# Teaching and Evaluation Scheme for Diploma in Engineering Courses

## Disciplines: Drilling Engineering

### Semester: 3rd

<table>
<thead>
<tr>
<th>SL NO</th>
<th>SUBJECT CODE</th>
<th>SUBJECT</th>
<th>PERIODS</th>
<th>EVALUATION SCHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>DET 301</td>
<td>EXPLORATORY DRILLING</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>DET 302</td>
<td>ENGINEERING GEOLOGY-I</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>DET 303</td>
<td>DRILLING MACHINERY-I</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>DET 304</td>
<td>DRILLING SKETCHING</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>DET 305</td>
<td>BLAST HOLE DRILLING</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td><strong>PRACTICAL/TERM WORK</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DEP 301</td>
<td>ENGG. GEOLOGY-I</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>DEP 302</td>
<td>DRILLING MACHINERY-I</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>DEP 303</td>
<td>DRILLING SKETCHING</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>DEP 304</td>
<td>PRACTICAL TRAINING REPORT AND VIVA VOCE</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>DEP 305</td>
<td>TECHNICAL SEMINAR</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>DEP 306</td>
<td>LIBRARY STUDY</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

Total Contact hours per week: 39

Abbreviations: L-Lecture, T-Tutorial, P-Practical, TA- Teacher’s Assessment, CT- Class test

Minimum Pass Mark in each Theory Subject is 35% and in Practical subject is 50%
Name of the Course: Diploma in DRILLING ENGINEERING

<table>
<thead>
<tr>
<th>Course code:</th>
<th>DET 301</th>
<th>Semester</th>
<th>3rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Period:</td>
<td>44</td>
<td>Examination</td>
<td>3 hrs</td>
</tr>
<tr>
<td>Theory periods:</td>
<td>4 P/W</td>
<td>Class Test:</td>
<td>20</td>
</tr>
<tr>
<td>Tutorial:</td>
<td></td>
<td>Teacher’s Assessment:</td>
<td>10</td>
</tr>
<tr>
<td>Maximum marks:</td>
<td>100</td>
<td>End Semester Examination:</td>
<td>70</td>
</tr>
</tbody>
</table>

RATIONALE:

It is important to highlight the types of materials involved in drilling earthy surface to the desired depth so as to record the thickness of different types of layers of rock materials which will be useful for exploring the hidden natural resources.

OBJECTIVES:

On completion of the course, student will be able to:

1. Develop the concept of Geology of the concealed and exposed mineral deposit and the type, size patterns of bore holes required to meet for exploring the natural treasure

2. Classify various methods of exploratory drilling techniques for boring shallow or deep holes manually or mechanically

3. Solve various drilling problems encountered and relevant techniques to overcome these,

4. To know various techniques of recovering core of the strata.

TOPIC WISE DISTRIBUTION OF PERIODS:

<table>
<thead>
<tr>
<th>SL.NO.</th>
<th>TOPIC</th>
<th>PERIODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>SURFACE Exploratory Drilling</td>
<td>05</td>
</tr>
<tr>
<td>2.</td>
<td>Methods of Exploratory Drilling</td>
<td>05</td>
</tr>
<tr>
<td>3.</td>
<td>Drilling Practices</td>
<td>07</td>
</tr>
<tr>
<td>4.</td>
<td>Wereline Coring System</td>
<td>07</td>
</tr>
<tr>
<td>5.</td>
<td>Reverse Circulation System</td>
<td>05</td>
</tr>
<tr>
<td>6.</td>
<td>Con-core Process of coring Operation</td>
<td>05</td>
</tr>
<tr>
<td>7.</td>
<td>Ground water exploration Drilling</td>
<td>06</td>
</tr>
<tr>
<td>8.</td>
<td>Foundation Exploration Drilling</td>
<td>04</td>
</tr>
</tbody>
</table>
COURSE CONTENTS (Based on specific objectives)

1.0. Surface Exploratory Drilling:

1.1 Give a concept on the purposes, patterns, types and sizes of bore holes for exploring valuable placer, load, vein and stratified mineral deposits.

