NSQF Aligned Curriculum for

Three Year (Six Semesters) Diploma Course in

MINING ENGINEERING

For the State of Uttar Pradesh

(Effective Session From 2023-24)

Prepared by:

Curriculum Development Centre

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PREFACE

An important issue generally debated amongst the planners and educators world over is how technical education can contribute to sustainable development of the societies struggling hard to come in the same bracket as that of the developed nations. The rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and opens economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by the State Board of Technical Education, UP to revise the existing curricula of diploma programmes as per the needs of the industry and making them NSQF compliant, are laudable.

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma programmes. The curricula for diploma programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. However, best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much needed dynamism in the system.

Sh. K. Ram
Director
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U.P, Kanpur

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1. SALIENT FEATURES OF DIPLOMA PROGRAMME IN MINING ENGINEERING

1)	Name of the Programme	:	Diploma Programme in Mining Engineering
2)	Duration of the Programme	:	Three years (Six Semesters)
3)	Entry Qualification	:	Matriculation or equivalent NSQF Level as Prescribed by State Board of Technical Education, UP
4)	Intake	:	37 (or as prescribed by the Board)
5)	Pattern of the Programme	:	Semester Pattern
6)	NSQF Level	:	Level - 5
7)	Ratio between theory and Practical		: 47 : 53 (Approx.)

8) Industrial Training:

Four weeks of Industrial training (during Semester Break) will be evaluated after II, IV & VI semester. Total marks allotted to each Industrial training will be 50.

9) Ecology and Environment:

As per Govt. of India directives, a subject on Environmental Studies has been incorporated in the curriculum.

10) Energy Conservation:

A subject on Energy Conservation has been incorporated in the curriculum.

11) Entrepreneurship Development:

This topic has been covered in the subject of "Mine Management" of curriculum.

12) Student Centered Activities:

A provision of 3-6 periods per week has been made for organizing Student Centered Activities for overall personality development of students. Such activities will comprise of co–curricular activities such as expert lectures, self study, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS and other cultural activities, disaster management and safety etc.

13) Project work

A project work has been included in the curriculum to enable the students to get familiarize with the practices and procedures being followed in the industries and provide an opportunity to work on some live projects in the industry.

2. EMPLOYMENT OPPORTUNITIES FOR DIPLOMA HOLDERS IN MINING ENGINEERING

The following are the major employment opportunities for diploma holders in Mining Engineering:

- In mining industries primarily in Private sector and to some extent in Public sector.
- In service sector like Mining and Geology Department, Mines and Mineral development agencies, Military Engg. Services, Mines Research and Development etc.
- In marketing sector for sales and after- sales services.
- As an Entrepreneur

  Though the diploma holders in Mining Engineering find placement in all functional areas like R&D, planning, shop floor production, quality control, inventory management but majority of them find employment in shop floor management.

3. LEARNING OUTCOMES OF DIPLOMA PROGRAMME IN MINING ENGINEERING

After undergoing this programme, students will be able to:

1.	Prepare and interpret drawings of mining machinery and sites.
2.	Use mining softwares to prepare drawings of mining machinery and sites.
3.	Understand mine maps and create them.
4.	Basic of survey and its practical implementation in mines.
5.	Understand geological features and in mapping.
6.	Estimate rock mass classification.
7.	Understand strata deformation and control.
8.	Understand and perform experiments on rock specimens.
9.	Understand the method of mining in coal and metals.
10.	Understand the equipment selection according to method of working.
11.	Understand blasting mechanics and drill pattern.
12.	Estimate the fragments and its modification in blasting.
13.	Perform environmental impact assessment.
14.	Perform sampling to estimate environmental pollution.
15.	Understand the Mine legislation.
16.	Understand the Mine Management.
17.	Understand the coal mine and metal mine regulation.
18.	Understand various technology and associated machines in mining

4. DERIVING CURRICULUM AREAS FROM LEARNING OUTCOMES OF THE PROGRAMME

The following curriculum areas/subjects have been derived from learning outcomes:

Sr. No.	Learning Outcomes	Curriculum Areas/Subjects
1.	Prepare and interpret drawings of engineering components.	– Engineering Drawing
2.	Basic overview and glimpse of mine industry and operation.	– Introduction of Mining Technology & Mining Geology
3.	Operate conventional machine for machining of components as per specifications	– Workshop Technology
4.	Understand the basics of mechanics applied to mining.	– Introduction to Mechanical Engineering
5.	Understand various technology and associated machines in mining	– Mining Technology
6.	Introduction to machine in mining.	– Mining Machinery
7.	Understand and map the geollogical features affecting mining	– Mining Geology
8.	Understand the electrical equipments used in mining maintenance.	– Electrical Technology and Electronics
9.	Survey and plan map of mines.	– Mine Surveying
10.	Various operations for coal mining, equipment selection and methods.	– Underground Coal Mining
11.	Use appropriate practices for conservation of energy and prevention of Mining Environment Pollution.	– Energy Conservation – Mine Environmental Engineering
12.	Understand methods of metal mining, productivity and pirating and method.	– Metalliferous Mining
13.	Planning of surface mines, slope stability, mine economics.	– Surface Mine, Planning and Design
14.	Introduction to rock mechanics and stability of mine excoriating.	– Rock Mechanics
15.	Understand the management of man power in mines.	– Mine Management
16.	Overview of legislating in Indian mining conditions from on legal framework.	– Mine Legislation and General Safety

17.	Prepare detailed project proposal and report.	– Project Work
18.	Apply concepts of Mechanics to solve engineering problems.	– Applied Mechanics
19.	Apply basic principles of Mathematics and Science to solve engineering problems.	– Applied Mathematics – Applied Physics – Applied Chemistry

5. ABSTRACT OF CURRICULUM AREAS

a) General Studies

1. Communication Skills
2. Mine Environmental Engineering
3. Energy Conservation

b) Applied Sciences

4. Applied Mathematics
5. Applied Physics
6. Applied Chemistry

c) Basic Courses in Engineering/Technology

7. Engineering Drawing
8. Workshop Technology
9. Introduction to Basic Languages in Computer Application

d) Applied Courses in Engineering/Technology

10. Introduction of Mining Technology & Mining Geology
11. Introduction to Mechanical Engineering
12. Workshop Technology
13. Mining Technology
14. Mining Machinery
15. Mining Geology
16. Electrical Technology and Electronics
17. Mine Surveying
18. Underground Coal Mining
19. Metalliferous Mining
20. Surface Mine, Planning and Design
21. Rock Mechanics
22. Mine Management
23. Mine Legislation and General Safety

e) Industrial Training

Project Work

6. HORIZONTAL AND VERTICAL ORGANISATION OF THE SUBJECTS

Sr. No.	Subjects	Distribution in Periods per week in Various Semesters					
		I	II	III	IV	V	VI
1.	Communication Skills	6	-	-	6	-	-
2.	Applied Mathematics	5	5	-	-	-	-
3.	Applied Physics	7	7	-	-	-	-
4.	Applied Chemistry	7	-	-	-	-	-
5.	Engineering Drawing	14	-	-	-	-	-
8.	Applied Mechanics	-	7	-	-	-	-
9.	Introduction of Mining Technology & Mining Geology	-	8	-	-	-	-
10.	Workshop Technology	-	10	-	-	-	-
11.	Introduction to Mechanical Engineering	-	-	8	-	-	-
13.	Mining Technology	-	-	8	7	-	-
14.	Mining Machinery	-	-	8	-	8	-
15.	Mining Geology	-	-	8	-	-	-
16.	Introduction to Basic Languages in Computer Application	-	-	7	-	-	-
17.	Electrical Technology and Electronics	-	-	-	7	-	-
18.	Mine Surveying	-	-	-	9	8	-
19.	Underground Coal Mining	-	-	-	8	-	-
20.	*Energy Conservation				5		
21.	Metalliferous Mining	-	-	-	-	8	-
22.	Mine Environmental Engineering	-	-	-	-	8	12
23.	Rock Mechanics	-	-	-	-	-	12
24.	Mine Management	-	-	-	-	-	7
25.	Mine Legislation and General Safety	-	-	-	-	-	8
26.	Project Work	-	-	-	-	-	8
32.	Student Centered Activities (SCA)	4	4	4	6	8	1
Total		43	41	43	48	48	48

7. STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN MINING ENGINEERING

FIRST SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1	*Communication Skills-I	4	-	2	4	20	10	30	50	2 ½	20	3	70	100
1.2	*Applied Mathematics- I	5	-	-	4	20	-	20	50	2 ½	-	-	50	70
1.3	*Applied Physics – I	5	-	2	5	20	10	30	50	2 ½	20	3	70	100
1.4	*Applied Chemistry	5	-	2	5	20	10	30	50	2 ½	20	3	70	100
1.5	Engineering Drawing	4	-	10	2	-	20	20	50	3	-	-	50	70
#Student Centred Activities (SCA)		-	-	4	1	-	30	30	-	-	-	-	-	30
Total		23	-	20	21	80	80	160	250	-	60	-	310	470

* Common with other diploma programmes

\# Student Centered Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

= Industrial training will be conducted after each Odd semester. And evaluation of the industrial training will be done after each successive Even semester. i.e. Industrial Training will be after 1st, 3rd & 5th semesters and Evaluation of Industrial Training will be done after 2nd, 4th and 6th semesters respectively.

SECOND SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1	*Applied Mathematics - II	5	-	-	4	20	-	20	50	2 ½	-	-	50	70
2.2	*Applied Physics -II	5	-	2	5	20	10	30	50	2 ½	20	3	70	100
2.3	+Applied Mechanics	5	-	2	5	20	10	30	50	2 ½	20	3	70	100
2.4	Introduction to Mining Technology & Mining Geology	4	-	4	5	20	20	40	50	2 ½	40	3	90	130
2.5	Workshop Technology	4	-	6	2	20	30	50	50	2 ½	60	4	110	160
2.6	=Mines Training, Report and Oral (04 weeks /yr)	-	-	-	6	-	60	60	-	-	-	-	-	60
#Student Centered Activities (SCA)		-		4	1	-	30	30						30
Total		**23**	**-**	**18**	**28**	**100**	**160**	**260**	**250**	**-**	**140**	**-**	**390**	**650**

* Common with other diploma programmes

\+ Common with diploma in Chemical Engg. and Civil Engg.

\# Student Centered Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

= Industrial training will be conducted after each Odd semester. And evaluation of the industrial training will be done after each successive Even semester. i.e. Industrial Training will be after 1st, 3rd & 5th semesters and Evaluation of Industrial Training will be done after 2nd, 4th and 6th semesters respectively.

THIRD SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
3.1	Introduction to Mechanical Engineering	4	-	4	4	20	20	40	50	2 ½	40	3	90	130
3.2	Mining Technology- I	4	-	4	4	20	20	40	50	2 ½	40	3	90	130
3.3	Mining Machinery-I	4	-	4	4	20	30	50	50	2 ½	60	4	110	160
3.4	Mining Geology	4	-	4	4	20	20	40	50	2 ½	40	3	90	130
3.5	Introduction to Basic Languages in Computer Application	2	-	5	2	-	30	30	-	-	60	3	60	90
#Student Centered Activities (SCA)		-	-	04	1	-	30	30	-	-	-	-	-	30
	Total	**18**		**25**	**19**	**80**	**150**	**230**	**200**	**-**	**240**	**-**	**440**	**670**

* Common with other diploma programmes

Student Centered Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

= Industrial training will be conducted after each Odd semester. And evaluation of the industrial training will be done after each successive Even semester. i.e. Industrial Training will be after 1st, 3rd & 5th semesters and Evaluation of Industrial Training will be done after 2nd, 4th and 6th semesters respectively.

FOURTH SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
4.1	*Communication Skills-II	4	-	2	4	20	10	30	50	2 ½	20	3	70	100
4.2	Mining Technology -II	4	-	3	4	20	20	40	50	2 ½	40	3	90	130
4.3	Electrical Technology and Electronics	5	-	2	5	20	20	40	50	2 ½	40	3	90	130
4.4	Mine Surveying-I	5	-	4	5	20	30	50	50	2 ½	60	4	110	160
4.5	Underground Coal Mining	4	-	4	4	20	20	40	50	2 ½	40	3	90	130
4.6	*Energy Conservation	3	-	2	3	20	10	30	50	2 ½	20	3	70	100
4.7	Mines Training, report| and oral (04 weeks /yr)	-	-	-	6	-	90	90	-	-	-	-		90
#Student Centered Activities (SCA)		-	-	6	1		30	30						30
Total		**25**	**-**	**23**	**32**	**120**	**230**	**350**	**300**		**220**		**520**	**870**

* Common with other diploma programme

Student Centered Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

= Industrial training will be conducted after each Odd semester. And evaluation of the industrial training will be done after each successive Even semester. i.e. Industrial Training will be after 1st, 3rd & 5th semesters and Evaluation of Industrial Training will be done after 2nd, 4th and 6th semesters respectively.

FIFTH SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
5.1	Metalliferous Mining	4	-	4	4	20	20	40	50	2 ½	40	3	90	130
5.2	Surface Mine, Planning and Design	4	-	4	4	20	20	40	50	2 ½	40	3	90	130
5.3	Mine surveying -II	4	-	4	4	20	30	50	50	2 ½	60	4	110	160
5.4	Mining Machinery-II	4	-	4	4	20	30	50	50	2 ½	60	4	110	160
5.5	Mine Environmental Engineering - I	4	-	4	4	20	20	40	50	2 ½	40	3	90	130
#Student Centered Activities (SCA)		-	-	8	1	-	30	30	-	-	-	-	-	30
	Total	**20**	-	**28**	**21**	**100**	**150**	**250**	**250**	**-**	**240**	**-**	**490**	**740**

* Common with other diploma programme

\# Student Centered Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

= Industrial training will be conducted after each Odd semester. And evaluation of the industrial training will be done after each successive Even semester. i.e. Industrial Training will be after 1st, 3rd & 5th semesters and Evaluation of Industrial Training will be done after 2nd, 4th and 6th semesters respectively.

SIXTH SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
6.1	Rock Mechanics	6	-	6	6	20	20	40	50	2 ½	40	3	90	130
6.2	Mine Environmental Engineering.- II	6	-	6	6	20	20	40	50	2 ½	40	3	90	130
6.3	Mine Management	6	1	-	6	20	-	20	50	2 ½	-	-	50	70
6.4	Mine Legislation and General Safety	6	2	-	6	20	-	20	50	2 ½	-	-	50	70
6.5	Project	-	-	8	6	-	50	50	-	-	100	3	100	150
6.6	Mine Training, Report and Oral (04 weeks/yr)	-	-	-	6	-	90	90	-	-	-	-	-	90
#Student Centered Activities (SCA)		-	-	1	1	-	30	30	-	-	-	-	-	30
Total		**24**	**03**	**21**	**37**	**80**	**210**	**290**	**200**	-	**180**	**-**	**380**	**670**

\# Student Centered Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safetyetc.

= Industrial training will be conducted after each Odd semester. And evaluation of the industrial training will be done after each successive Even semester. i.e. Industrial Training will be after 1st, 3rd & 5th semesters and Evaluation of Industrial Training will be done after 2nd, 4th and 6th semesters respectively.

8. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 30 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

i. 10 Marks for general behavior and discipline
(by HODs in consultation with all the teachers of the department)

ii. 5 Marks for attendance as per following:
(by HODs in consultation with all the teachers of the department)

a)	75 - 80%	2 Marks
b)	80 - 85%	4 Marks
c)	Above 85%	5 Marks

iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

a)	15	-	State/National Level participation
b)	10	-	Participation in two of above activities
c)	5	-	Inter-Polytechnic level participation

Note: There should be no marks for attendance in the internal sessional of different subjects.

1.1 COMMUNICATION SKILLS – I

L	T	P
4	-	2

RATIONALE

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

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- Understand the importance of effective communication
- Describe the process of communication
- Communicate effectively in different contexts
- Identify parts of speech
- Write correct sentences using appropriate vocabulary
- Reproduce and match words and sentences in a paragraph
- Write various types of paragraphs, notices for different purposes and composition on picture with appropriate format
- Read unseen texts with comprehension

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DETAILED CONTENTS

1 Basics of Communication (13 periods)

Definition and process of communication
Types of communication - formal and informal, oral and written, verbal and non-verbal
Communications barriers and how to overcome them
Barriers to Communication, Tools of Communication

2 Application of Grammar (18 periods)

Parts of Speech (Noun, verb, adjective, adverb) and modals
Sentences and its types
Tenses
Active and Passive Voice
Punctuation
Direct and Indirect Speech

3 Reading Skill (10 periods)

Unseen passage for comprehension (one-word substitution, prefixes, suffixes, antonyms, synonyms etc. based upon the passage to be covered under this topic)

4 Writing Skill (15 periods)

Picture composition
Writing paragraph
Notice writing

LIST OF PRACTICALS

Note: Teaching Learning Process should be focused on the use of the language in writing reports and making presentations.

Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a byproduct.

Listening and Speaking Exercises

1. Self and peer introduction
2. Newspaper reading
3. Just a minute Session-Extempore
4. Greeting and starting a conversation
5. Leave taking
6. Thanking
7. Wishing well
8. Talking about likes and dislikes
9. Group Discussion
10. Listening Exercises.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; DhanpatRai Publications, New Delhi.
3. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra
5. The Functional aspects of Communication Skills – Dr. P. Prsad, S.K. Katria & Sons, New Delhi
6. Q. Skills for success – Level & Margaret Books, Oxford University Press.
7. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR.

Websites for Reference:

1. http://www.mindtools.com/ page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	13	24
2	18	32
3	10	16
4	15	28
Total	**56**	**100**

1.2 APPLIED MATHEMATICS - I

L	T	P
5	-	-

RATIONALE

Contents of this course provide fundamental base for understanding elementary mathematics and their uses in solving engineering problems. Contents of this course will enable students to use basic mathematical function like logarithms, partial fractions, matrices and basic 2D, curves in solving various engineering problems of all fields.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Apply Binomial theorem to solve engineering problems
- Apply determinants properties and Crammer's rule to solve engineering problems
- Apply dot & cross product of vectors to find the solution of engineering problems
- Use complex numbers in various engineering problems
- Apply differential calculus and higher order to solve engineering problems
- Find velocity, acceleration, errors and approximation in engineering problems with application of derivatives.

DETAILED CONTENTS

1. Algebra -I (12 Periods)

Series: AP and GP; Sum, nth term, Mean

Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.

Determinants: Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Crammer's rule

2. Algebra- II (12 Periods)

Vector algebra: Dot and Cross product, Scaler and vector triple product.
Complex number.
Complex numbers, Representation, Modulus and amplitude Demoivre theorem, its application in solving algebraic equations, Mod. function and its properties.

3. Trigonometry (10 Periods)

Relation between sides and angles of a triangle: Statement of various formulae showing relationship between sides and angle of a triangle.
Inverse circular functions: Simple case only

4. Differential Calculus - I (18 Periods)

Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.
Methods of finding derivative, Trigonometric functions, exponential function, Function of a function, Logarithmic differentiation, Differentiation of Inverse trigonometric function, Differentiation of implicit functions.

5. Differential Calculus - II (18 Periods)

Higher order derivatives, Leibnitz theorem (without proof). Simple applications.
Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

INSTRUCTONAL STRATEGY

The basic instructional strategy to teach basic mathematics, Binomial theorem, trigonometry, differential equations etc. should be conceptual with real world applications of relevant branch. More numerical and theory examples can be used for clear understanding of the content**.**

MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3 Applied Mathematics-I by Chauhan and Chauhan, Krishna Publications, Meerut**.**
4. Applied Mathematics-I (A) by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1.	12	20
2.	12	20
3.	10	12
4	18	24
5	18	24
Total	**70**	**100**

1.3 APPLIED PHYSICS – I

L	T	P
5	-	2

RATIONALE

Applied physics includes the study of a diversified topics related to the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles. In all contents, SI units should be followed.

