select a suitable method of concentration of minerals to minimize the waste generation, economical and profitable as well as environment friendly. This course is helpful in grasping process of mineral beneficiation and also to gain knowledge about the various technical and economical issues to be considered in mineral processing.

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Credits | Examination Marks | | | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|
| L | T | P | C | Theory Marks | | | Practical Marks | | | |
| | | | | ESE (E) | PA (M) | | ESE (V) | | PA (I) | |
| | | | | | PA | ALA | ESE | OEP | | |
| 3 | 0 | 2 | 5 | 70 | 20 | 10 | 20 | 10 | 20 | 150 |

**Content:**

| Sr. No. | Content | Total Hrs | % Weightage |
|---|---|---|---|
| 1 | **Communition and Liberation :** Theory and practice of crushing and grainding. | 6 | 10 % |
| 2 | **Sizing and Classification :** Laws of setting of solids in fluid; laboratory methods of sizing and interpretation of sizing data, Industrial sizing by screens. Types of classifiers. Classification as means of sizing/concentration. | 8 | 20 % |
| 3 | **Gravity concentration Methods :** Jigging, flowing, Film concentration like spirals and shaking table, Heavy Media Separation Theory, application and limitations of each method. Introductory Froth Flotation: Physico-Chemical principles underlying flotation-reagents, flotation of sulphides, oxides and non-metalics. | 8 | 20 % |

| | | | |
|---|---|---|---|
| **4** | **Electrical Methods of Concentration :**<br>Electrostatic and Magnetic methods. | **2** | **10 %** |
| **5** | **Dewatering and drying:**<br>Thickening, filtration and drying coal washing, coal washability, crushing, sizing and cleaning of coal. | **6** | **12 %** |
| **6** | **Sampling :**<br>Importance and methods used in Ore-Dressing,Samples collection, reduction and handling. | **6** | **14 %** |
| **7** | **Simplified Flow Sheets:**<br>Beneficiation of coal and simple ores of copper, lead, zinc, Iron and manganese with reference to Indian deposits. | **6** | **14 %** |

**Suggested Specification table with Marks (Theory):**

| **Distribution of Theory Marks** | | | | | |
|---|---|---|---|---|---|
| R Level | U Level | A Level | N Level | E Level | C Level |
| **64 %** | **18 %** | **12 %** | **2 %** | **2 %** | **2 %** |

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Reference Books:**

| **Sr. No.** | **Author** | **Title of Books** | **Publication** |
|---|---|---|---|
| 1 | Wills | Mineral Processing Technology | Elsevier |
| 2 | A.M.Goudin | Principals of Mineral Dressing | Mc Graw Hills |
| 3 | S.K.Jain | Mineral Processing | CBS Publication |

**Course Outcome:**

After learning the course the students should be able to:

i. Prepare and design a flow sheet of ore beneficiation plant depending upon various conditions.
ii. Select suitable machineries and methods depending upon the economical conditions.
iii. Explain various technical parameters related with mineral processing.

iv. Follow the environment friendly and economic working procedure for mineral benificiation.

**List of Experiments:**

| Sr. No | Practical /Exercise | Approx. Hours Required |
|---|---|---|
| 1 | Performing Communition operation of Rock Samples using Jaw and Gyratory crushers. | 4 |
| 2 | Performing Sieve analysis test and drawing Log-Log curve. | 4 |
| 3 | Concentration of given sample of mineral by Jigging operation and analyze the result with remarks. | 4 |
| 4 | Concentration of Sulphide mineral by Froth Flotation technique and analyze the result with remarks. | 4 |
| 5 | Performing Coal preparation in Laboratory including all necessary steps. | 4 |
| 6 | Performing Heavy Media Separation test of any mineral. | 4 |
| 7 | Drawing Beneficiation Flow Sheet of various minerals. | 4 |
| **Total** | | **28** |

**Major Equipment:**

i. Various Size reduction equipments like Jaw Crusher, Gyratory Crusher, Cone Crusher, Ball Mill, Rod Mill etc.
ii. Various Sizing equipments like Sieve Shaker, Various size sieves,
iii. Weighing machine.
iv Jigging machine, Froth Flotation machine, Magnetic Separator,
Heavy media separation chamber, Will Fly Tables, Cyclone etc.
v Chemicals of different specific gravity, collectors, frothers etc.
vi Various charts and models etc.

**List of Open Source Software/learning website:**

i. www.researchgate.net
ii. www.min.eng.com
iii. www.journal.elsevier.com
iv. www.mdpi.com/journal/mineral

**ACTIVE LEARNING ASSIGNMENTS**: 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.