STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 5TH SEMESTER DRILLING ENGINEERING(wef 2020-21)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Entrepreneurship and Management & Smart Technology	4			20	80	3	100
Th.2		Exploratory Drilling-II	4			20	80	3	100
Th.3		Drilling Machinery-II	4			20	80	3	100
Th.4		Engineering Geology-III	4			20	80	3	100
Th.5		Mud & Cement Technology	4			20	80	3	100
		Total	20			100	400		500
		Practical							
Pr.1		Drilling Machinery-II Lab			4	25	50	3	75
Pr.2		Engineering Geology-III Lab			6	25	50	3	75
Pr.3		Mud & Cement Technology Lab			4	25	50	3	75
Pr.4		Project Phase-I			4	25	-	-	25
		Student Centred Activities(SCA)			1				
		Total			*19*	*100*	*150*		*250*
		Grand Total	**20**		**19**	**200**	**550**		**750**

Abbreviations: L-Lecturer, T-Tutorial, P-Practical. Each class is of minimum 55 minutes duration

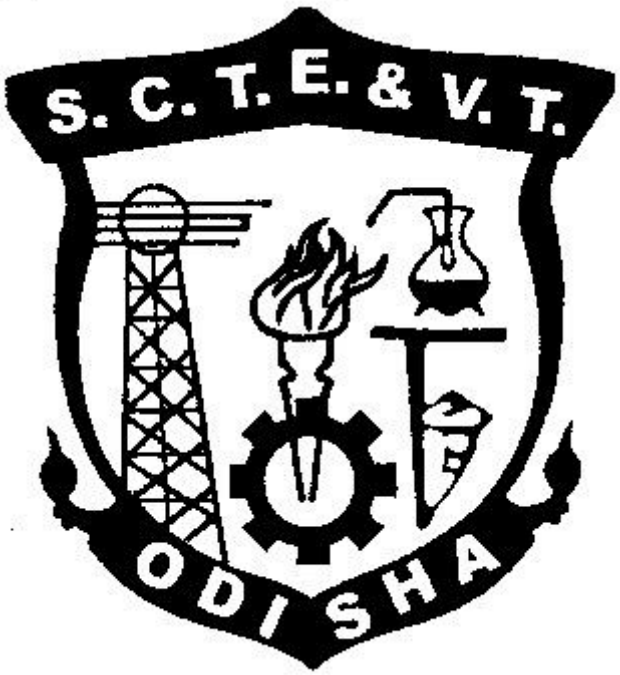
Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM etc., Seminar and SCA shall be conducted in a section.

There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

CURRICULLUM OF 5TH SEMESTER
FOR
DIPLOMA IN DRILLING ENGINEERING

(EFFECTIVE FROM 2020-21 SESSIONS)



STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

Th1. ENTREPRENEURSHIP and MANAGEMENT & SMART TECHNOLOGY

(Common to all Branches)

Theory	**4 Periods per week**	**Internal Assessment**	**20 Marks**
Total Periods	**60 Periods**	**End Sem Exam**	**80 Marks**
Examination	**3hours**	**Total Marks**	**100Marks**

Topic Wise Distribution of Periods

Sl No.	Topic	Periods
1	Entrepreneurship	10
2	Market Survey and Opportunity Identification(Business Planning)	8
3	Project report Preparation	4
4	Management Principles	5
5	Functional Areas of Management	10
6	Leadership and Motivation	6
7	Work Culture, TQM & Safety	5
8	Legislation	6
9	Smart Technology	6
	TOTAL	60

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students, so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mind set with managerial skill helps the student in the job market. The students can also be introduced with Startup and Smart Technology concept, which shall radically change the working environment in the coming days in the face of Industry 4.0

In this subject, the Students shall be introduced/ exposed to different concepts and Terminologies in brief only, so that he/she can have broad idea about different concepts/items taught in this subject. Solving numerical problem on any topic/item is beyond the scope of this subject.

OBJECTIVES

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

- Know about Entrepreneurship, Types of Industries and Startups
- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- know the management Principles and functional areas of management
- Inculcate leadership qualities to motivate self and others.
- Maintain and be a part of healthy work culture in an organisation.
- Use modern concepts like TQM
- Know the General Safety Rules
- Know about IOT and its Application in SMART Environment.