LEARNING OUTCOMES

After undergoing this course, the students must be able to:

- Identify the use of S.I. system of measurement with accuracy and how it is used in engineering
- Represent physical quantities as scalars and vectors, applying the physical laws and concepts of linear and circular motion in everyday life.
- Solve difficult problems (walking of man, horse and cart problem, flying of bird/ aircraft, etc.)
- Analyze and design banking of roads/railway tracks and apply conservation of momentum principle to Explain rocket propulsion, recoil of gun etc.
- Derive work, power and energy relationship and solve problems about work and power.
- Define work, energy and power and their units.
- Describe conservation of energy and its applications
- Understand the concept of rotational motion of a rigid body and its applications
- Apply the physical laws and concepts of gravity, its variation with longitude and latitude and its uses in space satellite etc. .
- Understand the concept of elasticity, surface tension, pressure and the laws governing movement of fluids.
- Express physical work in term of heat and temperature; Measure temperature in various processes on different scales (Celsius, Kelvin, Fahrenheit etc.)
- Distinguish between conduction, convection and radiation, identify the different methods for reducing heat losses
- Understand the laws of thermodynamics, Carnot cycle and their applications.

DETAILED CONTENTS

1. Units and Dimensions (10 Periods)

Need of Measurement in engineering and science, unit of a physical quantities - fundamental and derived units, systems of units (FPS, CGS and SI units)
Dimensions and dimensional formulae of physical quantities.
Principle of homogeneity of dimensions
Dimensional equations and their applications, conversion of numerical values of physical quantities from one system of units into another, checking the correctness of physical equations and deriving relations among various physical quantities
Limitations of dimensional analysis
Error in measurement, accuracy and precision of instruments, random and systematic errors, absolute error, relative error, and percentage error, Estimation of probable errors in the results of measurement (combination of errors in addition, subtraction, multiplication, division and powers), rules for representing significant figures in calculation.
Application of units and dimensions in measuring length, diameter, circumference, volume, surface area etc. of metallic and non metallic blocks, wires, pipes etc (at least two each).

2. Force and Motion (10 periods)

Scalar and vector quantities – examples, representation of vector, types ofvectors
Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statementonly), Scalar and Vector Product.
Resolution of Vectors and its application to lawn roller.
Force, Momentum, Statement and Derivation of Conservation of linearmomentum, its applications such as recoil of gun.
Impulse and its Applications
Circular motion (Uniform and Non-uniform), definition of angular displacement, angular velocity, angular acceleration, frequency, time period.
Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical)
Central force, Expression and Applications of Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist, Principle of centrifuge.
Application of various forces in lifts, cranes, large steam engines and turbines

3. Work, Power and Energy (10 periods)

Work: and its units, examples of zero work, positive work and negative work, conservative and non-conservative force,
Friction: modern concept, types, laws of limiting friction, Coefficient of frictionand its Engineering Applications.
Work done in moving an object on horizontal and inclined plane for rough and plane surfaces with its applications
Energy and its units: Kinetic energy and potential energy with examples and their derivation, work energy theorem.
Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.
Power and its units, calculation of power in numerical problems
Application of Friction in brake system of moving vehicles, bicycle, scooter, car trains etc.

4 Rotational Motion (10 periods)

Concept of translatory and rotatory motions with examples
Definition of torque with examples
Angular momentum, Conservation of angular momentum (quantitative) and its examples
Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid) (Formulae only). Concept of Fly wheel.
Rotational kinetic energy, Rolling of sphere on the slant plane,
Comparison of linear motion and rotational motion.
Application of rotational motions in transport vehicles, and machines.

5 Motion of planets and satellites (08 periods)

Gravitational force, Kepler's law of planetary motion,
Acceleration due gravity and its variation,
Gravitational Potential and Gravitational potential energy,
Motion of satellite, orbital velocity and time period of satellite, Total energy and Binding energy of a satellite, Escape energy and escape velocity,
Types of satellites, Geo-stationary satellite, semi-synchronous, polar satellite (concept only) and their uses in science and technology,
Concept of Black Holes

6. Properties of Matter (12 periods)

Elasticity: definition of stress and strain, different types of modulii of elasticity, Hooke's law, significance of stress strain curve
Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications
Surface tension: concept, its units, angle of contact, Capillary action and determination of surface tension from capillary rise method, applications of surface tension, effect of temperature and impurity on surface tension
Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.
Concept of fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem and their applications.

7. Heat and Thermodynamics (10 periods)

Difference between heat and temperature
Modes of transfer of heat (Conduction, convection and radiation with examples)
Different scales of temperature and their relationship
Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them
Heat conduction in a metal rod, Temperature gradient, Concept of Co-efficient of thermal conductivity, Uses and effects of Heat conduction in Daily life.
Isothermal and Adibatic process
Zeroth, First and second law of thermodynamics, Heat engine (concept Only),Carnot cycle.
Application of various systems of thermometry in refrigeration and air-conditioning etc.

LIST OF PRACTICALS (to perform minimum six experiments)

1 To find radius of wire and its volume and the maximum permissible error in these quantities by using both vernier calipers and screw gauge.
2 To find the value of acceleration due to gravity on the surface of earth by using a simple pendulum.
3 To determine the Radius of curvature of (i) convex mirror, (ii) concave mirror by spherometer
4 To verify parallelogram law of forces
5 To study conservation of energy of a ball or cylinder rolling down an inclined plane.
6 To find the Moment of Inertia of a flywheel about its axis of rotation
7 To determine the atmospheric pressure at a place using Fortin's Barometer
8 To determine the viscosity of glycerin by Stoke's method
9 To determine the coefficient of linear expansion of a metal rod
10 To determine force constant of spring using Hooks law

INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

MEANS OF ASSEMENTS

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- Viva Voce

RECOMMENDED BOOKS

1 Text Book of Physics for Class XI (Part-I, Part-II); N.C.E.R.T., Delhi
2 Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3 Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
4 B.Sc.Practical Physics by C L Arora, S. Chand Publication..
5 Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6 Engineering Physics by DK Bhhatacharya & Poonam Tandan; Oxford University Press, New Delhi
7 Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications
8 V. Rajendran,physics-I, Tata McGraw-Hill raw Hill publication, New Delhi
9 Arthur Beiser, Applied Physics, Tata McGraw-Hill raw Hill publication, New Delhi
10 Physics Volume 1, 5th edition, Haliday Resnick and Krane, Wiley publication

TOPIC WISE DISTRIBUTION OF PERIODS AND MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	15
2	10	15
3	10	15
4	10	15
5	08	10
6	12	16
7	10	14
Total	**70**	**100**

1.4 APPLIED CHEMISTRY

L	T	P
5	-	2

RATIONALE

The use of various chemicals and chemical products in diverse technical and engineering fields have repeatedly proved the importance of Applied Chemistry, which enhances its role to a new peak. On the other hand, ever increasing use of such materials will compel engineers, technocrats to acquire essential applied chemistry knowledge in order to select engineering materials, which not only suit them but also provide more environmental compatibility. This situation demands principles of Applied Chemistry in diploma-engineering courses. Principles of Applied Chemistry will enable budding engineers and technocrats to develop scientific temper and appreciate physical, chemical and engineering properties of materials. Hence the subject of Applied Chemistry.

LEARNING OUTCOMES

After undergoing this subject, the student will be able to:

- Classify various substances based on state of aggregation
- Substantiate the laws and principles on which structure of atom is established.
- Explain and predict properties of substances.
- Explain sources of water and various characteristics of water (quantitatively).
- Explain cause and factors which can adversely affecting natural water quality and remedial measures available for water purification
- Think critically, develop and adapt water conservation techniques.
- Explain corrosion of metal and their preventive measures.
- Explain chemical nature and causes of corrosion
- Apply correct and efficient methods of corrosion prevention.
- Explain chemistry of fuels and their relative advantages.
- Select most efficient fuel for the engine and engineering applications.
- Suggest how to subside air pollution caused by the use of fossil fuels
- Explain the chemistry of various polymers and plastics
- Verify suitability and select polymer/rubber/plastic materials for engineering applications.

DETAILED CONTENTS

1. Atomic Structure, Periodic Table and Chemical Bonding (14 periods)

Fundamental particles- mass and charges of electrons, protons and neutrons with names of the scientists who discovered these fundamental particles.

Bohr's model of atom and successes and limitations of atomic theory (qualitative treatment only).

Atomic number, atomic mass number isotopes and isobars.

Definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers and their significance,

Aufbau's principle, Pauli's exclusion principle and Hund's rule electronic configuration of elements with atomic number (Z) = 30 only. (Electronic configurations of elements with atomic number greater than 30 are excluded).

Modern periodic law and periodic table, groups and periods, classification of elements into s, p, d and f blocks (periodicity in properties - excluded)

Chemical bonding and cause of bonding and types such as ionic bond in NaCl sigma (σ) and pi (π) covalent bonds in H_2, HCl, Cl_2, elementary idea of hybridization in $BeCl_2$, BF_3, CH_4, NH_3 and H_2O, VSEPR, Molecular orbital Theory

States of Matter: Solid, Liquid & Gas, Metallic bonding- explanation with the help of electron gas (sea) model.

2. Fuels and Lubricants (18 periods)

Definition of fuel, classification of fuels, characteristics of good fuel, relative merits of gaseous, liquid and solid fuels

Calorific value-higher calorific value, lower calorific value, determination of calorific value of solid or liquid fuel using Bomb calorimeter and numerical examples.

Coal - types of coal and proximate analysis of coal

Fuel rating – Octane number and Cetane number, fuel-structural influence on Octane and Cetane numbers

Gaseous fuels – chemical composition, calorific value and applications of natural gas (CNG), LPG, producer gas, water gas and biogas.

Elementary ideal on – hydrogen as future fuels, nuclear fuels.

Lubricants: Definition and properties, mechanism, industrial application and its function in bearings.

Synthetic lubricants and cutting fluids.

3. Water (14 periods)

Demonstration of water resources on Earth using pie chart.

Classification of water – soft water and hard water, action of soap on hard water, types of hardness, causes of hardness, units of hardness – mg per liter (mgL^{-1}) and part per million (ppm) and simple numerical, pH and buffer solutions and their applications.

Disadvantages caused by the use of hard water in domestic and boiler feed water. Primming and foaming and caustic embrittlement in boilers.

Removal of hardness -Permutit process and Ion-exchange process.

Physico-Chemical methods for Water Quality Testing

a) Determination of pH using pH meter, total dissolved solids (TDS)

b) Testing and Estimation of- alkalinity, indicator their types and application total hardness by EDTA method and O'Hener's Method. (chemical reaction of EDTA method are excluded).

c) Understanding of Indian Water Quality standards as per WHO

Natural water sterilization by chlorine and UV radiation and reverse osmosis.

Municipality waste water treatment. Definition of B.O.D and C.O.D.

4. Electrochemistry (4 periods)

Redox Reaction, Electrode Potential, Nernst equation, Electrochemical cell (Galvanic and Electrolytes); Nernst equation.

5. Corrosion and its Control (10 periods)

Definition of corrosion and factors affecting corrosion rate.

Theories of

a) Dry (chemical) corrosion- Pilling Bedworth rule

b) Wet corrosion in acidic atmosphere by hydrogen evolution mechanism

Definition of passivity and galvanic series

Corrosion control:

a) Metal coatings – Cathodic protection, Cementation on Base Metal Steel – Application of Metal Zn (Sheradizing), Cr (Chromozing) and Al (Calorizing), Sacrificial protection and impressed current voltage

b) Inorganic coatings – Anodizing and phosphating,

c) Organic coatings - use of paints varnishes and enamels

d) Internal corrosion preventive measures- alloying (with reference to passivating, neutralizing and inhibition) and heat treatment (quenching, annealing)

6. Organic compounds, Polymers and Plastics (10 periods)

Classification of organic compounds and IUPAC Nomenclature

Definition of polymer, monomer and degree of polymerization

Brief introduction to addition and condensation polymers with suitable examples (PE, PS, PVC, Teflon, Nylon -66 and Bakelite)

Definition of plastics, thermo plastics and thermo setting plastics with suitable examples, distinctions between thermo and thermo setting plastics

Applications of polymers in industry and daily life

LIST OF PRACTICALS

1. Estimation of total hardness of water using standard EDTA solution

2. Estimation of total alkalinity of given water sample by titrating it against standard sulfuric acid solution
3. Proximate analysis of solid fuel)
4. Estimation of temporary hardness of water sample by O' Hener's Method.
5. Determination of flash and fire point of given lubricating oil using Able's flash point apparatus

INSTRUCTIONAL STRATEGY

Teachers may take help of various models and charts while imparting instructions to make the concept clear. More emphasis should be laid on discussing and explaining practical applications of various chemical process and reactions. In addition, students should be encouraged or motivated to study those processes in more details, which may find practical application in their future professional career.

MEANS OF ASSEMENTS

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- Viva Voice

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuricose & J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C. Jain & Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
4. Engineering Chemistry – A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
5. Applied Chemistry - I by Dr. P. K Vij & Shiksha Vij, Lords Publications, Jalandhar.
6. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, Meerut, India

SUGGESTED DISTRIBUTION OF MARKS

Topics	Time Allotted (hrs)	Marks Allotted (%)
1.	14	20
2.	18	24
3.	14	20
4.	4	6
5.	10	15
6.	10	15
Total	**70**	**100**

1.5 ENGINEERING DRAWING

L	T	P
4	-	10

RATIONALE

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.

Note:

i) First angle projection is to be followed
ii) Minimum of 18 sheets to be prepared and atleast 2 sheets on AutoCAD
iii) Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Identify and use of different grades of pencils and other drafting instruments which are used in engineering field
- Draw free hand sketches of various kinds of objects.
- Utilize various types of lines used in engineering drawing.
- Read and apply different dimensioning methods on drawing of objects.
- Use different types of scales and their utilization in reading and reproducing drawings of objects and maps.
- Draw 2 - dimensional view of different objects viewed from different angles (orthographic views)
- Draw and interpret complete inner hidden details of an object which are otherwise not visible in normal view
- To make projections of Solid
- Generate isometric (3D) drawing from different 2D (orthographic) views/sketches
- Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances
- Use basic commands of Auto CAD.

DETAILED CONTENTS

1. Introduction to Engineering Drawing (03 sheets)

Introduction to drawing instruments, materials, different types of lines inEngineering drawings as per BIS Specifications.

Practice of vertical, horizontal and inclined lines, triangles, rectangles, circles,hexagonal, pentagon with the help of drawing instruments.

Free hand and instrumental lettering (Alphabet and numerals) , (Capital Letter),vertical and inclined at 75 degree.

2. Dimensioning Technique (01 sheet)

Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)

Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches

3. Scales (02 sheets)

Scales –their needs and importance (theoretical instructions), type of scales, definition of R.F. and length of scale

Drawing of plain and diagonal scales

4. Orthographic Projections (06 sheets)

Theory of orthographic projections (Elaborate theoretical instructions)

Projection of Points in different quadrant

Projection of Straight Line (1^{st} and 3^{rd} angle)

- Line parallel to both the planes
- Line perpendicular to any one of the reference plane
- Line inclined to any one of the reference plane.

Projection of Plane – Different lamina like square, rectangular, triangular and circle inclined to one plane, parallel and perpendicular to another plane in 1^{st} angle only

Three views of orthographic projection of different objects. (At least one sheet in3^{rd} angle)

Identification of surfaces

5 Projection of Solid (01 sheets)

Definition and salient features of Solid

To make projections, sources, Top view, Front view and Side view of varioustypes of Solid.

6. Sections (02 sheets)

Importance and salient features
Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.
Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections
Orthographic sectional views of different objects.

7. Isometric Views (02 sheets)

Fundamentals of isometric projections and isometric scale.
Isometric views of combination of regular solids like cylinder, cone, cube and prism.

8. Common Symbols and Conventions used in Engineering (08 sheets)

Civil & Electrical fitting symbols.

9. Introduction to Machine Drawing (02 sheets)

Draw the assembly from part details of objects
Identify and draw different types of screw threads used in various machines andassemblies as per domestic and international standards
Draw different types of nuts, bolts and washers
Draw various locking devices and foundation bolts
Draw different section of various types of keys and cotter joints
Draw various riveted joints
AutoCAD

*** Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.**

INSTRUCTIONAL STRATEGY

Teacher should show model of realia of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on proper selection of drawing instruments and their proper use. The institute should procure AutoCAD or other engineering graphics software for practice in engineering drawings. Teachers should undergo training in AutoCAD/Engineering Graphic. Separate labs for practice on AutoCAD should be established.

MEANS OF ASSESSMENT

- Sketches
- Drawing
- Use of software

RECOMMENDED BOOKS

1. A Text Book of Engineering Drawing by Surjit Singh; Dhanpat Rai & Co., Delhi
2. Engineering Drawing by PS Gill; SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt; Charotar Publishing House Pvt. Ltd., Anand
4. Engineering Drawing I & II by JS Layall; Eagle Parkashan, Jalandhar
5. Engineering Drawing I by DK Goel, GBD Publication.

2.1 APPLIED MATHEMATICS - II

L	T	P
5	-	-

RATIONALE

Basic elements of integral calculus, differential calculus, numerical methods, differential m equations included in this course will play a vital role in understanding engineering problem mathematically. This will also develop analytical as well as conceptual abilities among students.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Calculate simple integration by methods of integration
- Evaluate the area under curves, surface by using definite integrals.
- Calculate the area and volume under a curve along areas
- Solve the engineering problems with numerical methods.
- Understand the geometric shapes used in engineering problems by co-ordinate geometry.

DETAILED CONTENTS

1. Integral Calculus - I (20 Periods)

Methods of Indefinite Integration: -

Integration by substitution.
Integration by rational function.
Integration by partial fraction.
Integration by parts.
Integration of special function

2. Integral Calculus - II: (20 Periods)

Meaning and properties of definite integrals, Evaluation of definite integrals.

Application: Length of simple curves, finding areas bounded by simple curves Volume of solids of revolution, centre of mean of plane areas.

Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule: their application in simple cases. Numerical solutions of algebraic equations; Bisections method, Regula-Falsi method, Newton-Raphson's method (without proof), Numerical solutions of simultaneous equations; Gauss elimination method (without proof)

3. Co-ordinate Geometry (2 Dimension) (18 Periods)

Circle
Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.

4. Co-ordinate Geometry (3 Dimension) (12 Periods)

Straight lines and planes in space
Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line (without proof)

INSTRUCTONAL STRATEGY

Basic elements of Differential Calculus, Integral Calculus and differential equations can be taught conceptually along with real engineering applications in which particular algorithm and theory can be applied. Numerical examples will be helpful in understanding the content of the subject.

MEANS OF ASSESSMENT

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

RECOMMENDED BOOKS

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3 Applied Mathematics-II by Chauhan and Chauhan, Krishna Publications, Meerut**.**
4. Applied Mathematics-I (B) by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut

SUGGESTED DISTRIBUTION OF MARKS

Topic	**Time Allotted (Periods)**	**Marks Allotted (%)**
1.	20	28
2.	20	28
3.	18	24
4	12	20
Total	**70**	**100**

2.2 APPLIED PHYSICS – II

L	T	P
5	-	2

RATIONALE

Applied physics includes the study of a diversified topics related to the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to learn and appreciate these concepts and principles. In all contents, SI units should be followed.

LEARNING OUTCOMES

After undergoing this subject, the student will be able to;

- Define wave motion its types (Transverse and Longitudinal), Periodic and Simple Harmonic Motion, solve simple problems.
- Define the terms: frequency, amplitude, wavelength, velocity of a wave.
- Explain various Engineering, Medical and Industrial applications of Ultrasonics.
- Apply acoustics principles to various types of buildings to get best sound effect
- Explain diffraction, interference, polarization.
- Define capacitance and its unit. They will be able to explain the function of capacitors in simple circuits, solve simple problems using C=Q/V
- Explain the role of free electrons in insulators, conductors and semiconductors, qualitatively the terms: potential, potential difference, electromotive force.
- Explain the concept of electric current, resistance and its measurement.
- List the effects of an electric current and their common applications, State and apply Ohm's law, calculate the equivalent resistance of a variety of resistor combinations, determine the energy consumed by an appliance, distinguish between AC and DC electricity
- Explain Biot-Savart Law, Ampere’s law, Lorenz Force.
- State the laws of electromagnetic induction, describe the effect on a current-carrying conductor when placed in a magnetic field
- Explain operation of moving coil galvanometer, simple DC motor
- Apply the knowledge of diodes in rectifiers, adapters IC’s and various electronic circuits. Apply the concept of light amplification in designing of various LASER based instruments and optical sources.
- Explain total internal reflection and apply this concept for optical fibre and its uses in Medical field and Communication.