2.0 Method of Exploratory Drilling:

2.1 Explain the operational procedure of various manual exploratory drilling methods and state their fields and applications.

2.2 State the various processes of percussive exploratory drilling methods indicating their field of application explain comprehensively with required sketch their working procedures, tools, equipments and accessories used in each methods.

2.3 State the different rotary core drills used for obtaining the core of the Sub-Surface strata, Explain with suitable sketches their operational procedures indication field of applications.

2.4 State the factors to be considered in the selection and application of core drilling for various types ground conditions.

3.0 Drilling Practices:

3.1 State the problems encountered during progress of drilling through fissured of broken ground, cave in information, soft and washable formation, soluble formation etc. and explain the means of overcoming them.

3.2 State the effect of excessive temperature on Diamonds and matrix and explain the coring operation of dry blocking drilling.

3.3 Explain the conventional coring operation and recovery system of diamond drilling.

3.4 Explain the triple tube wire line system of coring operation and state the precaution to be taken while using a new core bit.

3.5 State the relationship of bit pressure rotational speed and rate of penetration.

3.6 State the effect of rotational speed verses lineal travels on diamond wears.

3.7 Explain bit wear due to rock hardness.

3.8 Explain the causes of bit wear and explain the process of the controlling diamond wear.

4.0 Wire line Coring System:

4.1 State the objective wireline coring system.

4.2 Explain the working principles of wireline system.

4.3 State the application of wireline system of dry drilling.

4.4 Explain the structure of overshot and inner tube assembly.

4.5 Explain the mechanism of pivoting sphear head (knuckle head) and overshot latch.

5.0 Reverse circulation system:

5.1 Give the concept of Reverse circulation of drilling.
5.2 Explain the mechanism of Jet Educator.
5.3 Explain with suitable sketches the working principles of a direct circulation drilling machine.
5.4 Establish the conditions that favour the use of reverse circulating.

6.0 Con-core Process of Coring Operation:
6.1 Explain the principles and mechanism involved with pumping the core to the surface in con-core process of coring operation.
6.2 Compare and contrast between con-core and wireline system of coring operation.

7.0 Ground Water Exploration Drilling:
7.1 State the methods and techniques employed for ground water investigation.
7.2 States the aim and objectives of Geo Physics.
7.3 Explain how resistively survey is useful in determining the thickness of the weathered zone and depth of promising water bearing strata.
7.4 state the basic types of drill to be employed for test drilling and suggest suitable drills for the following formations.
7.4.1 Sand formation, Alluvia and semi consolidated, Boulder Strata, hard and compact formation and cave information.
7.5 How logging is helpful to correlate aquifers?
7.6 State the various logging methods of boreholes for exploration of ground water.
7.6.1 State and explain the following logging methods of borehole for exploration of ground water in brief.
   - Self potential, single point resistance, resistivity, Natural gamma, neutron, Caliper.
7.6.2 Conventional log, driller log, cutting log, mud log, drilling time log.

8.0 Foundation Exploration Drilling:
8.1 State the purpose of foundation exploration drilling.
8.2 Explain in brief the scope of foundation exploration drilling.
8.3 Explain the basic principles of foundation drilling for the formations of stumpy area, mud and clay, sand over burden, unconsolidated soil and clay, boulder overburden and hard and compact formation.