DETAILED CONTENTS

1. **Entrepreneurship**
   - Concept /Meaning of Entrepreneurship
   - Need of Entrepreneurship

- Characteristics, Qualities and Types of entrepreneur, Functions
- Barriers in entrepreneurship
- Entrepreneurs vrs. Manager
- Forms of Business Ownership: Sole proprietorship, partnership forms and others
- Types of Industries, Concept of Start-ups
- Entrepreneurial support agencies at National, State, District Level(Sources): DIC, NSIC,OSIC, SIDBI, NABARD, Commercial Banks, KVIC etc.
- Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

2. **Market Survey and Opportunity Identification (Business Planning)**

- Business Planning
- SSI, Ancillary Units, Tiny Units, Service sector Units
- Time schedule Plan, Agencies to be contacted for Project Implementation
- Assessment of Demand and supply and Potential areas of Growth
- Identifying Business Opportunity
- Final Product selection

3. **Project report Preparation**

- Preliminary project report
- Detailed project report, Techno economic Feasibility
- Project Viability

4. **Management Principles**
- Definitions of management
- Principles of management
- Functions of management (planning, organising, staffing, directing and controlling etc.)
- Level of Management in an Organisation

5. **Functional Areas of Management**
   a) Production management
      - Functions, Activities
      - Productivity
      - Quality control
      - Production Planning and control
   b) Inventory Management
      - Need for Inventory management
      - Models/Techniques of Inventory management
   c) Financial Management
      - Functions of Financial management
      - Management of Working capital
      - Costing (only concept)
      - Break even Analysis
      - Brief idea about Accounting Terminologies: Book Keeping, Journal entry, Petty Cash book, P&L Accounts, Balance Sheets(only Concepts)
   d) Marketing Management
      - Concept of Marketing and Marketing Management
      - Marketing Techniques (only concepts)
      - Concept of 4P s (Price, Place, Product, Promotion)
   e) Human Resource Management

- Functions of Personnel Management
- Manpower Planning, Recruitment, Sources of manpower, Selection process, Method of Testing, Methods of Training & Development, Payment of Wages

6. **Leadership and Motivation**

a) Leadership
- Definition and Need/Importance
- Qualities and functions of a leader
- Manager Vs Leader
- Style of Leadership (Autocratic, Democratic, Participative)

b) Motivation
- Definition and characteristics
- Importance of motivation
- Factors affecting motivation
- Theories of motivation (Maslow)
- Methods of Improving Motivation
- Importance of Communication in Business
- Types and Barriers of Communication

7. **Work Culture, TQM & Safety**
- Human relationship and Performance in Organization
- Relations with Peers, Superiors and Subordinates
- TQM concepts: Quality Policy, Quality Management, Quality system
- Accidents and Safety, Cause, preventive measures, General Safety Rules , Personal Protection Equipment(PPE)

8. **Legislation**

a) Intellectual Property Rights(IPR), Patents, Trademarks, Copyrights
b) Features of Factories Act 1948 with Amendment (only salient points)
c) Features of Payment of Wages Act 1936 (only salient points)

9. **Smart Technology**
- Concept of IOT, How IOT works
- Components of IOT, Characteristics of IOT, Categories of IOT
- Applications of IOT- Smart Cities, Smart Transportation, Smart Home, Smart Healthcare, Smart Industry, Smart Agriculture, Smart Energy Management etc.

Syllabus to be covered before IA: Chapter 1,2,3,4

RECOMMENDED BOOKS

1. Entrepreneurship Development and Management by R.K Singhal, Katson Books., New Delhi
2. Entrepreneurship Development and Management by U Saroj and V Mahendiratta, Abhishek Publications, Chandigarh
3. Entrepreneurship Development and Management by Vasant Desai, Himalaya Pub.House
4. Industrial Engineering and Management by O.P Khanna ,Dhanpat Rai and Sons
5. Industrial Engineering and Management by Banga and Sharma, Khanna Publications
6. Internet of Things by Jeeva Jose, Khanna Publications, New Delhi
7. Online Resource on Startups and other concepts
8. https://www.fundable.com/learn/resources/guides/startup

Th2. EXPLORATORY DRILLING –II

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 5th**
Theory Periods	**: 4 Periods/week**	**Internal Assessment**	**: 20**
Total Periods	**: 60**	**End Semester Examination**	**: 80**
Examination	**: 3 Hours**	**Maximum Marks**	**: 100**

TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topics	Periods
01.	Oil & Natural Gas Exploration Drilling	16
02.	Seabed Exploration Drilling Techniques	12
03.	Basic Drilling Practices in Oil well Drilling	20
04.	Drilling for Geo-Thermal Exploration	12
	Total	**60**

RATIONALE

It is important to highlight the types and techniques involved in drilling earth surface to the desired depth so as to explore valuable minerals which will be useful for energy requirements.

OBJECTIVE

On Competition of the subject, students will be able to:

1. Explain the working principle of different onshore & offshore oil well exploration drilling rigs.
2. Describe the different methods of oil and natural gas exploration drilling.
3. Explain the principle of oceanographic exploration techniques.
4. Explain different methods & practices adopted for safe drilling operation.
5. Explain drilling technique for prospecting of geothermal energy.

