

GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)**Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)**

Semester-VI

Course Title: Mine Management Safety and Legislation

(Course Code: 4362203)

Diploma programmer in which this course is offered	Semester in which offered
Mining Engineering	6 th Semester

1. RATIONALE

The course is designed to help the student in understanding the different statutory provisions of mines acts, rules and regulations essential for mining industries for maintaining law and order as well as safe working conditions in mining areas.

Diploma holders are supposed to work as supervisors in mines, where they have to manage the resources of the organization for safe, efficient and effective utilization of equipment, manpower, and time. Hence they should be aware of general management concepts, government laws, regulations, safety laws, etc.

This course aims to develop such knowledge which is required for effective and efficient management of mines as well as to equip future diploma mining engineers with the knowledge and skills to implement various necessary conditions as per legal frameworks, prioritize safety, uphold ethical standards, and contribute to sustainable mining practices throughout their careers.

2. COMPETENCY

The course should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- **Adopt the fundamental principles of mine safety, regulations and legislation.**
- **Analyze and interpret relevant legal frameworks and their application in mining operations.**
- **Select safe practices of working in the mine under the provision of mine act, rules and regulations.**

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with this competency are to be developed in the student to display the following Cos:

CO 1 : Recognize the fundamental of mine management principles, concepts and their application in the field of mining.

CO 2: Implement general provisions of mines act 1952 and mines rules 1955 in mines.

CO 3: Encourage the implementation of all provisions of Coal Mine Regulation 2017 in mines.

CO 4: Encourage the implementation of all provisions of Metalliferous Mine Regulation 1961 in mines.

CO 5: Adopt healthier and safety practices in the mining area.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
3	0	0	3	70	30	0	0	100

(*): Out of 30 marks under the theory CA, 10 marks are for assessment of the micro-project to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessing the attainment of the cognitive domain UOs required for the attainment of the COs.

Legends: **L**-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit, **CA** - Continuous Assessment; **ESE** - End Semester Examination.

5. AFFECTIVE DOMAIN OUTCOMES

- Act as a team member/ individual in decision making process.
- Displays a professional commitment to ethical practice on a daily basis.
- Develop safe working practice under the provision of mine rules and regulations.

The ADOs are best developed through the field-based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organization Level' in 2nd year.
- 'Characterization Level' in 3rd year.

