



Drilling Engineering Practices – MCQs (Module I and II)

1.0 Course Faculty Information

Name: Prof. Dr. M. Enamul Hossain
NSRIC Chair Professor in Sustainable Energy
NSRIC Inc., Toronto, Ontario, Canada

2.0 Course Information

Course Code	ENG-M-C00293 and ENG-M-C00294
Class Days	Follow posting in NSRIC LMS system
Class Time	Follow posting in NSRIC LMS system
Course Credit Hours	3
Class Location	NSRIC online platform
prerequisites and/or co-requisites	n/a
Level /A, E, H, I, K12, M, P, S, T, U, V, W	Mid-level courses / M

Note: The below classification of courses is related any areas of knowledge:

A: Advanced level academic level courses; **C:** Canadian immigration and training courses; **E:** Executive courses; **H:** Higher-level courses (i.e., graduate courses); **I:** Intermediate courses (i.e., university preparatory courses – Grade XII+); **K12:** Foundational, and lower-level courses; **M:** Mid-level courses (i.e., undergraduate courses); **P:** Professional courses; **S:** Short/seminar courses; **T:** Training courses; **U:** Tutorial Courses; **V:** Vocational training courses; and **W:** Workshop courses.

3.0 Professor Information

Name	Prof. Dr. M. Enamul Hossain
Title	NSRIC Chair Professor in Sustainable Energy
Contact Information	enamulh@nsric.ca ; dr.mehossain@gmail.com
Office Location	NSRIC online platform
Office Hours	10: 30 am – 11:30 am EST (Monday) by email appointment

4.0 Target Audiences

- Diploma and vocational training student.
- University undergraduate level student.
- Any student who is interested in drilling engineering.

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- Students who have completed Basics of Drilling Engineering I (Module 1 – 4) and Drilling Engineering II offered by Prof. M. Enamul Hossain.

5.0 Course Module Descriptions

Module I:

In drilling engineering, there is a clear shortcoming in fundamental understanding of theoretical concepts due to the lack of enough practices on multiple choice questions (MCQs). To date there are several textbooks that explain and cover drilling operations with fundamentals of drilling engineering. Unfortunately, there is no specific book or course so far where enough MCQs are available as an independent book or course except Prof. Hossain's book in the relevant area. As the first and only complete guide for petroleum engineering students and trainee engineers on basic and in-depth understanding of drilling engineering, this course is the best choice for the oil and gas industry community.

Module I covers the fundamental issues for beginners who are interested in learning drilling engineering through enough MCQs to have a deep understanding on each topic and some self-practiced MCQs. In addition, each chapter contains enough MCQs for a comprehensive understanding of the subject. This will make the students interested in enrolling the course. The course explains the scientific concepts in the form of MCQs for each topic in a readable fashion very clearly. The answers are listed at the end of each chapter. The module includes all the basic aspects of drilling engineering including an introduction to drilling engineering, rig operations, drilling fluids, drilling hydraulics, well control and monitoring system, pore and fracture pressure estimation. This module is a foundation, resource guide and an excellent source for petroleum engineering students and drilling engineers who want to learn concepts in detail through Q&A mode.

The course is designed for audiences/students who have basic knowledge on drilling engineering. The course contains two modules (Module I – II) and each module covers six chapters. Students are strongly advised to complete the course title “Basics of Drilling Engineering I and Drilling Engineering II” by Prof. M. Enamul Hossain at NSRIC Platform to understand this course content.

Keywords: Multiple Choice Question (MCQ), drilling rig, rig components, hoisting system, introduction to drilling engineering, rig operations, drilling fluids, drilling hydraulics, well control and monitoring system, pore and fracture pressure estimation.

Module II:

In drilling engineering, there is a clear shortcoming in fundamental understanding of theoretical concepts due to the lack of enough practices on multiple choice questions (MCQs). To date there are several textbooks that explain and cover drilling operations with fundamentals of drilling engineering. Unfortunately, there is no specific book or course so far where enough MCQs are available as an independent book or course except Prof. Hossain's book in the relevant area. As the first and only complete guide for petroleum engineering students and trainee engineers on basic and in-depth understanding of drilling engineering, this course is the best choice for the oil and gas industry community.

