STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 6TH 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		Fluid Mechanics & Hydraulic Machines	4			20	80	3	100
Th.2		Tube Well Drilling	4			20	80	3	100
Th.3		Advanced Drilling Technology	4			20	80	3	100
Th.4		Elective (Any One) (a) Oil Well Drilling (b) Drilling Safety	4			20	80	3	100
		Total	*16*			*80*	*320*		*400*
		Practical							
Pr.1		Fluid Mechanics & Hydraulic Machines Lab			4	25	25	3	50
Pr.2		Tube Well Drilling Lab			4	25	25	3	50
Pr.3		Advanced Drilling Technology Lab			4	25	50	3	75
Pr.4		Project Phase -II			6	50	100	3	150
Pr.5		Life Skill			2	25	-	-	25
		Student Centred Activities(SCA)			3				
		Total			*23*	*150*	*200*		*350*
		Grand Total	**16**		**23**	**230**	**520**		**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/Idea Tinkering and Innovation Lab Practice 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 6TH SEMESTER
FOR
DIPLOMA IN DRILLING ENGINEERING

(EFFECTIVE FROM 2020-21 SESSIONS)

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

Th1. FLUID MECHANICS & HYDRAULIC MACHINES

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 6th**
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.	Properties of fluids.	16
02.	Bernoulli's equation and its applications	16
03.	Flow through orifice, wire & notches	14
04.	Flow through pipes	08
05.	Miscellaneous hydraulic devices	06
	Total	**60**

RATIONALE

The fundamental knowledge about Fluid Mechanics and Hydraulic Machines and its applications are very essential for drilling engineers.

OBJECTIVE

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

1. Describe the properties of fluid, principles various pressure measuring devises.
2. Explain Bernoulli's equation and it application.
3. Describe flow through orifices and notches.
4. Explain the concept of flow through pipe.
5. Explain the working principle of miscellaneous hydraulic machines.

COURSE CONTENTS

1.0 Properties of fluids

- 1.1 Define fluid.
  - 1.1.1 Classify fluid.
  - 1.1.2 Units used in hydraulics.
- 1.2 Define various properties of fluid.
  - 1.2.1 Define density, specific weight, specific volume and Specific Gravity.
  - 1.2.2 Define viscosity, surface tension and capillary phenomenon.
  - 1.2.3 Solve numerical problems.
- 1.3 Define pressure of fluids.
  - 1.3.1 State atmospheric pressure, absolute pressure, vacuum pressure and gauge pressure.
  - 1.3.2 Explain the pressure measuring devices such as piezometer, manometers, U-tube manometers, differential manometers and bourdon tube pressure gauge.
  - 1.3.3 Solve numerical problems.

2.0 Bernoulli's equation & its application.

- 2.1 State different types of flow.
  - 2.1.1 State and derive continuity equation.

2.2 Define energy.
- 2.2.1 Define pressure energy.
- 2.2.2 Define kinetic energy.
- 2.2.3 Define potential energy.

2.3 Explain Bernoulli's theorem with derivation
- 2.3.1 State the limits of Bernoulli's equation
- 2.3.2 Explain the various applications of Bernoulli's equation / theorem.
- 2.3.3 Explain the working of venturimeter, orifice meter & Pitot tube.
- 2.3.4 Solve numerical problems.

3.0 Flow through orifice,wire and noteches

3.1 Define orifice.
- 3.1.1 Classify orifice.
- 3.1.2 Flow through an orifice.
- 3.1.3 Define orifice coefficients.
- 3.1.4 Explain Cv, Cc, and Cd.
- 3.1.5 Establish the relation between Cv, Cc, and Cd.

3.2 Define weir.
- 3.2.1 Classify weir.
- 3.2.2 Explain flow over rectangular weir.

3.3 Define notches.
- 3.3.1 Classify notches..
- 3.3.2 Explain flow over V – notch

4.0 Flow through pipes.

4.1 Explain loss of head in pipes due to friction.
- 4.1.1 State Darcy's & Chezy's formula.

4.2 Define hydraulic gradient and total energy line.

5.0 Miscellaneous hydraulic devices

5.1 Describe the working principle of hydraulic ram .
5.2 Describe the working principle of hydraulic accumulator.
5.3 Describe the working principle of hydraulic press.
5.4 Describe the working principle of hydraulic lift.