COURSE CONTENTS

1.0 Oil & Natural Gas Exploration Drilling

- 1.1 Give a concept on the applications of cable tool drilling.
- 1.2 Mention the merits & demerits of cable tool drilling.
- 1.3 Give a concept on basic operational principle of hydraulically operated rotary drill.
- 1.4 Explain basic principle of operations of onshore rigs for oil exploration drilling.
  - 1.4.1 Explain drilling procedure in kelly drive & top drive system.
  - 1.4.2 Explain casing driving.
- 1.5 Offshore oil exploration.
  - 1.5.1 Basic principle of offshore oil exploration.
  - 1.5.2 Different drill rigs used in offshore exploration and field of application.
  - 1.5.3 Principle of operation of offshore drill rigs(Fixed platform, Barge, Jack up, Submersible, Semisubmersible, Floater, Drillship etc).

2.0 Seabed Exploration Drilling Techniques

- 2.1 State the different types of submersible rigs for oceanographic research.
- 2.2 Explain the principle of operation with diver – operated rig for the exploration of minerals on seabed.
- 2.3 Explain with required sketch the principle of operation of Maricore drill.
- 2.4 State the principle areas of application of Maricore drill.

2.5 Offshore Platforms.

2.5.1 State the forms of platform to carry out investigation work on the seabed.

2.5.2 State the stability of offshore platforms.

2.5.3 Explain with required sketch the offshore exploration drilling procedure from a floating platform.

3.0 Basic Drilling Practices in Oil Well Drilling

3.1 Balanced Drilling Practices.

3.1.1 Define Rate of penetration & Explain factors affecting ROP.

3.1.2 Specify the need of straight hole.

3.1.3 Causes of crooked holes/hole deviation.

3.1.4 Dog-leg severity and hazards related to Dog-leg severity & its prevention.

3.1.5 Drilling Practices to maintain straight hole.

3.2 Down hole Problems, Causes and Prevention.

3.2.1 Pipe sticking

3.2.2 Pipe failure

3.2.3 Shale problems

3.2.4 Lost circulation

3.3 Well Control.

3.3.1 Define Kick and Blow Out.

3.3.2 Define Primary, Secondary & Tertiary well control.

3.3.3 Explain hydrostatic pressure, bottom hole pressure & formation pressure.

3.3.4 State the Causes of Kick.

3.3.5 Well control practices.

3.3.6 Crew opposition during well control operation.

3.3.7 Well killing method.

3.3.8 Purpose of pressure testing in BOP, choke and kill manifold.

3.3.9 Pressure testing procedure.

4.0 Drilling for Geo-Thermal Exploration

4.1 What is Geothermal Energy?

4.1.1 Countries potentially rich in geothermal resources.

4.1.2 Enumerate the places of hot springs of India to become new sources of electric energy to supplement power generated from traditional sources.

4.2 Which rig is suitable to carry out drilling a steam wells?

4.3 Explain the geological and economical conditions under which the existence of geothermal is based.

4.4 Explain the stages of exploratory drilling operation for geothermal areas.

4.4.1 What are the purposes of shallow well drilling and coring operation and outfits required?

4.4.2 State the objectives of deep exploratory drilling for Geothermal energy exploration.

4.4.3 Give a concept of drilling technique for prospecting geothermal energy.

4.4.4 What are the factors to be kept in view in selecting the drill for geothermal exploration?

4.4.5 Give a concept on the problem encountered during drilling of steam producing zone.

SYLLABUS COVERAGE UP TO INTERNAL ASSESSMENT

Chapters- 1 & 2

BOOKS RECOMMENDED

1. Rotary Drilling Handbook by J.E. Brantly
2. Petroleum Engineering by Carl Gatlin
3. Oil well Drilling Technology by W. Mccray & Frank W. Cole
4. Diamond Drilling Hand Book by J.D. Cummins
5. Ground Water Drilling by O.P. Honda
6. Drilling Technology Handbook by C.P. Chugh

Th3. DRILLING MACHINERY-II

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 5th**
Theory Periods	**: 4 Periods/week**	**Internal Assessment**	**: 20**
Total Periods	**: 60**	**End Semester Examination**	**: 80**
Examination	**: 3 Hours**	**Maximum Marks**	**: 100**

TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topics	Periods
01.	Oil Well Drill Rig	04
02.	Power Generating & Transmitting System	06
03.	Rotating & Feeding Mechanism	10
04.	Hoisting Mechanism	10
05.	Drill string	10
06	Casing & Well head fittings	08
07	Circulating System	07
08	Fishing	05
	Total	**60**

RATIONALE

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

OBJECTIVE

There is every possibility of occurrence of troubles at every step of action in oil well drilling operation due to lack of knowledge in

(1) Mechanism of different units of rig.
(2) Mechanisms of different tools and equipment.
(3) Working principles of different pumps and the troubles with it.
(4) Bottom hole obstacles.
(5) Designing Rig and Equipments.
(6) Troubleshooting in equipments and can take steps for appropriate remedies.