DETAILED CONTENTS

1. Wave motion and its applications (12 periods)

Wave motion, transverse and longitudinal wave motion with examples, sound and light waves, relationship among wave velocity, frequency and wave length and its application

Wave equation y = r sin wt, phase, phase difference, principle of superposition of waves

Simple Harmonic Motion (SHM): definition and characteristic, expression for displacement, velocity, acceleration, time period, frequency in S.H.M., Energy ofa body executing S. H. M., simple pendulum, concept of simple harmonic progressive wave,

Free, Damped and forced oscillations, Resonance with examples, Q-factor

Definition of pitch, loudness, quality and intensity of sound waves, intensity level, Echo and reverberation, Sabine formula for reverberation time(without derivation), coefficient of absorption of sound, methods to control reverberation time and their applications, Accoustics of building defects and remedy.

Ultrasonics –production, detection, properties and applications in engineering and medical applications.

2. Wave Optics (6 periods)

Dual nature of light, wave theory of light, laws of reflection and refraction, Snell's law, Power of lens, magnification.

Two-Source Interference, Double-Slit interference, Interference due to thin films, Fresnel's biprism.

use of interference making highly efficient solar panel.

diffraction, Single Slit diffraction, Intensity calculation etc

Polarization of electromagnetic waves, polarizing sheets, polarizing by Reflection (Brewser's law), Malus law, use of polariods.

3. Electrostatics (12 periods)

Concept of charge, Coulombs law, Electric field of point charges, Electric lines of force and their properties, Electric flux, Electric potential and potential difference.

Gauss law of electrostatics: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere.

Capacitor and its working principle, Capacitance and its units. Capacitance of parallel plate capacitor. Series and parallel combination of capacitors (numericals), charging and discharging of a capacitor.

Dielectric and its effect on capacitance, dielectric break down.

Application of electrostatics in electrostatic precipitation of microbes and moisture separation from air and gases in industry for pollution control (Brief explanation only)

4. Current Electricity (12 periods)

Electric Current, Resistance, Specific Resistance, Conductance, Specific Conductance, Series and Parallel combination of Resistances. Factors affecting Resistance, Colour coding of carbon Resistances, Ohm's law. Superconductivity.

Kirchhoff's laws, Wheatstone bridge and its applications (meter bridge and slide wire bridge)

Concept of terminal potential difference and Electro motive force (EMF), potentiometer.

Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy

Examples of application of DC circuits in various electrical and electronics equipment such as C.R.O, T.V., Audio-Video System, Computers etc.

5. Magneto Statics and Electromagnetism (12 periods)

Magnetic poles, force on a moving charge, circulating charges, force on a current carrying wire, Hall effect, torque on a current loop.

Magnetic field due to moving charge(Biot-Savart Law), due to current (Biot-Savart Law), parallel currents, field of a solenoid, Ampere's law.

Faraday's law, Lenz' law, motional emf, induced electric fields.

Magnetic dipole and force on a magnetic dipole in a non-uniform field, Magnetization, Gauss' law for magnetism.

Types of magnetic materials. Dia, para and ferromagnetic materials with their properties,

Application of electromagnetism in ac/dc motors and generators.

6. Semiconductor physics (8 periods)

Types of materials (insulator, semi conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction diode and its V-I characteristics

Diode as rectifier – half wave and full wave rectifier (centre taped),

Semiconductor transistor, pnp and npn (concepts only)

Application of semiconductor diodes (Zener, LED) and that of transistor as amplifier and oscillator.

7. Modern Physics (8 Periods)

Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; laser and its characteristics, population inversion, Types of lasers; Ruby and He-Ne lasers, engineering and medical applications of lasers.

Fibre optics: Total internal reflection and its applications, Critical angle and conditions for total internal reflection, introduction to optical fibers, light propagation, types, acceptance angle and numerical aperture, types and applications of optical fibre in communication.

Introduction to nanotechnology, nanoparticles and nano materials,

LIST OF PRACTICALS (To perform minimum six experiments)

1. To determine the velocity of sound with the help of resonance tube.
2. To find the focal length of convex lens by displacement method.
3. To find the refractive index of the material of given prism using spectrometer.
4. To find the wavelength of sodium light using Fresnel's biprism.
5. To verify laws of resistances in series and parallel combination

6. To verify ohm's laws by drawing a graph between voltage and current.
7. To measure very low resistance and very high resistances using Slide Wire bridge
8. Conversion of Galvanometer into an Ammeter and Voltmeter of given range.
9. To draw hysteresis curve of a ferromagnetic material.
10. To draw characteristics of a pn junction diode and determine knee and break down voltages.
11. To find wave length of the laser beam.
12. To find numerical aperture of an optical fiber.

INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

MEANS OF ASSESSMENT

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- Viva-Voice

RECOMMENDED BOOKS

1. Text Book of Physics (Part-I, Part-II); N.C.E.R.T., Delhi
2. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
4. Practical Physics, by C. L. Arora, S Chand publications
5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6. Modern Engineering Physics by SL Gupta, Sanjeev Gupta, Dhanpat Rai Publications.
7. Physics Volume 2, 5th edition, Haliday Resnick and Krane, Wiley publication
8. Fundamentals of Physics by Haliday, Resnick & Walker 7th edition, Wiley publication

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	12	18
2	6	8
3	12	18
4	12	16
5	12	16
6	8	12
7	8	12
Total	**70**	**100**

2.3 APPLIED MECHANICS

L	T	P
5	-	2

RATIONALE

The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Interpret various types of units and their conversion from one to another.
- Analyze different types of forces acting on a body and draw free body diagrams.
- Determine the resultant of coplanar concurrent forces.
- Calculate the co-efficient of friction for different types of surfaces.
- Calculate the least force required to maintain equilibrium on an inclined plane.
- Determine the centroid/centre of gravity of plain and composite laminar and solid bodies.
- Determine velocity ratio, mechanical advantage and efficiency of simple machines

DETAILED CONTENTS

1. Introduction (06 periods)

Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.

Definition, basic quantities and derived quantities of basic units and derived units

Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration

Concept of rigid body, scalar and vector quantities

2. Laws of forces (12 periods)

Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force

Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of superposition

Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of

forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components

Free body diagram

Equilibrant force and its determination

Lami's theorem (concept only)

[Simple problems on above topics]

Type of Load, supports, Beams- analysis for simply supported, cantilever beams

3. Moment (14 periods)

Concept of moment

Moment of a force and units of moment

Varignon's theorem (definition only)

Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support)

Parallel forces (like and unlike parallel force), calculating their resultant

Concept of couple, its properties and effects

General conditions of equilibrium of bodies under coplanar forces

Position of resultant force by moment

[Simple problems on the above topics]

4. Friction (14 periods)

Definition and concept of friction, types of friction, force of friction

Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction

Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.

Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:

a) Acting along the inclined plane Horizontally
b) At some angle with the inclined plane

5. Centre of Gravity (10 periods)

Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies

Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion

Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed

[Simple problems on the above topics]

6. Simple Machines (14 periods)

Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines

Simple and compound machine (Examples)

Definition of ideal machine, reversible and self locking machine

Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency

System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency

Working principle and application of wheel and axle, Weston's Differential Pulley Block, simple screw jack, worm and worm wheel, single and double winch crab.

Expression for their velocity ratio and field of their application

[Simple problems on the above topics]

LIST OF PRACTICALS

1. Verification of the polygon law of forces using gravesend apparatus.
2. To verify the forces in different members of jib crane.
3. To verify the reaction at the supports of a simply supported beam.
4. To find the mechanical advantage, velocity ratio and efficiency in case of an inclined plane.
5. To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
6. To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel.
7. To find mechanical advantage, velocity ratio and efficiency of single purchase crab.
8. To find out center of gravity of regular lamina.
9. To find out center of gravity of irregular lamina.
10. To determine coefficient of friction between three pairs of given surface.

INSTRUCTIONAL STRATEGY

Applied Mechanics being a fundamental subject, the teacher are expected to emphasize on the application of "Applied Mechanics" in various subjects so that students are able to appreciate the importance of the subject. Students should also be made conversant with the use of scientific calculator to solve numerical problems

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid and end-term written tests
- Model/prototype making.

RECOMMENDED BOOKS

1. A Text Book of Applied Mechanics by S Ramamurtham,Dhanpat Rai Publishing Co. Ltd.
2. A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
3. A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi..
4. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.
5. Test Book of Applied Mechanics by AK Upadhya, SK Kataria & Sons, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	8
2	12	18
3	14	20
4	14	20
5	10	14
6	14	20
Total	**70**	**100**

2.4 INTRODUCTION TO MINING TEDHNOLOGY & MINING GEOLOGY

L	T	P
4	-	4

RATIONALE

Mining engineering will be responsible to prepare mining plan of the area in varying geological conditions and carrying out mining to achieve optimal output. The student of mining engineering will be responsible for carrying out mining, in structurally complex area, paleontological horizon, varied hydro geological conditions etc. Ultimately from geological formation which are economically rich with varied characters.

LEARNING OUTCOMES

Course Outcome: After completing the course student will be able to:

- Basic knowledge of the mining.
- Basic knowledge and skill of geological conditions of the earth.
- Identify the different type of mineral and rocks.
- Knowledge of geological agents and their action.
- Demonstrate and knowledge of the physical and chemical properties of the mineral and rocks.
- Knowledge in Structural Geology.
- Knowledge of underground water, distribution of ground water & water table etc.
- Apply the Knowledge gained in the context of exploration of mining geology.

DETAILED CONTENTS

1. INTRODUCTION : (04 periods)

Geology, the science of the earth and its branches, their scopes & aims. Definition of mining and minerals

2. PHYSICAL GEOLOGY : (06 periods)

Introduction to origin and age of the earth - Tidal hypotheses, condensation of the earth, changes from the liquid to solid state, origin of contents and oceans. Age of the earth.

3. Weathering of rocks :- (03 periods)

Definition, physical factors, biological factors chemical factor, type of weathering, chemical weathering of feldspar, mica and lime stones.

4. Geological Agents and Their Action :- (10 periods)

Erosion transportation and deposition by rivers, with the glaciers. Nature of river, Types of mineral deposition by the rivers,

5. Mineralogy :- (15 periods)

Definition, crystal line and amorphous aggregates i.e. minerals. Physical properties of minerals, Moh's scale description of the rock forming minerals, description of important mineral families feldspar, feldpathoids, amphiboles phyroxenes and mica. Coal and solid hydrocarbon minerals, Identify river bed minerals, building stone minerals.

6. Petrology :- (07 periods)

Rocks as an aggregates of the minerals, cycles of rock formation.

Igneous Rocks :- Forms texture, structure, classification Bowen's reaction series.

Sedimentary Rocks :- Cycles of sedimentation, structure and texture of sedimentary rocks, classification of sedimentary rocks.

Metamorphic Rocks :- Metamorphism - agents and kinds. facies concept. Textures and structure of meta morphic rocks.

7. Structural Geology :- (05 periods)

Dip, strike, outcrops and in crops, structural planes and topography, Igneous structure .

Folds and Faults: Definition, classification , mechanism and its effects on mineral deposits and mining. Impact of folding and faulting on outcrops.

Joints and lineation: Definition, classification and mechanism unconformities, over laps, inlier and outlier. Influence of these on mining. Representation of structural data and joints by orthographic and stereographic projection.

8. Ground Water :- (03 periods)

Zones of distribution of ground water, water tables, perched water table, porosity and permeability of rocks.

9. Introduction of Mining : (03 periods)

Introduction of underground coal mining, open cast coal mining Open cast mining, Small quarry, Underground metal ferrous mining Placer mining.

LIST OF PRACTICALS

1. Study and identification of important rock forming mineral in the hand specimen.
2. Study and identification of important rocks in hand specimen.
3. Study and identification of geomorphologic models.
4. Study and identification of important economic minerals in hand-specimen.
5. Study and sketch of model showing different types of faults, folds & their relation to topography.
6. Drawing of cross sections determination of dip strike from geological maps.

6. Identification of important fossils in hand specimen.

INSTRUCTIONAL STRATEGY

As for as possible teachers while teaching are supposed to give practical examples of various geological conditions &" expose the students from time to time to the actual mine site where above mentioned aspects are visible and mining techniques are adopted with modifications based on geological parameters.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid and end-term written tests
- Model/prototype making

RECOMMENDED BOOKS

1. Text book of Geology By P.K. Mukharjee
2. Text book of Engineering Geology By Parbin Singh
3. Text book of Physical Geology By A.K. Dutta
4. Rutley's Elements of Minerology By H.H. Read
5. Text bok of Petrology By Tywell
6. Text book of Structural Geology By M.P.Billings
7. Text book Hydrageology BY S.P. Garg
8. Elements of Mining-I By D. J. Deshmukh

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	4	8
2	6	8
3	4	8
4	4	8
5	7	14
6	8	16
7	9	22
8	4	8
9	4	8
Total	**48**	**100**

2.5 WORKSHOP TECHNOLOGY

L	T	P
4	-	6

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. Workshop Technology are included in the curriculum in order to provide hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

LEARNING OUTCOMES

After completing the course, the students will be able to:

- Identify tools and equipment used and their respective functions.
- Identify different types of materials and their basic properties.
- Use and take measurements with the help of basic measuring tools/equipment.
- Select proper tools for a particular operation.
- Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
- Prepare simple jobs independently and inspect the same.
- Follow safety procedures and precautionary measures.
- Use safety equipment and Personal Protection Equipment.

DETAILED CONTENTS (PRACTICAL EXERCISES)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

1. **House Keeping And Safety Precautions** : (07 periods)

   Housekeeping - Definition i.e. self responsibilities of student related with the activities of work shop, cleanliness of work area. Setting of tools at the start and end of operation, discipline during work. Safety guards for different operation in workshop, proper position for different operations. Proper utilization of tools and equipments.

2. Materials : (07 Periods)

Classification of materials - Metals and nonmetals, ferrous, nonferrous metals and their alloys, composition, properties and uses of cast iron, carbon, steels, brass, bronze, gunmetal duralumin.

3. Fitting : (07 Periods)

Various fitting tools - Hammers, files, scrapers, chisels, drills, reamers, taps, dies, scriber, surface gauge, surface plate, center punch, dot punch, scales, try square, callipers, vee block, angle plate, vices etc. various
fitting operation.

4. Plumbing : (07 Periods)

Classification of pipes, application of cement and PVC pipes for water supply, plumbing tools and accessories -pipe dies, wrenches and pipe vice. Plumbing fittings - Socket, elbow, tee, reducer, nipple, union, coupling, plug, bend, float valve, valves and taps, pipe laying.

5. Smithy :- (07 Periods)

Blowers, anvils, swages, chisel, hammers, tongs, swage blocks, drifts, punches, fillers set hammers, flatters, rivet heads, rakes and pokers, brass scale and callipers. Power hammer and hearths.

6. Carpentry :- (07 Periods)

Quantities of good timber, common Indian timber- Teak, shisham, sal, Deodar, Mango, Babul, Kail, Bansum, Seasoning of timber, defects in timber, plywood, laminated board, hard board, batten board, carpentry tools, carpentry tools, carpentry joints, preparation of surface and polishing of timber.

7. Welding :- (07 Periods)

Tools and equipment used. Introduction to welding, types of welding, principle high pressure and low pressure, different types of flames. fluxes, filler welding, electrodes, welding techniques, edge preparation, welded joints, safety precaution. Principal of arc welding, soldering and brazing composition of solders and brazing materials.

8. Sheet Metal :- (07 Periods)

Common sheet metals tools- Stakes, hammers, hand punch, grooves, rivet set, chisels. Marketing an measuring tools, Simple sheet metal operations and machines- Bar folder, burring, trimming, seaming, crimping, beading, grooving, wiring, riveting, circular shear machine.

NOTE :-

Study of tools and equipment should be made in reference of their specifications and functions.

PRACTICALS

Fitting :-

Simple exercises involving following operations -Filing, chipping, drilling, tapping, threading with dies and hacksawing. Manufacturing any one utility article involving the use of above operations.

Plumbing :-

Cutting and threading of water pipes, bending of pipes with simple pipe fittings viz; sockets, elbow, tee, reducer, nipple, plug, bend, float valve, valve and taps, union, coupling.PVC pipe fitting work. Fitting of tap stop valve and water meter, repair of bib cock and stop valve.

Smithy :-

Simple exercise involving following operations- Drawing, jumping, upsetting, bending, riveting, and forge welding. Manufacturing any two utility articles involving the use of above operations.

Carpentry :-

Simple exercises involving following operation- Marketing, sawing, planing, chiseling, drilling, boring, grooving riveting, moduling. Preparations of simple joint-cross half lap joint, devetail joint, mortise joint, tennon joint, mitre joint, exercise involving polishing operation. Manufacturing any one utility article involving the use of above operation and fixing laminates.

Welding :-

Preparations of edges for arc and gas welding and preparing following joints- lap joints, butt joint, tee joint. Manufacturing any one utility article involving above operations. Exercises on soldering and brazing.

Sheet Metal :-

Simple exercises involving basic operations - cutting, riveting, soldering and brazing.

Note :-

Students have to prepare a practical note book showing the names, specifications and uses of tools and equipment for each shop with figures.

MEANS OF ASSESSMENT

– Workshop jobs
– Report writing, presentation and viva voce

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
6. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi
7. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	7	12.5
2	7	12.5
3	7	12.5
4	7	12.5
5	7	12.5
6	7	12.5
7	7	12.5
8	7	12.5
Total	**56**	**100**

3.1 INTRODUCTION TO MECHANICAL ENGINEERING

L	T	P
4	-	4

RATIONALE

The subject General Mechanical Engineering is basically introduced to give knowledge to mining engineering students about the various mechanical engineering fundamentals like properties of steam, steam generators, turning, shaping, planning, slotting and grinding operations. The students are expected to be well known and equip with the above knowledge.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Apply thermodynamic laws.
- determine enthalpy, specific heat capacity and P-V-T surface of an ideal and real gas.
- explain the working, construction and applications of steam boilers and steam generators
- explain the functions and uses of air compressors.
- explain the working of IC engine.
- assist in testing an IC engine.
- Explains the concept of refrigeration and air conditioning.
- Determine the power transmitted by the belts.
- Explains the psychometric chart.
- explain the functioning of steam turbine, gas turbine and jet propulsion.

DETAILED CONTENTS

1. ELEMENTS OF ENGINEERING THERMODYNAMICS: (14 periods)

Basic definition of heat, work. Thermodynamic process. Parameters of working body & their units. Equation of state. Universal gas constant. Relation between heat capacity & temperature Determination of quantity of heat. Elementary concept of laws of Thermodynamics. First law & second law. Graphical representation of process. The work of expansion & compression of gas. Change in the state of ideal gas - Isochoric, Isothermal & Adiabatic process. Carnot cycle.

2. I.C. ENGINES: (10 periods)

Definition. Classification, Principles of operation of 4 stroke engine, Names of different parts of I.C. engine & their functions. Purpose of cooling & Lubrications. Ignition system of S.I. engines.

3. AIR COMPRESSORS: (12 periods)

Description and working of reciprocations and rotary compressor, single and multi stage compressor, conditions of maximum efficiency, efficiency of compressor, volumetric efficiency, effect of cylinder clearance and altitude on efficiency of compressors, advantage of using compressed air in mines, portable compressor air motor.

4. POWER TRANSMISSION: (10 periods)

Power transmission by belts, volt ratio, compound belt drive, centrifugal tension in belts, maximum power transmitted by belts, speed at maximum horse power

5. REFRIGERATION AND AIRCONDITIONING: (10 periods)

Bell Coleman refrigerator. Vapor compression and absorption refrigerators. Psychometric chart. Introduction to comfort air conditioning.

LIST OF PRACTICALS

1. Study of constructional features and working of Cochran boilers.
2. Study of constructional features and working of Locomotive boilers.
3. Description, study and working of Electric vehicles.
4. Study the principle of working of 4-stroke and 2 stroke diesel engines.
5. Study of reciprocation air compressor in respect of the following construction features, operation, starting and stopping, safety devices.
6. Study of rotary air compressor in respect of the following construction features, operation, starting and stopping, safety devices.
7. To find the power and efficiency of a compressor and quality and quantity of air required for compressed air machines.
8. To find the loss of air pressure in pipes and hoses of various diameters.
9. Brake test on diesel engine and calculation of horse power

INSTRUCTIONAL STRATEGY

The aim of this subject is to deliver the basic knowledge of mechanical engineering. This subject focuses on types of energy. This subject also gives knowledge of the air conditioning methods and Power transmission systems.