SYLLABUS COVERAGE UP TO INTERNAL ASSESSMENT

Chapters- 1 & 2

BOOKS RECOMMENDED

1. Hydraulics and Hydraulic Machine by R.S.Khurmi
2. Fluid Mechanics by Modi & Seth
3. Hydraulics and Hydraulic machines by S.Ramanutham
4. Fluid Mechanics & Hydraulic Machines by R.K.Bansal

Th2. TUBE WELL DRILLNG

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 6th**
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.	Occurrence of Ground water	12
02.	Drilling Techniques	16
03.	Screening Water Wells	06
04.	Well Development	10
05.	Testing of Water Wells	10
06.	Failure of wells	06
	Total	**60**

RATIONALE

Initialized knowledge of Tube Well Drilling Technology is essential for drilling engineers associated with various Ground water exploration works.

OBJECTIVE

On completion of the course, students will be able to

1. Name the terms used ground water hydrology.
2. Explain the various drilling techniques for boring tube wells in various types of formation.
3. Select suitable rig for Tube Well Drilling.
4. Explain the working principle of various drilling rigs for boring deep and shallow wells.
5. Analyze the drilling problems at various depth of holes in different types of formations.
6. Explain the techniques of installing, casing and stainer, packing of lining etc.
7. Explain different techniques of borehole development, sandstone well development aquifer development etc.
8. Describe the techniques of testing yield; open pipe flow, and draw down water level of bore wells.

COURSE CONTENTS

1.0 Occurrence of Ground Water

1.1 Define terms used in Ground water hydrology project: aquifer, water table, perched water table, artesian well, porosity, permeability, void ratio, co-efficient permeability, radial flow, draw down, cone of depression, transmissibility, well yield, Sp. yield, Sp. retaintion, Safe Yield etc.

1.2 Explain the occurrence and origin of subsurface water.

1.3 Classify the type of wells and define flow of water

2.0 Drilling Techniques

2.1 Specify the different types of drills used for water well drilling.

2.2 Explain the basis for selection and application of drills.

2.3 Differentiate the various methods of drilling shallow wells.

2.4 Compare & contrast a hard percussive boring and manual rotary boring.

2.5 Explain a D.T.H. drill respect to conventional rotary procedure of drilling.
2.6 Explain the hydraulic percussive drilling and earth auger drill.
2.7 State the principle of operation of hydraulic rotary drill.
2.8 State the need of flushing system for rotary drill.
2.9 State the various problems encountered during water well drilling.
2.10 Describe the various types of disturbed strata for water well drilling.
2.11 Specify drilling fluid problems during drilling.
2.12 Explain grouting and sealing casing.

3.0 Screening Water Wells

3.1 Design the length of screen to be lowered in the water wells.
3.2 Explain the methods of installation of screen.
3.3 Describe the procedure of fixing the screen by gravel packing

4.0 Well Development

4.1 Define the Purpose of Well Development
4.1.1 Describe the various techniques of well development.
4.1.2 Compare and contrast among the various methods
4.2 Explain the procedure of aquifer development using acids and explosives.
4.3 Explain the procedure of development of sandstone wells

5.0 Testing of Water Wells

5.1 Mention the object of testing water wells.
5.2 State how the following testing are carried out
(a) Pumping rate, (b) Water level measurement, (c) Aquifer test, (d) Draw down measurement, (e) Yield test
5.3 Estimate the quantity of flow following the above test

6.0 Explain the causes of failure of wells and suggested remedies.

SYLLABUS COVERAGE UP TO INTERNAL ASSESSMENT

Chapters- 1 & 2

BOOKS RECOMMENDED

1. Groundwater Drilling by O.P. Honda
2. Groundwater & Wells by Jonson
3. Groundwater and Tube Wells by S.P. Garg
4. Groundwater Hydrology by David Keith Todd
5. Groundwater Wells by Fletcher

Th3. ADVANCED DRILLING TECHNOLOGY

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 6th**
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.	Directional Drilling Technique & Application	20
02.	Horizontal Drilling Technology	16
03.	Borehole Surveying	10
04.	Rotary Drill with Down Hole Motors	14
	Total	60

RATIONALE

In view of the rapid change in technological development coupled with globalization of India economy a drilling engineer needs to know the current technology in drilling methods.