On completion of the paper, students will be able to explain the mechanisms of oil well rig machineries, mechanism of allied tools and equipment, mechanisms of circulating pump & troubles associated causes and remedies of oil well fishing job, and economic operation of machineries.

COURCE CONTENTS

1.0 Oil Well Drill Rig

1.1 Give a brief description about different oil well drill rigs used in both offshore and onshore.

1.2 Systems used in oil well drill rig. (Power generating & transmitting, Rotating and Feeding, Hoisting, Tubing, Circulating, Well head, Fishing etc.)

2.0 Power Generating & Transmitting System

2.1 Explain the sources of power supply for oil well drill along with comparison between them.

2.2 Calculate power requirement of power plant for oil well drill rig
2.3 Explain the type of drives for power transmission in oil well drilling rig.

3.0 Rotating & Feeding Mechanism

3.1 Explain requirement rotating & feeding mechanisms in oil well drill rig
3.2 State components in rotating & feeding system
3.3 Explain the different systems of transmission of power to rotary table of oil well drill.
3.4 Explain rotating and feeding mechanism in top drive system
3.5 Explain different components in top drive system.
3.6 Enumerate different feeding mechanism and explain such.

4.0 Hoisting Mechanism

4.1 Requirement of hoisting mechanism and Components in such (Derrick, Mast, Substructure, Hoisting line, Draw work, Travelling block, Swivel, Weight Indicator etc.)
4.2 Different types of Derrick & Mast along with field of application
4.3 Factors consideration in designing derrick & derrick load calculation
4.4 Calculate the mechanical advantages of block & tackle system.
4.5 Hoisting power calculation.
4.6 Components of draw work (Hoisting drum, cathead, clutch & break along with types)

5.0 Drill String

5.1 State the components of rotary drill string and explain their functions
5.2 Tubings
- 5.2.1 Kelly, Drill pipe, Drill collar, Drill string auxiliaries along with types & functions.
- 5.2.2 Reason of drill pipe failure.
- 5.2.3 Drill string design.

5.3 Bits
- 5.3.1 State the different types of bits used in oil well drilling.
- 5.3.2 Bit design features.
- 5.3.3 Possible causes of bit dullness & remedies
- 5.3.4 Bit selection methods

6.0 Casing & Well Head Fittings

6.1 Casing
- 6.1.1 State the different casing used in oil well drilling & their functions.
- 6.1.2 Explain the different designs of well casings.
- 6.1.3 Give the specifications of different casings.
- 6.1.4 Enumerate the casing appliances used.
- 6.1.5 Explain factors influence casing design & design criteria of casing.

6.2 Well head fittings.
- 6.2.1 Explain the procedure of installation of wellhead fittings & function of wellhead fittings.
- 6.2.2 State the different types of B.O.P. and explain the mechanism involved.
- 6.2.3 State the function of B.O.P.
- 6.2.4 Control mechanism of B.O.P.
- 6.2.5 Operational procedure of B.O.P.

7.0 Circulating system

7.1 Equipments used in Circulating system
7.2 Classify the different types of pumps used in oil fields.
7.3 Derive the formula for fluid pumping rate (GPM/Volume) of a duplex double action pump operating at 100% volume efficiency.
7.4 Derive the formula for hydraulic H.P. of pump.
7.5 Derive the formula for the horsepower available for speedy digging of hole due to mud jetting action of bit.

7.6 Work out some problems on size of pumps for lifting of drill cuttings efficiently.
7.9 Explain the steps to be taken against cavity and water hammer of reciprocating pump.

8.0 Fishing

8.1 Define Fish & Fishing.
8.2 Describe the probable causes of fishing in oil wells.
8.3 Enumerate the fishing tools used in oil well drilling.
8.4 Derive the formula of calculating the depth of a fish.
8.5 Explain the various techniques to be adopted for fishing operation.

SYLLABUS COVERAGE UP TO INTERNAL ASSESSMENT

Chapters- 1, 2, 3 & 4

BOOKS RECOMMENDED

1. Rotary Drilling Hand Book by J.E. Brantly.
2. Oil Well Drilling Technology by W. Mccray & Frank W.Cole.
3. Practical Petroleum Engineering Hand Book by Joseph Zaba & W.B. Doherty.
4. Petroleum Exploration Hand Book by Grahama B. Moody.
5. Petroleum Engineering by Carl Gatlin.