6. UNDERPINNING THEORY

Only the major Underpinning Theory is formulated as higher level UOs of Revised Bloom's taxonomy in order development of the COs and competency is not missed out by the students and teachers. If required, more such higher level UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit 1 : General Principles Of Management	1a. Explain principles of mine management. 1b. Explain role, function & authority of DGMS.	1.1 Definition of Mine management. 1.2 Principles of scientific management. 1.3 Role of mining Industry in country's economic development.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
	1c. Illustrate organizational structure of mining company. 1d. Enlist qualities of good supervisor. 1e. Compare between time study and method study. 1f. Explain the functions of trade union. 1g. Enlist objective of CSR activities. 1h. Describe various ways of implementing CSR activities in mining areas.	1.4 DGMS. 1.4.1 Introduction of DGMS. 1.4.2 Role & Function of DGMS. 1.4.3 Examinations Conducted by DGMS. 1.5 Mining company organizational structures. 1.6 Qualities of good supervisor. 1.7 Work study: 1.7.1 Principles and advantages of time study. 1.7.2 Principles and advantages of method Study. 1.8 Functions of trade unions. 1.9 Strikes and lockouts as per Industrial Dispute Acts. 1.10 Corporate Social Responsibility (CSR). 1.10.1 Objectives of CSR. 1.10.2 Advantages of CSR activities. 1.10.3 Various ways of implementing CSR activities in mining areas.
Unit – 2: Mine Legislation (Part-I) Mine Act 1952 & Mines Rules 1955	2a. Describe general provisions related to mines act & rules.	2.1 Mine Act 1952. 2.1.1 Provisions related to committee constructed under section 12. 2.1.2 Provisions related to the drinking water. 2.1.3 Provisions related to employment of a persons below 18 years of age. 2.1.4 Provisions of Act in respect of notice to be given about accidents. 2.1.5 Provisions related to hours of work below ground and above ground. 2.1.6 Provisions of limitations of daily hours of work including overtime. 2.1.7 Provisions of act related to leave wages. 2.2 Mines Rues 1955. 2.2.1 Important definitions. 2.2.2 Provisions related to lavatories, urinals on surface and underground. 2.2.3 Rules related to First Aid. 2.2.4 Provisions related to Pit safety committee.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
		<p>2.2.5 Rules related to qualification, appointment and duties of welfare officer.</p> <p>2.2.6 Rules related to qualification, appointment and duties of workmen inspector.</p> <p>2.2.7 Provisions related to welfare amenities.</p>
Unit – 3: Mine Legislation (Part-II) Coal Mine Regulation 2017	<p>3a. Define various statutory terms & definitions used in CMR 2017.</p> <p>3b. Explain duties & responsibilities of various mining officials as per CMR 2017.</p> <p>3c. Describe general provisions related to CMR 2017.</p>	<p>3.1 Important definitions.</p> <p>3.2 The other terms limited to CMR only - Define the terms Shot firer, Overman, Assistant or Under manager, on setter, Fiery seam, Gassy seam of first, Second and third degree, General body of air.</p> <p>3.3 Duties and responsibilities of Overman, Sirdar, Manager, Safety Officer, and Ventilation Officer.</p> <p>3.4 General requirements about mine Plans & types of mine plan.</p> <p>3.5 Provisions related to open cast working.</p> <p>3.6 Provisions related to setting of supports.</p> <p>3.7 Provisions related to development & depillaring operation.</p> <p>3.8 Provisions related to precaution against dust.</p> <p>3.9 Provisions related to precaution against eruption of gas.</p> <p>3.10 Provisions related to dangers from underground inundation.</p> <p>3.11 Provisions related to precautions after a fire has broken out.</p> <p>3.12 Provisions related to standards of ventilation.</p> <p>3.13 Precautions against fire in the ventilation appliances.</p> <p>3.14 Precautions against inflammable gases and noxious gases.</p> <p>3.15 Provisions related maintenance, examination and use of safety lamp.</p>

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit – 4: Mine Legislation (Part-III) Metalliferous Mine Regulation 1961	<p>4a. Define various statutory terms & definitions used in MMR 1961.</p> <p>4b. Explain duties & responsibilities of various mining officials as per MMR 1961.</p> <p>4c. Describe general provisions related to MMR 1961.</p>	<p>4.1 Important definitions.</p> <p>4.2 Duties & responsibilities of Workmen, Assistant manager/ Underground manager, Mining mate, Blasters, Winding enginemen, Haulage enginemen, Magazine in-charge.</p> <p>4.3 Provisions related to ladders and ladder ways.</p> <p>4.4 Provisions related to man winding, winding in sinking shaft, examination of winding equipment.</p> <p>4.5 Provisions related to haulage roadways, travelling roadways, examination of haulage engines and track.</p> <p>4.6 Provisions related to danger from Surface water, underground inundation.</p> <p>4.7 Provisions related to bratices, doors, stopping, air crossing & auxiliary fan.</p> <p>4.8 Provisions related to general lighting and standards of lighting in mines.</p> <p>4.9 Provisions related drilling charging stemming and firing of short holes, inspection after short firing.</p> <p>4.10 Provisions related to storage of explosives, magazines, cartige transport of explosives.</p> <p>4.11 Provisions related to misfire & general precautions regarding explosive.</p>
Unit 5: Accident, Health And Safety	<p>5a. Explain the importance of mine safety.</p> <p>5b. Classify & define various types of accidents.</p> <p>5c. Write accident investigation report.</p> <p>5d. Prepare safety promoting banners & slogans.</p> <p>5e. Explain various occupational diseases with their preventive measures.</p>	<p>5.1 Introduction of mine safety.</p> <p>5.2 Definitions of accident: Fatal, Serious bodily injury, reportable injury, Minor injury, Disaster and Major accident.</p> <p>5.2.1 Unsafe acts of persons.</p> <p>5.2.2 Unsafe conditions.</p> <p>5.2.3 Accident Investigation Procedure.</p> <p>5.3.4 Structure of the accident report.</p> <p>5.4 Various safety propaganda techniques. [Safety Banners, Safety Week, National Safety Awards (Mines), Importance of safety conferences, Safety Policy]</p> <p>5.5 Cost of accidents.</p> <p>5.5.1 Direct and Indirect cost of accidents.</p> <p>5.5.2 Zero accident potential (ZAP) working.</p>

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
		5.5.3 Minimum accident potential (MAP) working. 5.6 Occupational diseases in mining, their causes and preventive measures.

