GANPAT UNIVERSITY

FACULTY OF DIPLOMA ENGINEERING

Programme	Diploma in Petrochemical Technology				
Semester	IV		Version	1.0.0.0	
Effective from Academic Year	2026-27		Effective for the batch Admitted in	JULY 2025	
Course code	1PCT4103	Course Name	Drilling Engineering		

I.TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course Code	Learning Scheme						Assessment Scheme										
		Actual Contact Hrs./Week			SLH	NLH	Credits	Theory				Practical				Based on SL		Total Marks
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL		SLA		
								MAX	MAX	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN	
DSC	1PCT4103	3	-	-	1	4	2	40	60	100	40	-	-	-	-	20	8	120

Abbreviation:	**CL**- Classroom Learning	**TL** - Tutorial Learning	**LL** - Laboratory Learning
	SLH - Self Learning Hours	**NLH** - Notional Learning Hours	**SLA** - Self Learning Assessment
	FA - Formative Assessment (Term work +Mid Sem Exam +Attendance)		**SA** - Summative Assessment

II. PRE-REQUISITES

III. INDUSTRY /EMPLOYER EXPECTED OUTCOMES

Industry and employers expect drilling engineers to understand core drilling operations, drilling fluid and equipment fundamentals, identify and prevent drilling problems, ensure safe and efficient well practices, and apply environmentally responsible drilling and waste management methods.

IV. COURSE LEARNING OUTCOMES

At the end of the course, students will be able to achieve the following course learning outcomes:

CO1: Understand drilling rig components and well planning.

CO2: Describe drill string, casing design, and bit selection.

CO3: Explain cementation techniques and slurry design basics.

CO4: Understand drilling waste management and sustainability principles.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's)&CO's	Marks	Hours
Unit 1: Basic Drilling Practices	**TLO1.1** Explain basics of well planning and objectives **TLO1.2**Discuss drilling rig: components, selection & layout **TLO1.3** Discuss Hoisting, circulation & rotary systems **TLO1.4** Rig power transmission & control **TLO1.5** Describe drilling fluids: functions, types, properties **TLO1.6** Discuss Mud processing, pressure / separation equipment	**1.1** Basics of well planning **1.2** Drilling rig components and their selection criteria **1.3** Outline hoisting, circulation, and rotary systems used in drilling operations **1.4** Rig power transmission and control systems **1.5** Drilling fluids, their functions, properties, and classifications. **1.6** Mud equipment used for Pressure control and solid separation	**16**	**12**

Unit 2: Drill String, Casing & Bit Design	**TLO2.1** Identify drill string – components, function & application **TLO2.2** Explain basics of drill string design **TLO**2.3 Describe casing configuration, operation & setting depth **TLO2.4** Discuss casing types & performance properties **TLO2.5** Describe roller cone bits, PDC bits, application areas **TLO2.6** Bit selection: formation-based criteria	**2.1** Drill string components and their functions **2.2** Drill string design considerations. **2.3** Casing practices, configuration, and operational steps. **2.4** Classify casing types and their properties **2.5** Function and types of drill bits. **2.6** Bit selection: formation-based criteria	**15**	**12**
Unit 3: Cementation Techniques	**TLO3.1** Describe Purpose of cementing **TLO3.2** Discuss Oil-well cement types (API grades) **TLO3.3Explain** Cement classification & additives **TLO3.4** Slurry design basics **TLO3.5Explain** Cementing equipment (float collar, centralizer, plugs) **TLO3.6** Discuss Primary cementing methods **TLO3.7** Describe Factors ensuring good cementation	**3.1** Objectives of well cementing **3.2** Oil-well cement types and their properties **3.3** Cement based on applications. **3.4** Basics of slurry design **3.5** Cementing equipment used in field operations **3.6** Primary cementing methods **3.7**Characteristics of good quality cementation	**14**	**11**
Unit 4: Drilling Problems	**TLO4.1**Explain Pipe sticking, differential & mechanical causes **TLO4.2** Describe lost circulation, deviation control, formation damage **TLO4.3** Explain Borehole stability issues **TLO4.4** Describe drill string fatigue, failure modes **TLO4.5** Explain Bit wear, wireline failure **TLO4.6** Explain Kick warning signs, blowout control basics	**4.1** Pipe sticking and pipe failure mechanisms **4.2** Lost circulation, hole deviation, and formation damage. **4.3** Borehole instability. **4.4** Drill string fatigue failure causes **4.5** Bit failure and wireline issues. **4.6** well kick and blowout indicators and control measures	**15**	**10**

VI. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

- Video lectures or industry documentaries on drilling rigs and well operations
- (e.g., rig systems, drilling process animations, drilling fluid operations)
- Demonstrate basic drilling fluid concepts using safe substitute materials
- (simulate mud density/viscosity and discuss importance in real drilling)
- Debate/Presentation: "Causes and Control Measures for Common Drilling Problems"
- with real-world industry examples (pipe sticking, lost circulation, well kicks)

Mini Projects

- Conduct a mock safety audit of a laboratory/ workshop area
- (identify hazards similar to drilling sites and suggest improvements)
- Prepare a model of a drilling rig or its subsystems
- (e.g., hoisting system, circulation system, rotary system)
- Case study on drilling incidents
- (investigate a real drilling failure/accident and propose preventive measures)
- Invite industry expert or alumni talk
- To share real drilling operation experiences, rig safety culture, and best practices.

VII. LIST OF REFERENCE BOOKS

Sr. No.	Title	Author	Publication
1	Petroleum Engineering: Drilling and Well Completion	Carl Gatlin	Prentice Hall
2	Well Engineering and Construction	Hussain Rabia	Endeavour Publications.
3	Fundamentals of Drilling Engineering	Mitchell & Miska	SPE
4	Drilling Engineering: A Complete Well Planning and Approach	Neal J. Adams	PennWell

VIII. LINK OF LEARNING WEB RESOURCE

1	**NPTEL – Drilling and Well Completion** https://nptel.ac.in/courses/117107097 **NPTEL – Drilling and Well Completion** https://nptel.ac.in/courses/117107097 **Society of Petroleum Engineers (SPE) – Learning Resources** https://www.spe.org/en/education

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Basic Drilling Practices	CO1	12	5	5	6	16
2	Drill String, Casing & Bit Design	CO2	12	5	5	5	15
3	Cementation Techniques	CO3	11	4	5	5	14
4	Drilling Problems	CO4	10	5	4	5	15
		Grand Total	**45**	**19**	**19**	**21**	**60**

X. COs AND POs AND PSOs MAPPING

Course outcome (Cos)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	2	1	3	2	1
CO2	3	3	2	2	1	2	1	3	3	1
CO3	2	3	3	2	1	3	1	3	3	2
CO4	2	2	3	2	1	3	2	2	3	3

Legends: - *3- High 2-Moderate/Medium 1-Slight/Low 0-None*