Th4. ENGINEERING GEOLOGY – III

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 5th**
Theory Periods	**: 4 Periods/week**	**Internal Assessment**	**: 20**
Total Periods	**: 60**	**End Semester Examination**	**: 80**
Examination	**: 3 Hours**	**Maximum Marks**	**: 100**

TOPIC WISE DISTRIBUTI ON OF PERIODS

Sl. No.	Topics	Periods
01.	Geology of Soil	13
02.	Formation of Ore deposits	17
03.	Engineering Geology	17
04.	Groundwater Engineering	13
	Total	**60**

RATIONALE

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

OBJECTIVE

On Competition of the subject, students will be able to:

1. Describe the important properties of soil and soil types
2. Explain the various prospecting and exploration techniques treasures of ore deposits.
3. Plan and executive exploration projects.
4. Explain hydrologic cycle, groundwater movement and, most importantly, the recharge of ground water, which is fast depending.

COURSE CONTENTS

1.0 Geology of Soils

- 1.1 Define soil.
- 1.2 Describe the engineering properties of soils.
- 1.3 Describe the various types of soils.
- 1.4 Explain the mineralogy of soils.

2.0 Formation of Ore deposits

- 2.1 What is magmatic concentration deposits Describe?
- 2.2 Describe how sedimentation process helps in formation of mineral deposits.
- 2.3 Write short notes on contact metasomatism.
- 2.4 Pegmatites are the store house of minerals. eclucidate.
- 2.5 Describe hydrothermal deposits with examples.
- 2.6 Describe how supergene enrichment helps in enrichment of sulphide ores.
- 2.7 Difference between residual & mechanical concentration deposits.
- 2.8 Describe residual and mechanical concentration deposits.

3.0 Engineering Geology

- 3.1 Describe the engineering properties of rocks.
- 3.2 Describe the criteria for selection of a dam site or reservoir.

3.3 Describe the geology of bridge sites.
3.4 Describe the geology of tunnel sites.

4.0 Groundwater Engineering

4.1 Describe the hydrologic cycle.
4.2 Explain the origin of ground water.
4.3 Give an account for vertical distribution of ground water.
4.4 Define-aquifer, aquiclude, aquifuse and aquitard.
4.5 Define porosity.
4.6 Define permeability.
4.7 Define safe yield.
4.8 Define over draft.
4.9 Explain the various methods of artificial recharge of ground water.

SYLLABUS COVERAGE UP TO INTERNAL ASSESSMENT

Chapter- 1 & 2

BOOKS RECOMMENDED

1. Engineering Geology & Rock Mechanics by N. Nuncan
2. A Text Book of Geology by P.K. Mukherjee
3. Geological Prospecting & Exploration by V.M. Kreeter
4. Ground Water Hydrology by David K. Todd
5. A Geology of Engineers by F.G.H. Bly
6. Hand Book for Prospecting by Richard M.Pearl

Th5. MUD & CEMENT TECHNOLOGY

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 5th**
Theory Periods	**: 4 Periods/week**	**Internal Assessment**	**: 20**
Total Periods	**: 60**	**End Semester Examination**	**: 80**
Examination	**: 3 Hours**	**Maximum Marks**	**: 100**

TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topics	Periods
01.	Circulating Fluids	12
02.	Mud Chemistry	20
03.	Cementation	20
04.	Storage and Maintenance	08
	Total	60

RATIONALE

For efficient drilling proper requirement of additives is essential. Mud & Cement Technology hence the drilling engineers to provide all relevant information regarding well drilling fluid and cementation.

OBJECTIVE

The science of drilling fluids is a dynamic subject. Many changes on it have been occurred since the commencement of 20th century by the pioneers of exploring countries.

Hence, improvements of drilling fluid have been pronounced since the same is treated as a tool to flush cutting from several thousand meters of depth in to surface.

The concept of the paper is to provide information relating to well drilling fluid and cementation, which an operating Engineer or an operations man needs in his everyday work for progress of drilling efficiently. On completion of the paper, students will be able to assess the deficiently of mud and cement and suggest proper requirement of additives for better score of drilling.

COURSE CONTENTS

1.0 Circulating Fluids

1.1 Give a concept on development of circulating fluid.
1.2 State the functions of circulating fluid.
1.3 Explain the properties to evaluate drilling fluid.
1.4 State the desirable properties of drilling fluid.
1.5 State the undesirable properties of drilling fluid.
1.6 State the properties of drilling fluid that add in performance.

2.0 Mud Chemistry

2.1 Classify the different types of mud & explain.
2.2 Enumerated the minimum testing equipment/ apparatus for field testing kit.
2.3 Explain the various methods of testing mud parameters like viscosity, density, pH value , sand content, gel strength, filtration properties etc.
2.4 Explain the different chemicals used as additives towards controlling drilling mud for

solving difficulties, encountered during drilling for at extending depths of holes.

2.5 Compare and contrast the mud path between direct and reverse circulation system.

2.6 Derive the formula for calculating fluid requirement in terms of volume and also calculate return velocity, critical velocity, pressure drop etc.