7. SUGGESTED SPECIFICATION TABLE FOR QUESTIONPAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	General Principles of Management	16	8	12	---	20
II	Mine Legislation (Part – I) – Mines Act 1952 & Mines Rules 1955	7	3	8	---	11
III	Mine Legislation (Part II) – CMR 2017	7	3	4	7	14
IV	Mine Legislation (Part III) – MMR 1961	7	---	4	7	11
V	Accident, Health And Safety	5	6	4	4	14
Total		42	20	32	18	70

Legends: R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary slightly from above table

8. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Field visit to explain mine organizational set up and identify responsibilities and powers of different job positions.
- Field visit to mine for study safety features being used by the organization.
- Use case study method to explain management and safety related problems related to mining industries.
- Attend the expert lecture on following topics of mine legislation: Mines Act 1952, Mines Rules 1955, CMR 2017 & MMR.1961
- Participate in the quiz on following topics of mine legislation: Mines Act 1952, Mines Rules 1955, CMR 2017 & MMR .1961
- Participate in the group discussion on following topics: Importance of safety, Causes and remedial measures of accidents and Zero accident potential working in mine.
- View safety related videos regarding surface & underground various mining operations published by DGMS.
- Undertake micro project.

9. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- a) Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- b) Guide student(s) in undertaking micro-projects.
- c) '**L**' in **section No. 4** means different types of teaching methods that are to be employed by teachers to develop the outcomes.
- d) About **20% of the topics/sub-topics** which are relatively simpler or descriptive in nature is to be given to the students for **self-learning**, but to be assessed using different assessment methods.
- e) With respect to **section No.10**, teachers need to ensure to create opportunities and provisions for **co-curricular activities**.
- f) Guide students on how to address safety issues in mines.
- g) Video lectures showing safety standards used in mines.
- h) Guide students on how to address issues of industrial dispute.
- i) Animated documentaries on various CSR activities.

10. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be **individually** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

- a) Power point presentation on latest circulars published by DGMS.
- b) Enlist various CSR activities by a nearby Mining company in brief and prepare report on it.
- c) Enlist various mining trade unions, their recent activities and prepare a report on it.
- d) Prepare report of any near by mines regarding their organizational chart and functioning of pit safety committee.
- e) Power point presentation on duties and responsibilities of Mine Manager, Safety Officer, Ventilation Officer and other mining officials as per CMR 2017 & MMR 1961.
- f) Make SOP related poster on precautions against dust & eruption of gases in surface as well as underground gassy mines as per CMR 2017.
- g) Make SOP related poster on examination & uses of safety lamp carried out in underground gassy mines as per MMR 1961.

- h) Prepare a poster showing all CONVENTIONS FOR PREPARING PLANS AND SECTIONS as per CMR 2017
- i) Prepare a notice of diseases encountered by a miner as per form-V of MMR 1961.
- j) Prepare a banner related occupational diseases with precautionary measures.
- k) Present case study of a mines accident inquiry report.

11. SUGGESTED LEARNING RESOURCES

Sr No	Title Of Book	Author	Publication
1	Mine Management (Latest Edition)	V.N.Singh	Lovely Prakashan,
2	Safety In Mines (Latest Edition)	Kejariwal B.K.	Lovely Prakashan
3	Mine Management, Legislation And General Safety (Latest Edition)	S.Ghatak	Coal field Publisher, Aasansol
4	A Study Of Mine Management, Legislation And General Safety (Latest Edition)	L.C.Kaku	Lovely Prakashan
5	Mine's management legislation and General Safety (Coal) (Latest Edition)	Dr. S.K.Das	Lovely Prakashan
6	Mine Management Legislation & General Safety (Latest Edition)	Dr. N.C.Dey	Lovely Prakashan