MEANS OF ASSESSMENT

- Class Tests/Quiz
- Viva-Voce
- Presentation

RECOMMENDED BOOKS

1. Engineering Thermodynamics by PK Nag; Tata McGraw Hill, Delhi.
2. Basic Engineering Thermodynamics by Roy Chaudhary; Tata McGraw Hill, Delhi.
3. Engineering Thermodynamics by CP Arora; Tata McGraw Hill, Delhi.
4. A Treatise on Heat Engineering by VP Vasandani and DS Kumar; Metropolitan Book Company.
5. Internal Commercial Engine by V. Ganeshan; Tata McGraw Hill, Education
6. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh
7. Refrigeration and Air Conditioning by Domkundwar; Dhanpat Rai and Sons, Delhi.
8. Refrigeration and Air Conditioning by CP Arora; Tata McGraw Hill, New Delhi.
9. Refrigeration and Air Conditioning by R.S Khurmi and J.K. Gupta; S Chand and Company Limited, New Delhi.
10. Refrigeration and Air Conditioning by Dr.Harjeev Khanna; Dhanpat Rai and Sons, Delhi.
11. Refrigeration and Air Conditioning by Dr. R.K Rajput; S.K. Kataria and Sons, Ludhiana

Online Resources

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	14	25
2	10	18
3	12	21
4	10	18
5	10	18
Total	**56**	**100**

3.2 MINING TECHNOLOGY-I

L T P

4 - 4

RATIONALE

The diploma holders in mining engineering will be responsible for carrying out mining operation after locating a mineral rich area by exploration.
The course content of the subject includes basic terminology, method of exploring a mineral, drilling and blasting methods. As far as possible teachers while teaching are expected to give practical examples of mining operations i.e. boring, drilling & blasting from time to time.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Understand different nomenclature & technical terminology used in mining Engg.
- Identify which mining system should be adopted according to the site condition and type of Mining.
- know of about principle and method of prospecting -kit- shaft, trend & patterns.
- Identify drilling equipments & tools & patterns & their selection.
- Know about classification & properties, storage & handling of explosives
- Calculate explosive quantity, powder factor, detonator factor.
- Understand different types of blasting.
- Know Sustainable method of mining (Sand, bagri, boulday & morrum) their guidelines
- Sustainable sand mining guidelines 2016.

DETAILED CONTENTS

1. **INTRODUTION TO MINING INDUSTRY:** (07 periods)

   Mineral resources of India with focus on Uttar Pradesh. Mining of important minerals of Uttar Pradesh and India, various terms used in Mining. Mode of entry by inclines, adits and shafts.

2. **INTRODUCTION TO MINING SYSTEM:** (07 periods)

   Mining system adopted in underground coal mining, metalliferous mining, open cast mining (manual, semi-mechanised, mechanised). Nomenclature and technical terminology used in all types of mining operation.

3. **DRILLING AND PROSPECTING:** (14 periods)

(a) **DRILLING:**

Terminology for drilling equipments and tools for under ground mining. Drilling patterns and their selection. Wedge, Burn, Fan, Pyramid cut, etc. for drivage and stone drift. Drilling pattern for coal working.

(b) **PROSPECTING:**

Principle and method of prospecting - pit, shaft, trench and boreholes.
Principle of boring, selection of sites for boreholes, surface layout for boring, methods of boring - precussive and rotary system. Details of equipment, properties of drilling mud. Borehole logging, maintenance of records.
Deviation of borehole, survey of boreholes, difficulties in boring, fishing tools and their uses.

4. **EXPLOSIVE AND BLASTING:** (14 periods)

Classification and properties of explosives. Storage and handling of explosives, Various initiating devices - fuse, cord, detonators, exploders, basic tool and equipment, safe practices in use of explosive, priming charging, stemming. Calculation of explosive quantity, powder factor, detonator factor.
Dangers due to static electricity in blasting circuits and their testing. Precautions before connection, firing, series and parallel connection. Misfire, socket, their causes and handling. Precautions after blasting. Introduction to SMS, SME, PMS and Heavy ANFO system, Electronic detonators & ordinary safety focus.

5. **DEEP HOLE BLASTING**: (07 periods)

Calculation of charges, multi row blasting, twin bench blasting, muffle blasting, V-cut square cut and staggered patterns, over casting/side casting by blasting, deep hole blasting in u/g mines, Control Blasting techniques.

6. **RIVER BED MINING (Sustainable method of sand mining):** (07 periods)

Mining of sand, bajri, boulders and morrum(coarse sand) exclusively Found in river bed as per sustainable sand mining guidelines-2016 & 2020 of MOEF & CC Government of India.

LIST OF PRACTICALS

1. Preparation of sketch showing various mining terms.
2. Study and preparation of mineral map of India showing important mineral occurrences.
3. Study, sketch and operate the feed mechanism of the given drilling machine and accessories.
4. Study and sketch of Hydraulic feed mechanism of the drilling machine.
5. Study, sketch and use of the boring and fishing hole.
6. Study and sketch of various types of detonators relays and exploders.
7. Study and sketch of firing circuits, their laying and checking.
8. Different types of pattern, drilling, charging and blasting of explosives.
9. Study and sketch of approved types of explosive magazines.
10. Study and sketch of different types of drilling patterns used in u/g mines.

INSTRUCTIONAL STRATEGY

Expose the students to real life problems. Plan assignments so as to promote problem solving abilities and develop continuedlearning skills.

MEANS OF ASSEESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

RECOMMENDED BOOKS

1. Elements of mining I & II - D.J. Deshmukh
2. Drilling Technology - Chugh
3. Elements of mining - AROGYAMSWAMY
4. Sustainable Sand Mining Guidelines-2016 - MOEF & CC Govt. Of India
5. Mining and Working Vol 1 & 2 - S. Ghatak (Lovely Prakashan,Dhanbad)
6. Under Ground Mines - D.J Deshmukh

Website for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	07	12
2	07	12
3	14	26
4	14	26
5	07	12
6	07	12
Total	**56**	**100**

3.3 MINING MACHINERY-I

L	T	P
4	-	4

RATIOANLE

The diploma holders in mining engineering will be responsible to supervise the working of the machinery at a mine site. purchase of machinery at the initial stage in any mining project with justification, suitability and efficiency of the machines according to the nature of mineralization, depth of occurrence type of mining and local geological condition.
This subject will provide him basic knowledge and skills of different type of machineries like face machineries pumps haulage, conveyors, locomotives etc.
The teachers are supposed to give demonstration of functioning of working models in the laboratory as well as machineries in operation at the actual mining site.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Know about face Machinery in detailed.
- Understand different modes of Transportation used in mining (Rail haulage, Conveyors, Locomotives)
- Identify different open cast machinery and their working and safety
- Know how communication doing in Mining industries.
- Understand to Mining surveillance system

DETAILED CONTENTS

1. **Face Machinery**: (08 Periods)

Principles of drilling , Cutting and ploughing, Drills , Coal cutting machines , loaders , continuous miners and cutter - loaders , Features of modern shearers.

2. **Transport:** (24 Periods)

(i) Rail haulage Types of rope haulage, Track, mine tubes and mine cars , safety appliances on haulage roads , locomotive haulage.

(ii) Conveyors: Construction and operation of belt , chain and cable belt conveyors. Aerial ropeways-types , construction, application and operation.

(iii) LOCOMOTIVES:

Types, diesel, battery, electric and compressed air driven.Comparision.their construction , operation , application and maintenance.

3. **Open Cast Machinery**: (08 Periods)

Blast hole drills , rippers and scrapers , shovels , drag lines, dumpers, road graders and dozers - their construction and operation , bucket wheel excavators, spreaders- construction and operation .

4. **Mine Communication** (08 Periods)

Signalling , telephone and wireless communication.

5. **MMS (Mining Surveillance System) :** (08 Periods)

GIS based, RPID based, Geo-fencing, Truck dispatch system (TDS), Slope pick radar system.
(Developed by MEIT (Ministry of Electronics and Information Technology), Government of India)

LIST OF PRACTICALS:

1. Electric drill construction, working and maintenance.
2. Study and sketch of gear arrangement of coal cutting machines.
3. Study and sketch of cutting machines, picks and pick boxes.
4. Measurement of rate of penetration by jack hammer.
5. Study and sketch of compressed air mono pumps and various Mine's pumps.
6. Study and sketch of haulage clips, drag, jimcro
7. Study and sketch of continuous Miner and Long-wall shearer.
8. Pneumatic loader.
9. Shuttle car used in coal mines.
10. Tension arrangements unloading of buckets of an aerial rope- way.
11. Tension arrangement of an endless rope haulage.
12. Changing of rope of an endless rope haulage.
13. Different types of locomotives used in mines.

MEANS OF ASSEESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

RECOMMENDED BOOKS

1. Open cast mining by C.P.Singh.
2. Surface mining by G.B.Mishra.
3. Elements of Mining-II by D. J Deshmukh
4. Mining and Working By S. Ghatak

Website for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	14
2	24	44
3	08	14
4	08	14
5	08	14
Total	**56**	**100**

3.4 MINING GEOLOGY

L	T	P
4	-	4

RATIONALE

The diploma holders in mining Engineering will be responsible for the development mines and supervision of sampling, assay plan, geological mapping, estimation of ore reserves to get optimal output.
The course contents of the subject provides him basic knowledge about economic fuel geology, detailed aspects of metallic and nonmetallic economic materials their characteristics and geological mapping etc.
The teacher while teaching supposed to conduct technical visits of mines, where, different techniques of ore reserves estimation and geological mapping are in practice justified in varied situation.

LEARNING OUTCOMES

After completion of this course, the students will be able to:

- Identify the important minerals & important rocks
- Think critically, formation and classification of mineral deposits in India.
- Know the origin & constituents of fossil fuels their occurrence in India.
- Substantiate the definition and scope of Stratigraphy.
- Understand geologic formation of India.
- Apply correct & efficient method to control Environmental pollution
- know about rivers ecology.

DETAILED CONTENTS

1. **Formation of Mineral Deposits :** (14 Periods)

Definition of ore and gangue minerals, tenor and grade of ores. Classification of mineral deposits. Introduction of various processes of formation of economic mineral deposits.
Crystallography: Definition, Application and scope, crystal system description , geologic occurrences, geographical distribution in India and uses of the important rock forming minerals / groups .
Fossil Fuels: Origin and constituents of coal and petroleum. Structural Features of coal seams and reservoir traps . Their occurence in India.

2. **Economic Fuel Geology :** (12 Periods)

Ore genesis and geothermo -barometry ,study of formation and classification of mineral deposits in India: Iron, Copper, lead, Zinc , manganese, Baxuite, Chromite, gold and silver minerals.

3. **Stratigraphy :** (10 Periods)

Definition and scope , Geological time scale .Fossils : Definition and importance of Fossils to geologist and mining engineers . Conditions, Modes of preservation and uses Stratigraphic scale . Major geologic formation of India : Dharwar, Cuddapah, Vindhyan , Gondwana and Tertiary systems. Their economic importance.

4. **Engineering Geology:** (10 Periods)

Different types of rocks, Physiomechanical properties of rocks, Structural geology, stereo projections, rock mass Classification

5. **Environmental Geology :** (10 Periods)

Introduction and its role in mitigation and control of environmental pollution and rivers ecology .

INSTRUCTIONAL STRATEGY

Expose the students to real life problems. Plan assignments so as to promote problem solving abilities and develop continuedlearning skills.

MEANS OF ASSEESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Small projects
- Viva-voce

LIST OF PRACTICALS

1. Study and identificaion of important minerals in hand specimen.
2. Study and identification of impotant rocks in hand specimen.
3. The study of different economic minerals in hand specimen.
4. Geological sections of simple maps representing simple structures and completion of outcrops on Topographical maps.
5. Microscopic study of 10 important rock forming minerals.
6. Study and sketch of bronton compass and clinometer, including surveying.
7. Microscopic study of syenite, dolerite, basalt, granite, gabbro, micaschist, gneiss, dolomatic lime stone
8. Plotting of bore log, calculation of ore reserve and sampling.
9. Preparation of assay plans.
10. Stereo projection of joints.

RECOMMENDED BOOKS

1. Text book of Geology of India and Burma BY M.S. Krishnan
2. Ore deposite of India. By Gokhlae & Ray.
3. India's Mineral Resouces By Krishnaswamy
4. Text book of mine economic By Sinha & Sharma
5. Winning Coal & Iron in india By R.T. Deshmukh & D.J. Deshmukh
6. Industrial Minrals By Sinha

Website for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	14	25
2	12	21
3	10	18
4	10	18
5	10	18
Total	**56**	**100**

3.5 Introduction to Basic Languages in Computer Application

L	T	P
2	-	5

RATIONELE

Computers are being used for design and information processing in all branches of engineering. An exposure to fundamentals of computer programming is very essential for all diploma holders. this subject has been included to introduce students in the use and application of computers in engineering.

LEARNING OUTCOMES

- Identify Computer Hardware Components, Network Components and Peripherals.
- Explain the role of an Operating System.
- Install System and Application Software.
- Explain the function of the system components including Processor, Motherboard and Input-output devices.
- Use Word Processing Software to prepare document.
- Use Spreadsheet Software to create workbooks and automate calculation.
- Use Presentation Software to create interactive presentation.
- Perform fundamental tasks common to most application software including print, scan, save, edit, cut, copy, paste, format, spell and grammar check.
- Find and evaluate information on the Web.
- Install Antivirus.
- Safeguard against Online Frauds, threats and crimes.
- Use online office tools (Google suits)

DETAILED CONTENTS

1. **Introduction to Computer:** (04 Periods)

   A. Block Diagram of Computer.
   B. Types Of Computer
   C. Types of Input and Output devices
   D. Memories Devices (Its Types and Basic).

2. **INTRODUCTION TO OPERATING SYSTEMS (MS-DOS/MS-WINDOWS:)** (02 Periods)

   What is operating system, its significance, Commands of DOS, Features/Application of window.

3. **WORD PROCESSING/ WORKSHEET/ PRESENTATION** (06 Periods)

File, Edit, View, **Insert, Format,** Tools, Table, Mail Merge Introduction, Use of Tools/Icons for preparing simple Mini Project. Introduction, Use of Tools/Icons for preparing simple presentation on Power Point.

4. **DATABASE OPERATION** : (02 Periods)

Create database using MS Access, Create Table and Creating Reports.

5. **Introduction to Internet**: (04 Periods)

What is Network, How to send & receive messages, Use of Search Engines, Surfing different web sites. Creating Mail ID, Use of Briefcase, Sending./replying emails. Internet of things (IOT), Artificial Intelligence (AI)

6. **INTRODUCTION TO ADVANCE TOOLS :** (04 Periods)

I. Steps requires to solving problems.
A. Flow Chart
B. Algroithm
C. Programming, C++, JAVA and its utility.

II. Use of advance Tools such as Skype, Team viewer, Installation of Modem, use of WiFi, etc

7. **INTRODUCTION TO MINING SOFTWARE :** (06 Periods)

MINEX, SURPAC: Numerical modeling software like Rock Science; Blast Fermentation analysis software like WIPFRAG.

.

LIST OF PRACTICALS

1. Practice on utility commands in DOS.

2. Composing, Correcting, Formatting and Article (Letter/Essay/ Report) on Word Processing tool Word and taking its print out.

3. Creating, editing, modifying tables in Database tool.

4. Creating labels, report, generation of simple forms in Database tool.

5. Creating simple spread sheet, using in built functions in Worksheet tool..

6. Creating simple presentation.

7. Creating mail ID, Checking mail box, sending/replying e-mails.

8. Surfing web sites, using search engines.

Note: In the final year, related students have to use the concept of MS Word/MS Excel/MS Access/ MS Power Point in their respective branch's project work such as creating project report through MS Word/Creation of statistical data in MS Excel/Creation of database in MS Excel/ Demonstration of project through Power Point Presentation.

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connections and proficient in making use of MS Office/Open Office/Libre office/Google Suite in addition to working on internet. The student should be made capable of working on computers independently.

MEANS OF ASSEESSMENT

- Class Tests/Quiz
- Software Installation and Use
- Viva-Voce
- Presentation

RECOMMEMDED BOOKS

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Information Technology for Management by Henery Lucas, Tata McGraw Hills, New Delhi
3. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
4. Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, New Delhi.
5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. On Your Marks - Net…Set…Go… Surviving in an e-world by AnushkaWirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar

11. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

Online Resources (Including Software link):

1. www. tutorialspoint..com
2. www.sf.net
3. Gsuite.google.com
4. Spoken-tutorial.org
5. Swayam.gov.in
6. **https://www.3ds.com/products-services/geovia/products/minex/**
7. **https://www.3ds.com/products-services/geovia/products/surpac/**
8. **https://wipware.com/products/wipfrag-image-analysis-software/**

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	04	14
2	02	7
3	06	22
4	02	7
5	04	14
6.	04	14
7.	06	22
Total	**28**	**100**

4.1 COMMUNICATION SKILLS – II

L	T	P
4	-	2

RATIONALE

Knowledge of English Language plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Frame correct sentences with illustrations
- Comprehend the language correctly
- Interpret the language correctly
- Use given material in new situations.
- Correspond effectively using various types of writings like letters, memos etc.
- Communicate effectively in English with appropriate body language making use of correct and appropriate vocabulary and grammar in an organized set up and social context.

DETAILED CONTENTS

1. Functional Grammar (16 periods)

   Prepositions
   Framing Questions
   Conjunctions
   Tenses

2 Reading (16 periods)

   Unseen Passage for Comprehension (Vocabulary enhancement - Prefixes, Suffixes, one-word substitution, Synonym and Antonym) based upon the passageshould be covered under this topic.

3 Writing Skill (24 periods)

   Correspondence

   a) Business Letters- Floating Quotations, Placing Orders, Complaint Letters.

b) Official Letters- Letters to Government and other Offices Memos, Circular, Office Orders Agenda & Minutes of Meeting Report Writing

LIST OF PRACTICALS

Note: Teaching Learning Process should be focused on the use of the language in writing reports and making presentations.
Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a byproduct.

Speaking and Listening Skills

1. Debate
2. Telephonic Conversation: general etiquette for making and receiving calls
3. Offering- Responding to offers.
4. Requesting – Responding to requests
5. Congratulating
6. Exploring sympathy and condolences
7. Asking Questions- Polite Responses
8. Apologizing, forgiving
9. Complaining
10. Warning
11. Asking and giving information
12. Getting and giving permission
13. Asking for and giving opinions

INSTRUCTIONAL STRATEGY

Students should be encouraged to participate in role play and other student-centered activities in class rooms and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2 Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.
3 High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR,Chandigarh.

Websites for Reference:

1. http://www.mindtools.com/ page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	16	28
2	16	28
3	24	44
Total	**56**	**100**

4.2 MINING TECHNOLOGY-II

L	T	P
4	-	3

RATIONALE

The diploma holders in mining engineering will be responsible for the development of mines in scientific manner in hard as well as soft rock's area to achieve optimal output along with safety of workers, engaged in various activities related to mining.
Subjects provide him basis as well as up to date knowledge & skills shaft sinking and tunneling course contents also includes elementary aspects as mineral processing.
It is expected from teachers to give typical examples and conduct technical visits to expose the students with mining technological aspects in the mining area.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Select appropriate site, size and shape of shafts
- Understand different terminology related to shaft sinking
- Select special methods of sinking in difficult ground.
- Know about different tunnel boring machines
- Substantiate Scope, object & limitation of elementary mineral processing.
- Use resources optimally and economically.
- Know the working and uses of modern loader Machines & Heavy dumpers.
- Perform shaft sinking, tunneling and inclined development.
- Substantiate the theory and practice of crushing and grinding

.

DETAILED CONTENTS

1. Mine Development (22 Periods)

1.1 Shaft Sinking :

Site selection size and shape of shafts, sinking shaft- preparatory arrangements, drilling and blasting, mucking, hoisting, ventilation, pumping, lighting and dewatering , temporary and permanent lining, complete cycle operation, Mechanized shaft sinking.

Special methods of sinking in difficult and water bearing ground . piling, drop shaft caisson, cementation, freezing etc. Shaft sinking by shaft borers, widening and deepening of shafts.

1.2 Development to Inclined and Adits

1.3 Tunnelling :

Main haulage drifts and tunnels: Purpose, shape , size and location ;excavation-ground breaking , muck disposal, ventilation and supporting .High speed drifting / tunnelling : application of mechanical methods, road headers and tunnel boring machines.