3.0 Cementation

3.1 3.1 State the objectives of cementing.
3.2 Mention the principles adopted for preparation of cementing operation.
3.3 Explain the various methods for cementing through drill pipe and injector.
3.4 List out the machineries used in cementing units.
3.5 Describe various types of oil well cements.
3.6 Compare and contrast accelerators and retarders in connection with setting time.
3.7 Derive the formula for calculating the requirement of cement.
3.8 Explain the principles and procedure of single stage/double stage & multi stage cementation.

4.0 Storage & Maintenance

4.1 Give a layout plan of storage of cement and chemicals at drill site.
4.2 Describe the systematic maintenance of cement, mud and chemicals at drill site.

SYLLABUS COVERAGE UP TO INTERNAL ASSESSMENT

Chapters- 1 & 2

BOOKS RECOMMENDED

1. Oil well Drilling Technology by W. Mccray & Frank W. cole
2. Rotary Drilling Handbook by J.E. Brantly
3. Composition and Properties of Oil Well Drilling Fluids by W.F. Rogers
4. Drilling Mud & Fluid Additives by John Me, Dermott

Pr1. DRILLING MACHINERY-II LAB

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 5th**
Lab Periods	**: 4 Periods/week**	**Sessional**	**: 25**
Total Periods	**: 60**	**End Semester Examination**	**: 50**
Examination	**: 3 Hours**	**Maximum Marks**	**: 75**

RATIONALE

It is imperative that a drilling engineer should be thoroughly conversant with various types of drilling machine, accessories, instruments and fittings for supervising any drilling operation.

OBJECTIVE

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

1. Explain the mechanism of different drilling rigs.
2. Describe the use of operating tools and equipments.
3. Explain the mechanism circulating system.
4. Describe use and application directional wells and well head fittings.
5. Describe the application of bore hole surveying instruments.

COURCE CONTENTS

1. Study and sketching of turbo drill from cut section.
2. Study and sketching of layout of churn drilling site.
3. Study and sketching of churn drill operating tools and equipments.
4. Study and sketching of layout of oil well drilling site.
5. Study and Sketching of oil well drilling accessories and equipments.
6. Study and sketching of oil well draw work.
7. Study and sketching of oil well blow out preventer (BOP).
8. Study and sketching of well with circulating system.
9. Study and sketching directional wells.
10. Study and sketching well head fittings.
11. Study and sketching of bore hole surveying instruments.

Pr2. ENGINEERING GEOLOGY-III LAB

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 5th**
Lab Periods	**: 6 Periods/week**	**Sessional**	**: 25**
Total Periods	**: 90**	**End Semester Examination**	**: 50**
Examination	**: 3 Hours**	**Maximum Marks**	**: 75**

RATIONALE

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 identification of common rocks for drilling engineers.

OBJECTIVE

On completion of this semester, student will have an outline about the various structures found underneath the earth surface, measure the dip and strike of the rock strata, interpret the borehole data. The student will have a complete idea about the interior of the earth surface and the origin.

COURCE CONTENTS

1. Interpretation of structural maps for litho-studies of engineering sites.
2. Geological interpretation of borehole data.
3. Measurement of dip and strike of strata.

Pr3. MUD & CEMENT TECHNOLOGY LAB

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 5th**
Lab Periods	**: 4 Periods/week**	**Sessional**	**: 25**
Total Periods	**: 60**	**End Semester Examination**	**: 50**
Examination	**: 3 Hours**	**Maximum Marks**	**: 75**

RATIONALE

For efficient drilling proper requirement of additives is essential. Mud & Cement Technology Lab hence the drilling engineers to provide all relevant information regarding properties of well drilling fluid, mud pumps and cementation.

OBJECTIVE

The concept of the paper is to provide information relating to properties of well drilling fluid, circulating pumps and cementation, which an operating engineer or an operations man needs in his everyday work for progress of drilling efficiently. On completion of the paper, students will be able to assess the deficiently of mud and cement and suggest proper requirements for better score of drilling.

COURCE CONTENTS

1. Study and sketching of Simplex, Duplex, and Triplex reciprocating pumps.
2. Study and sketching of Centrifugal pump.
3. Determination of specific gravity, viscosity, gel strength, filtration loss, sand content and pH value of drilling fluid/mud.
4. Study and sketching of cementing units and cement mixer from cut section.

Pr4. PROJECT PHASE - I

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 5th**
Lab Periods	**: 4 Period/week**	**Sessional**	**: 25**
Total Periods	**: 60**	**End Semester Examination**	**: -**
Examination	**: -**	**Maximum Marks**	**: 25**

RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of Drilling Engineering practices in real life situations, so as to participate and manage large Drilling Engineering projects in future.
Entire Project shall spread over 5th and 6th Semester. Part of the Project covered in 5th Semester shall be named as *Project Phase-I* and balance portion to be covered in 6th Semester shall be named as *Project Phase-II*.