OBJECTIVE

Considerable research is going on throughout the world to develop new methods of drilling and excavating rocks. Knowledge of the developing technology is a necessary pre requisite to growth of any Industry. After completion of the course, students will be able to:

1. Generalize the history of drilling technology and its rapid progressing development.
2. Developed the basic concept of Down Hole Motors and its progressing R & D.
3. Recognise the application of development method of drilling technology.
4. Explain the mechanism and technology of different surface exploratory drilling techniques, tools, and equipment.

COURSE CONTENTS

1.0 Directional Drilling Technique & Application

1.1 Define directional drilling.
1.2 State the purposes of directional drilling.
1.3 State the factors that govern planning of directional drilling project.
1.4 Classify the directional drilling and explain in brief.
1.5 Outline the concept on built – up chart.
1.6 Enumerated the requirements of surface and down hole equipment for directional drilling projects.
1.7 State the common deflecting tools used in oil well directional drilling.
1.8 Directional drilling terminology.
1.9 Directional drilling techniques in oil well drilling.
1.10 State the basic methods of orientation of deflection tools and explain comprehensively.
1.11 Bottom hole assemblies.
1.12 Well bore survey calculations.
1.13 Survey Instruments used in directional drilling.
1.14 Derive a formula to calculate the bottom hole position of directional drilling.
1.15 Work out some problems on above.
1.16 State and explain the common deflecting tools used for directional drilling at

diamond drill holes.

1.17 State the factors influencing structures and nature of the formation for deviation of diamond drill hole.

2.0 Horizontal Drilling Technology

2.1 Define horizontal drilling.
2.2 Advantage of horizontal drilling and field of application.
2.3 Considerations for planning a horizontal well.
2.4 Bottom hole assemblies for horizontal drilling.
2.5 Measuring while drilling in horizontal drilling.
2.6 Logging while drilling in horizontal drilling.

3.0 Bore Hole Surveying

3.1 State the necessity of bore hole surveying.
3.2 State the various causes of deviation of bore holes.
3.3 State the factors that increase or decrease the deviation of bore hole.
3.4 Explain the methods of controlling deviations of bore holes.
  3.4.1 State the general classes of instruments used for surveying bore holes.
3.5 Explain the methods of testing inclination of bore holes by
  3.5.1 Hydrofluoric acid method.
  3.5.2 Mass compass.
  3.5.3 Gyroscopic clinograph.

4.0 Rotary Drills with Down Hole Motors

4.1 Compare the result of Turbo drill with conventional rotary system.
4.2 Explain the merits and demerits of Turbo drilling over Rotary method.
4.3 Specify the main operating characteristics of a give Turbo Drill.
4.5 State the different basic drilling mechanism of down hole motors.
4.6 Give a concept on Dyna drill.
  4.6.1 Explain how to achieve the require amount of hole deviation with dyna drill
  4.6.2 State the special field of application of dyna drills.
4.7 State the main differences between various turbo drills.
4.8 Explain the working principle of down hole motor with hydro dynamic characteristics.
4.9 Explain the working principle of positive displacement motor drill.
4.10 Explain of structure of down the hole Electo motor drill.
4.11 Classify the types of Turbo drills according to their design features.
  4.11.1 Explain the performance characteristics of turbo drill.
  4.11.2 Derive the formula for power output of turbo drill.

SYLLABUS COVERAGE UP TO INTERNAL ASSESSMENT

Chapters- 1 & 2

BOOKS RECOMMENDED

1. Rotary Drilling Hand Book by J.E. Brantly
2. Exploratory Drilling by B.O.A.
3. Manual of Drilling Technology by C.P.Chugh
4. Diamond Drilling by C.P.Chugh
5. Petroleum Engineering by Carl Gatlin

Th4(a). OIL WELL DRILLING
(Elective)

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 6th**
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	Well Planning	08
02	Exploratory Drilling Camp	06
03	Coring and Core Analysis	08
04	Well Logging	10
05	Drill Stem Testing	10
06	Well Completion	12
07	Economics	06
	Total	**60**

RATIONALE

Specialized knowledge of oil well drilling is essential for drilling engineers to engage in oil well drilling industry.

