



# IIPM SCHOOL OF ENGINEERING & TECHNOLOGY

## LESSON PLAN: 2023-24

### Sub: Surface Mining Technology (SMT)

Branch : Mining Engineering Semester : 3rd  
 Faculty name : Sanjay Kumar Majhi  
 Duration : 60 hours

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|----------|---|
| Unit - 1 | <b>Choice of Opencast Mining</b> <ul style="list-style-type: none"> <li>State factors affecting choice of Open casting Mining method.</li> <li>Define stripping ratio.</li> <li>Determine overburden/ore ratio.</li> <li>Find out cut off stripping ratio.</li> <li>Determine quarriable limit.</li> <li>State favorable conditions for mechanized Opencast Mines.</li> <li>State limitations of large open pits.</li> <li>Define Box cut and determine the location of Box cut.</li> </ul>   |
| Unit – 2 | <b>Benching</b> <ul style="list-style-type: none"> <li>Determine bench parameters- height, width &amp; slope.</li> <li>Determine length of bench for overburden and ore.</li> </ul>   |
| Unit – 3 | <b>Slope Stability</b> <ul style="list-style-type: none"> <li>Define slope stability.</li> <li>Factors affecting slope stability.</li> <li>Types of slope stability.</li> <li>Causes and prevention of slope stability.</li> </ul>  |
| Unit – 4 | <ul style="list-style-type: none"> <li><b>Explosive and blasting accessories</b></li> <li>Define explosive, state constituents of explosives , properties &amp; characteristics of explosives.</li> <li>Classify explosives, state composition and uses of explosives.</li> <li>Explain PMS and SMS.</li> <li>Define permitted explosive and classify permitted explosive.</li> <li>Explain sheathed, equivalent sheathed and ultra safe explosive.</li> <li>State properties of permitted explosives.</li> <li>State composition &amp; constructional features of safety fuse, detonating fuse, detonating relay, igniter cord, nonel and raydet..</li> <li>Describe different types of detonators and uses, state advantages of delay detonators.</li> <li>State different types of exploder, its construction and safety features, circuit tester.</li> <li>Describe stemming rod, crack detector knife, crimper.</li> </ul> |
| Unit – 5 | <b>Drilling</b> <ul style="list-style-type: none"> <li>Explain different principles and methods of exploratory drilling in surface mining.</li> <li>State different types of drill used in Opencast mining.</li> <li>Describe simple constructional features of churn drill, drills master, wagon drill</li> </ul>  |

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|                 | <p>and jack hammer.</p> <ul style="list-style-type: none"> <li>• State D.T.H..</li> <li>• Describe different types of drill bits in drilling.</li> </ul>   |
| <b>Unit – 6</b> | <p><b>Blasting practices in Mines</b></p> <ul style="list-style-type: none"> <li>○ Describe preparation of charge.</li> <li>○ State procedure of firing shots, direct and inverse initiation, stemming materials, water ampoules, cushion firing.</li> <li>○ Define blasting efficiency.</li> <li>○ State and describe plaster shooting and pop shooting, toe blasting.</li> </ul> |
| <b>Unit – 7</b> | <p><b>Controlled Blasting Techniques as per statutory provision</b></p> <ul style="list-style-type: none"> <li>○ State and describe pre-splitting, cushion blasting, muffle blasting, coyote hole blasting, chambered hole blasting, directional blasting, Electronics Blasting System (EBS) .</li> </ul>  |
| <b>Unit – 8</b> | <p><b>Magazines</b></p> <ul style="list-style-type: none"> <li>○ Describe layout and arrangement of different types of magazines, state their safety features.</li> </ul>  |

| <b>Sl. No.</b> | <b>Title of the Book</b>    | <b>Name of Authors</b> |
|----------------|-----------------------------|------------------------|
| 1              | Surface Mining Technology   | S.K. DAS               |
| 2              | Blasting Manuals            | Sandhu & Pradhan       |
| 3              | Blasting Practices in Mines | S.K. DAS               |
| 4              | EMT VOL I                   | D.J. DESHMUKH          |
| 5              | Surface Mining              | G.B. Mishra            |

## Objective

- Develop the concept of choice of Opencast Mining.
- Determine bench parameters.
- Define slope stability and types, prevention of Slope failure.
- Explain various compositions, properties of Explosives and Blasting accessories.
- State and explain different drilling methods.
- Explain blasting practice in Mines.
- Describe blasting techniques as per statutory provisions.
- Identify basic constructional features and safety provisions of magazine.