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Module II covers the fundamental issues and in-depth concepts for beginners and practicing engineers who are interested in learning drilling engineering through enough MCQs to have a deep understanding on each topic and some self-practiced MCQs. In addition, each chapter contains enough MCQs for a comprehensive understanding of the subject area. This will make the students interested in enrolling the course. The course explains the scientific concepts in the form of MCQs for each topic in a readable fashion very clearly. The answers are listed at the end of each chapter.

This module includes all the basic and detailed aspects of drilling engineering including basics of drillstring design, cementing jobs design, drill bit and casing design, horizontal and directional drilling, drilling cost analysis and finally, well completions. This course is a foundation, resource guide and an excellent source for petroleum engineering students and drilling engineers who want to learn concepts through Q&A mode. The course is designed for audiences/students who have basic knowledge on drilling engineering. The course contains two modules (Module I – II) and each module covers six chapters. Students are strongly advised to complete the course title “Basics of Drilling Engineering I and Drilling Engineering II” by Prof. M. Enamul Hossain at NSRIC Platform to understand this course content.

Keywords: Multiple Choice Question (MCQ), drillstring, drillstring design and evaluation, bottom-hole assembly, ROP optimization, cementing jobs design, drill bit and casing design, horizontal and directional drilling, drilling cost analysis and finally, well completions.

6.0 Course Learning Outcomes

Upon successful completion of this course, students will be able to:

- CLO1: Become familiar with drilling rigs and different rig components through enough MCQs.
- CLO2: Understand the well control and monitoring system through 100s of MCQs.
- CLO3: Ability to understand types of drilling fluids, functions, and properties of drilling fluids through enough MCQs.
- CLO4: Understand the basics of cementing concepts through sufficient of MCQs.
- CLO5: Ability to understand hydrostatic and formation pressure concepts through 100s of MCQs.
- CLO6: Understand the basics of casing and Bottom-hole assembly (BHA) through sufficient MCQs.
- CLO7: Familiarize with common drilling problems (e.g., hole stability and lost circulation) through enough MCQs.
- CLO8: Understand the drilling bit tooth wearing, design, selections, and evaluation through 100s of MCQs.
- CLO9: Understand the design, selection, and evaluation of drillstring and Bottom-hole assembly (BHA) through sufficient MCQs.
- CLO10: Understand the factors affecting rate of penetration (ROP) and become acquainted with ROP optimization techniques (i.e., drill-off test and drilling response test) through 100s of MCQs.
- CLO11: Ability to understand the manufacturing of casing, casing rig side operations, handling procedure (e.g., running procedures, landing procedures, casing design and selection criteria through sufficient MCQs.
- CL012: Become familiar with the basic concepts of directional drilling, importance, classification, and planning of a directional well path through sufficient MCQs.

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CLO13: Become familiar and in-depth understanding with the various drilling systems and well design techniques through enough MCQs.

CL14: Ability to understand different drilling costs and economic and accordingly develop a drilling plan based on economic analysis i.e., authorization for expenditure (AEF) through 100s of MCQs.

7.0 How the course supports the attainment of the student outcomes

Student Learning Outcomes (1-6)						
1	2	3	4	5	6	7
Moderate	Moderate	Moderate	Low	Moderate	Moderate	

8.0 Course Materials

Online course materials

- Online presentation documents in pdf form
- Audio/visual recording of lectures (Optional)
- Online tutorial and meeting with students upon request
- Enough MCQs for study and self-practiced MCQs with answers in pdf form in the MLS system
- Reading materials if any in pdf form

Textbook and resources (If any)

- 1) **Hossain, M.E.** and Al-Majed, A.A. (2015). Fundamentals of Sustainable Drilling Engineering. ISBN 978-0-470878-17-0, John Wiley & Sons, Inc. Hoboken, New Jersey, and Scrivener Publishing LLC, Salem, Massachusetts, USA, pp. 786.
- 2) **Hossain, M.E. (2016)**. Fundamentals of Drilling Engineering: MCQs and Workout Examples for Beginners and Engineers. ISBN: 978-1-119083-56-6, John Wiley & Sons, Inc. Hoboken, New Jersey, and Scrivener Publishing LLC, Salem, Massachusetts, USA, pp. 854.