2. **ELEMENTARY MINERAL PROCESSING :** (20 Periods)

Scope, object and limitation of mineral processing. Theory and practice of crushing and grinding. Brie idea of jaw crusher, cone crusher, ball mill. Heavy media separation and jigging methods of coal washing. Introductory froth floatation principle, floatation of sulphides , oxides and coal Simplified sheets for coal ,copper ,lead ,zinc , gold, iron, manganese ores and lime stone.

3. Mechanised Loader Machines & Heavy dumpers- Pick top and Pick bottom layouts. (14 Periods)

LIST OF PRACTICALS

1. Sketches of temporary lining during shaft sinking.
2. Sketches of permanent lining shaft.
3. Study and Sketch of surface arrangements for shaft sinking..
4. Study and Sketch drilling and blasting pattern for shaft sinking.
5. Study and Sketches of arrangement for freezing methods of shaft sinking.
6. Study, Sketch and layout of signaling bell, and visual indicators circuits.
7. Study of flow chart of beneficiation of important ores of India.

   a. Flow chat of Pyrophyllite and diaspore

   b. Flow chart of silica sand

c. Flow chart of rock phosphate.

d. Flow chart of Coal.

e. Flow chart of Iron.

MEANS OF ASSEESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Report Writing
- Viva-voce

INSTRUCTIONAL STRATEGY

Students should be encouraged to participate in role play and other student-centered activities in class rooms and actively participate in listening exercises

RECOMMENDED BOOKS

2. Elements of mining I & II BY D.J. Deshmukh
3. Mineral Dressing By Gaudin

Website for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (periods)	Marks Allotted (%)
1	22	40
2	20	35
3	14	25
Total	**56**	**100**

4.3 ELECTRICAL TECHNOLOGY & ELECTRONICS

L	T	P
5	-	2

RATIONALE

The superiority of electricity as power over other means in use in home or industry cannot be denied. So it is imperative to introduce the mechanical engineering students with electrical machines and their various uses.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Understand the meaning of basic electrical quantities such as voltage, current, power etc.
- Use working principle of transformer.
- Use basic Network Theorem and Kirchoff's laws.
- Understand the concept of Junction Diode, transistor and field effect transistor
- Understand Electroplating and Anodising process.
- Understand The types of electro heating.

DETAILED CONTENTS

1. **ELECTRIC INDUCTION**: (04 Periods)

Faraday's Laws of electromagnetic induction. Self and mutual induction. Statically and Dynamically induced e.m.f., Lenz's law. Fleming's left hand and right hand rule.

2. **A. C. THEORY:** (12 Periods)

Production of alternating e.m.f. Definition of cycle, Frequency, Amplitude, Time period, Instantaneous, Average, R.M.S. maximum values of sinusoidal wave. Form factor, peak factor. Representation of a sinusoidal quantity by a mathematical expression and phasor, phase and phase difference, Relationship of voltage and current for pure resistance, pure inductance and pure capacitive reactance, impedance. Solution and phasor diagrams of simple R.L.C. series and parallel circuits. Active and reactive power. Significance of P.F.

3. **THREE PHASE CIRCUITS**: (06 Periods)

Production of Three phase voltage, advantages of three phase supply. Concept of star and delta connections. Relationship between phase and line values of currents and voltages, Power in three phase circuits, simple numerical problems.

4. **MEASUREMENT & MEASURING INSTRUMENTS:** (12 Periods)

(i) Primary and secondary instruments-Indicating, Recording and Integrated instruments.

(ii) Working principle and construction of the following instruments.

(a) Ammeter & Voltmeter (Moving coil & Moving Iron). Extension of their ranges.

(b) Dynamometer type wattmeter.

(c) Single Phase A. C. Energy Meter.

(iii) Measurement of power in a single phase and three phase circuits by wattmeter, Use for digital multimeter for measurement of voltage, Current and testing of devices.

5. **D. C. MACHINES:** (12 Periods)

D. C. Generator:

Working principle, Constructional details, e.m.f. equation,

Types of generators and their applications.

D. C. Motor:

Working principle, Back e.m.f., Types of D. C. motor and elementary idea of their characteristics.
Torque equation,
Methods of speed control (Description Only).

6. **TRANSFORMERS:** (06 Periods)

Working principle and constructional details of a single phase and 3 phase transformers, e.m.f. equation, Losses and efficiency, Cooling of transformers, Elementary idea of auto transformers and welding transformers.

7 INDUCTION MOTORS: (12 Periods)

(a) Three Phase Induction Motors:

Working principle and constructional details-Types of induction motors-Slip ring and Squirrel cage. Slip in induction motors. Speed torque characteristic, Starting and speed control. Application of induction motors in industry. General faults and their remedies.

(b) Single Phase Induction Motors:

Working principle and constructional details and application of single phase motors (Split phase, Capacitor start and Run Motor). A. C. series motors, General faults and their remedies.

8. ELECTRONICS: (06 Periods)

Basic idea of semi conductors P & N type. Semi conductor diodes, Zener diodes and their applications in rectifiers. Transistors-PNP and NPN-their characteristics. Introduction to basic logic gates.

LIST OF PRACTICALS

1. To change the speed and direction of rotation of D.C. shunt motor by

   (a) Armature control method.
   (b) Field control method.

2. To change the speed and direction of rotation of D.C.. compound motor by

   (a) Armature control method.
   (b) Field control method.

3. To measure the terminal voltage with variation of load current of

   (a) D.C. shunt generator.
   (b) D.C. compound generator.

4. To perform load test on a single phase transformer and determine its efficiency.

5. To start and run a induction motor by

   (a) Star Delta Starter.
   (b) Auto Transformer Starter.

6. To measure slip of an induction motor by direct loading.

7. To start and change the direction of rotation of an induction motor.

8. To measure transformation ratio of a single phase transformer.

9. To measure power and P.F. in a single phase circuit by Ammeter, Voltmeter and Wattmeter.

10. To measure power and P.F. in a 3 phase/A.C. circuit by two wattmeter method.

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for effective teaching-learning
2. Expose students to real life problems
3. Plan assignments so as to promote problem solving abilities and develop continue learning skills.
4. More focus should be given on practicals.

MEANS OF ASSEESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Actual Practical Performance
- Report Writing
- Viva-voce

RECOMMENDED BOOKS

.

1. A Textbook of Electrical Technology (vol-1 & vol-4) by B.L. Theraja & A.K. Theraja
2. A Textbook of Electrical Technology (vol-1 & vol-4) by V.K. Mehta
3. Aircraft Electrical and electronics systems by Thomas & Esmin
4. Basic Electrical Engineering by V K Mehta & Rohit Mehta
5. Aircraft Electrical System by EHJ Pallett

Websites for Reference:
www.nptel.ac.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	04	6
2	12	17
3	06	8
4	12	17
5	12	17
6	06	9
7	12	17
8	06	9
Total	**70**	**100**

4.4 MINE SURVEYING - I

L	T	P
5	-	4

RATIONALE

The diploma holders in mining engineering will be responsible to carry out survey of the mine area in open cast as well as underground so that efficiency planning for the development of the mining area & proper development of the mine be obtained.

The subject provide him elementary knowledge of surveying as chain survey, compass survey, level survey and Theodolite survey with reference to mining and mine surveying.

As for as possible teachers while teaching are supposed to give demonstration of different type of surveying and instruments used in each survey and preparation of survey plan.

LEARNING OUTCOMES

At the end of the course, the students will be able to:

- Understand difference between chain surveying & geodetic surveying.
- Know about different types of chain & tapes.
- Calculate difference of level between two points with dumpy level and auto level.
- Perform leveling with dumpy level
- Measure bearing of line with help of Compass
- Prepare maps for closed mining sites and open mining sites with Survey instrument
- Measure long line with chain or table

DETAILED CONTENTS

1. **INTRODUCTION :** (08 Periods)

Definition of plane surveying and geodetic surveying. Use of surveying in engineering. Principles of surveying. Methods of locating a point.

2. **Theory of Errors:** (06 Periods)

Classification & causes of errors, most probable true & residual errors, average & standard errors, most probable values of single observation & arithmetic means, laws of weight. Adjustment of traverse. Adjustment of errors in triangulation.

3. **CHAIN SURVEYING:** (12 Periods)

Brief description and uses of :-

i) Scales (different type of scale)

ii) Chains - meter chain, engineer's chain, gunter's chain, revenue chain.

iii) Tapes - linen, metallic, fibre glass, steel, invar, steel band.

iv) Ranging rods, offset rods.

v) Line ranger, cross staff, optical square.

vi) ARROWS: (12 Periods)

Folding, unfolding, testing and adjusting the chain. Ranging chain lines - Direct indirect. Method of chaining on plane ground conventional signs in surveying. Reading and recording results in field book. Chaining on sloping ground - direct method and indirect method, common errors and precautions to be taken in the field to minimise them. To calculate correct dimension with a defective chain/tape - correction for change in temperature, sag, etc. Chain surveys of small areas - triangulation, traversing. Preparation of a reference sketch, Fixing and marking - stations, base line, chain lines, check lines, tie lines, chain angles, Changing and detail filling by taking off-sets Booking results in field book and plotting common obstacles in chain surveying. Chaining through obstacles.

4. COMPASS SURVEYING: (12 Periods)

Names and function of different parts of a prismatic compass and surveyor's compass , their construction and uses .

Definition of meridian, magnetic meridian, true meridian, magnetic declination, dip, bearing - fore bearing, back bearing whole circle bearing, quadrantile bearing or reduced bearing - conversion of whole circle bearing to quadrantile bearing and vice versa. Reading the bearing of lines with the help of prismatic compass and computing included angles. Distribution of instrumental error.

Definition of local attraction. Causes of local attraction and its effect on observed bearing. Correction of error due to local attraction.

Traversing with chain and compass, open traverse, closed traverse. Booking readings in field book computation and plotting. Adjustment of errors in a closed traverse.

5. LEVELING: (12 Periods)

Definition of level, leveling instruments, level line, names and function of different parts of dumpy level & tilting level.

Temporary adjustment of a dumpy level & tilting level, difference between dumpy level & tilting level.

Definition of the term-axis of telescope, line of collimation axis of bubble tube, vertical axis of the instrument. Height of the instrument and height of the line of collimation, focusing, parallax, its removal ,bench marks, back sight, intermediate sight, change point.

Simple & differential leveling with dumpy & tilting levels, reduction of level by various methods, arithmetic checks, errors in leveling & precautions to be taken.

6. DIALS: (08 Periods)

Construction and use of the miners dial, Vernier and micro optic dials, traversing, booking and plotting.

7. CONTOURS (12 Periods)

Plane table surveying : Methods and instruments

Contouring :Definition, characteristics of contours, method of contouring by level, the Theodolite, tachometer, use of contour map .interpolation of contours. Estimation of Area and walls.

LIST OF PRACTICALS

1. Chains :

i. Study of various types of chain, types and other accessories e.g. engineers chain, metric chain, steel tape, metallic tape, cross staff, optical square, line ranger.

ii. Use of Chains :-

a. Folding and unfolding chains.

b. Testing and adjusting the lengths of chains.

c. Ranging and chaining on level and sloping ground.

d. Setting right angles.

e. Setting parallel lines

f. Taking offsets.

iii. Recording observation in field book and plotting.

2. Compass :

i. Study of the different parts of prismatic compass.

ii. Measurements of bearings by prismatic compass.

iii. Traverse by prismatic compass and graphical adjustment of closing error.

3. Study of different parts and temporary adjustment of

(i) Dumpy level.
(ii) Tilting level.

4. Study of leveling staves and Theodolite.

5. Use of dumpy level and tilting level in :

   i. Finding the difference in level between two points.

   ii. Longitudinal sectioning and its plotting.

   iii. Cross sectioning and its plotting.

   iv. Reciprocal leveling

6. Testing and adjustment of dumpy and tilting levels.

7. Testing and adjustment of mining dial and survey of a small area with mining dial and plotting.

8. Contouring and preparation of a contour survey plan of an uneven area.

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for effective teaching learning.
2. Students should be taken to various industrial units for clear conception of topics.
3. Efforts should be made to relate the process of teaching with direct experiences in theindustry.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests,
- Model/prototype making
- Practical tasks

RECOMMENDED BOOKS

1. Surveying — By B. C. Punmia
2. Surveying — By K. R. Arora
3. Mine's and Surveying — By S. Ghatak

Websites for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	11
2	06	10
3	12	17
4	12	17
5	12	17
6	08	11
7	12	17
Total	**70**	**100**

4.5 UNDERGROUND COAL MINING

L	T	P
4	-	4

RATIONALE

The diploma holder in mining Engineering will be Responsible to select a suitable method in mining, in different types of deposit coal mines.
The where content covers detailed aspects about the method of mining, their criteria of section on Indian perspective.
This teachers are expected to demonstrate various methods **with the suitable models.**

LEARNING OUTCOMES

After undergoing the subject, the student will be able to:

- Know about mining condition in Indian coalfields.
- Apply correct and efficient method of Pillar mining.
- Understand the basic concept of Long wall mining.
- Process and their requirement and equipments used for long wall mining.
- Select underground coal mine planning.
- Able to differentiate between long mining wall and short wall mining.
- Draw the layout of working of short wall mining
- To know the process of under winning method

DETAILED CONTENTS

1. Introduction: (06 Periods)

mining condition in Indian coalfields , choice of mining methods .

2. Bord and Pillar mining: (06 Periods)

Design of bord and pillar working, the panel system, panels and inter- panel barriers , size of pillar and galaries. Method of driving galaries ; preparatory arrangement for depillaring .Pillar extraction and safety , Room & pillar method of working .

3. Long Wall Mining: (08 Periods)

Long wall system of working , advancing and retreating methods ; design of longwall working - long wall layout, face length, panel length ,size of great roads , development of Long wall panels , equipment of a long wall face, strata behaviour and support requirements.

4. Underground coal mine planning: (08 Periods)

Elements of underground coal mining planning - size and production capacity of mines, in-seam mining versus horizon mining.

5. Mining of Thin and Steeply Inclined Seams : (12 Periods)

Inclined and Horizontal classification, problems of mining thick seams, modern multi- slice methods- inclined slicing, horizontal slicing and cross slicing in ascending and descending sequence.
Under winning methods - Sub level caving, integral caving, blasting gallery method and hydraulic mining .
Concept of thin seams, problems in mining thin seams , equipment and methods for thin seam extraction, special mining method.

6. Short wall and high wall mining method: (06 Periods)

layout of working , equipment and system of extraction and high wall mining Method, description of method, production and productivity estimation.

7. Ground Control and support design: (10 Periods)

Design of pillars, stress analysis of simple mine openings, different types of roof supports, power of supports, self advancing goaf edged supports, shotcrete support, goaf different types of roof bolts, local and regional supports, back filling in mines.

LIST OF PRACTICALS

1 Study & layout of broad & pillar method of working.

2 Study & layout of long wall method of working.

3 Layout of bord and pillar working with highly mechanized system of mines.

4 Layouts of Horizon method of mining.

5 Layout for depillaring working with conventional and highly mechanized mines system.

INSTRUCTIONAL STRATEGY

In addition to theoretical instructions, different activities pertaining to Environmental Stud like expert lectures, seminars, visits to green house, effluent treatment plant of any industry, rain water harvesting plant etc. may also be organized.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-term and end-term written tests

RECOMMENDED BOOKS

1.	Elements of mining I & II	By D.J. Deshmukh
2.	Advance coal mining	By B. Singh
3.	Principles and Practices of Modern Coal Mining	By R. D. Singh

Websites for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	11
2	06	11
3	08	14
4	08	14
5	12	21
6	06	11
7	10	18
Total	**56**	**100**

4.6 ENERGY CONSERVATION

L	T	P
3	-	2

RATIONALE

The requirement of energy has increased manifolds in last two decades due to rapid urbanization and growth in industrial/service sector. It has become challenging task to meet ever increasing energy demands with limited conventional fuels and natural resources. Due to fast depletion of fossil fuels and a tremendous gap between supply and demand of energy, it is essential to adopt energy conservation techniques in almost every field like industries, commercial and residential sectors etc. Energy conservation has attained priority as it is regarded as additional energy resource. Energy saved is energy produced. This course covers the concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in general industry and details out energy audit methodology and energy audit instruments.

LEARNING OUTCOMES

After undergoing this subject, the students will be able to:

- define principles and objectives of energy management and energy audit.
- understand Energy Conservation Act 2001 and its features.
- understand various forms & elements of energy.
- identify electrical and thermal utilities. Understand their basic principle of operation and assess performance of various equipments.
- identify areas of energy conservation and adopt conservation methods in various systems.
- evaluate the techno economic feasibility of the energy conservation technique adopted.

DETAILED CONTENTS

1. Basics of Energy (05Periods)

   Classification of energy- primary and secondary energy, commercial and non- commercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators.
   Global fuel reserve
   Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors)
   Impact of energy usage on climate

2. Energy Conservation and EC Act 2001 (05Periods)

Introduction to energy management, energy conservation, energy efficiency and its need
Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.
Standards and Labeling: Concept of star rating and its importance, Types of product available for star rating

3. Electrical Supply System and Motors (05Periods)

Types of electrical supply system
Single line diagram
Losses in electrical power distribution system
Understanding Electricity Bill: Transformers Tariff structure, Components of power (kW, kVA and kVAR) and power factor, improvement of power factor, Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)
Transformers: Introduction, Losses in transformer, transformer Loading, Tips for energy savings in transformers
Electric Motors
Types of motors, Losses in induction motors Features and characteristics of energy efficient motors, Estimation of motor loading, Variation in efficiency and power factor with loading, Tips for energy savings in motors

4. Energy Efficiency in Electrical Utilities (05Periods)

Pumps: Introduction to pump and its applications, Efficient pumping system operation, Energy efficiency in agriculture pumps, Tips for energy saving in pumps
Compressed Air System: Types of air compressor and its applications, Leakage test, Energy saving opportunities in compressors.
Energy Conservation in HVAC and Refrigeration System: Introduction, Concept of Energy Efficiency Ratio (EER), Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.

5. Lighting and DG Systems (03Periods)

Lighting Systems: Basic definitions- Lux, lumen and efficacy, Types of different lamps and their features, Energy efficient practices in lighting
DG Systems: Introduction, Energy efficiency opportunities in DG systems, Loading estimation

6. Energy Efficiency in Thermal Utilities (05Periods)

Thermal Basics: Thermal energy, Energy content in fuels, Energy Units and its conversions in terms of Metric Tone of Oil Equivalent (MTOE)
Energy Conservation in boilers and furnaces: Introduction and types of boilers, Energy performance assessment of boilers, Concept of stoichiometric air and excess air for combustion, Energy conservation in boilers and furnaces, Do's and Don'ts for efficient use of boilers and furnaces
Cooling Towers: Basic concept of cooling towers, Tips for energy savings in cooling towers
Efficient Steam Utilization

7. Energy Conservation Building Code (ECBC) (03Periods)

ECBC and its salient features
Tips for energy savings in buildings: New Buildings, Existing Buildings

8. Waste Heat Recovery and Co-Generation (03Periods)

Concept, classification and benefits of waste heat recovery
Concept and types of co-generation system

9. General Energy Saving Tips (05Periods)

Energy saving tips in:
- Lighting
- Room Air Conditioner
- Refrigerator
- Water Heater
- Computer
- Fan, Heater, Blower and Washing Machine
- Colour Television
- Water Pump
- Cooking
- Transport

10. Energy Audit (03Periods)

Types and methodology
Energy audit instruments
Energy auditing reporting format

PRACTICAL EXERCISES

1. To conduct load survey and power consumption calculations of small building.
2. To check efficacy of different lamps by measuring power consumption and lumens using lux meter.
3. To measure energy efficiency ratio (EER) of an air conditioner.
4. To measure effect of valve throttling and variable frequency drive (VFD) on energy consumption by centrifugal pump.
5. To measure and calculate energy saving by arresting air leakages in compressor.
6. To measure the effect of blower speed on energy consumed by it.

STUDENT ACTIVITIES ON ENERGY CONSERVATION/ENERGY EFFICIENCY

- Presentations of Case Studies
- Debate competitions
- Poster competitions
- Industrial visits
- Visual Aids

INSTRUCTIONAL STRATEGY

Teachers are expected to lay considerable stress on understanding the basic concepts in energy conservation, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject must be supplemented by demonstrations and practical work in the laboratory. Visits to industries must be carried out. Expert from industry must be invited to deliver talks on energy conservation to students and faculty.

