 IIPM SCHOOL OF ENGINEERING & TECHNOLOGY

**LESSON PLAN: 2022-23**

**Sub: Th.3- Mine Ventilation (MV)**

**Branch : Mining Semester : 4th**

**Faculty name : Soumya Ranjan Dash**

**Duration : 60 hours**

**Syllabus :**

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| **UNIT 01** | **Natural Ventilation**  **o Definition of natural ventilation and factors affecting natural ventilation.**  **o Describe the different types of Thermometer.**  **o Describe the different types of Barometer.**  **o Describe kata thermometer.**  **o Describe water gauge.**  **o Calculate ventilation pressure by using piton static tube.**  **o Explain effects of heat & humidity.**  **o Explain natural ventilation motive column, geothermic gradient.**  **o Enumerate laws of mine air friction and solve problems on above.**  **o Statutory provision as per CMR 2017,MMR 1961.** |
| **UNIT 02** | **Air Crossing and distribution**  **o Describe ventilation stopping, air crossing, ventilation door, brattice partition.**  **o Describe different types of ventilation.**  **o Accessional & declensional ventilation.**  **o Homotropal & Antitropal ventilation.**  **o Boundary ventilation.**  **o Central & combined ventilation.**  **o Explain splitting of air current & solve numerical problems on splitting.**  **o Describe air locks at pit top.** |
| **UNIT 03** | **Mechanical Ventilation**  **o Explain construction & principle of operation of centrifugal flow fans.**  **o State fan laws & calculate fan efficiency and capacity.**  **o Explain installation of mine fan with reversal arrangement.**  **o Describe fan drift, fan drive, evasee and diffusers. Explain fan characteristics and mine characteristics.**  **o Describe methods of output of mine fans.** |
| **UNIT 04** | **Booster fan and its Effects**  **o Describe installation, location and purpose of booster fan.**  **o Solve problems relating to booster fan.** |
| **UNIT 05** | **Auxiliary Ventilation**  **o Describe systems of auxiliary ventilation.**  **o Describe advantages & disadvantages of auxiliary ventilation.** |
| **UNIT 06** | **Ventilation Survey**  **o Describe methods of pressure survey using barometer, gauge and pitot tube with manometer. o Describe the method of measurement of cross-sectional area.**  **o Describe the method of velocity measurements by using anemometer, voltmeter, and pitot- static tube and smoke & cloud method.**  **o Determine percentage of oxygen, methane, carbon monoxide SO2 & H2S.** |
| **UNIT 07** | **Leakage of air in Mines**  **o Describe causes and preventive measures of leakage of air in mines.** |

**Books Suggested:**

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| * Mine Ventilation | G B Mishra |
| * EMT II * Mine Ventilation | D J Deshmukh  L C KAKU |

**Objective :**

o Describe different instruments measuring temperature, pressure and humidity and have idea on natural ventilation and laws of mine air friction.

o Describe different types of ventilation and methods of air crossings and distribution.

o Illustrate different types of fans, fan characteristics, Mine characteristics and selection of fans.

o Identify different locations of booster fan and solve simple problems relating to this.

o Explain different systems of auxiliary ventilation and its advantages and disadvantages.

o Explain different ways of pressure survey, quantity survey & quality survey.

o Explain causes & preventives measure of leakage of air in mines.

**Learning Outcome:** The provision of proper ventilation is very essential for any underground mining operation. As a mining Engineer, one should have the thorough knowledge of types of ventilation, methods of air crossing, types of fans etc

