MIN ENG 4424: Mineral Processing II (Mechanics and Design)

Missouri University of Science and Technology
Department of Mining and Nuclear Engineering

3 Credit Hours

Course Description: Mineral Particle mechanics of comminution, sizing, classification, concentration, filtration, and thickening. Mill and equipment selection and design including flowsheet, development and plant assessment.

Prerequisites: MIN ENG 3412 (Co-listed with Met Eng 5270) or equivalent; engineering standing.

Course Goals: Upon completion of the course, students will possess the knowledge needed to design a mineral processing operation that ensures maximum profitability for a mining company while achieving the required product quality specifications. Students will understand the methodology used to select the appropriate unit operations, determine the optimum operating conditions and select the required size of the unit. A knowledge of product quality assurance programs that includes the monitoring of plant efficiency will be demonstrated.

Textbooks: Course Notes

References:


Learning Outcomes: (Undergraduate and Graduate Students)

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<th>Outcome</th>
<th>Implementation Strategy</th>
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<td>1. Develop processing flow sheets for the production of aggregates and mineral concentrates from raw ore material.</td>
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<td>2. Obtain the knowledge for the typical process circuits used to treat aggregates and ores containing one or more valuable minerals.</td>
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<td>3. Conduct mass and water balances throughout the process flow sheet.</td>
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<td>4. Estimate the particle size distribution produced from various comminution devices based on established models for each unit.</td>
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<td>5. Design the unit processes needed to achieve a given particle size reduction in a communication circuit</td>
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<td>6. Predict solid-solid and solid-liquid separation performances based on known physical properties of the raw material and process unit models.</td>
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<td>7. Determine the process unit, size and number needed to effectively achieve solid-solid separations and solid liquid separations.</td>
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Course Topics:

1. Flow Sheet Development
   a. Aggregates
   b. Minerals
2. Crushing and Grinding Systems
   a. Breakage Characteristics and Predictions
   b. Unit Scale-Up, Size and Number Selection
   c. Comminution Circuit Evaluation and Design
3. Froth Flotation Design and Performance Predictions
   a. Feed Characterization
   b. Conventional Flotation
   c. Column Flotation
   d. Process Circuits
4. Magnetic Unit System Design
5. Dewatering
   a. Filtration
   b. Centrifuges
6. Clarification
   a. Thickener Design
   b. Waste Disposal Design

Course Grading:  
Homework Assignments  100%

Late Policy:  
Assignments submitted late with be deducted 4 points for each day that the paper was late. Papers due on a Friday and submitted on the following Monday will be deducted 4 points. After being two weeks late, the assignment will be given a zero grade.

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