RECOMMENDED BOOKS

1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015
2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015

4. Handbook on Energy Audit & Environmental Management by Y P Abbi &Shashank Jain published by TERI. Latest Edition

Important Links:

(i) Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. www.beeindia.gov.in.
(ii) Ministry of New and Renewable Energy (MNRE), Government of India. www.mnre.gov.in.
(iii) Uttar Pradesh New and Renewable Energy Agency (UPNEDA), Government of Uttar Pradesh. www.upneda.org.in.
(iv) **Central Pollution Control Board (CPCB),** Ministry of Environment, Forest and Climate Change, Government of India. www.cpcb.nic.in.
(v) Energy Efficiency Sevices Limited (EESL). www.eeslindia.org.
(vi) Electrical India, Magazine on power and electrical products industry. www.electricalindia.in.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	5	12
2	5	12
3	5	12
4	5	12
5	3	7
6	5	12
7	3	7
8	3	21
9	5	7
10	3	7
Total	**42**	**100**

5.1 METALLIFEROUS MINING

L	T	P
4	-	4

RATIONALE

The diploma holders in Mining Engineering will be responsible to select a suitable method to approach the mineral, developing the area, selecting Techno-economic method of extraction & carrying out actual extraction of minerals.
The course content of this subjects covers in detail about the method of developing a mine, selecting method of work weather by open cast or underground & in detail about various methods of Mining.
Teachers are expected to arrange visits for onsite observation of various methods of mining.

LEARNING OUTCOMES

After undergoing this course, the students will be able to :

- Understand the concept of Alimake raise climber.
- Understand the basic concept of shrinking method.
- Perform the the square set stopping method.
- Able to perform sublevel stopping methods.
- Prepare the sketch of block caving, sublevel caving and top slicing methods.
- Able to understand and prepare modern ring hole drilling and blasting system as used at Zawar mines and Khetri copper mine.

DETAILED CONTENTS

1. **Opening up of Ore Deposits:** (16 Periods)

   Choice of mode of entry-adit , shaft, declined and combined mode. their applicability , number and disposition : Choice of level interval and block / block length ; shape , size , position , excavation and equipping of shaft station , grizzley , ore / waste bin , main orepass system , underground crushing and loading stations, under ground chambers, sump and other subsdiary excavation ; arrangement for dumping into main orepass.

2. **Mine Development in Metalliferous mine :** (16 Periods)

   Driving of raises by conventional methods Alimakeraise climber, its cycle of operation, drop raising using large dia drills,raise borers, winzes, pit botteom station methods of stops preparation.

3. Stoping Method : (16 Periods)

Factors influencing the selection of stoping methods, various methods of stoping under-hand, overhand, breast stoping, shrinkage stoping cut and fill method. Block caving, sublevel caving, vertical crater mining, square set stoping, sublevel stoping.

4 Deep Pressure Mining (08 Periods)

LIST OF PRACTICALS

1. Study and sketch of Alimake raise climber.
2. Study and sketch of shrinkage method.
3. Study and sketch of sqaure set stoping method.
4. Study and sketch of cut and fill method.
5. Study and sketch of sublevel stoping methods.
6. Study and sketch of block caving, sublevel caving and top slicing methods.
7. Study and sketch of modern ring hole drilling and blasting system as used at Zawar mines and Khetri copper mine.

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/Prototype making.

RECOMMENDED BOOKS

1. S.M.E. Handbook BY Hartman
2. Introduction to mining BY G.B. Mishra
3. Surface mining By D.J. Deshmukh
4. Opercast mining

Websites for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	16	29
2	16	29
3	16	29
4	08	13
Total	**56**	**100**

5.2 SURFACE MINE, PLANNING AND DESIGN

L	T	P
4	-	4

RATIONALE

The diploma holders in mining engineering will have to prepare feasible planning & development in varied geological conditions with optimal output.
The course content of the subject will provide essential and detail knowledge about mine supports, subsidence and stowing technology.
The teachers while teaching are supposed to give demonstration of present mining technological situations and challenges in mining fields with reference to above mentioned mining technological aspects.

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LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Understand the various types of stone crushers.
- Draw the layout of crushing plant
- Understand the concept of open cast mining.
- Identify the various types of mechanical loaders.
- Understand the blasting pattern in hard rock building Stone mines.
- Able to draw the diagram of polishing unit.

DETAILED CONTENTS

1. **INTRODUCTION:** (14 Periods)

General information of mining, basic definition of various terms related to surface mining, concept of stripping method, operating and ultimate pits, continuous miners and bucket bill explanations, advantages & disadvantages. Opening up of deposits, driving of trenches, laying of communication routes, system of disposal of overburden, removal of cover rock. General opencast mining methods, basic layout, choice of mining methods, dumper- shovel scraper, ripper.

2. **MINING AND PROCESSING OF BUILDING STONES :** (14 Periods)

Mining of granite and sand stone for grits, boulders, stone, Bricks, etc. Blasting pattern in hard rocks and sand stones. Controlled blasting in sand stone areas, Stone crushing plant Types of stone crushers.

3. **MINING OF DIMENSIONAL STONES :** (14 Periods)

Resources of marble, granite, slate, sandstone, limestone as dimensions, their uses, marketing and export.

Conventional, diamond wire saw cutting, jet flame, helicoidal wire saw, Lorfman chain saw cutter, hydraulic jacks, track mounted rock drills, monoblade block dresser, mechanised crane, controlled blasting.

4. (14 Periods)

Design of Pits and Dump Source, different layouts for all rows, design of mine benches for estimating over burden and extraction of minerals, concept of factor of safety, factors influencing equipment selection, mine runnage and its planning.

LIST OF PRACTICAL

1. Sketch and diagram of various types of stone crushers.
2. Layout of crushing plant
3. Layout of open cast mining.
4. Sketch and diagram of mechanical loaders.
5. Sketch and diagram of tippler and dumpers.
6. Layout of mines composing loaders, machines and dumpers.
7. Sketch and diagram of blasting pattern in hard rock building Stone mines.
8. Sketch and diagram of blasting pattern of controlled blasing
9. Sketch and diagram of wire saw.
10. Study of dragline.

INSTRUCTIONAL STRATEGY

1. Use teaching aids for classroom teaching
2. Give assignments for solving numerical problems
3. Arrange industry visits to augment explaining use of various machine components like belt, rope, chain, gear drives, action due to unbalanced masses, brake clutch, governors, fly wheels, cams and gear drives
4. Video films may be used to explain the working of mechanisms and machine components like clutch, governors, brake etc.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/Prototype making.

RECOMMENDED BOOKS

1. Surface Mixing — By Samir Das
2. Elements of Mining I,II & III Vol. — By D. J. Deshmukh
3. Surface Mining — By G. B. Mishra

Website for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	14	25
2	14	25
3	14	25
4	14	25
Total	**56**	**100**

5.3 MINE SURVEYING-II

L	T	P
4	**-**	**4**

RATIONALE

The diploma holders in Mining Engg. will be responsible for various types of surveying methods used for preparing various types of plans and sections used in open cast as well as underground surveying.
The subject will provide him basic knowledge, triangulation, correlation, setting out curves, stope surveying. As far as possible teachers while teaching are supposed to give practical knowledge of surveying with timing fields as per course content.

LEARNING OUTCOMES

- Solve mathematical problems using algebraic and Trigonometric functions
- Demonstrate fundamental knowledge of the systems and processes used to construct the built environment.
- Perform basic land surveying instruments & Perform related calculations.
- Understand the basic concept of theodolite their types and their functioning.
- Substantiate the principles of tachometry, types & uses.
- Solve the problem related to triangulation
- Know the functioning of GPS & GIS.
- Can able to operate Total Station & also can identify the best use of total station

DETAILED CONTENTS

1. **Theodolite :** (08 Periods)

Types of theodolite and their construction, measurement of horizontal & vertical angles. Theodolite traversing, traverse calculations, adjustment of the traverse, computation of co-ordinates, temporary & permanent adjustment.

2. **Tachometer:** (07 Periods)

Principles of tachometer , types of tachometers, use of tachometer for determination of distances and levels , Tachometric surveying, problem solving.

3. **Triangulation:** (07 Periods)

Principles involved in triangulation, purpose of triangulation, base line measurement, method of measuring angles, reference direction, true magnetic meridian, booking readings, calculation of coordinates and plotting.

4. **Correlation:** (07 Periods)

Needs for correlation, method of correlation of surface and underground surveying through inclines, one or two vertical shafts, steeply inclined shafts. correlation by magnetic needles.

5. (a) Total Station and laser profiling system - (10 Periods)

(b) Astronomical Surveying:

Use of gyrotheodolite for determination of true Norts, global positioning system and its application in mine surveying, drone based application in mine survey, Remote sensing and GIS system.

6. **Mine Plans and Sections:** (10 Periods)

Different type of mine plans and sections, concept of scale and R.F. , legal requirement to mine plans and sections, conventional signs, preparation and preservation of mine plans and sections. Enlargement of plans , use of ediographer and pantograph, represttation of geological and other features on mines plans sections plan to be checked on the change ownership, recopeining of mines.

7. EDM: (07 Periods)
Principle of measurement , types , corrections, selection of equipment , Total station.

LIST OF PRACTICAL

1. i. Study of the different parts of a theodolite.

   ii. Reading of horizontal and vertical angles.

   iii. Traversing and plotting by gales method.

   iv. Testing and adjustment of a theodolite.

2. Determination of tachometer constants.

3. Determination of height of an inaccessible point by tachometric survey.

4. Determination of distance between two inaccessible objects(base line method)

5. Exercise on tachometric contouring.

6. Base line measurement.

7. Triangulation of small area.

8. Maintaining the grade or roads by grade peg method.

9. correlation by single shaft and double dhaft or incline.

10. Setting out curves.

11. Stop surveying by the method of tape triangulation.

12. stop surveying by tying in the method.

13. Study, sketch and use of a plan meter.

14. Study and preparation of a mine plan per mining regulation.

15. Determination of azimuth of line by method observing a start at equal altitude.

16. Different problems on dip, faults and outcrops of a bed.

17. Study of G.T. sheets and laying out.

18. Surveying of small quarry.

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for effective teaching learning.
2. Students should be taken to various industrial units for clear conception of topics.
3. Efforts should be made to relate the process of teaching with direct experiences in theindustry.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/Prototype making.

RECOMMENDED BOOKS

1. Surveying vol.II&III By- B.C.Punmia
2. Metalliferrous Mines regulation 1961. By- Wini berg
3. Metalliferrous Mine Surveying. ---do------
4. Answer to papers Mine Surveyor's nundation of nundation examination. By- D.K.Jain
5. Mine Surveying vol.III By- S-Ghatak

Websites for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	14
2	07	13
3	07	13
4	07	13
5	10	17
6	10	17
7	07	13
Total	**56**	**100**

5.4 MINING MACHINERY-II

L	T	P
4	-	4

RATIONALE

The diploma holders in mining engineering are expected to know about various types of wires ropes, winding system and mineral handling at pit top and pit bottom
The course content of the subject will provide him basic knowledge and skills about various types of wire ropes winding systems and pit top and pit bottom layouts, mine fires and inundation.
The teachers while teaching are supposed to give practical examples relating to mining fields.

LEARNING OUTCOMES

- Understand the concept of wire ropes.
- Identify and use the winding system.
- Understand the principal of tunnels, raises and shafts.
- Understand the use of different mine pumps and their characteristics

DETAILED CONTENTS

1. **WIRE ROPES :** (12 Periods)

Types, construction and use, care and maintenance , rope splicing .

2. **WINDING :** (12 Periods)

Types of winding system- drum winding and friction winding. shaft fittings- signals , guides, clutch plate, keps, tilting plateform, cage receivers, winding drums, drives. Fitting of Winding engines – brakes, depth indicator, automatic contrivance, friction sheave, suspension gear, cages and skips , multilevel and deep winding, Safety devices, Periodic inspection and Maintenance.

3. **FULL FACE BORERS FOR TUNNELS, RAISES AND SHAFTS :** (12 Periods)

Principle of operation, construction features, their suitability, operation and maintenance of boring machines.

4 **MINE PUMPS AND FANS :** (12 Periods)

Types of construction and characteristics of mine pumps and fans, Sluggish and Parallel application, Installation of mine pumps and fans.

5 TRANSPORT SYSTEM (08 Periods)

LIST OF PRACTICAL

1. Capping and recapping of wire ropes.
2. Study different types of safety hooks
3. Suspension of nipes and cables in the shaft
4. Pit top layouts.
5. Pit bottom layouts
6. Various types of water dams.

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for effective teaching learning.
2. Students should be taken to various industrial units for clear conception of topics.
3. Efforts should be made to relate the process of teaching with direct experiences in theindustry.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/Prototype making.

RECOMMENDED BOOKS:

1.	Elements of Mining Vol-III	By D. J. Deshmukh
2.	Mine Fires, Explosion,Recovery and Innundations.	By M. A. Ramlu.
3.	Water Problems in Mines	By Rakesh & M. C. Lele
4.	Mine Disasters in india VOL I & II	By National Council of Safety in Mines
5.	Combating coal fires	By Dr. B. Singh
6.	Mining of Coal	By S. Ghatak

Websites for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	12	21
2.	12	21
3.	12	21
4.	12	21
5.	08	16
Total	**56**	**100**

5.5 MINE ENVIONMENTAL ENGINEERING - I

L	T	P
4	-	4

RATIONALE

The diploma holders in mining Engineering will be responsible for the development of mine maintaining proper environmental conditions in open cast and underground mining.
The course content of the subject provide him basic knowledge and skills about mine environmental engineering i.e. heat and humidity in mines, mine gases ventilation and lighting. The teachers while teaching are supporte to give practical examples of environmental conditions of various working in India and typical world examples and visits of mine sites.

Learning Outcomes

After undergoing this course, the students will be able to:

- Understand the concept of heat and humidity in mines
- Knowledge about the mine atmosphere, gases in mine and their physical and chemical properties.
- Identify the use of anemometer and velimeter and to make readings to calculate air flow.
- Understand the principal and types of mine fans with layouts for regulation of air current.
- Dust and its harmful effect on the human body.

DETAILED CONTENTS.

1. Mine Gases: (12 Periods)

Mine atmosphere, requirements of breathing air mine gases, their physical and chemical properties, physiological effects; detection of gases by flame safety lamps, gas detection equipment their working and up keep, Fire damp explosion.

2. Heat and Humidity in Mines and General Conditions: (12 Periods)

Geothermal-gradient, humidity its determination and effect, kata thermometer, effects of heat and moisture in mine absolute and relative humidity, dew point, determination of humidity, hygrometer. Control of temperature and humidity in deep mines, air conditioning in mines.

3. Ventilation: (12 Periods)

Natural and artificial ventilation, distribution and coursing of air currents, law of air flow, equivalent orifices; measurement of air flow by anemo menters and volume resistance and power required; construction of stopping's air crossing and doors; leakage and its prevention, mine fans main, auxiliary and booster type - their construction and uses reversible arrangements,

splitting of air currents; simple numerical problems; time for clearing noxious gases, principles of ventilation survey.

4. **Lighting:** **(06 Periods)**

Various types of flame and electric safety lamps their working and maintenance; lamp rooms - design and organisation standard of illumination, illumination survey, photometry.

5. Dust: **(08 Periods)**

Formation, dangers, dust sampling apparatus, preventive and suppression measures for dust . plantation techniques in different forest areas ,national parks and water sources, coal dust explosion.

6. **Spontaneous combustion of coal and Mine fires-** **(06 Periods)**

Factors affecting spontaneous combustion of coal, incubation period, sources of mine fire and their mitigation.

LIST OF PRACTICALS

1. Study and sketch of whirling hygrometer and determination of relative humidity.
2. Study and use of kata thermometer.
3. Testing of methane with flame safety lamps.
4. Study of anemometer and velimeter and to make readings to calculate air flow.
5. To study P.S. Carbonmonoxide, detector.
6. To study Mc Luckie's methanometer and gas detector.
7. To study different types of flamen safety lamps.
8. To study a standard lamp room layout.
9. Study of principal types of mine fans with layouts for regulation of air current.
10. Study of a cap lamp.

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for effective teaching learning.
2. Students should be taken to various industrial units for clear conception of topics.
3. Efforts should be made to relate the process of teaching with direct experiences in theindustry.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making

RECOMMENDED BOOKS

1. Mine Environmental Engg. By G. B. Mishra
2. Elements of Mining Vol. II By D. J. Deshmukh

Websites for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	21
2	12	21
3	12	21
4	06	11
5	08	15
6	06	11
Total	**56**	**100**

6.1 ROCK MECHANICS

L	T	P
6	-	6

RATIONALE

The diploma holders in mining engineering will be responsible for stability of underground construction and to design a safe opening in mine.

Dimensional stone technology has been gaining popularity for the past few years and diploma holder in mining is liable to know different methods of mining barble, grainite/sandstone, etc. and subsequent processing of these stones.

Course content of the subject covers study of rock properties, strength and their behavior under static and dynamic loading. Also it includes detail knowledge of various method of mining dimensional stone, processing machine, cutter, dresser, etc. While teaching teachers should arrange visit for nearly by stone mines for practical demonstration. In laboratory they should arrange for study of rock properties and determining their strength.

LEARNING OUTCOMES

Understand the role of rock mechanics in mining.

- Perform the tensile and shear test on different types of rocks.
- Understand the different properties of rock like porosity, moisture content, permeability etc.
- Know about the failure criteria of rocks.
- Perform the measurement with the help of strain gauges.
- Determine the slope stability.

DETAILED CONTENTS

1. Introduction to Rock Mechanics: (13 Periods)

Role & status of rock mechanics in mining, rock properties, introduction to stress / strain, isotropic and anisotropic, continuous and non-continuous, homogenous and non-homogenous rocks and analysis of stress, strain & constitutive relations in isotropic & anisotropic rocks. Rock concepts related to Indices: Specific gravity, hardness porosity, moisture content, permeability, swell index. Slake durability, thermal conductivity.

2. **Mechanical Properties of rocks** (13 Periods)

Compressive, tensile & shear strength, modulus of Elastisity, Poisson's ratio and triaxial strength. determination of in-situ strength and deformation modulus, in-situ stresses. Rheological models and time dependent properties of rocks.

3. **Failure Criteria:** (12 Periods)

Introduction, mechanics of rock failure, Mohr's general theory failure, griffth's theory, 'Hack and Brown' failure criteria .

4. **Concept of redistribution of stresses**: (12 Periods)

Analytical solution for stress around simple opening, concept of stress concentration and relaxation, zone of influence, independent and complex openings.

5. **Mining induced subsidence:** (12 Periods)

Mechanism, types and factors affecting subsidence, subsidence control techniques and its measurement.

6. Rock Instrumentation: (11 Periods)

Significance of Rock instrumentation, different types of Sensex and data acquisition system and their application, working principles of vibrating wire and strain gauge based instruments, Accuracy and Decision.

7. **Slope Stability**: (11 Periods)

Factors influencing stability of slopes, method of improving stability of slopes, waste dumps. Effect of ground water table on stability.

LIST OF PRACTICALS

1. To determination uniaxial compressive strength of given specimen.
2. To determine tensile strength of given specimen.
3. To determine compressive strength of given specimen
4. To determine tri-axial shear strength of given specimen.
5. To determine slake durability of rock sample.
6. Study of rock behaviour under tri-axial loading.

INSTRUCTIONAL STRATEGY

1.Use computer based learning aids for effective teaching learning.
2.Students should be taken to various industrial units for clear conception of topics.
3.Efforts should be made to relate the process of teaching with direct experiences in theindustry.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid- Semester Examination
- Group discussion
- Semester Examination
- Presentation

RECOMMENDED BOOKS

1.	Mining Electronics & Instrumentation	B. Singh
2.	Mechanical Properties of rock	A. Jumkis
3.	Rock Slope Engineering	Hock & Bray J.W.
4.	Experimental Stress Analysis	Hames W. Dally, William R.Raley Pub : Mccraw Hill Book company
5.	Mining & Processing of Dimensional Stone Lecture	Note for ISTE Summer School 1991.

Website for Reference

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	13	16
2	13	16
3	12	14
4	12	14
5	12	14
6	11	13
7	11	13
Total	**84**	**100**

6.2 Mine Environmental Engineering -II

L	T	P
6	-	6

RATIONALE

The diploma holders in mining engineering will be responsible for mining without disturbing the ecosystem and main training normal environmental condition within the mine so that target production will be achieved along with safety of the mines and people residing in the near by areas
This subject will provide him basic knowledge about concept and scope of engg. , impact assessment technique , preparation of environmental impact assessment plan, environmental management plan , rehabilitation techniques ,pattern of energy consumption in the mining as well as environmental condition within the mine like heat and humidity , mine gases, ventilation and lighting. possible teachers while teaching are supposed to give practical examples of the typical mining fields and expose the students from time to time the actual mining sites.