OBJECTIVE

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

1. Develop the basic concept of rules, regulations for taking lease, concession, and permission etc.
2. Planning of well.
3. Analyze requirement for drilling camps, setting of camp, arrangement and construction of road, site camp houses, store, and rest sheds etc.
4. Explain the process of coring operation and core analysis.
5. Interpret different logging of sequence of strata.
6. Evaluation of oil well.
7. Familiarize with different bore hole completion methods.
8. Indicate the economical methods of drilling.

COURSE CONTENTS

1.0 Well Planning

1.1 Describe the salient features for preparation of oil well planning.
1.2 Explain how drilling plan can be efficiently implemented.
1.3 State the important stages of construction and completion of oil wells.

2.0 Exploratory Drilling Camp

2.1 Explain the procedure of management technique to maintain camp, office, store, transport and communication.
2.2 List out the camp equipment required for establishment of drilling personnel.

3.0 Coring and core analysis

3.1 State the general coring methods and equipment used in oil well drilling.
3.2 Explain the operational procedure of the equipment used for coring operation.

3.3 Explain the procedure of recovery and sampling of core.
3.4 State how the core analysis data help in core analysis.

4.0 Well Logging

4.1 What is Logging
4.2 Explain the purpose of logging.
4.3 State and explain the various logging methods such as self potential logging, single point resistance logging, resistivity logging, natural gamma logging, neutron logging, caliper logging etc.
4.4 State and explain conventional logging methods such as drillers log, cutting log, time log and mud log.

5.0 Drill Stem Testing

5.1 Define drill stem testing.
5.2 Explain the purpose of analysis.
5.3 Explain the procedure of analysis.

6.0 Well Completion

6.1 Classify the major categories of well completion.
  6.1.1 State the field of application of open hole completion.
  6.1.2 Describe the methods of completion of open hole.
6.2 State the field of application of conventional perforated method of well completion.
  6.2.1 Explain the various conventional casing perforated completion method of well activation.
  6.2.2 Describe the process of Bullet perforating and Jet perforating methods of casing.
  6.2.3 What do you mean carrot free?
  6.2.4 Compare and contrast Bullet perforating and Jet perforating methods of oil well development for penetration of multiple casing stings.
  6.2.5 What are the principal factors to be considered for perforated completions?
6.3 What are the problems occurred during production if sand will not be checked.
  6.3.1 What are the most common methods employed for excluding sand and explain the technologies.
6.4 What is permanent type well completion? State the primary advantages of this technology and explain its operational principle process of stimulation.

7.0 Economics

7.1 State the factors to be considered for economical production and exploration of petroleum.
7.2 Explain the salient features for reducing drill cost.

SYLLABUS COVERAGE UP TO INTERNAL ASSESSMENT

Chapters- 1, 2, 3 & 4

BOOKS RECOMMENDED

1. Oil Well Drilling Technology by W. Mccray & Frank W. Cole
2. Rotary Drilling Handbook by J.E. Brantly
3. Petroleum Engineering by Carl Gatlin
4. Petroleum Engineering Handbook by Grahm G. Moddi
5. Drilling Practices Manual by Preston L. Moore

Th4(b). DRILLING SAFETY
(Elective)

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 6th**
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	Health Hazards from Rock Drilling	08
02	Safety aspects relating to I/C engine drive, electric drive, compressed air & hydraulically driven drilling machine.	15
03	Safety precaution in Diamond Drilling	08
04	Rig Safety Rule under safety rules for the use of Mining equipment	14
05	Safety precaution in Oil Well Drilling	15
	Total	**60**

RATIONALE

Since drilling operation involves frequent accidents, it is very important for a drilling engineer to be fully aware of various safety measures that need to be taken during such operations.

OBJECTIVE

The emissions coming out during drilling operations are the causes of diseases to the drilling personnel. Exploratory drills driven by I/C Engine, Electric motors, Compressed air etc., involves full of accidents and health hazards. Drilling with oil well drilling operation is not only associated with accidents at the every stages of drilling life but also there is every possibility of occurrence of fire and blow out at oil field.