LEARNING RESOURCES
RECOMMENDED BOOKS
1. SURFACE mining by G.B. Mishra
2. Diamond drilling Hand Book by J.D. Cummins
3. Diamond drilling by C.P. Chugh
4. UMS Vol-III
5. Ground water drilling by O.P. Honda.
Name of the Course: Diploma in DRILLING ENGINEERING

<table>
<thead>
<tr>
<th>Course code:</th>
<th>DET 302</th>
<th>Semester</th>
<th>3rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Period:</td>
<td>44</td>
<td>Examination</td>
<td>3 hrs</td>
</tr>
<tr>
<td>Theory periods:</td>
<td>4 P/W</td>
<td>Class Test:</td>
<td>20</td>
</tr>
<tr>
<td>Tutorial:</td>
<td></td>
<td>Teacher’s Assessment:</td>
<td>10</td>
</tr>
<tr>
<td>Maximum marks:</td>
<td>100</td>
<td>End Semester Examination:</td>
<td>70</td>
</tr>
</tbody>
</table>

RATIONAL:

In majority of the cases, materials that need to be drilled in order to reach the hidden treasure are rocks and minerals. It is, therefore, essential to have the basic knowledge of geology for drilling engineers.

OBJECTIVES:

On completion of the subject, student will have an outline about the interior of the earth, different rocks that make up the earth surface processes that operate causing disintegration and decomposition of rocks, students will be able to identify various mineral in the field based on the study of their physical properties. Students will be able to select various geological structures that govern location of ore deposits.

They will further be able to (i) categories the various sequences of strata for the purpose of drilling and (ii) Identify the areas where there is possibility of occurrence of minerals.

TOPIC WISE DISTRIBUTION OF PERIODS (Theory):

<table>
<thead>
<tr>
<th>SL.NO.</th>
<th>TOPIC</th>
<th>PERIODS</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The origin, nature and Geological classification of rock materials.</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Surface processes causing rock disintegration</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Elements of mineralogy</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Elements of Structural Geology</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

COURSE CONTENTS (Based on specific Objectives):

1.0. The origin, nature and Geological classification of rock materials.

1.1. Explain the internal structure of the earth with required diagram.

1.2. Define a rock classify three major rock groups.

2.0. Surface processes causing rock disintegration:

2.1. Define weathering and erosion.

2.2. Explain with suitable sketches the erosional depositional features produced wind.

2.3. Explain the erosional features produced by rivers with neat diagram.
2.4. Explain the depositional produced by river with neat diagram
2.5. Different between glacious and iceberg
2.6. Explain the erosional features produced by glacious.
2.7. Explain the depositional features produced by neat sketches.
2.8. Define a moraine. Describe the different types of moraine.

3.0. **Elements of mineralogy:**

3.1. Enumerate and describe different physical properties of minerals
3.2. Explain the brief the silicates structures with their proper diagram
3.3. Define rock forming minerals
3.4. Give the mineralogy and physical properties of quartz and feldsher.

4.0. **Elements of Structural Geology:**

4.1. Define dip and strike
4.2. Distinguish between true dip and apparent dip
4.3. Define folds; give the classification with brief description.
4.4. Define faults; give their classification with brief description
4.5. Reorganization of faults in the fields
4.6. Define unconformity. Describe the different types of unconformity with neat sketches.
4.7. Define joints. Describe important joints.

**LEARNING RESOURCES**

**RECOMMENDED BOOKS:**

1. A Text Book of Geology by P.K. Mukharjee
2. Rutley’s Elements of mineralogy by H.H. Reid
Name of the Course: Diploma in DRILLING ENGINEERING

<table>
<thead>
<tr>
<th>Course code:</th>
<th>DET 303</th>
<th>Semester</th>
<th>3rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Period:</td>
<td>44</td>
<td>Examination</td>
<td>3 hrs</td>
</tr>
<tr>
<td>Theory periods:</td>
<td>4 P/W</td>
<td>Class Test:</td>
<td>20</td>
</tr>
<tr>
<td>Tutorial:</td>
<td></td>
<td>Teacher’s Assessment:</td>
<td>10</td>
</tr>
<tr>
<td>Maximum marks:</td>
<td>100</td>
<td>End Semester Examination:</td>
<td>70</td>
</tr>
</tbody>
</table>

RATIONALE:

It is imperative that a drilling engineer should be thoroughly conversant with various type of drilling machine for supervising any drilling operation.