12. SOFTWARE/LEARNING WEBSITES

Unit 1 : General Principles of Management

- [https://nscpolteksby.ac.id/ebook/files/Ebook/Hospitality/Production%20and%20Operations%20Management%20\(2008\)/8.%20Chapter%207%20-%20WORK%20STUDY%20%28TIME%20AND%20MOTION%20STUDY%29.pdf](https://nscpolteksby.ac.id/ebook/files/Ebook/Hospitality/Production%20and%20Operations%20Management%20(2008)/8.%20Chapter%207%20-%20WORK%20STUDY%20%28TIME%20AND%20MOTION%20STUDY%29.pdf)
- [Examination \(dgms.gov.in\)](#)
- [ORGANISATIONALSTRUCTURE.pdf \(dgms.gov.in\)About DGMS](#)
- https://www.youtube.com/watch?v=vNOAR-F54&list=PLgk-8purBMo_vZjJdq_Pn101t6k93TjVp&index=1&pp=iAQB
- https://www.youtube.com/watch?v=3Kx384hKkas&list=PLgk-8purBMo_vZjJdq_Pn101t6k93TjVp&index=2&pp=iAQB
- https://www.youtube.com/watch?v=kFWrFTb5pc4&list=PLgk-8purBMo_vZjJdq_Pn101t6k93TjVp&index=3&pp=iAQB
- https://www.youtube.com/watch?v=ktNfLC66wm4&list=PLgk-8purBMo_vZjJdq_Pn101t6k93TjVp&index=4&pp=iAQB

8. Trade Union Act 1926-
https://www.indiacode.nic.in/bitstream/123456789/13322/1/trade_unions_act_1926
9. The Industrial Dispute Act 1947 –
https://www.indiacode.nic.in/bitstream/123456789/17112/1/the_industrial_disputes_act.pdf

Unit 2 : Mine Legislation (Part – I) – Mines Act 1952 & Mines Rules 1955

Mine Act 1952 - <https://labour.gov.in/sites/default/files/theminesact1952.pdf>

1. <https://www.youtube.com/watch?v=rLUAHVpLVU8&t=668s>
2. <https://www.youtube.com/watch?v=RvzqQYWLGRl>

Mine Rules 1955 - https://www.dgms.gov.in/writereaddata/UploadFile/Mines_Rules_1955.pdf

1. <https://www.youtube.com/watch?v=1EUBQ8JqcXE&pp=ygUbbWluZXMgcVVsZXMGMTk1NSBkZWZpbmF0aW9u>
2. <https://www.youtube.com/watch?v=mobw1Jb03Ns>
3. <https://www.youtube.com/watch?v=xgZZVXaA0Dw>
4. <https://www.youtube.com/watch?v=oDkNful6zSc&t=12s>
5. https://www.youtube.com/watch?v=Y8bZGRSY_rk
6. <https://www.youtube.com/watch?v=FCNSNz4dsjs>
7. <https://www.youtube.com/watch?v=tr4K2vOY8c4>

Unit 3 : Mine Legislation (Part – II) CMR 2017

CMR 2017 - <https://www.dgms.net/Coal%20Mines%20Regulation%202017.pdf>

1. https://www.youtube.com/watch?v=jujzSS_AL-Q&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=1&pp=iAQB
2. <https://www.youtube.com/watch?v=fVJjAaokXWk&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=4&pp=iAQB>
3. <https://www.youtube.com/watch?v=olnrgd4iMQY&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=5&pp=iAQB>
4. <https://www.youtube.com/watch?v=iireHH2YhI4&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=12&pp=iAQB>
5. <https://www.youtube.com/watch?v=FgTUIxEC0iw&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=13&pp=iAQB>
6. <https://www.youtube.com/watch?v=ju1hhGLje3g&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=14&pp=iAQB>
7. <https://www.youtube.com/watch?v=gYWKObktQLc&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=15&pp=iAQB>
8. <https://www.youtube.com/watch?v=ihyfZcWHWjl&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=17&pp=iAQB>
9. <https://www.youtube.com/watch?v=0RVJG8jahE0&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=18&pp=iAQB>
10. <https://www.youtube.com/watch?v=E2n0pYDjjOg&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=20&pp=iAQB>