Exploratory drillers are the pride of the nation. They are the explorers of hidden traverses of natural minerals resources. The economy of nation depends upon the application of natural resources. Hence the concerned personnel required to be saved not only from accidents involved but also the potential health hazards of drilling operation and will be able to lead a healthy life being saved from fearful diseases.

The course has been designed after careful consideration to make the drillers aware of safety cautions at every stage of oil well drilling, minerals exploration drilling. Blast hole drilling, Tube well drilling etc., along with safety rules and regulations as applicable to above. On completion of the course students will be:

1. Well aware of accidents and health hazards associated with the operation of above mentioned machineries.
2. Able to advise precautionary measures for saving not only their lives but also lives of their co-workers.
3. Benefiting the nation/drilling organization/drilling contractors by economical meterage of drilling, sustaining the life compensation, economic use of fuel, wealth, machineries etc.

COURSE CONTENTS

1.0 Health Hazards From Rock Drilling.

1.1 Define pneumonoconiosis.

1.2 Classify and explain pneumonoconiosis.
1.3 State preventive measures for hazards of rock drills.
1.4 Explain with sketches different means of dust suppression during Blast hole drilling operation.

2.0 Safety Aspect

2.1 State the general safety precautions to be observed while dealing with electric motor driven machineries.
2.2 State the different I/C engines.
2.3 State and explain the pollution of environment due to emissions of I/C engines.
2.4 State and explain the health hazards occurred due to emissions of I/C engines.
2.5 Explain the general safety precaution to be observed in dealing with I/C engine driven machineries.
2.6 State the daily checks, care and maintenance for weekly, monthly, half yearly and yearly.
2.7 Explain the procedure of starting of compressor prior to drilling operation
2.8 Explain the danger involved with receiver tank and valves of compressor.
2.9 State the safety precautions to be taken against explosion of receiver tank of compressor.

3.0 Safety precautions in Diamond drilling.

3.1 Analyze the causes of accidents involved in diamond rotary drilling.
3.2 Explain comprehensively the training to be given to a new worker to assist in diamond drilling operation.

4.0 Rig Safety Rules under safety Rules for the use of Mining Equipment.

4.1 State the measures against elements of danger involved in operation of rig safe operation and organization of drilling rig safety rules under safety for the use of Mining Equipment.
4.2 Give the concept of general rig operation rules to be observed by the operator as per “Rig Safety Rules” under safety rules for the use of Mining equipment.
4.3 State the precautions to be taken in moving and setting up of rigs as per “Rig Safety Rules”.
4.4 Explain comprehensively the safe rig operating procedure as per “Rig Rules” under safety rules for the use of Mining Equipments.

5.0 Safety precaution in Oil Well Drilling

5.1 Enumerate the various causes of accidents occurred at oil well drill site.
5.2 Explain the Preventive measures to be taken to eliminate accidents.
5.3 State the safety measures have to be observed under oil well mast.
5.4 What is fire triangle?
5.5 Explain the different classes of fire.
5.6 Explain the causes of fire at oil well drill site.
5.7 State the different fire fighting extinguishers used at oil well site.
5.8 State the statutory acts, rules and regulations applicable to oil mines.

SYLLABUS COVERAGE UP TO INTERNAL ASSESSMENT

Chapters- 1, 2 & 3

BOOKS RECOMMENDED

1. Wining of Coal & Iron Ore by R.T. Deshmukh.
2. Safety in Open Casts Mining by M .Kev & C. Kev.
3. Drilling Technology Handbook by C.P. Chugh.
4. Diamond Drilling Handbook by J.D. Chmmins.
5. Rotary Drilling Handbook by J.E. Brantly

Pr1. FLUID MECHANICS & HYDRAULIC MACHINES LAB

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 6th**
Lab Periods	**: 4 Periods/week**	**Sessional**	**: 25**
Total Periods	**: 60**	**End Semester Examination**	**: 25**
Examination	**: 3 Hours**	**Maximum Marks**	**: 50**

RATIONALE

The fundamental knowledge about Fluid Mechanics and Hydraulic Machines and its applications are very essential for drilling engineers.