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| **Sl. No** | **Chapter** | **Proposed Week for Teaching** | **Lecture No.** | **Sub. Topic** | **Important Teaching Points** | **Content Source** |
| **1** | **I** | **I** | **01** | Natural Ventilation | Definition & Factors affecting natural ventilation | G B Mishra  LC kaku |
| **2** | **02** | Natural Ventilation | Types of thermometer & kata thermometer | G B Mishra  LC kaku |
| **3** | **03** | Natural Ventilation | Types of barometer  Water gauge | G B Mishra  LC kaku |
| **4** | **04** | Natural Ventilation | Ventilation pressure by piton static tube  Effects of heat & humidity | G B Mishra  LC kaku |
| **5** | **II** | **05** | Natural Ventilation | natural ventilation motive column, geothermic gradient. | G B Mishra  LC kaku |
| **6** | **06** | Natural Ventilation | laws of mine air friction and problems | G B Mishra  LC kaku |
| **7** | **07** | Natural Ventilation | Statutory provision as per CMR 2017,MMR 1961 | G B Mishra  LC kaku |
| **8** | **08** | Natural Ventilation | Unit Test-I  Revision |  |
| **9** | **II** | **III** | **01** | Air Crossing & Distribution | Ventilation stopping, air crossing, ventilation door, brattice partition. | **D J Deshmukh**  **UMS Vol-I** |
| **10** | **02** | Air Crossing & Distribution | Different types of ventilation | **D J Deshmukh**  **UMS Vol-I** |
| **11** | **03** | Air Crossing & Distribution | Accessional & declensional ventilation | **D J Deshmukh**  **UMS Vol-I** |
| **12** | **04** | Air Crossing & Distribution | Homotropal & Antitropal ventilation. | **D J Deshmukh**  **UMS Vol-I** |
| **13** | **IV** | **05** | Air Crossing & Distribution | Boundary ventilation | **D J Deshmukh**  **UMS Vol-I** |
| **14** | **06** | Air Crossing & Distribution | Central & combined ventilation | **D J Deshmukh**  **UMS Vol-I** |
| **15** | **07** | Air Crossing & Distribution | Splitting of air current | **D J Deshmukh**  **UMS Vol-I** |
| **16** | **08** | Air Crossing & Distribution | Numerical problems on splitting | **D J Deshmukh**  **UMS Vol-I** |
| **17** | **V** | **09** | Air Crossing & Distribution | Air locks at pit top. | **D J Deshmukh**  **UMS Vol-I** |
| **18** | **10** | Air Crossing & Distribution | Unit Test-II  Revision |  |
| **19** | **III** | **01** | Mechanical Ventilation | Construction of centrifugal flow fans | **G B Mishra**  **UMS Vol-I** |
| **20** | **02** | Mechanical Ventilation | Principle of operation of centrifugal flow fans. | **G B Mishra**  **UMS Vol-I** |
| **21** | **VI** | **03** | Mechanical Ventilation | Fan laws & calculation of fan efficiency and capacity | **G B Mishra**  **UMS Vol-I** |
| **22** | **04** | Mechanical Ventilation | Installation of mine fan with reversal arrangement | **G B Mishra**  **UMS Vol-I** |
| **23** | **05** | Mechanical Ventilation | Fan drift, fan drive | **G B Mishra**  **UMS Vol-I** |
| **24** | **06** | Mechanical Ventilation | Evasee and diffusers | **G B Mishra**  **UMS Vol-I** |
| **25** | **VII** | **07** | Mechanical Ventilation | Fan characteristics and mine characteristics | **G B Mishra**  **UMS Vol-I** |
| **26** | **08** | Mechanical Ventilation | Methods of output of mine fans | **G B Mishra**  **UMS Vol-I** |
| **27** | **09** | Mechanical Ventilation | Unit Test-III  Revision |  |
| **28** | **IV** | **01** | Booster Fan & its Effect | Installation of Booster Fan | **L C Kaku**  **G B Mishra**  **UMS Vol-I** |