**Learning Outcome:** As a Mining Engineer, one has to develop the basic concepts and principles of winning and working in mines. Further, he should have basic knowledge of explosives for development of mines.

| Sl. No | Chapter | Proposed Week for Teaching | Lecture No. | Sub. Topic                 | Important Teaching Points   | Content Source            |
|--------|---------|----------------------------|-------------|----------------------------|---|---------------------------|
| 01     | I       | 1 <sup>ST</sup>            | 01          | Choice of open cast mining | Introduction and types mines  | Surface Mining Technology |
| 02     |         |                            | 02          | Choice of open cast mining | Factors affecting on choice of open cast mining                             | Surface Mining Technology |
| 03     |         |                            | 03          | Choice of open cast mining | Condition favouring adoption of mechanized o/c mines                        | Surface Mining Technology |
| 04     |         |                            | 04          | Choice of open cast mining | Stripping ratio, Break even ratio, <u>Factors affecting stripping ratio</u> | Surface Mining Technology |
| 05     |         | 2 <sup>ND</sup>            | 01          | Choice of open cast mining | Quarriable limit  | Surface Mining Technology |
| 06     |         |                            | 02          | Choice of open cast mining | Limitation on large open pit mines  | Surface Mining Technology |

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|----|-----------|-----------------|-----------------|------------------------------------|--|---|---------------------------|
| 07 | <b>II</b> |                 | 03              | Choice of open cast mining         | Doubt Clearing Class   |   |                           |
| 08 |           |                 | 04              | Choice of open cast mining         | Box cut,Location ,layout   | Surface Mining Technology               |                           |
| 09 |           |                 | 3 <sup>RD</sup> | 01                                 | Choice of open cast mining   | Determination of overburden,ore ratio   |                           |
| 10 |           |                 |                 | 02                                 | Choice of open cast mining   | Calculation of ore reserve and OB       | Surface Mining Technology |
| 11 |           | 03              |                 | Choice of open cast mining         | Doubt Clearing Class on 1 <sup>st</sup> chapter  |   |                           |
| 12 |           | 04              |                 | Bench Parameters                   | Bench terminology in open cast mines with figure   | Surface Mining Technology               |                           |
| 13 |           | 4 <sup>TH</sup> | 01              | Bench Parameters                   | Bench,Bench height,,face,width,crest,t oe,bench face angle,pit slope angle                   | Surface Mining Technology               |                           |
| 14 |           |                 | 02              | Bench Parameters                   | Cut,safety catch,berm,description of berm  | Surface Mining Technology               |                           |
| 15 |           |                 | 03              | Bench Parameters                   | Determination of bench Parameters...Height,Wi dth and slope                                  | Surface Mining Technology               |                           |
| 16 |           |                 | 04              | Bench Parameters                   | Length of ore bench andOB bench and Doubt Clearing Class                                     | Surface Mining Technology               |                           |
| 17 |           | 5 <sup>TH</sup> | 01              | Class test                         | Chapter 01 and 02  |   |                           |
| 18 |           |                 | 02              | Slope stability                    | Intro,slope stability  | Surface Mining Technology               |                           |
| 19 |           |                 | 03              | Slope stability                    | Types of slope stability   | Surface Mining Technology               |                           |
| 20 |           |                 | 04              | Slope stability                    | Factors affecting slope stability  | Surface Mining Technology               |                           |
| 21 |           | 6 <sup>TH</sup> | 01              | Slope stability                    | Cause of slope stability   | Surface Mining Technology               |                           |
| 22 |           |                 | 02              | Slope stability                    | Prevention of slope stability on ore bench,OB bench and OB dump yard                         | Surface Mining Technology               |                           |
| 23 |           |                 | 03              | Slope stability                    | Doubt Clearing Class   |   |                           |
| 24 |           |                 | 04              | Explosive and Blasting accessories | Blasting,explosive,comp osition of explosive,diff. properties and charactristic of explosive | Explosive & Blasting Practices in Mines |                           |