OBJECTIVES

After undergoing the Project Work, the student will be able to:

1. Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real life working environment, preferably in an industrial environment.
2. Develop working models or applications and implement these for the actual needs of the community/industry.
3. Explain the working of industrial environment and its work ethics.
4. Explain what entrepreneurship is and how to become an entrepreneur.
5. Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
6. Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.

GENERAL GUIDELINES

The individual students have different aptitudes and strengths and also areas of interest. Project work, therefore, should match the strengths and interest of the 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 (right from beginning of 5th semester). Students should be allotted a problem of interest to him/her as a 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. Preferably there should not be more than 5 students, if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

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

Sl. No.	Performance Criteria
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

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 done by the students and invite leading Industrial organizations to such an exhibition.

PROJECT PHASE-I AND PHASE-II

The Project Work duration shall cover two semesters (5^{th} and 6^{th} sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5^{th} semester under Project Phase-I. The students may be allowed to study literature, any existing system and then define the problem/objective of the Project. Preliminary work up to design of the system have to be complete in Phase-I. Execution of work may begin in Phase-I depending on the Project. Project Milestones are to be set so that progress can be tracked. In Phase-II execution of work and documentation has to be complete. Project Report has to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher, Guides can make suitable alteration in the components of task and schedule.

At the end of Project Phase-I in 5^{th} Semester there shall be one presentation by each group to mark to progress and also judge whether the Project is moving in right direction as per the objective of the Project.

Equipment list

Drilling Machinery-II Lab

Serial No	Item	Quantity
1.	Turbo drill	01 No.
2.	Cut section Turbo drill	01 No.
3.	Cable Tool Churn Drill Jar	01 No.
4.	Churn Drill Stem	01 No.
5.	Bits- Regular pattern bit, Churn star bit, Spudding bit	01 No. each
6.	Rope Saver	01 No.
7.	Bailers- Dirt Valve Bailer, Flat bottom bailer, Sand pump	01 No. each
8.	Cut section of Bailers- Dirt Valve Bailer, Flat bottom bailer, Sand pump	01 No. each
9.	Drive Clamp	
10.	Drive Head	01 No.
11.	Drive Shoe	01 No.
12.	Casing elevator	01 No.
13.	Babcock socket	01 No.
14.	Fishing jar	01 No.
15.	Full circle slip socket	01 No.
16.	Friction socket	01 No.
17.	Combination socket	01 No.
18.	Latch Jack	01 No.
19.	Tool Wrench	01 No.
20.	Swivel Wrench	01 No.
21.	Model of Oil Well Drill Site	01 No.
22.	Kelly Assembly	01 No.
23.	Drill Pipe	01 No.
24.	Tool Joint	01 No.
25.	Drill Collar	
26.	Drag bit, Fish tail bit, Fourway bit, Cut section of rolling cutter bit, PCD bit, Zublin Simplex bit, Zublin differential bit	01 No. each type
27.	Oil well core barrel with diamond cutter head	01 No.
28.	Smith hole opener	01 No.
29.	Cut section of swivel	01 No.
30.	Elevator	01 No.
31.	Rotary table slip	01 No.
32.	Weight indicator	01 No.
33.	Working Model of rotary table	01 No.
34.	Badger jet bit, Spudding bit, Knuckle joint, Spiral stabiliser, Button stabiliser, Drill bed stabiliser, Two cutter hole opener, Non magnetic pop joint	01 No. each type
35.	Working model of rotary table mechanism	01 No.
36.	Cut section of rotary table	01 No.
37.	Working model of top drive system	01 No.
38.	Cut section of top drive	01 No.

39.	Working model of Draw work hoisting system	01 No.
40.	Cut section of BOP- Both Ram type & Annular type	01 No.
41.	Cut model of BOP control system	01 No.
42.	Cut Section of Duplex slush pump	01 No.
43.	Model of Directional hole	01 No.
44.	Well head for Oil well.	01 No.
45.	Bore hole surveying equipments- Single shot instrument, Multi shot instrument, Clinometer, Topuri drill hole surveying instruments, Photographic angle reading device, Gyroscopic multi shot instruments, Mass compass, Measuring while drilling NWD tools with software	01 No. each type