OBJECTIVES:

On completion of the course, students will be able to:

1. Explain the mechanism of different units of drilling rig
2. Analyze the causes of vibrations
3. Know the effects of vibration
4. Explain the mechanism of different core barrels
5. Use and apply diamond and TC bits according to the rock information
6. Find out the fish causes of obstruction of further progress of drilling.

In this context, it should be noted that exploratory drilling is highly expensive job generally conducted at inaccessible, hilly and remote areas. There is a very possibility of brake down of the machinery parts due to prolong use or improper maintenance. Minor break downs are required to be repair immediately at drill site, otherwise the manpower hours of drilling will become multiple. The drilling progress and economical met rage of drilling depends upon the experience of driller, who operates the rig. Drillers are the pride of the nation and hence should be accomplished ones.

TOPIC WISE DISTRIBUTION OF PERIODS (Theory):

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>TOPIC</th>
<th>PERIODS</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Diamond drilling rig</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Vibration in diamond drilling</td>
<td>07</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Derrick</td>
<td>07</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Core Barrels</td>
<td>06</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Core Bit</td>
<td>08</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>Casings</td>
<td>07</td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>Fishing</td>
<td>06</td>
<td></td>
</tr>
</tbody>
</table>

COURSE CONTENTS (Based on specific Objectives):

1.0. Diamond drilling rig:

   1.1. Explain the general mechanical features of diamond drills
1.2. State the common technical specification of diamond drills
1.3. State the different sources of powers for diamond drills and compare their merits and demerits
1.4. Explain the mechanism of transmitting power to hoisting drum spindle for the rotary motion of the drill string
1.5. State the different feed mechanisms used in core drills and discuss their effectiveness.
1.6. Explain the feed mechanism of screw feed and hydraulic feed drill head
1.7. Solve problems relating capacity of rig to deploy for various depths to be drilled at different attitudes.

2.0. Vibration in Diamond Drilling:

2.1. State the causes of vibration in diamond drill and suggest their remedies.
2.2. State the miscellaneous causes of vibration.
2.3. Explain the means of elimination of vibration due to rock formation.
2.4. State the effect of rod strength vibration on core recovery and diamond wear.

3.0. Derrick:

3.1. State the different types of derricks used in core drilling
3.2. Explain the construction and design of different derricks
3.3. State the field of application of different derricks
3.4. Explain the process of erection and dismantling of different types of derricks used in core drilling
3.5. State the daily, weekly, monthly and yearly care and maintenance of derricks

4.0. Core Barrels:

4.1. State the different core barrels used in coring operation
4.2. State the different sizes of core barrels
4.3. Explain the design construction of core barrel of different series
4.4. State the field of application of ST, different types of DT and TT wireline core barrel

5.0. Core Bits:

5.1. State the different types and designs of bits used in coring operation
5.2. State the various sizes of Diamond and TC bits
5.3. Discuss the field of application of different bits
5.4. State the function of Reamer Shells
5.5. Explain the use of Reamer Shell of different series
5.6. State the use of PCD bits
5.7.
6.0. Casing:

6.1. State the function of Casing
6.2. Explain the casing requirement for the progress of hole depth
6.3. Enumerate the casing appliances
6.4. State the general difficulties, occurring in the lowering and recovery casing
6.5. State the general repairing works to be carried out for reused of old casings
6.6. State the different types of casing used in core drilling
6.7. Differentiate F.C. casing with F.J. casing

7.0. Fishing:

7.1. What do you mean by fishing?
7.2. State the means and determining the position and condition of detached tools
7.3. How to calculate the depth of fish?
7.4. Enumerate the various fishing tools used in diamond drilling for recovering the fish including hydraulic jar.