11. https://www.youtube.com/watch?v=ObV-lcbWs_M&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=21&pp=iAQB
12. https://www.youtube.com/watch?v=kGjC946_vXo&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=23&pp=iAQB
13. <https://www.youtube.com/watch?v=k53xCETpmhY&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=25&pp=iAQB>
14. <https://www.youtube.com/watch?v=mMK8qG4Jb9o&list=PLG--VdFWYp2nton--xg821FTENZI3amKA&index=19&pp=iAQB>

Unit 4: **Mine Legislation (Part – III)** MMR 1961

MMR 1961 - <https://www.dgms.gov.in/writereaddata/UploadFile/Metalliferous1961.pdf>

1. <https://www.youtube.com/watch?v=ApfbmuSJeU8>
2. <https://www.youtube.com/watch?v=p-xh5i11YJA>
3. <https://www.youtube.com/watch?v=ESjWduNp9Gc>
4. <https://www.youtube.com/watch?v=-3gRQJceufw>
5. <https://www.youtube.com/watch?v=6uT6i1enmDk>
6. <https://www.youtube.com/watch?v=60yeRai9eEc>
7. https://www.youtube.com/watch?v=1Vg4_gdFKXo
8. https://www.youtube.com/watch?v=nkgsuDc_EpY
9. <https://www.youtube.com/watch?v=ufoYAXX5Kck>
10. <https://www.youtube.com/watch?v=UcyPmUYT-gE>
11. https://www.youtube.com/watch?v=JU4NSX_X7KY
12. <https://www.youtube.com/watch?v=s4B44blaB8k>
13. <https://www.youtube.com/watch?v=O5wV5GCgFWg>
14. <https://www.youtube.com/watch?v=mHyYV0XJNMQ>

Unit 5: **Accident, Health And Safety**

1. <https://www.youtube.com/watch?v=PQL70zNbnzw&pp=ygUfYWVWNjaWRlbnQgaGVhbHRoICYgc2FmZXRS5lG1pbmluZw%3D%3D>

13. PO-COMPETENCY-CO MAPPING:

Semester VI	Mine Management Safety and Legislation (Course Code:4362203)									
	POs and PSOs									
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/development of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Management	PO 7 Life-long learning	PSO 1	PSO 2	PSO 3
<u>Competency</u>	<ul style="list-style-type: none"> Adopt the fundamental principles of mine safety, regulations and legislation. Analyze and interpret relevant legal frameworks and their application in mining operations. Select safe practices of working in the mine under the provision of mine act, rules and regulations. 									
Course Outcomes CO1 : Recognize the fundamental of mine management principles, concepts and their application in the field of mining.	3	----	----	----	----	----	2	---	---	---
CO2 : Implement general provisions of mines act 1952 and mines rules 1955 in mines.	3	----	----	----	----	----	2	---	---	---
CO3: Encourage the implementation of all provisions of Coal Mine Regulation 2017 in mines.	2	2	3	----	2	----	2	---	---	---
CO4 : Encourage the implementation of all provisions of Metalliferous Mine Regulation 1961 in mines.	2	2	3	----	2	---	2	---	---	---
CO5: Adopt healthier and safety practices in the mining area.	2	2	2	----	2	---	---	---	---	---

Legend: '3' for high, '2' for medium, '1' for low and '-' for no correlation of each CO with PO.

14. COURSE CURRICULUM DEVELOPMENT COMMITTEE**GTU Resource Persons**

Sr. No.	Name and Designation	Institute	Contact No.	Email
1.	S.G.Srivastav I/c Head Of Dept. (Mining Engineering)	Government Polytechnic Bhuj	94285 46433	shashiv07@rediffmail.com
2.	S.S.Shah Lecturer (Mining Engineering)	Government Polytechnic Bhuj	94285 46433	samayshah02@gmail.com
3.	S.N.Heruvala Lecturer (Mining Engineering)	Government Polytechnic Bhuj	94285 46433	snheruvala@gmail.com