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|----|------------|------------------|----|------------------------------------|--|---|
| 25 |            | 7 <sup>TH</sup>  | 01 | Explosive and Blasting accessories | Classification of explosive and use of explosive   | Explosive & Blasting Practices in Mines |
| 26 |            |                  | 02 | Explosive and Blasting accessories | Explain PMS and SMS  | Explosive & Blasting Practices in Mines |
| 27 |            |                  | 03 | Explosive and Blasting accessories | Permitted explosive & classification   | EMT vol. 1                              |
| 28 |            |                  | 04 | Explosive and Blasting accessories | Sheathed explosive, Equivalent sheathed explosive, & ultra safe explosive                            | EMT vol. 1                              |
| 29 | <b>III</b> | 8 <sup>TH</sup>  | 01 | Explosive and Blasting accessories | Properties of Permitted explosive  | EMT vol. 1                              |
| 30 |            |                  | 02 | Explosive and Blasting accessories | Composition & constructional features of safety fuse, detonating fuse, relay, ignitor, nonel, raydet | Explosive & Blasting Practices in Mines |
| 31 |            |                  | 03 | Explosive and Blasting accessories | Types of detonator, its uses, advantages of delay detonator  | Explosive & Blasting Practices in Mines |
| 32 |            |                  | 04 | Explosive and Blasting accessories | Types of exploder, its construction, safety feature & circuit tester                                 | EMT vol. 1                              |
| 33 |            | 9 <sup>TH</sup>  | 01 | Explosive and Blasting accessories | Stemming rod, crack detector, knife, crimper   | EMT vol. 1                              |
| 34 |            |                  | 02 | Explosive and Blasting accessories | <u>Class test &amp; doubt class</u>  |   |
| 35 |            |                  | 03 | DRILLING                           | Intro. & application of Drilling/Boring  | EMT vol. 1                              |
| 36 |            |                  | 04 | Drilling                           | Principles & method of exploratory drilling in o/c mines   | EMT vol. 1                              |
| 37 | <b>IV</b>  | 10 <sup>TH</sup> | 01 | Drilling                           | Types of drill used in o/c mines   | EMT vol. 1                              |
| 38 |            |                  | 02 | Drilling                           | Construction features of churn drill & rope drill  | EMT vol. 1                              |
| 39 |            |                  | 03 | Drilling                           | Drill master, wagon drill, & jack hammer   | EMT vol. 1                              |
| 40 |            |                  | 04 | Drilling                           | Explanation of D.T.H& T.L.D  | Explosive & Blasting Practices in Mines |

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| 41 | V | 11 <sup>TH</sup> | 01 | Drilling  | Diff. types of drill bits in drilling              | EMT vol. 1                              |
| 42 |   |                  | 02 | Drilling  | <u>Doubt Clearing Class</u>                        |   |
| 43 |   |                  | 03 | BLASTING Practices in o/c mines                 | Intro & Description                                | Explosive & Blasting Practices in Mines |
| 44 |   |                  | 04 | Blasting Practices in o/c mines                 | Preparation of loading & charge                    | EMT vol. 1                              |
| 45 |   | 12 <sup>TH</sup> | 01 | Blasting Practices in o/c mines                 | Procedure of blasting or firing                    | EMT vol. 1                              |
| 46 |   |                  | 02 | Blasting Practices in o/c mines                 | Pattern of blasting                                | Explosive & Blasting Practices in Mines |
| 47 |   |                  | 03 | Blasting Practices in o/c mines                 | Diff. system of Blasting initiation                | Explosive & Blasting Practices in Mines |
| 48 |   |                  | 04 | Blasting Practices in o/c mines                 | Procedure of stemming                              | Surface Mining Technology               |
| 49 |   | 13 <sup>TH</sup> | 01 | Blasting Practices in o/c mines                 | Water ampoules,cushion blasting                    | Explosive & Blasting Practices in Mines |
| 50 |   |                  | 02 | Blasting Practices in o/c mines                 | Blasting efficiency                                | Surface Mining Technology               |
| 51 |   |                  | 03 | Blasting Practices in o/c mines                 | Diff. types of secondary blasting                  | Explosive & Blasting Practices in Mines |
| 52 |   |                  | 04 | Blasting Practices in o/c mines                 | Class test on chapter 5 & 6                        |   |
| 53 |   | 14 <sup>TH</sup> | 01 | Controlled Blasting techniques use in o/c mines | Pre-splitting,Cushion blasting                     | Explosive & Blasting Practices in Mines |
| 54 |   |                  | 02 | Controlled Blasting techniques use in o/c mines | Muffled blasting,coyote hole blasting              | Explosive & Blasting Practices in Mines |
| 55 |   |                  | 03 | Controlled Blasting techniques use in o/c mines | Chambered hole blasting,Electronic blasting system | Explosive & Blasting Practices in Mines |
| 56 |   |                  | 04 | Controlled Blasting                             | Diff. directional blasting                         | Explosive & Blasting                    |

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|----|------------------|----|--|---|--|-----------------------|
|    |                  |    |  | techniques use<br>in o/c mines                        |  | Practices in<br>Mines |
| 57 | 15 <sup>TH</sup> | 01 | Controlled<br>Blasting<br>techniques use<br>in o/c mines | Revision ,Discussion<br>and Doubt clearing<br>class   |  |                       |
| 58 |                  | 02 | MAGAZINE   | Intro. , layout of<br>magazine & types of<br>magazine | Explosive &<br>Blasting<br>Practices in<br>Mines |                       |
| 59 |                  | 03 | Magazine   | Safety features of<br>magazine                        | Explosive &<br>Blasting<br>Practices in<br>Mines |                       |
| 60 |                  | 04 | Magazine   | Unit test on chapter 7 &<br>8                         |  |                       |

Signature of

**Faculty Member**

**HOD**

**Principal/ Director**