LEARNING RESOURCES:

RECOMMENDED BOOKS:

1. Diamond Drilling by C.P. Chugh
2. Diamond Drilling hand Book by J.D. Cummins
3. Drilling Technology Hand Book by C.P. Chugh
4. Oil Well Drilling Technology by Me Cray and Cole
Name of the Course: Diploma in DRILLING ENGINEERING

<table>
<thead>
<tr>
<th>Course code:</th>
<th>DET 304</th>
<th>Semester</th>
<th>3rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Period:</td>
<td>44</td>
<td>Examination</td>
<td>3 hrs</td>
</tr>
<tr>
<td>Theory periods:</td>
<td>4 P/W</td>
<td>Class Test:</td>
<td>20</td>
</tr>
<tr>
<td>Tutorial:</td>
<td></td>
<td>Teacher’s Assessment:</td>
<td>10</td>
</tr>
<tr>
<td>Maximum marks:</td>
<td>100</td>
<td>End Semester Examination:</td>
<td>70</td>
</tr>
</tbody>
</table>

RATIONALE:

Before starting the actual drilling operation, which is very expensive, it is essential for a drilling engineer to first select the piece of land and locate bore hole points. This is not possible without the knowledge of mind surveying.

OBJECTIVES:

On completion of the course, students will be able to:

01. Locate the bore hole points establish on a grid pattern method
02. Select the area of a piece of land to be explored
03. Calculate the volume of ore reserves
04. Read the counter map and locate the position/direction of dip/strike of a vain.

TOPIC WISE DISTRIBUTION OF PERIODS (Theory):

<table>
<thead>
<tr>
<th>SL.NO.</th>
<th>TOPIC</th>
<th>PERIODS</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Measurement of distance</td>
<td>06</td>
<td></td>
</tr>
<tr>
<td>02.</td>
<td>Compass survey</td>
<td>09</td>
<td></td>
</tr>
<tr>
<td>03.</td>
<td>Leveling</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>04.</td>
<td>Contouring</td>
<td>09</td>
<td></td>
</tr>
<tr>
<td>05.</td>
<td>Calculation of ore reserves</td>
<td>07</td>
<td></td>
</tr>
</tbody>
</table>

COURSE CONTENTS (Based on Specific Objectives):

1.0. Measurement of Distance:

1.1. Enumerate and explain the different measuring instrument used for measuring distances and taking offsets.

1.2. Derive the formula for finding out the correct chain length in case the measurement with incorrect chain/tape

1.3. Explain chaining and ranging of a line

1.4. Explain the process of chaining and ranging of a line due to various obstacles
1.5. State the offsets and explain taking offsets.

**2.0. Compass Survey:**

2.1. Explain the prismatic compass, it’s adjustment and use
2.2. State the reference directions employed for compass
2.3. State the explain different bearings
2.4. Explain the process of conversion of WCB to QB and QB to WCB
2.5. Explain the computation of angels from bearing and bearing from angels
2.6. Explain local attraction and its determination and correction to the bearings
2.7. Explain closed and open traverse and its bearings
2.8. Explain the procedure of reconnaissance and field booking for compass survey
2.9. Explain the process of adjustment of closing error of compass surveying
2.10. State the means of computation of areas by geometry and coordinates

**3.0. Leveling:**

3.1. Define the following terms:
   - A Level line
   - Horizontal Plane
   - A horizontal line
   - Vertical line
   - Datum surface
   - Elevation of a point
   - Difference in elevation
   - Bench marks
   - B.S, F.S., I.S., C.P. station
   - H.I.
3.2. Explain the construction of dumpy level with neat sketch
3.3. Explain the staff; their types and uses
3.4. Explain the adjustment of Dumpy level of taking staff/reading
3.5. Explain the staff observation
3.6. Explain the methods of leveling
3.7. Explain the rise and fall method of booking
3.8. Explain how to find R.L. of a point
3.9. Explain how to plot level sections
3.10. Explain how to measure the cutting or filling from a level selection.