OBJECTIVE

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

1. Describe the properties of fluid and working principles various pressure measuring devises.
2. Explain Bernoulli's equation and it application.
3. Describe flow through orifices and notches.
4. Explain the concept of flow through pipe.
5. Explain the working principle of miscellaneous hydraulic machines.

COURSE CONTENTS

1. Measurement of pressure by using various pressure gauges.
2. Verification of Bernoulli's theorem by Bernoulli's verification apparatus.
3. Determination of discharge through venturimeter.
4. Find out orifice coefficient by orifice tank set up.
5. Determination of head loss due to friction for different pipes by pipe flow.
6. Study and sketching of hydraulic press
7. Study and sketching of hydraulic ram.
8. Study and sketching of hydraulic accumulator.
9. Study and sketching of hydraulic lift.

Pr2. TUBE WELL DRILLING LAB

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 6th**
Lab Periods	**: 4 Periods/week**	**Sessional**	**: 25**
Total Periods	**: 60**	**End Semester Examination**	**: 25**
Examination	**: 3 Hours**	**Maximum Marks**	**: 50**

RATIONALE

Initialized knowledge of Tube Well Drilling Technology Lab is essential for drilling engineers associated with various Ground water exploration works.

OBJECTIVE

On completion of the course, students will be able to

1. Explain the mechanism of DTH drilling rig.
2. Explain the different accessories DTH drilling rig.
3. Describe the process of installation of screen.
4. Explain use and application bits and different types of casings according to the rock.

COURSE CONTENTS

1. Study and sketching of DTH Rig.
2. Study and sketching of accessories & equipments of DTH Rig.
3. Study and sketching of different types of compressor.
4. Study and sketching of reverse and direct circulation drilling.
5. Study and sketching of various shallow drilling techniques.
6. Study and sketching of different types of screen.
7. Study and sketching the procedure of fixing the screen by gravel packing.
8. Study and sketching various techniques of well developments.
9. Study and sketching different types of casing used in tube well drilling.
10. Study and sketching different types of bit used in tube well drilling.

Pr3. ADVANCED DRILLING TECHNOLOGY LAB

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 6th**
Lab Periods	**: 4 Periods/week**	**Sessional**	**: 25**
Total Periods	**: 60**	**End Semester Examination**	**: 50**
Examination	**: 3 Hours**	**Maximum Marks**	**: 75**

RATIONALE

In view of the rapid change in technological development coupled with globalization of India economy a drilling engineer needs to know the current trends in drilling methods.

OBJECTIVE

Considerable research is going on throughout the world to develop new methods of drilling and excavating rocks. Knowledge of the developing technology is a necessary pre requisite to growth of any Industry. After completion of the course, students will be able to:

1. Developed the basic concept of advanced drills.
2. Recognize the application of development method of drilling technology for oceanographic research for mineral, oil and natural gas exploration.
3. Explain the mechanism and technology of different surface exploratory methods, drilling rigs, tools and equipment.

COURSE CONTENTS

Study and sketching from cut sections of

1. Types of casings.
2. Fire jet drill.
3. Electric heater drill.
4. Odex drill.
5. Submersible rigs.
6. Maricore drill.
7. Offshore platforms.
8. Sonic drill.
9. Down the Hole Motor Electro drill.
10. Reverse circulation drill.
11. Con-core coring operation.

Pr4. PROJECT PHASE - II

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 6th**
Lab Periods	**: 6 Periods/week**	**Sessional**	**: 50**
Total Periods	**: 90**	**End Semester Examination**	**: 100**
Examination	**: 3Hours**	**Maximum Marks**	**: 150**

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 and practices in real life situations, so as to participate and manage a large Drilling engineering projects, in future. Entire Project spreads over 5th and 6th Semester. Part of the Project covered in 5th Semester was 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:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Develop software packages or applications and implement these for the actual needs of the community/industry.
- 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.
- 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.
- To achieve real life experience in Project design.
- To develop the skill of writing Project Report

Project Phase-I and Phase-II

The Project work duration covers 2 semesters(5th and 6th sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group was done in the beginning of 5th semester under Project Phase-I. The students were allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work and Design of the system also have to be complete in Phase-I. Development may also begin in this phase. Project Milestones are to be set so that progress can be tracked .

In Phase-II Development, Testing, Documentation and Implementation have to be complete. Project Report have 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-II in 6^{th} semester there shall be one presentation by each group on whole Project work undertaken by them.