LEARNING OUTCOMES

- To understand the effect of environmental factors on mining.
- Identify the effect of humidity, wind, rainfall dust on the environmental condition.
- Prepare the mine closure plan.
- Analyze the environmental impact on river bed mining.
- Under Utilization of mine waste and tailing and disposal of waste.

DETAILED CONTENTS

1. **Introduction:** (12 Periods)

Scope and concept of environmental engg. and mine environmental engg. .

2. **Environmental Impact Assessment :** (16 Periods)

Base line data collection ,compilation , interpretation and analysis , various types of approaches , buffer zones. Impact on climatic conditions and sources-heat , humidity, wind ,rainfall, dust. Impact on level , flora , land use pattern and socio- economic survey.
I.S.I. standards of air ,soil, water and noise pollution their control, I.S.I. standards applicable to mines. Acid mine water and drainage and control . Environmental management plan based on impact assessment.

3. **Reclamation and Rehabilitation:** (16 Periods)

Reclamation of open cast mines with special reference to cast benefit approaches . Land use management plan in mining industry with special reference to cast benefit degradation, reclamation and scaping , utilisation of mine waste , tailing and disposal of waste.

4. **Dust, Air and Water Pollution:** (16 Periods)

Formation, dangers, dust sampling apparatus, preventive and suppression measures for dust . Planation techniques in different forest areas , near national parks and water sources. Air pollution-causes and remedies, Water Pollution- causes and remedies,

5. **Mines Closure Plan :** (10 Periods)

Preparation of Mines Closure Plan

6. **Environmental Impact Assessment Of river bed mining :** (14 Periods)

Effect of mining in river bed- impact assessment

LIST OF PRACTICALS

1. Measurement of noise level of different mining machineries .
2. Determination of vibrations produced by machineries .
3. Determination of pH values of water samples discharged from mines.
4. Measurement of dust particles produced by blast hole drills.
5. Study, sketch and describe the Konimeter.
6. Study, sketch and describe the dust trap.
7. Study, sketch and describe the gravimetric dust extractor.
8. Measurement of dust by portable hand held dust extractor.

INSTRUCTIONAL STRATEGY

1.Use computer based learning aids for effective teaching learning.
2.Students should be taken to various industrial units for clear conception of topics.
3.Efforts should be made to relate the process of teaching with direct experiences in the industry.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making
- Preparation of different charts
- Viva-voce

RECOMMENDED BOOKS

1. Impact of mining on enviroment — By- R.K. Trivedi.
2. Enviromental Mangaement of Mining operation — By- prof.B.B.Dhar.
3. Enviromental Impact of industrials mining activittie — By- Lalit N.Patnaik.
4. Elements of Mining-II — By D. J. Deshmukh

Websites for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARK

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	12	14
2	16	19
3	16	19
4	16	19
5	10	12
6	14	17
Total	**84**	**100**

6.3 MINE MANAGEMENT

L	T	P
6	1	-

RATIONALE

The knowledge of this subject is required for mining engineering technicians, but it becomes more important for those technicians who wish to choose mining industry as their career. This course is designed to develop understanding of various functions of mining management.

LEARNING OUTCOME

- To understand the classical theory, administrative theory and behavior approach of management.
- To identify the role of manager in staffing, manpower planning and recruitment of the employees.
- Use the different operations research techniques like PERT and CPM.
- To understand the concept of management information system.
- Identify the role of inventory in materials management.

DETAILED CONTENTS

1. **INTRODUCTION :** (14 Periods)

Evaluation of management thought, Classical theory : Scientific management, administrative theory, Behaviour approach. Non classical theory : Behavioural model. Modern theory : System approach. Total quality management.

2. **MANAGEMENT PROCESS :** (14 Periods)

Planning, organising, directing, motivating, controlling, co-ordinating and communicating. Role of manager. Staffing : Jobs analysis, manpower planning and recruitment. Performance appraisal. Manpower development and planning.

3. **ORGANISATION :** (12 Periods)

Principles of organisation. Departmentation : Levels of management, organisational chart.

4. **TECHNNIQUES OF OPERATIONS RESEARCH : OR MODELS :** (12 Periods)

PERT and CPM. some applications in mining industry.

5. **MANAGEMENT INFORMATION SYSTEM :** (10 Periods)

Introduction, concepts, design, implementation and case study.

6. **HUMAN RESOURCE DEVELOPMENT :** (12 Periods)

Management, development and training of personnel. Role of human factors, Industrial psychology and sociology. Workers participation, Trade Union

7. **MATERIALS MANAGEMENT :** (10 Periods)

Introduction : purchase and stores management : inventory analysis and control, value analysis.

INSTRUCTIONAL STRATEGY

1.Use computer based learning aids for effective teaching learning.
2.Students should be taken to various industrial units for clear conception of topics.
3.Efforts should be made to relate the process of teaching with direct experiences in theindustry.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making
- Preparation of different charts
- Viva-voce

RECOMMENDED BOOKS

1. Mine's management legislation and General Safety – By S. Ghatak
2. Mine's Rule 1955
3. Vocational Training Rules
4. Crache Rules
5. Mines Rescue Rules 1985
6. D.G.M.S. circular

Website for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	14	17
2	14	17
3	12	14
4	12	14
5	10	12
6	12	14
7	10	12
Total	**84**	**100**

6.4 MINE LEGISLATION AND GENERAL SAFETY

L	T	P
6	2	-

RATIONALE

The diploma holders of Mining Engineering should know various mines act, rules and their provisions for proper regulation of mine. He should also know about the cause of accidents happening in mine and their preventive measures.
The subject contains detailed knowledge of various mines act, rules and regulation relating ventilation, welfare, opening, methods of work, explosives, mineral concession etc.
Teachers at the time of teaching should quote practical examples of accident occurred in mines, its causes, relating rules regulations and preventive measures taken after that.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Understand the different mining laws of India.
- Understand the health and safety laws applied in the mining area.
- Develop the safe working environment in the mine.
- Understand the provision of Indian explosive act and rules.

DETAILED CONTENTS

1. **INTRODUCTION :** (16 Periods)
   Mining laws of India; National Mineral Policy.

2. **MINERAL CONSERVATION ANF DEVELOPMENT LAWS** (18 Periods)

   Salient Provisions of the mines and minerals(Regulation & Development) Act 1957; Mineral Concession Rules, and Mineral Conservation and Development Rules, 1988. Salient Provision of Indian Explosive Act and Rules

3. **HEALTH & SAFETY LAWS** (25 Periods)

   The Mines Act 1952, The Mines Rules 1955; The Coal Mines Regulations, The Metalliferous Mines Regulations, Mines Rescue Rules, 1985; Additional Provisions of Indian Electricity Rules, 1956, applicable to mines.

4. **SAFETY IN MINES** (25 Periods)

   Occupational hazards of mining; Accidents and their classification; Causes and Prevention of accidents, Mining disaster, Emergency measures and organisation. Accidents enquiry report. Cost of accidents. Measures for improving safety in mines.

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for effective teaching learning.
2.Students should be taken to various industrial units for clear conception of topics.
3.Efforts should be made to relate the process of teaching with direct experiences in the industry.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making
- Preparation of different charts
- Viva-voce

RECOMMENDED BOOKS

1. Legislation in Indian Mines — Rakesh & Prasad
2. Coal Mines Regulation 1957 — Geeta Book Store, Dhanbad
3. Mining Manual — Pub. Dimonion Law Depot, Dhanbad
4. Metalliferrous Mines regulation-1961 — Geeta Book Store,Dhanbad
5. Explosive Act 1984 — Pub. Eastern Book Comp. Lucknow
6. Indian electricity rules-1965 — Geeta Book Store Dhanbad
7. U. P. Miner Mineral (Concession) Rule 1963
8. Mines and Mineral DevelopmentAnd Regulation Act- 1957
9. Mines Act- 1952

Website for Reference:

http://swayam.gov.in
http://nptel.ac.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	16	19
2	18	21
3	25	30
4	25	30
Total	**84**	**100**

6.5 PROJECT WORK	L	T	P
	-	-	8

RATIONALE

Problems related to mine planning will be given during the course work at the start of term students will be sent to various mining organisation to collect the data and specifications of machineries from the mines. Some models/charts related to method of working, operation of machineries shall also be prepared at institutional level.
The student will submit the report after completion of examination.

LEARNING OUTCOMES

After undergoing the project work, students will be able to:
Apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place the learner for project oriented practical training in actual work situation for the stipulated period with a view to:

* Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study
* Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
* Develop firsthand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.
* Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.

INDUSTRIAL TRAINING :

Industrial training will divided into two terms.

Part I :

During this training student will be sent to open cast, U/G coal and U/G metal mines, for equal duration. The training will be supervised by the faculty member.

Part II :

During this training student will given choice placed training.

General Guidelines

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interestto him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

This practical training cum project work **should not be considered** as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

The projects given to students should be such for which someone is waiting for solution. Some of the suggested project activities are given below:

1. Mine Ventilation and Design.
2. Risk and Safety.
3. Mine Environment.
4. Mine Economics.
5. Strata Control and Surface Design.
6. Projects connected with repair and maintenance of machines.
7. Estimating and costing projects.
8. Design of jigs / fixtures.
9. Projects related to quality control.
10. Project work related to increasing productivity.
11. Projects relating to installation, calibration and testing of machines.
12. Projects related to wastage reduction.
13. Project, related to fabrication.
14. Energy efficiency related projects.
15. Projects related to improving an existing system

NOTE: Each student has to take one project individually and one to be shared with a group of four-five students depending upon cost and time involved. There is no binding to take up the above projects as it is only a suggestive list of projects.

A suggestive criterion for assessing student performance by the external (person from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance Criteria	Max.** Marks	Rating Scale				
			Excellent	Very Good	Good	Fair	Poor
1.	Selection of project assignment	10%	10	8	6	4	2
2.	Planning and execution of considerations	10%	10	8	6	4	2
3.	Quality of performance	20%	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20%	20	16	12	8	4
5.	Sense of responsibility	10%	10	8	6	4	2
6.	Self expression/ communication skills	5%	5	4	3	2	1
7.	Interpersonal skills/human relations	5%	5	4	3	2	1
8.	Report writing skills	10%	10	8	6	4	2
9	Viva voce	10%	10	8	6	4	2
Total marks		**100**	**100**	**80**	**60**	**40**	**20**

The overall grading of the practical training shall be made as per following table.

In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance to improve and re-evaluate before being disqualified and declared "not eligible to receive diploma ". It is also important to note that the students must get more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

	Range of maximum marks	**Overall grade**
i)	More than 80	**Excellent**
ii)	79 <> 65	Very good
iii)	64 <> 50	Good
iv)	49 <> 40	Fair
v)	Less than 40	Poor

Important Notes

1. **These criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.**

2. **The criteria for evaluation of the students have been worked out for 200 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.**

3. **The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.**

4. **It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.**

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work.

10. RESOURCE REQUIREMENT

PHYSICAL RESOURCES

(A) Space requirement

Norms and standards laid down by All India Council for Technical Education (AICTE) are to be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

(B) Equipment requirement:

Following Laboratories are required for Diploma Programme in Mining Engineering:

- Communication Laboratory
- Applied Physics Laboratory
- Applied Chemistry Laboratory
- Engineering Drawing
- Applied Mechanics
- Introduction to Basics Language in Computer Application
- Carpentry Shop
- Sheet Metal Soldering & Brazing Shop
- Fitting and Plumbing Shop
- Welding Shop
- Electrical Technology & Electronics Laboratory
- Mine Surveying Lab
- Geology Lab
- Rock Mechanics Lab
- Mining Machinery and Mining Technology Lab
- Mine Environmental Engineering Lab
- Energy Conservation Lab

EQUIPMENT REQUIREMENT FOR MINING ENGG.

Sr. No.	Description	Qty	Total Price (Rs)
COMMUNICATION LABORATORY			
1.	Stools	40	10,000
2.	Display Board/Screen	2	6,000
3.	Sound recording and playing system	1	6,000
4.	Audio cassettes	60	2,000
5.	Overhead Projector	1	5,000
6.	Transparencies slides	100	500
7.	TV, VCR and camera for video recording	1 each	20,000
8.	English spoken course	1	2,000
9.	A Quiz room equipped with two way audio system, back projection system and slide projector	1	30,000
10.	Miscellaneous	LS	1,500
APPLIED PHYSICS LABORATORY			
1.	Vernier calipers Working length 160 mm, Internal and external dia with locking arrangement	12	2,000
2.	Screw Gauges Working length 15 mm, pitch 0.5 mm, least count .005 mm	12	2,000
3.	Spherometers Distance between legs 2.5 mm, pitch 0.5 mm, least count .005 mm.	12	2,000
4.	Mirrors (convex, concave)	5 Each	1,500
5.	Pendulum Setup	02	4,000
6.	Gravesand's Apparatus	02	3,000
7.	Inclined Plane Setup	02	2,000
8.	Flywheel Setup	02	4,000
9.	Prism	05	1,500
10.	Spectrometer	02	25,000
11.	DC Ammeters Moving coil weston-type ammeter with ebonite stand	10	3,500
12.	DC Miliammeters	2	1,000
13.	DC Microammeters	2	700
14.	DC voltmeters	10	700
15.	DC Millivoltmeters	10	2,000
16.	Sensitivity Galvanometer	2	800
17	Student Galvanometers	10	4,000
18.	Demonstration type DC Ammeters Range; 0 to 1 Amp.	2	1,000
19.	D type DC Voltmeter Range : 0 to 1 Volt	2	1,000
Sr. No.	**Description**	**Qty**	**Total Price (Rs)**

20.	D type Galvanometers Sensitivity : 20 microamperes per scale division,	8	8,000
21.	Resistance boxes (dial type) assorted	8	8,000
22.	Rheostats	10	4.000
23.	Miscellaneous items (Spring, Pan, Glycerine, Optic fibre, Ferromagnetic material)	LS	2,000
24.	Fortin's Barometer (Wall type)	2	20,000
25.	Stoke's Apparatus	2	10,000
26.	Gumther's Apparatus	2	16,000
27.	Resonance Tube Apparatus with accessories and Tuning fork set	2	14,000
28.	Sodium Lamp setup with Biprism	2	10,000
29.	Ohmic resistance coil	10	5,00
30.	Slide wire bridge	2	8,000
31.	PN Junction diode Apparatus	2	10,000
32.	Laser (as per requirement)	1	1,00,000
33.	Numerical aperture setup	1	25,000
34.	Miscellaneous	LS	3,000

APPLIED CHEMISTRY LABORATORY

Sr. No.	**Description**	**Qty**	**Total Price (Rs)**
1.	Digital Balance	1	80,000
2.	Burette 50ml	30	3,000
3.	Pipette 25ml	60	4,000
4.	Beakers 100ml	60	4,000
5.	Burette stand	30	30,000
6.	Glazed tile	30	1,000
7.	Conical flask 50ml (Titration flask)	60	4,000
8.	Standard (Measuring) flask (to prepare standard solution) 250ml/100ml	30	6,000
9.	Able's Flash Point apparatus	2	10,000
10.	(1/10)°C thermometer	06	6,000
11.	Candles	20	100
12.	Crucible with lid	06	2,000
13.	Muffle furnace	1	18,000
14.	Decicators	06	8,000
15.	Pair of tongue (small and big)	24 (small) 2 (big)	2,000

Sr. No.	Description	Qty	Total Price (Rs)
16.	Chemicals - EDTA-1 kg - Eriochrome Black-T(solochrome black T)-200g - Buffer solution (NH_3 - 2.5 ltr, NH_4Cl – 1 kg) - Zinc sulphate- 500g - H_2SO_4- 2.5 ltr - Phenolphthalein indicator (as per requirement) - Methyl orange indicator (as per requirement) - Charcoal (as per requirement) - Kerosene- 1 ltr	LS	20,000
17.	Miscellaneous	LS	2,000
	ENGINEERING DRAWING		
1.	Drawing Boards (700 x 500mm)	30	12,500
2.	Draughtsman Tables	30	90,000
3.	Draughtsman Stools	30	20,000
4.	Computer Aided Drawing (CAD) Software	30 User	5,00,000
5.	Model of different wooden joints	1	1,000
6.	Model of different screw threads	1	1,000
7.	Model of various locking devices	1	1,000
8.	Model of various joints	1	1,000
9.	Cut section Model of various couplings	1	3,000
10.	Miscellaneous	LS	5,000
APPLIED MECHANICS LABORATORY			
1.	Polygon law of forces apparatus	1	2,000
2.	Jib crane	1	4,000
3.	Apparatus for reaction at supports	1	5,000
4.	Inclined plane and friction apparatus	1	2,500
5.	Screw jack	1	1,000
6.	Worm and worm wheel	1	3,500
7.	Single Purchase Winch Crab	1	4,000
8.	Miscellaneous	LS	1,000
INTRODUCTION TO BASIC LANGAUGES IN COMPUTER APPLICATION			
1.	Computer System with latest configuration	30	8,00,000
2	Printer (MFP)	1	25,000
3	Printer (Laser)	1	35,000
4.	Plotter	1	75,000
5.	Digitiser	1	50,000
6.	Antivirus Software	LS	10,000
7.	Internet Facility on Computers	LS	2,00,000

Sr. No.	Description	Qty	Total Price (Rs)
8.	Mining Software	30 user	5,00, 000
9.	LCD Projector	1	35,000
10.	UPS	30	60,000
11.	Software (latest windows, latest MS Office)	1	1,00,000
12.	Scanner	1	10,000
13.	Miscellaneous	LS	5,000
CARPENTRY SHOP			
Sr. No.	**Description**	**Qty**	**Total Price (Rs)**
1	Work benches fitted with carpenter vices	5	20,000
2.	Circular saw grinder	1	6,000
3.	Wood cutting band saw-vertical	1	10,000
4.	Bench grinder	1	5,000
5.	Drilling machine	1	8,000
6.	Wood turning lathe	1	40,000
7.	Wood Planner	1	20,000
8.	Tool accessories measuring and marking Instruments	25	25,000
9.	Band saw blade brazing unit	1	10,000
10.	Miscellaneous	LS	1,500
SHEET METAL SOLDERING & BRAZING SHOP			
Sr. No.	**Description**	**Qty**	**Total Price (Rs)**
1.	Hammers	8	3,000
2.	Mallets (Hard & Soft)	5	2,000
3.	Sheet and wire Ganges	LS	8,00
4.	Shearing Machine	1	20,000
5.	Bar folding Machine	1	20,000
6.	Burring machine	1	10,000
7.	Various sheet (black plain, galvanized iron, corrugated, Aluminium)	1 Each	1,000
8.	Hand Shears/Snippers	4	2,000
9.	Nuts, Bolts, Rivets, Screw	LS	5,00
10.	Shearing machine 120 cm.	1	5,000
11.	Solder electric	2	2,000
12.	Solder furnace type	2	1,000

13.	Brazing equipments and accessories	1	10,000
14.	Blow lamp	2	1,000
	Miscellaneous	LS	1,000

FITTING AND PLUMBING SHOP			
Sr. No.	**Description**	**Qty**	**Total Price (Rs)**
1.	Work benches with vices (4 vices on each bench)	5	30,000
2.	Marking tables with scribers	4	24,000
3.	Surface plates	5	20,000
4.	Accessories like calipers, V blocks, height, gauges steel rules and scribers	25	50,000
5.	Tool kits – taps, dies, drills	25	40,000
6.	Tool kits – chiesels, hammers, files, hacksaw	25	25,000
7.	Drilling machine	2	12,000
8.	Pipe vice	4	1,000
9.	Chain wrenches	5	1,250
10.	Ring spanner set	5	600
11.	Pipe die set 2”	2 set	1,000
12.	Pipe bending device	1	5,000
13.	Various plumbing fittings	LS	2,000
14.	Miscellaneous	LS	1,500