**4.0. Contouring:**

4.1. What do you mean by contouring and explain
4.2. State the characteristics of counter line
4.3. State the uses of counter plan
4.4. Explain interpolation of counter gradient by different methods

**5.0. Calculation of Ore Reserves:**
5.1. Explain the different methods of determining areas

5.2. Calculate the volume of ore reserves from the information obtained from exploring drilling

LEARNING RESOURCES:

Recommended books:

01. A Text Book of Surveying by T.P. Karnetkar
02. A Text Book of Surveying by T.A. Agor.
03. Survey and Leveling by T.P. Karnetkar
04. Mineral Economics by Sinha and Sharma
05. Mining Geology by Mc. Kinstry.
Name of the Course: Diploma in DRILLING ENGINEERING
Course code: DET 305  
Semester 3rd  
Total Period: 44  
Examination 3 hrs
Theory periods: 4 P/W  
Class Test: 20  
Tutorial:  
Teacher’s Assessment: 10  
Maximum marks: 100  
End Semester Examination: 70

RATIONALE:
Since the outcome of mining depends upon the efficiency of blast hole drilling technology, it is imperative that a drilling engineer should have through knowledge in blast hole drilling techniques.

OBJECTIVES:
The economic condition of the richest countries has been developed by utilizing their natural resources and hence the mining industries of the nations have been growing day by day throughout the world. The outcome of mining depends upon the efficiency of blast hole drilling techniques. This is why the curriculum has been designed having considered the day to day improvement of drilling technology for various mining fields. On completion of the subject, students have better knowledge in blast hole drilling technology suitable for mines and they will be able to:

1. Generalize the scope, purpose, importance and Historical Development.
2. Classify the different drilling methods, their principle and field of application
3. Explain the mechanism and working principles of various rock drills used in O/C as well U/G mines
4. Describe the various drill steels bits used, for different mining ground or Heavy engineering project used like foundation for reservoir, multistoried building, tunnels, drifts etc. for the purposes of blasting.
5. Describing the various rock drills troubles and understand their remedies
6. Describe the physical and mechanical properties of rocks/minerals have a concept to determine the same.

TOPIC WISE DISTRIBUTION OF PERIODS (Theory):
SL.NO.  TOPIC  PERIODS L
01. Introduction, scope, purpose of drilling and Historical Development 07
02. Blast hole drilling by rock drills 14
03. Rotary Blast hole Drilling 08
04. Fire Jet Drilling 05
05. Rock Mechanics 10
COURSE CONTENTS (Based on Specific Objectives):

1.0. Introduction, Scope, Purpose of Drilling and Historical Development:

1.1. Introduce the blast hole drilling

1.2. State the opportunity of blast hole drilling in view of economic policy of the nation.

1.3. State the economic opportunity to drill a hole to ascertain the core of strata of sub-surface.

1.4. Explain the limits of action of drilling

1.5. Give a concept on the prospects of drilling personnel in the field, blast hole drilling and employment in public sector job.

1.6. Explain how the prosperity of nation depends upon blast hole drilling

1.7. Explain the scope of drilling in the national and international level in view of absorption.

1.8. State the basic mechanism of rock breaking

1.8.1. With rotary percussive method

1.8.2. With rotary drilling and cutting tools used

1.8.3. With percussive drilling and cutting tools used

1.8.4. With rotary percussive drilling and cutting tools used.

2.0. Blast Hole Drilling by Rock Drills:

2.1. Define rock drilling

2.2. Classify rock drills

2.2.1. State the field of application of rock drills

2.2.2. Explain with sketches the working principles of jack hammer and drifter

2.2.3. State the different parts of jack hammer and drifter drill

2.2.4. State the function of Ratchet and pawl mechanism, Rifel bar, Rifel bar not shank of piston, drill chunk, thriotte valve.

2.2.5. Explain the lubricating system of jack hammer £ dnfte

2.2.6. State the field of application of air leg drill

2.2.7. Explain the working principles of air leg drill

2.2.8. State the help of application of wagon drill

2.2.9. Give a general description wagon drill

2.2.10. State the field of application of churn drill

2.2.11. State the type of churn drill

2.2.12. Draw neatly the sketch of a walking beam type of churn drilling in operation and label the different units of churn drill and components of drill string and explain their functions.
2.2.13. Explain the drilling procedure of above
2.2.14. Give a concept of supports and feeding arrangements of different class rock drills
2.2.15. State the different types of mounting such as crawler truck mountain trailer mounted etc.

