4297 - MINE VENTILATION

Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)			
					Theory		Practical Ex.	Total
Lectures	Practical	Credits						
3	2	5	25	25	3 Hrs	100	50/or	200

Pre-requisite	Source
4296	MIN

Semester	Theory	Test	Total	TW	PR	Gr Total
	75	25	100	50	50	200

Rationale: Mine ventilation is an important aspect in underground mining. With increased depth, it has gained importance in open cast mine also. This course is intended to study all aspects of mine ventilation including skills for measurement of various parameters. Objective: On completion of this course a diploma holder who intend to work in underground metal & coal mines will also be able to look after the ventilation aspects.

COURSE CONTENTS	Hrs	Mks
1. MINE GASES Atmospheric air, different types of gases found in the mines, their sources, physical, chemical and physiological properties of various gases, gassyness of mine, methane layering, gas blowers. Instruments used for detection of various gases – flame safety lamp, methanometer, multi-gas detector, CO-detector, collection of air samples permissible concentration as per mine regulation. CMR: -116, 130, 121, 136 (a), 142,143, 144, 145, 146, 147, 155, 156, 157, 158.	8	16
2. MINE ATMOSPHERE The objectives of mine ventilation; the atmospheric pressure, Fortin and Aneroid Barometers, sources of water vapour and heat in mines. Effect of humidity at the work places, heat stroke, whirling hygrometer, and kata thermometer.	4	8
3. NATURAL VENTILATION Various factor causing NVP, The motive column, limitations of NVP, numerical examples.	6	12
4. MECHANICAL VENTILATION The fan house, mine regulations related to it, forcing & exhaust system, central and bound ventilation system, ventilation structures for regulation and direction of air current – stopping, door, air-lock, regulator and air crossing, assential and descential ventilation, homotropal and antitropal ventilation, air leakage and their prevention.	6	12
5. LAWS OF MINE AIR FLOW Pressure loss due to flow and pressure difference, measurement of the pressure difference by inclined manometer, measurement of air velocity by different instruments, pitot tube, angle of yaw, atkinsons formula on pressure loss, laminar flow, turbulent flow, the resistance to flow of air, an introduction to head resistance and local resistance, galleries in parallel and series, numerical problems on frictional resistance and mine resistance, purpose of splitting, advantages and disadvantages, equivalent orifice, numerical examples.	10	20
6. MINE FANS Centrifugal fan and axial flow fan, principle of action and comparison, air reversal arrangement. The fan laws, theoretical depression, Horsepower, manometric, mechanical and overall efficiencies. The evassee and its functions, savings in head due to evassee, mine characteristic curve, characteristic curves of fans, fans in series and parallel, Comparison of characteristic curves of fans with mine characteristic curve and location of operating point. CMR: - 131,132,133,134, 135, 136.	7	14
7. AUXILIARY FAN AND BOOSTER FAN Ventilation of narrow headings by auxiliary fans, different methods. Contra rotating axial flow fan, rigid and flexible ducts, purpose of installation of booster fans, neutral line, critical pressure of booster fan, advantages and disadvantages. CMR:- No. 137, 138, 140	5	10
8. VENTILATION SURVEY Objectives, ventilation survey stations, pressure survey with aneroid barometer and with inclined manometer, quantity survey, precautions and duties of ventilation officer. CMR: 139	4	8
Total	48	100

PRACTICALS: (Any Ten)

1. Measurement of absolute pressure with the help of Fortin barometer and Aneroid Barometer and to study changes in pressure with change in temperature and humidity.

2. Measurement of relative humidity with Whirling hygrometer & to study Kata thermometer
3. To sketch various ventilation appliances such as stopping doors, Air locks, regulators and air crossing
4. Measurement of air velocity with vane-anemometer and to counter check air measured with velometer and vice versa.
5. Measurement of pressure difference with inclined manometer keeping various inclinations.
6. Measurement of air velocity with pitot tube.
7. Sketches of installation of centrifugal fan and axial flow fan.
8. Study of fan laws by changing the speed of rotation.
9. Sketches of installation of auxiliary fan and booster fan.
10. To study the effect of changing pitch in axial flow fan
11. Sketches of general ventilation layout.
12. Study of pressure loss in ventilation ductings.

REFERENCE BOOKS:

1) Element of Mining Technology, Vol. II by Shri D. J. Deshmukh.
2) Mine Ventilation by A. Skochinsky
3) Numerical problems on Mine Ventilation by Shri L. C. Kaku.
4) Mine Ventilation by Shri G. B. Mishra
5) Mine Ventilation (Question & paper) by B. Ghosh.
6) Mine Environment & Ventilation by Shri G. B. Mishra.
7) The Coal Mine Regulation – 1957 by Shri L. C. Kaku.