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 organisations to such an exhibition.

The Project Report need to be prepared as per standard format and following is the indicative format. The Teacher Guide may make minor alteration keeping the sense in tact.

Organization of Project Report

1. Cover page:
   It should contain the following (in order)
   (i) Title of the Project
   (ii) "Submitted in partial fulfillment of the requirements for the Diploma in <Branch Name>"
   (iii) By Name of the Student(s)
   (iv) Logo of the Institution
   (v) Branch Name/Depart Name and Institution Name with Address
   (vi) Academic Year
2. 1^{st} Inner page
   Certificate:

It should contain he following

"This is to certify that the work in this Project Report entitled <Project Title> by <Name of student(s)> has been carried out under my supervision in partial fulfillment of the requirements for the Diploma in <Branch Name>" during session <session > in <Branch /Department Name> of <Institute name> and this work is the original work of the above student(s).

Seal and signature of the Supervisor/Guide with date

3. 2nd Inner Page
   Acknowledgement by the Student(s)
4. Contents.
5. Chapter wise arrangement of Reports
6. Last Chapter: Conclusion
   It should contain
   (i) Conclusion
   (ii) Limitations
   (iii) Scope for further Improvement
7. References

Pr5. LIFE SKILL

Name of the Course: Diploma in Drilling Engineering			
Course Code	**:**	**Semester**	**: 6th**
Lab Periods	**: 2 Periods/week**	**Sessional**	**: 25**
Total Periods	**: 30**	**End Semester Examination**	**: -**
Examination	**: -**	**Maximum Marks**	**: 25**

Objective: After completion of this course the student will be able to**:**

- Develop team spirit i.e. concept of working in team
- Apply problem solving skills for a given situation
- Use effective presentation techniques
- Apply task management techniques for given projects
- Enhance leadership traits
- Resolve conflict by appropriate method
- Survive self in today's competitive world
- Face interview without fear

DETAIL CONTENTS:

1. SOCIAL SKILL

Society, Social Structure, Develop Sympathy and Empathy
Swot Analysis – Concept, How to make use of SWOT
Inter personal Relation**:** Sources of conflict, Resolution of conflict ,
Ways to enhance interpersonal relation

2. PROBLEM SOLVING

Steps of Problem solving**:**

- Identify and clarify the problem,
- Information gathering related to problem,
- Evaluate the evidence,
- Consider alternative solutions and their implications,
- Choose and implement the best alternative,
- Review
- Problem solving techniques:

1) Trial and error, 2) Brain storming, 3) Lateral (Out of Box) thinking

3. PRESENTATION SKILL

Body language , Dress like the audience
Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT,
Voice and language – Volume, Pitch, Inflection, Speed, Pause
Pronunciation, Articulation, Language, Practice of speech.
Use of AV aids such as Laptop with LCD projector, white board etc.

4. GROUP DISCUSSION AND INTERVIEW TECHNIQUES

Group Discussion:
Introduction to group discussion, Ways to carry out group discussion,
Parameters— Contact, body language, analytical and logical thinking,
decision making
Interview Technique :
Dress, Posture, Gestures, facial expression, Approach

Tips for handling common questions.

5. WORKING IN TEAM

Understand and work within the dynamics of a groups.
Tips to work effectively in teams,
Establish good rapport, interest with others and work effectively with them to meet common objectives,
Tips to provide and accept feedback in a constructive and considerate way ,
Leadership in teams, Handling frustrations in group.

6. TASK MANAGEMENT

Introduction, Task identification, Task planning , organizing and execution, Closing the task

PRACTICAL

List of Assignment: *(Any Five to be performed including Mock Interview)*

a. SWOT analysis:-

Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT.

a) Your past experiences,
b) Achievements,
c) Failures,
d) Feedback from others etc.

b. Solve the True life problem assigned by the Teacher.

3. Working in a Team

Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slum area, social activities like giving cloths to poor etc.(One activity per group where Team work shall be exhibited)

4. Mock Interview

5. Discuss a topic in a group and prepare minutes of discussion.

6. Deliver a seminar for 5 minutes using presentation aids on the topic given by your teacher.

7. Task Management

Decide any task to be completed in a stipulated time with the help of teacher. Write a report considering various steps in task management (with Break up into sub tasks and their interdependencies and Time)

Note: -1. Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic.