Engineering Geology Lab

Serial No	Item	Specification	Quantity
1.	Common **Rock** forming Mineral samples	Common **Rock** forming mineral samples along with sample trey and primary information about the mineral	50 Nos. of different mineral samples
2.	Common **Ore** forming Mineral samples	Common **Ore** forming mineral samples along with sample trey and primary information about the mineral	50 Nos. of different mineral samples
3.	Hardness Box	Mho's hardness box with all 9 minerals.	30 Nos.
4.	Streak plate	Standard size for laboratory use	50 Nos.
5.	Brunton Compas	Specifications include a compass bubble level, clinometer level, sighting mirror with lubber line and sighting hole, induction dampened needle, and adjustable sighting points. The vertical angle clinometer scale featuring 1 degree increments with a range of 90 degrees or 100% grade scale with an accuracy of 1/2 degree.	15 Nos.
6.	Polarising microscope	Head: Monocular Inclinable Body with Built in Sliding Bertrand Lens & Polarizer.Focusing: Graduated Separate Coarse & Fine knobs.Nosepiece: Quadruple revolving with positive cantering & click stops. Illumination: Mirror & Tungsten Lamp.Objectives: SEMI PLAN P4x, P10x, P40x Spring Loaded.Eyepieces: WF 10x, 15x with Cross & 10x with Micrometer. Stage: 130mm Graduated Rotatable Stage 360 Degree in steps of 5 Degree.Compensator: Mica: 1/4th Wavelength, Gypsum: Full Wavelength, Condenser: NA 1.25 Movable with rotating Graduated Polarizer. Microscope should be included with Bertrand Lens &Analyzer, Objectives: Semi Plan P4x, P10x, P40x, Eyepiece WF10x, 15x Cross, 10x	02 Nos.

		Micro, Gypsum/Mica retarding Plates, Mirror Attachment, Tungsten Lamp 15W 110v/240v, Blue Filter, Cleaning Cloth, Dust Cover, Instruction manual, Carrying case	
7.	Thin section of common minerals	Thin section of the different minerals should perfectly mounted in slide with cover slip.	50 Nos. of different minerals
8.	Thin section of common rocks	Thin section of the different minerals should perfectly mounted in slide with cover slip.	50 Nos. of different rocks
9.	**Igneous rocks in hand specimen**	Common **Igneous Rocks** in hand specimen along with specimen trey and primary information about the rock specimen	30 Nos. of different Igneous rock specimen
10.	**Sedimentary rocks in hand specimen**	Common **Sedimentary Rocks** in hand specimen along with specimen trey and primary information about the rock specimen	30 Nos. of different Igneous rock specimen
11.	**Metamorphic rocks in hand specimen**	Common **Metamorphic Rocks** in hand specimen along with specimen trey and primary information about the rock specimen	30 Nos. of different Igneous rock specimen

Mud & Cement Technology Lab

Serial No	Item	Quantity
01	Alkalinity test kit	02 Nos.
02	Beaker- 1000ml, 500ml, 100ml, 50ml	10 Nos. each type
03	Calcimeter	03Nos.
04	Cement compressive strength tester	01No.
05	Cement consistometer	01No.
06	Cement Permeameter	01No.
07	Cement plug set	01 No.
08	Cement slurry testing kit	02 Nos.
09	Cementing centralizer	01 No.
10	Conical flask- 100ml, 250ml, 500ml	10 Nos. each type
11	Cut model of Centrifugal Pumps- Diffuser type, Multistage diffuser type	01 No. each type
12	Cut model of Reciprocating Pumps- Simplex double acting pump, Duplex double acting pump, Triplex pump	01 No. each type
13	Cut section of cement guide shoe	01 No.
14	Cut section of Degasser	01 No.
15	Cut section of Float collar	01 No.
16	Cut section of Float shoe	01 No.
17	Cut section of RTTS Packer	01 No.
18	Cut section of Squeeze Packer	01 No.
19	Cut section of Well head cementing equipment	01 No.
20	Desander	01 No.
21	Desilter	01 No.
22	Differential sticking Tester	02 Nos.
23	Electrical stability tester	03 Nos.

24	Field fluid testing kit	03 Nos.
25	Filter press	03 Nos.
26	Formation packer shoe	01 No.
27	Glass electrode pH meter	03 Nos.
28	Glass measuring cylinder-500ml, 250ml, 100ml, 50ml	10 Nos. each type
29	Graduated jug	05 Nos.
30	Hamilton Beach Mixer	03 Nos.
31	High temperature aging cell	06 Nos.
32	Hydrometer	05 Nos.
33	Jet type mud mixture	01 No.
34	Lubricity Tester	02 Nos.
35	Marsh funnel	05 Nos.
36	Mud balance	05 Nos.
37	Multi stage cementer	01 No.
38	Oil mud test kit	02 Nos.
39	Plug and baffle set	01 No.
40	Portable roller aging oven	01 Nos.
41	Resistivity meter	03 Nos.
42	Retort kit	01No.
43	Rheometer	01No.
43	Rotary viscometer with cup	05 Nos.
46	Roto wall cleaner	01 No.
47	Sand content Set-(200mesh sieve funnel, Measuring glass tube	03 Nos.
48	Scratcher	01 No.
49	Self fill differential collar	01 No.
50	Shale shaker	01 No.
51	Shearometer	05 Nos.
52	Standard filter press kit	03 Nos.
53	Static Fluid loss test kit	01No.
54	Stirring Fluid loss test kit	01No.
55	Stop watch	05 Nos.
56	Thermo cup	03 Nos.