GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: MINE VENTILATION
(COURSE CODE: 3352202)

Diploma Programme in which this course is offered	Semester in which offered
Mining Engineering	5th Semester

1 RATIONALE

The diploma holders in mining engineering will be responsible to keep underground mines in comfortable working conditions & safe by ensuring brisk ventilation. They should be able to select the suitable fans & drive as well as select proper airways to ventilate whole mine &/or its various parts, economically. This subject provides them basic knowledge of mine atmosphere, its ventilation & lighting, its associated problems & remedies.

2 LIST OF COMPETENCY (Programme outcome according to NBA terminology)

The course content should be taught and with the aim to develop required skills in the students so that students are able to acquire following competency:

- **Operate and maintain mine atmosphere, mine ventilation & lighting in mining operations safely.**

3 COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Assess quality of air in mine atmosphere.
ii. Comprehend principles of ventilation to improve quality of atmosphere in underground mines.
iii. Comprehend importance of lighting in safe mining operations.

4 TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	150
4	0	2	6	70	30	20	30	

Legends: L - Lecture; **T -**Tutorial/Teacher Guided Student Activity; **P -** Practical; **C -** Credit; **ESE** -End Semester Examination; **PA -** Progressive Assessment

5 COURSE DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Mine Atmosphere	1a: Explain composition of surface & mine air. 1b: Explain formation, properties, physiological effects, detection, causes of its increase/reduction in percentage & remedial measures of different types of mine gases. 1c: Explain mine air sampling & measurement. 1d: Explain effects of humidity & temperature.	1.1 Composition & Comparison of Mine atmosphere & surface atmosphere. 1.2 Constituents, properties & physiological effects of various common mine air gases like Oxygen with causes of its reduction, Nitrogen & Carbon dioxide with reasons of its increasing percentage. 1.3 Impurities in mine air- (a) Toxic Gases- (i) Carbon dioxide (CO_2) - formation with reasons of its increasing percentage, properties & physiological effects. (b) Acutely poisonous gases- (i) Carbon mono oxide- Sources, properties, physiological effects & its detection by MSA Detector. (ii) Sulphurated Hydrogen (H_2S)-formation, propertie physiological effects. (iii) Nitrous fumes (NO, NO_2, N_2O_4)- formation, properties & physiological effects. (iv) Sulphur dioxide (SO_2)- formation, properties & physiological effects. (c) Non toxic gases- Methane (CH_4) (Firedamp)- emission, properties, limits of inflammability (Cowards diagram), its layering, Drainage & emission. 1.4 Firedamp detection by flame safety Lamp & precautions when detected beyond safe levels. 1.5 Different damp with its compositions. 1.6 Mine air Sampling & analysis: Orsat apparatus & Haldane apparatus.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		1.7 Humidity & temperature- causes, effects & its measurement (by Hygrometer & Kata thermometer).
Unit – II Mine Ventilation	2a. Explain process of natural ventilation in mines. 2b. Draw a ventilation plan for an underground mine. 2c. Explain mechanical ventilation by fan with its types & construction. 2d. Explain the process of conducting ventilation survey in a mine and analysing the results of ventilation survey.	2.1 Natural ventilation- causes & its establishment. 2.2 Standards of ventilation. 2.3 Mechanical Ventilation by fans- (a) Fan types- basis of suction/forcing, construction & location & its major factors for its selection. (c) Installation of main fan at shaft top. (d) Centrifugal fan- its principle, Installation, Sirocco fan. (e) Air screw or Axial flow fan: installation, construction & salient features. (f) Comparison between Centrifugal & Axial flow fan. (g) Fan drives, Air velocity & controlling the quantity of air delivered. 2.4 laws of fan ventilation. 2.5 Distribution of air & its control: Ventilation stoppings, Air crossings, Doors, brattice partition, Splitting. 2.6 Auxiliary fan & Booster fan: its Purpose & installation (both). 2.7 Ventilation surveys in mines**:** Quantity surveys, pressure surveys, Qualitative surveys. (Anemometer & Velometer)
Unit – III Mine Lighting	3a. Explain general lighting places with its instruments. 3b. Describe power lighting system from electric mains. 3c. Describe Measures to improve lighting in underground mines	3.1 General lighting places in mines. 3.2 Lighting by Cap lamp, Flameproof electric torch, Acetylene portable hand lamp. 3.3 Power lighting from Electric mains- requirement & salient features. 3.4 Measures to improve lighting in underground mines.

6. SUGGESTED SPECIFICATIONTABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Mine Atmosphere	24	6	12	12	30
2	Mine Ventilation	26	4	13	13	30
3	Mine lighting	06	2	04	04	10
	Total	**56**	**12**	**29**	**29**	**70**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's Revised 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.

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills ***(outcomes in psychomotor and affective domain)*** so that students are able to acquire the competencies/course outcomes. Following is the list of practical exercises for guidance.

Note*: outcomes in psychomotor domain are listed here as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of* ***Course Outcomes*** *related to affective domain. Thus over all development of* ***Programme Outcomes (****as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty members should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical / Exercise (outcomes in psychomotor domain)	Appox. Hrs. Required
1	I	Determination of relative humidity by whirling hygrometer.	4
2	I	Design a layout of Cap Lamp room.	4
3	I	Determination of cooling power of the mine air by using kata thermometer.	4
4	II	Measurement of air velocity, quantity and pressure in a duct by using a pitot tube.	4
5	III	Design and Describe air crossing, regulator, Ventilating door, air lock at pit top etc.	4
6	III	Find out CH4% in a gassy mine by using different types of flame safety lamps.	2
7	I	Analyse mine gases which are found behind a sealed off fiery area.	4
8	I	Determination of CO gas percentage by using CO detector.	2
		Total	**28**

8. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Explore internet to study different technologies systems and practices being used in different kind of mines and prepare reports. Different students may study different systems.
ii. Seminar Presentation based on above study.

9. SPECIAL INSTRUCTIOAL STRATERGIES (If any)

i. Arrange visit to nearby industry and study different technologies systems an practices being used in different kind of mines and prepare reports.
ii. Students may be asked to prepare projects on different systems.

10. SUGGESTED LEARNING RESOURCES

(A) List of Books:

S. No.	Title of Books	Author	Publication
1	Elements of Mining Technology - II	D. J. Deshmukh	Central techno publication
2	U.M.S.	-	Lovely Prakashan
3	Mine Environment & Ventilation.	G.B.Mishra	Lovely Prakashan

B. List of Major Equipment/Materials:

i. Models.

C List of Software/Learning Websites

i. Wikipedia.
ii. www.youtube.com

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. S.G Srivastav,** (I/c HOD) Lecturer, G.P.Bhuj
- **Prof**. **P.Y Trivedi**, Lecturer, G.P.Bhuj

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. Dr. K .K Pathak**, Prof. Dept. of Civil & Environment Engineering
- **Prof. Peeyush Verma**, Professor, Department of Vocational Education & Entrepreneurship Development