2.3. State the field of application of electrically driven drills
2.3.1. Explain the working principles of electrically operated blast hole drills

2.4. Explain the working of petrol driven hammer drills
2.4.1. State the steps to be taken to minimize noise of hammer drills

2.5. State the field of application of down the hole drills
2.5.1. Explain with line diagram the different units of down the hole drill state their function.
2.5.2. Clarify down the hole drill (DHD) and down the hole hammer (DTH)
2.5.3. Explain the effect of gauge wear and recommended the condition of bit to reground
2.5.4. Explain systematically the drilling procedure of a down the hole drill

2.6. Define drill steels
2.6.1. State the different sizes of drill steels
2.6.2. State the different designs of drill steels
2.6.3. Compare and contrast the merits and demerits of integral steels and detachable steels and bits
2.6.4. State the composition of a good drill steel
2.6.5. Explain with sketches the field of application of different drill steels and used in rock drills
2.6.6. Describe the process of forging hardening of drill steels

3.0. **Rotary Blast Hole Drilling:**

3.1. State the field of application of Auger drills
3.1.1. State the different types of augers used in drills specifying their suitability for ground condition
3.1.2. Explain with sketches the different units of an auger drill

3.2. Explain the procedure of auger drilling for the purpose of blast hole
3.2.1. Explain the common problems encountered during drilling and suggest the remedies

3.3. State the field of application of air, water or mud flushed rotary drills with drag bits
3.3.1. Illustrate the above drill and label the different units and their function.

3.4. State the field of application of rotary drills with roller bits using air water or mud as flushing medium.
3.4.1. Discuss the merits and demerits of above flushing system

3.5. Define drilling patterns
3.5.1. State the factor to be considered while choosing the drilling patterns
3.5.1.1. Define Primer, Easer, Trimmer

3.5.1.2. State the drilling patterns

3.5.1.3. Explain with sketches

3.6. Define the term Incline, Drift, Slopes, Raise

3.6.1. Explain with sketches the blast hole patterns for development of mines for Incline, Drift, Slopes, Raise

4.0. Fire Jet Drilling:

   4.1. Enumerate Spallable rocks

   4.2. Specify the main operating characteristics of fire jet drill

   4.3. Explain the configuration of fire jet drill

   4.4. Explain the procedure and working principles of fire jet drilling

5.0. Rock Mechanics:

   5.1. Define rock mechanics

   5.2. State and explain the physical properties of rock/minerals

   5.3. State the mechanical properties of rock/minerals

   5.4. Define rock drillability

      5.4.1. Give a concept of rock drillability.

LEARNING RESOURCES:

RECOMMENDED BOOKS:

1. Surface Mining by G.B. Mishra
2. Winning of Coal and Iron-ore by R.T. Desmukh and D.J. Desmukh
3. Drilling Technology Hand Book by C.P. Chugh.
## Name of the Course: Diploma in DRILLING ENGINEERING

<table>
<thead>
<tr>
<th>Course code:</th>
<th>DEP 301</th>
<th>Semester</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Period:</td>
<td>66</td>
<td>Examination</td>
<td>4 hrs</td>
</tr>
<tr>
<td>Lab. periods:</td>
<td>6 P/W</td>
<td>Term Work</td>
<td>25</td>
</tr>
<tr>
<td>Maximum marks:</td>
<td>50</td>
<td>End Semester Examination:</td>
<td>25</td>
</tr>
</tbody>
</table>

01. Identification of Ore Mineral, Industrial mineral 7 rocks forming mineral in hand specimens.

02. Determination specific gravity of small specimen by Holl’s Balance.

**N.B.**  Students will submit their sessional records for evaluation on completion of course.

Individual viva-voce test will be conducted by the internal examiners at the end of the Semester.
Name of the Course: Diploma in DRILLING ENGINEERING