| **29** | **VIII** | **02** | Booster Fan & its Effect | Installation of Booster Fan | **L C Kaku**  **G B Mishra**  **UMS Vol-I** |
| **30** | **03** | Booster Fan & its Effect | Location of Booster Fan | **L C Kaku**  **G B Mishra**  **UMS Vol-I** |
| **31** | **04** | Booster Fan & its Effect | Purpose of Booster Fan | **L C Kaku**  **G B Mishra**  **UMS Vol-I** |
| **32** | **05** | Booster Fan & its Effect | Effect of Booster fan | **L C Kaku**  **G B Mishra**  **UMS Vol-I** |
| **33** | **IX** | **06** | Booster Fan & its Effect | Problems related to booster fan | **L C Kaku**  **G B Mishra**  **UMS Vol-I** |
| **34** | **07** | Booster Fan & its Effect | Problems related to booster fan | **L C Kaku**  **G B Mishra**  **UMS Vol-I** |
| **35** | **08** | Booster Fan & its Effect | Problems related to booster fan | **L C Kaku**  **G B Mishra**  **UMS Vol-I** |
| **36** | **09** | Booster Fan & its Effect | Unit Test-IV |  |
| **37** | **X** | **10** | Booster Fan & its Effect | Revision |  |
| **38** | **V** | **01** | Auxiliary Ventilation | Systems of Auxiliary Ventilation | **G B Mishra**  **D J Deshmukh** |
| **39** | **02** | Auxiliary Ventilation | Systems of Auxiliary Ventilation | **G B Mishra**  **D J Deshmukh** |
| **40** | **03** | Auxiliary Ventilation | Systems of Auxiliary Ventilation | **G B Mishra**  **D J Deshmukh** |
| **41** | **XI** | **04** | Auxiliary Ventilation | Advantages of Auxiliary Ventilation | **G B Mishra**  **D J Deshmukh** |
| **42** | **05** | Auxiliary Ventilation | Disadvantages of Auxiliary Ventilation | **G B Mishra**  **D J Deshmukh** |
| **43** | **06** | Auxiliary Ventilation | Unit Test-V |  |
| **44** | **07** | Auxiliary Ventilation | Revision |  |
| **45** | **VI** | **XII** | **01** | Ventilation Survey | Pressure Survey using differential barometer | **G B Mishra**  **UMS Vol-I** |
| **46** | **02** | Ventilation Survey | Pressure Survey using gauge & pitot tube with manometer | **G B Mishra**  **UMS Vol-I** |
| **47** | **03** | Ventilation Survey | Method of measurement of cross-sectional area | **G B Mishra**  **UMS Vol-I** |
| **48** | **04** | Ventilation Survey | Method of measurement of cross-sectional area | **G B Mishra**  **UMS Vol-I** |
| **49** | **XIII** | **05** | Ventilation Survey | Velocity measurement by using anemometer, voltmeter | **G B Mishra**  **UMS Vol-I** |
| **50** | **06** | Ventilation Survey | Velocity measurement by pitot-static tube | **G B Mishra**  **UMS Vol-I** |
| **51** | **07** | Ventilation Survey | Velocity measurement by smoke & cloud method | **G B Mishra**  **UMS Vol-I** |
| **52** | **08** | Ventilation Survey | Determination % of Oxygen, Methane, CO, SO2 & H2S | **G B Mishra**  **UMS Vol-I** |
| **53** | **XIV** | **09** | Ventilation Survey | Unit Test-VI |  |
| **54** | **10** | Ventilation Survey | Revision |  |
| **55** | **VII** | **01** | Leakage of Air in Mines | Causes of Leakage of Air in mines | **G B Mishra**  **UMS Vol-I** |
| **56** | **02** | Leakage of Air in Mines | Causes of Leakage of Air in mines | **G B Mishra**  **UMS Vol-I** |
| **57** | **XV** | **03** | Leakage of Air in Mines | Preventive measures of Leakage of Air in mines | **G B Mishra**  **UMS Vol-I** |
| **58** | **04** | Leakage of Air in Mines | Preventive Measures of Leakage of Air in mines | **G B Mishra**  **UMS Vol-I** |
| **59** | **05** | Leakage of Air in Mines | Unit Test-VII |  |
| **60** | **06** | Leakage of Air in Mines | Revision |  |

Signature of

**Faculty Member HOD Principal/ Director**