9.0 Academic Integrity

Students are encouraged to have a look at the NSRIC's statement of academic integrity at NSRIC website. It is noted that by signing this syllabus, you will acknowledge that you have understood that any detected plagiarism should be reported.

10. Assessment for Grade

This course is an academic course (i.e., K12, and university level courses) and thus based on individual and team performance, students are evaluated followed by Table 1.

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Therefore, the program courses contain only assignments for assessment. Student will receive a “Certificate of completion” after successful completion of the course.

Table 1: NSRIC grading system

Type of Assessment	Grade %
Participation/Engagement/Performance	10%
Assignments	15%
Quizzes	10%
Research Project	20%
Midterm Exam I	15%
Midterm Exam II	15%
Final Exam	15%
Total	100%

Important Note:

- i) The below classified courses (i.e., academic courses) will only be evaluated based on the grade system shown in Table 2. A grade and certificate will be issued for the student(s) and participant(s).
A: Advanced level academic level courses; **H:** Higher-level courses (i.e., graduate courses); **I:** Intermediate courses (i.e., university preparatory courses – Grade XII+); **K12:** Foundational, and lower-level courses; **M:** Mid-level courses (i.e., undergraduate courses).
- ii) The below classified courses will **not** be evaluated based on the grade system shown in Table 2. A certificate will be issued for the student(s) and participant(s).
E: Executive courses; **P:** Professional courses; **S:** Short/seminar courses; **T:** Training courses; **U:** Tutorial Courses; **V:** Vocational training courses; and **W:** Workshop courses.

At the end of the term, the below Table 2 will be used for translating your marks into a “Latter Grade” based on NSRIC grading policy.

Participation/Engagement/Performance

Your participation in every aspect of the course is important for the learning process. Your engagement in every discussion in the course, due delivery of all practices will be fruitful. These efforts from your side will reflect your performance in the course delivery and your commitments. This performance is the reflection of your dream grade!!

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Table 2: NSRIC grading system

Marks	Letter Grade	Points	Description
≥ 93	A+	4.00	Outstanding
≥ 90	A	3.75	
≥ 87	A-	3.50	Excellent
≥ 84	B+	3.25	Very good
≥ 81	B	3.0	
≥ 78	B-	2.75	Moderately Good
≥ 75	C+	2.50	Good
≥ 72	C	2.25	
≥ 69	C-	2.0	Moderately Good
≥ 66	D+	1.75	Pass
≥ 63	D	1.50	
≥ 60	D-	1.25	Poor Pass
< 60	F	0	Failing

11.0 Advice and additional requirements

I advise you to:

- Please contact me if you need any help.
- Students are expected to attend all scheduled online lecture classes.
- Students are expected to study from the course materials and/or textbooks which will help to easily read and understand.
- Students are encouraged to write their own notes during lectures/presentations (pdf PowerPoint presentations, and additional materials if any).
- Students are encouraged to attend online platform classes on time because late-attende disrupts the flow of the class for both the instructor and the other students.

Additional information (During Online Course offering Period)

- The PowerPoint course materials, and video lectures will be available at the NSRIC Platform.
- There will be scheduled discussion/tutorial sessions on **every Monday** at the class scheduled time. All students must attend this session (Need student request).
- There will be an office hour for students on Monday from 10:30 am – 11:30 am, Toronto, Canada time. Students need to send an email request so that a zoom meeting can be arranged. In addition, any time student can set up an online appointment (i.e., phone, zoom, and/or other mode of communications) based on availability of the course instructor. However, student should send an email request for setting up this type of meeting.