	WELDING SHOP		
Sr. No.	**Description**	**Qty**	**Total Price (Rs)**
1.	Electrical welding transformer set with accessories	3	30,000
2.	Gas Cutting Unit	1	3,000
3.	Work benches with vices	3	5,000
4.	Welding generator set	1	10,000
5.	Oxy acetylene welding set with accessories	1	7,000
6.	Acetylene generating set	1	6,000
7.	Electric welder tool kit	10	10,000
8.	Projection welding machine	1	15,000
9.	Brazing equipment with accessories	1	10,000
10.	Soldering irons	3	1,000
11.	Pedestal grinder	1	10,000
12.	Metal spraying gun	1	10,000
13.	Spot welder	1	25,000
14.	TIG welding set	1	1,00,000
15.	MIG welding set	1	1,00,000
16.	Welding Partition Screen	5	2,500
17.	Miscellaneous	LS	3,000

ELECTRICAL TECHNOLOGY AND ELECTRONICS LABORATORY			
Sr. No.	**Description**	**Qty**	**Total Price (Rs)**
1.	D.C. Shunt Motor 3 Kw. 1500 RPM with 3 Point Starter.	2	20,000
2.	D.C. Compound Motor 3 Kw. 1500 RPM	2	20,000
3.	Single Phase Transformer 1 KVA 50 Hz. Primary Voltage 230 with tapping at 50%, 86.6 % Facility	2	12,000
4.	3 Phase Induction Motor 415 V., 50 Hz, 440 RPM, 3 KVA Star/Delta/Autotransformer Starter.	2	10,000
5.	Loading Drum Spring Balance & Belt Arrangement.	2	2,000
6.	Tachometer (Analog/Digital)	1	2.000
7.	3 Phase Inductive Loading of Variable Nature	1	8,000
8.	Single Phase Inductive Loading Variable 0-10 Amp., 50 Hz.	1	8,000
9.	Moving Coil Ammeter 0-10 Amp.	8	1,000
10.	Moving Coil Voltmeter 0-300 V.	8	8,000
11.	Moving Iron Ammeter 0-10 Amp.	8	8,000
12.	Moving Iron Voltmeter 0-300 V.	8	8,000
13.	Wattmeter Single Phase Dynamo Type 75/300/600 V. 2.5/5 Amp.	4	10,000
14.	Three Phase Variable Inductive Loading.	1	8,000
15.	Single Phase Variable Inductive Loading with Rheostat.	1	8,000
16.	Megger 0-20 Mega Ohm, 500 RPM .	-	-
17.	Flouroscent Tube With Choke.	1	100
18.	SCR Bread Board	1	1,000
19.	Power Supply 230 V.	1	1,000
20.	Moving Coil Ammeter 0-500 M.A.	1	1,000
21.	Moving Coil Voltmeter 0-250 V.	1	2,000
22.	Energy Meter Single Phase 230 V., 5 Amp	1	15,00

*MINE SURVEYING LAB

A. Linear Measuring Instruments
1. i) Metre Chain -30
ii) Gunter's Chain -66 ft
iii) Engineer's Chain -100 ft
2. Steel Band -200 ft
3. Tape
i) Inver Tape -30m,50m
ii) Steel Tape -30m
iii) Metalic Tape -30m
4. Arrow -40cm.(each)
5. Wooden Peg -15cm(each)
6. Ranging Pole -1.8m,4m,6m
7. Off Set Rod -3m
8. Plumb Bob -500gm,100gm,50gm
9. Optical Square
10.Spring Balance

B. Compass
i) Primatic Compass

C. Theodolite
i) Vernier Theodolite
ii) Microptic Theodolite
iii) Wild T2

D. 1.Level
i) Dumpy Level
ii) Tilting
iii) Precise Level

2. Levelling Staff
i) Inver Precision Levelling Staff
ii) Telescope Levelling Staff

E. Dial
i) Microptic Dial
ii) Miner's Dial

F. Tacheometer

G. i) Plane Table with Stand
ii) Alidade =metal(brass or gunmetal) or box wood
straight edge or ruler = 50 cm long

or

iii) Microptic Alidade

iv) Trough compass or a circular box compass with two doubbles tube at right angle to each other Mounted on a square base plate.

or

Sprit level (2"*1/2"*1/2")

v) Plumbing fork or U frame

H. i) Plani meter(Determining the area of a given figure or plan area)

or

ii) Electronic planimeter

I. Box Sextant

J. Clinometer's (Indian partarn clinometer)

K. Abney Level

L. For Enlarging and Redusing plan

i) Proportional Compass

ii) Pentagraph

iii) Edeograph

M. Thermometer -(00-50C0, 0C0-100C)

N. Total Station -(0- GPS) Instruments

* Quantity should be decided during Lab setup and according to requirement.

* GEOLOGY LAB

1. Horse Shoe Magnet
2. Geological Hammers
3. Mineral showing optical characters
4. One set of 60 minerals showing colour luster 1"+1"
5. Blow pipe equipment consisting 28 items of oppratus
6. Crystal Models of wood appraf.3"+5"
7. Geological map of jharia coal field
8. Geological raniganj coal field
9. Geological map of india
10. Geological Bihar and Orissa
11. Clinometer compass
12. Steel yard balance
13. Magnifying Lens
14. Contact Gonio meter
15. Typical Indian Rock 4"x 3"
16. Indian mineral specimen trimmed 3"x2"
17. Mineral of the mohis hardness in bop
18. One set of 14 Nos. wooden models
19. Steel yard Balance
20. Polarizing microscope with optical equipment
21. Quartz wedge code word
22. Mica Plate Komer
23. Structure & from collection of 30 minerals
24. Cleavage collection of minerals
25. Minerals in industry
26. Spring balance
27. Models showing set of fields
28. Igneous rocks
29. Important mvertelerate fossils'
30. Microsection of important mineral
31. Micro set of important rocks
32. Prospecting Hammer with ctrisel end 2
33. One set of 10 No.s of fault models Type 'b' in diff. colours wood
34. Rocks-granodiorite,pyroxinite olivine,basalt,arkose,grite
35. Minerals-Labrodorite
36. Minerals size 3"x2"- inter red
37. Albite 3"x2"
38. Microcline 3"x2"
39. Sodalite 3"x2"
40. Biolite 3"x2"
41. Phlogolite 3"x2"
42. Ilmenite 3"x2"
43. Limonite 3"x2"
44. Malachite 3"x2"

45.Mineral-Lepidolite 7x5cm specimen
46.Specimen Mineral lignite 7x5 cm
47.Specimen Mineral peat 7(5 cm
48.Silver ore 7x5 specimen
49.Specimen Mineral gold quartz 7x5
50.Rock specimen 4"x3" approx. granite singhlihum
51.Seynite 4"x3" approx.
52.Diorite 4"x3" approx.
53.Gabbro c.g. 4"x3" approx.
54.Peridolite 4"x3" approx.
55.Nephelene Syenite 4"x3" approx.
56.Dumite 4"x3" approx.
57.Lamprophyes 4"x3" approx.
58.rhyolite pinx pavaghd 4"x3" approx.
59. Dacite 4"x3" approx.
60.Truchite 4"x3" approx.
61. Decon Trap Rock.- 4"x3" approx
62. Inter Trappean Rock 4"x3" approx.
63. vindhyan sandstone 4"x3" approx.
64. sand stone 4"x3" approx.
65. Kaimur sand stone 4"x3"approx.
66. Phylite 4"x3" approx.
67. Makrana marble (white) 4"x3" approx.
68. Slate (kangra) 4"x3" approx.
69.speciman of mineral 7.5x5 cm.approx.
70. Rocks 10x7.5 cm. approx. limestone, trachyte,Syenite, bronzite, pyroxenite, Basalt with zeolites.
71. printed blank labels- 4"x3" and 3"x1".

* Quantity should be decided during Lab setup and according to requirement.

* ROCK MECHANICS LAB

1. Core drilling machine
2. Cutting Machine with diamond saw.
3. lapping machine.
4. Universal testing machines of different capacities.
5. Direct shear appratus.
6. point load strength test appratus .
7. Prot dia Konov appratus.
8.Slake durability appratus.
9.Porosimeter
10.Electric oven
11. Hydraulic pump.
12. Physical balance.
13. strain indicator with strain gauges.
14. Center hole hydraulic jack.
15. Vibration monitor.
16. Rebound hammer.
17. Extensometer.
18.Load cell.

* Quantity should be decided during Lab setup and according to requirement.

* MINING MACHINARY AND MINING TECHNOLOGY LAB

1.Miners safety halmets.
2. Mask dust trap complete with filter bag.
3. Spare Filter bag to above.
4. pen Knives
5. Walker Steel Yard Balance with well polished wooden case.
6. miners safety hats.
7. Diamond drill rods.
8. Siemens Drill 280 r.p.m.
9. Pick Boxes.
10.Chain links
11. Rivet bush and rivet pins.
12.Cutter picks
13. set screws
14.suction hose.
15. E rod spear ,E rod recovery tap, E rod coupling tap
16. 24" pipe wrench
17. Siskol Bit Grade M for coal
18. Siskol Bit Grade M for stone
19. Diamond drill rod 2'-3"
20. AXL starting care barrel 1.5".

21. EXL Bit & shell recovery tap.
22. AX cross chopping Bit.
23. AXL Block Bit
24. EXL Block Bit
25. M & C 3 puller with 5" dia roller including board for 18" belt.
26. AX Double Type Slojvel type core barrel 10 long
27. AX casing with coupling 5' long
28. AX Flush coupled casing with coupling 10' long
29. AX casing shoe
30. Sylvester pit prop with draver complite with 3ft.
31. Pikrase size L 5HP 400/440 VHts
32. M.S. coal tub 4'X3'X3'
33. K.E.W. make wheels
34. Friction Roller with block
35. Jim crow for 24 lbs rails
36. Tub-Re Railer (R.H. & L.H.)
37. Coricoddia type PB 3/
38. AB-10 Air circuit Breaker
39. Non-HP circuit Breaker type
40. Barker Daries wiriding rop cappel
41. 16" sheare pully Block
42. Cromrl well Miners safety size 7 1/8
43. Meco chock release 6"X30"
44. Little Demon Magneto L.T.
45. M.E.6 Battery type Explore
46. Victor Midget Gate end box 440 volt.
47. Birams Air Meter.
48. combined pivot & static tube overall.
49. Whirling Hygrometer.
50. Leather Sling Case.
51. Celsins Tables.
52. Standard Kata.
53. Victors.
54. Blagdon Durham Manually.
55. Dowtx Duke.
56. Anderson Boyes CH4/E.
57. Hydraulic Burster.
58. Hydraulic Pump Complete with Tools.
59. 2 ft.& 4'6" long special section drill rod.
60. 15' length-1/4" bore hose.
61. 3.5" dia cutter head with pilots.
62. Split shank drilling bits with core type.
63. Set of tools for siemer drill.
64. Velox mines approved electrical safety torch.
65. Projection lamp 750W,115V for 16mm projection.
66. Sound Lamp 3/4 amps 4V for 16mm projection.

67. Combrian Flint Relights lamp type No-4,6 & 8.

68. 10 Type Charger
69. 10 Type Frame.
70. Leather Belts-36",42"& 48".
71. G-W Cap Lamps.
72. Bed ford JYE- 179" WB chassis channel
73. Yorkshire patent star model 2c Haulage
74. MSA all purpsoe work gloves
75. Flap
76. Winding rope socket
77. Dust Mark Respirator
78. Assembly of roof Belts of different type
79. Rock Drills
80. lubricator
81. hose pipe of 3/4"
82. Pusher Leg
83. Drill rod
84. Pneumatic pick bore
85. Detachable Drill Bits
86. Drill steel For bits
87. Tricone Rock roller drill bit with A.P.I. thread
88. Auxiliary Axial mine fan
89. Starter with ammeter and voltmeter
90. Air compressor
91. Air pipe
92. Pressure gauge
93. Electric motor starter
94. Jekey Dustractor CMRS design for jack hammers only
95. Aneroid Barometer open dile
96. Thermadyne velometer, model
97. Kata thermometer
98. Portable Methenometer
99. Air nozzle
100 Anemometer.
101.Flame proof safety lamp.
102.Whirling Hygromter
103.Haulage couplings
104.Haulage Clipes

* Quantity should be decided during Lab setup and according to requirement.

MINE ENVIRONMENT ENGINEERING LABORATORY			
1.	pH Meter	01	500
2.	Turbidity Meter	01	5000
3.	Oven with Temperature Controller and Forced Air Circulation Type	01	20000
4.	B.O.D. Incubator	01	25000
5.	Water Analysis Kit	01	5000
6.	High Volume Sampler	01	40000
7.	Electrical Balance for weighing upto 1/10 of milligram (capacity)	01	1000
ENERGY CONSERVATION LABORATORY			
1	Clamp meter	02	5000
2	Multimeter	02	2000
3	Power Analyser	01	20000
4	Different types of lamps (LS) – 60 W lamp, 230 V , 100 V – 200 W lamp – 500 W lamp – 100 W lamp, 110 V, 150 V	10	500
5	Lux meter	02	5000
6	Centrifugal pump, 1 kW	1	15,000
7	Standard window A.C.	01	20000
8	Anemometer	02	5000
9	Thermometer	03	2000
10	Flow meter	02	10000
11	Pumping set with at least two pumps of different capacity.	1 set	10000
12	Pressure gauge fitted on discharge lines	1 set	2000
13	Variable Frequency Drive	02	50000
14	A small compressor with a small network of pipe line fitted with suitable pipeline, pressure gauge, safety valve and loading / unloading pressure switch.	1	3000
15	Stop watch	2	1000
16	Small blower (1.5 kW motor) with inlet and outlet ducts of approximately one meter length on both sides	1	10000
17	Black Box (for checking lamp efficacy including stand and luxmeter)	1	25000

Note:

1. The specifications and price of equipment mentioned above used as broad guidelines for purchase of equipment.
2. Any other items not mentioned in the lit of equipment can be purchased as provision has been made for purchase under the item miscellaneous for each lab/shop.
3. Any additional equipment, already available in the institute, may be used for demonstration to the students.

NOTE:

In addition to the above, laboratories in respect of physics, chemistry, Computer Centre etc will be required for effective implementation of the course. Provision for photocopiers, PC facilities along with LCD Projection System etc. has also to be made.

(C) Furniture Requirement

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

Human Resources Development:

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE.

11. EVALUATION STRATEGY

INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching- learning endeavor is to ensure the quality of the product which can be assessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

Formative Evaluation

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

Summative Evaluation

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and systematic manner since any mistake or lacuna is likely to affect the future of students.

In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work
- Professional Industrial Training

A. Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems. The formative evaluation for theory subjects may be caused through sessional /class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end-term evaluation of theory, the question paper may comprise of three sections.

Section-I

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

Section-II

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

Section-III

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section

Table II : Suggested Weightage to be given to different ability levels

Abilities	Weightage to be assigned
Knowledge	10-30 percent
Comprehension	40-60 percent
Application	20-30 percent
Higher than application i.e. Analysis, Synthesis and Evaluation	Upto 10 percent

B. Practical Work

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals/field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to

performance on task, quality of product, general behavior and it should be followed by viva-voce.

C. Project Work

The purpose of evaluation of project work is to assess students ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

D. Professional Industrial Training

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage in activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behaviour, quality of report and presentation during viva-voce.

12. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION

This curriculum document is a Plan of Action and has been prepared based on exhaustive exercise of curriculum planning and design. The representative sample comprising selected senior personnel (lecturers and HODs) from various institutions and experts from industry/field have been involved in curriculum design process.

The document so prepared is now ready for its implementation. It is the faculty of polytechnics who have to play a vital role in planning instructional experiences for the courses in four different environments viz. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the changes in stipulated students behaviour as in the curriculum document. It is important for the teachers to understand curriculum document holistically and further be aware of intricacies of teaching-learning process (T-L) for achieving curriculum objectives. Given below are certain suggestions which may help the teachers in planning and designing learning experiences effectively. These are indicative in nature and teachers using their creativity can further develop/refine them. The designers of the programme suggest every teacher to read them carefully, comprehend and start using them.

(A) Broad Suggestions:

1. Curriculum implementation takes place at programme, course and class-room level respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its rationale and philosophy.

2. An academic plan needs to be prepared and made available to all polytechnics well in advance. The Principals have a great role to play in its dissemination and, percolation upto grass-root level. Polytechnics, in turn are supposed to prepare institutional academic plan.

3. HOD of every Programme Department along with HODs and Incharges of other departments are required to prepare academic plan at department level referring to institutional academic plan.

4. All lecturers/Senior lecturers are required to prepare course level and class level lesson plans referring departmental academic plan.

(B) Course Level Suggestions

Teachers are educational managers at class room level and their success in achieving course level objectives lies in using course plan and their judicious execution which is very important for the success of programme by achieving its objectives.

Polytechnic teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/workshop practicals, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out progressive assessment of theory, assignments, library, practicals and field experiences. Teachers are also required to do all these activities within a stipulated period of time. It is essential for them to use the given time judiciously by planning all above activities properly and ensure execution of the plan effectively.

Following is the gist of suggestions for subject teachers to carry out T-L process effectively:

1. Teachers are required to prepare a course plan, taking into account departmental academic plan, number of weeks available and courses to be taught.

2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of contents to be covered, learning material for execution of a lesson plan. They may follow steps for preparing lesson plan e.g. drawing attention, state instructional objectives, help in recalling pre-requisite knowledge, deliver planned subject content, check desired learning outcomes and reinforce learning etc.

3. Teachers are required to plan for expert lectures from field/industry. Necessary steps are to plan in advance, identify field experts, make correspondence to invite them, take necessary budgetary approval etc.

4. Teachers are required to plan for guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The assignments and seminars can be thought of as terminal outcome of library experiences.

5. Concept and content based field visits may be planned and executed for such content of course which is abstract in nature and no other requisite resources are readily available in institute to impart them effectively.

6. There is a dire need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem based learning/activity learning/ experiential learning approach effectively. The development of lab instruction sheets for the course is a good beginning to provide lab experiences effectively.

7. Planning of progressive assessment encompasses periodical assessment in a semester, preparation of proper quality question paper, assessment of answer sheets immediately and giving constructive feed back to every student

8. The student centered activities may be used to develop generic skills like task management, problem solving, managing self, collaborating with others etc.

9. Where ever possible, it is essential to use activity based learning rather than relying on delivery based conventional teaching all the time.

10. Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.

11. Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.

12. Students may be given relevant and well thought out project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment.

13. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, research institutes and other relevant field organizations in the state.

13. LIST OF EXPERTS

List of experts who contributed in the development of the curriculum in Review and Revision for the Three year (Six Semester) Diploma Textile Technology at Directorate of Geology & Mining, U.P. Luck now on 01 December 2022 are honorable named below:

1.	Shri Vipin Kumar Jain (IAS)	Additional Director Directorate of Geology & Mining, U.P. Lucknow
2.	Prof. Suryaprakash Gupta	H.O. D and Professor of Department of Mining, I.I.T.(B.H.U.), Varanasi
3.	Prof A. K. Verma	Associate Professor, Department of Civil & Environmental Engg., I.I.T. Patna
4.	Shri S. K. Singh	Ex. Joint Director Directorate of Geology & Mining, U.P. Lucknow
5.	Shri Amit Kushik	Joint Director Directorate of Geology & Mining, U.P. Lucknow
6	Prof. G.S.P. Singh	Associate Professor, IIT, BHU, Varanasi
7.	Shri Ajeet Kumar Mishra	Joint Director East Zone Tech. Edu. Department
8.	Shri Dhirendra Singh	Principal Govt. Poly. Talbehat, Lalitpur
9.	Dr. A. P. Singh	Deputy Director IRDT UP, Kanpur
10.	Dr. Bhardwaj Pandir	Assit. Professor, IIT, BHU, Varanasi
11.	Shri Sambhaskar Singh	Coordinator of the Workshops Assistant Professor IRDT UP, Kanpur
12.	Shri Bhupendra Yadav	Senior Mines Officer, Directorate of Geology & Mining, U.P. Lucknow
13.	Shri. Kamlesh Kumar Roy	Senior Mines Officer, Directorate of Geology & Mining, U.P. Lucknow
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15.	Shri Anant Kumar Singh	Mines Officer, Directorate of Geology & Mining, U.P. Lucknow
16.	Shri Raj Ranjan Kumar	Mines Officer, Directorate of Geology & Mining, U.P. Lucknow
17.	Shri Virendra Pratap Singh	Mines Officer, Directorate of Geology & Mining, U.P. Lucknow

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19.	Shri Chandra Prakash Gupta	Mines Officer, Directorate of Geology & Mining, U.P. Lucknow
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