<table>
<thead>
<tr>
<th>Course code:</th>
<th>DEP 302</th>
<th>Semester</th>
<th>3rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Period:</td>
<td>66</td>
<td>Examination</td>
<td>4 hrs</td>
</tr>
<tr>
<td>Lab. periods:</td>
<td>6 P/W</td>
<td>Term Work</td>
<td>25</td>
</tr>
<tr>
<td>Maximum marks:</td>
<td>50</td>
<td>End Semester Examination:</td>
<td>25</td>
</tr>
</tbody>
</table>

01. Study of Drilling accessories, instruments and fittings.

02. Study of different fishing tools.

03. Study of different drill machines, different units of rig by dissembling and assembling.

04. Practicing the starting of Diesel Engine, Petrol Engine and running Electric Motors.

05. Study of different types of water pumps, different units of reciprocating, centrifugal, turbine, mono pumps, submersible pump etc by dissembling and assembling.

06. Operational techniques and maintenance of rig, Simplex, Duplex, Triplex and mono pump at site.

07. Practicing the operation of rig at the site.

**N.B. :** Students will be grouped to study in Laboratory and practice operation of drill machine. They will submit a Sessional Report on the daily practical performance, which evaluated by the committee formed in the Institution.
### DRILLING SKETCHING
#### PRACTICAL

<table>
<thead>
<tr>
<th>Name of the Course: Diploma in DRILLING ENGINEERING</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course code:</strong> DEP 303</td>
<td><strong>Semester</strong></td>
</tr>
<tr>
<td><strong>Total Period:</strong> 44</td>
<td><strong>Examination</strong></td>
</tr>
<tr>
<td><strong>Lab. periods:</strong> 4 P/W</td>
<td><strong>Term Work</strong></td>
</tr>
<tr>
<td><strong>Maximum marks:</strong> 50</td>
<td><strong>End Semester Examination:</strong></td>
</tr>
</tbody>
</table>
PRACTICAL TRAINING REPORT AND VIVA

<table>
<thead>
<tr>
<th>Name of the Course: Diploma in DRILLING ENGINEERING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course code: DET 304</td>
</tr>
<tr>
<td>Total Period: 31 weeks</td>
</tr>
<tr>
<td>Lab. periods:</td>
</tr>
<tr>
<td>Maximum marks: 75</td>
</tr>
</tbody>
</table>

Training report and viva:

Students will go for a practical training to various drilling projects of central/state/private company for a period of 4 weeks at the end of the session. The training seats will be arranged by the Training department, students will submit a period after completion of their practical to the concern staff of the department.

The training report, unless submit along with the certificate duly signed by the in charge of drilling Project as a token of this training engagement, will not be accepted and will not be evaluated.
TECHNICAL SEMINAR

Name of the Course: Diploma in DRILLING ENGINEERING

<table>
<thead>
<tr>
<th>Course code:</th>
<th>DET 305</th>
<th>Semester</th>
<th>3rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Period:</td>
<td>22</td>
<td>Examination</td>
<td>4 hrs</td>
</tr>
<tr>
<td>Lab. periods:</td>
<td>2 P/W</td>
<td>Term Work</td>
<td>25</td>
</tr>
<tr>
<td>Maximum marks:</td>
<td>50</td>
<td>End Semester Examination:</td>
<td>25</td>
</tr>
</tbody>
</table>

1. After returning from the practical Training, students will prepare project on the basics of their practical training experience.

   Students will select topics individually or in a group consisting of three related to the project. Students should prepare the project repots with active support and guidance from the members of faculty.

   Students should be encouraged to extensively use library facilities, audiovisual aids, and modern teachers methods and also to collect relevant materials from different technical magazines and journals. Each student should be usually asked to present a paper on the topic in the seminar within fifteen minutes followed by a question session for five minutes.

2. Students should be encouraged to collect newspaper clippings and magazine cutting on each emerging technology, to be displayed on the date of the seminar.

3. The sessional records are to be maintained and evaluated by a team of faculty members and the team would award final marks.

   In the examination, students should be evaluated by External Examiner and Internal Examiner.