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12.0 Course Topics

- Introduction to drilling engineering and petroleum engineering units.
- Drilling rig systems, planning and managing, drilling operations.
- An overview of drilling engineering and mud pump and hoisting system.
- Well control and monitoring system.
- Drilling fluids composition and rheology.
- Drilling fluid hydraulics.
- Formation pore and fractures pressure estimation.
- Cementing.
- Basic concepts of casing and its properties, casing design and selection criteria including manufacturing of casing, rig side operations, handling running and landing procedures.
- Basic concepts of rotary drilling bit and classification, drilling bit tooth wearing, design, selections, and evaluation.
- Fundamental concepts of drillstring and bottom-hole assembly.
- Drilling problems, safety, and environmental issues.
- Drillstring and bottom-hole assembly design/evaluation.
- Factors affecting rate of penetration (ROP) and ROP optimization techniques.
- Drill-off test and drilling response test.
- Prediction and detection of abnormal pressure zones.
- Basic concepts of directional drilling, importance, classification, and planning of a directional well path.
- Well planning and wellbore surveying techniques.
- Drilling costs estimation and authorization for expenditure (AFE)

Requirements/Instructions

Students are advised to register all drilling engineering modules courses for becoming the master in the subject area.

Bundled Program Description

These bundled courses program is designed for the audiences who are interested to learn the about in-depth of drilling engineering related to oil and gas operations through multiple choice questions (MCQs) and Q&A session mode. The course content is designed for students and practicing engineers who are in diploma or undergraduate level, early career professionals in oil and gas industry, and interested in learning drilling engineering in details. This program includes all the basic aspects of drilling engineering including an introduction to drilling engineering, rig operations, drilling fluids, drilling hydraulics, well control and monitoring system, pore and fracture pressure estimation, basics of drillstring design, cementing jobs design, drill bit and casing design, horizontal and directional drilling, drilling cost analysis and finally, well completions.

The course contains two modules (Module I – II) and each module contains 11 and 12 lectures. Students are strongly advised to complete the course title “Basics of Drilling Engineering I and Drilling Engineering II” by Prof. M. Enamul Hossain at NSRIC Platform to understand this course content.

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13.0 Course Contents and Schedule

Lec. No.	Module	Topics	Remarks
Module I			
01	Introduction	Chapter 1-Introduction MCQs	
02	Drilling rig	Chapter 2_Rig components MCQs	
03	Drilling rig	Chapter 2_Rig components MCQ Exercise	Assessment 1
04	Drilling fluids	Chapter 3_Drilling fluids MCQs	
05	Drilling fluids	Chapter 3_Drilling fluids-MCQs Exercises	Assessment 2
06	Drilling hydraulics	Chapter 4_Drilling hydraulics MCQs	
07	Drilling hydraulics	Chapter 4_Drilling hydraulics MCQs Exercises	Assessment 3
08	Well Monitoring	Chapter 5_Well Monitoring Sys MCQs	
09	Well Monitoring	Chapter 5_Well Monitoring Sys MCQs Exercises	Assessment 4
10	Formation Pressure	Chapter 6_Formation Pore Pressure MCQs	
11	Formation Pressure	Chapter 6_Formation Pore Pressure MCQs Exercises	Assessment 5
Module II			
12	BHA Design	Chapter 7_BHA Design MCQs	
13	BHA Design	Chapter 7_BHA Design MCQs Exercises	Assessment 6
14	Casing Design	Chapter 8_Casing Design MCQs	
15	Casing Design	Chapter 8_Casing Design MCQs Exercises	Assessment 7
16	Cementing	Chapter 9_Cementing MCQs	
17	Cementing	Chapter 9_Cementing MCQs Exercises	Assessment 8
18	Directional drilling	Chapter 10_Directional drilling MCQ	
19	Directional drilling	Chapter 10_Directional drilling MCQ Exercise	Assessment 9
20	Drilling Costs	Chapter 11_Drilling Costs MCQs	
21	Drilling Costs	Chapter 11_Drilling Costs MCQs Exercises	Assessment 10
22	Well Completion	Chapter 12_Well Completion MCQs	
23	Well Completion	Chapter 12_Well Completion MCQs Exercises	Assessment 11

Prepared by Prof. M. Enamul Hossain, NSRIC Chair Professor in Sustainable Energy, Dept. of Petroleum Engineering, OE Division, NSRIC Inc., London, ON, Canada.

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