Note: -2. The following Topics may be considered for Seminar/GD in addition to other Topics at the discretion of the Teacher.

(Comparison with developed countries, Occupational Safety, Health Hazard, Accident & Safety, First-Aid, Traffic Rules, Global Warming, Pollution, Environment, Labour Welfare Legislation, Labour Welfare Acts, Child Labour Issues, Gender Sensitisation ,Harassment of Women at Workplace)

METHODOLOGY:

The Teacher is to explain the concepts prescribed in the contents of the syllabus and then assign different Exercises under Practical to the students to perform.

Books Recommended:-

Sl.No	Name of Authors	Title of the Book	Name of the Publisher
01	E.H. Mc Grath , S.J	Basic Managerial Skills for All	PHI
02	Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
03	Adair, J	Decision making & Problem Solving	Orient Longman
04	Bishop , Sue	Develop Your Assertiveness	Kogan Page India
05	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.

Equipment List

Fluid Mechanics & Hydraulic Machines Lab

Serial No	Item	Quantity
1.	Pressure measuring devices (A.)Piezometer (B.)U-tube Manometer (C.)U-tube Differential Manometer (D.)Bourdon tube pressure gauge	03 Nos. each type
2.	Bernoulli's Apparatus	03 Nos.
3.	Venturimeter set up (A.)Rectangular notch Venturimeter (B.)V-notch Venturimeter	03 Nos.each type
4.	Orifice meter set up	03 Nos.
5.	Friction coefficient measurement device in pipe flow	03 Nos.
6.	Model of Hydraulic Press	01 No.
7.	Model of Hydraulic Ram	01 No.
8.	Model of Hydraulic Accumulator	01 No.
9.	Model of Hydraulic Lift	01 No.

Tube Well Drilling Lab

Serial No	Item	Quantity
1.	DTH Rig with compresser	01 No.
2.	DHD Hammer-5inch	01 No.
3.	Button Bit-5inch,	03 Nos.
4.	DTH drill rod	10 Nos.
5.	Cut section of DHD Hammer-5inch	01 No.
6.	Reciprocating Compressor, Centrifugal Compressor, Rotary vane Compressor, Screw Compressor.	01 No. each type
7.	Screens- Continuous slot type, Pipe base type, Slotted metal type, Slotted plastic type, Well point type	01 No. each type
8.	Developed Tube Well model with screen and gravel packing.	01 No.
9.	Model of driven shallow well with driving equipment.	01 No.
10.	Model of Jetted shallow well with jetting equipment.	01 No.
11.	Model well development equipments like pumping, surging with air and backwashing with air.	01 No. each type
12.	Model of hydraulic jetting and hydraulic fracturing well development equipments.	01 No. each type
13.	PVC Casing with one end pin and another end box thread.	05 Nos.
14.	Casings (both flush couple and flush jointed) - NX, HX size.	05 Nos. each size
15.	Bits- Button bit, Fishtail bit, Pilot bit, Rock	03 Nos. each type

	roller bit, Three way cone bit, Carbide bit, star bit, Chisel bit	

Advanced Drilling Technology Lab

Serial No	Item	Quantity
1.	Oil Well Casings of all size	03 Nos.
2.	Model Firejet Drill	01 No.
3.	Model of Electric Heater Drill	01 No.
4.	Model of Odex Drill	01 No.
5.	Model of Submersible Rig	01 No.
6.	Model of Maricore Drill	01 No.
7.	Model of Sonic Drill Rig	01 No.
8.	Different types of offshore rig with platforms- Fixed Platform, Self Elevating, Submersible, Semi-Submersible, Jack-up, Floating, Complaint Tower, Drill Ship	01 No. each type
9.	Down the hole motor electro drill	01 No.
10.	Model of Reverse circulation drill rig	01 No.
11.	Reverse circulation drill hammer	01 No.
12.	RC Hammer	01 No.
13.	Cut section of RC Hammer	01 No.
14.	RC drill rod	05 Nos.
15.	Cut section of RC drill rod	02 Nos.
16.	Model of con-core process	01 No.