



## Coiled-tubing Drilling and Fishing Operations

### 1.0 Course Faculty Information

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

### 2.0 Course Information

Course Code	ENG-A-C00108
Class Days	Saturday and Sunday
Class Time	9:00 am – 10:30 am EST (Self-study)
Course Credit Hours	1 (7 Hrs.)
Class Location	NSRIC online platform
Prerequisites and/or co-requisites	Horizontal and Multilateral Drilling
Level /A, E, H, I, K12, M, P, S, T, U, V, W	Professional courses / P

**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.

ENG – Engineering  
PET – Petroleum

### 3.0 Professor Information

Name	Prof. Dr. M. Enamul Hossain
Title	NSRIC Chair Professor in Sustainable Energy
Contact Information	<a href="mailto:enamulh@nsric.ca">enamulh@nsric.ca</a> ; <a href="mailto:dr.mehossain@gmail.com">dr.mehossain@gmail.com</a>
Office Location	NSRIC online platform
Office Hours	08:30 am – 09:30 am EST (Monday) by email appointment only

### Our Specializations:

1. **ADK:** to create different avenues and opportunities for the **Acquisition and Dissemination of Knowledge**.
2. **BDM:** to create **Business Development and Marketing** relationships for the growth of the institution.
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## 4.0 Course Description

This course is designed for audiences and students who are interested to learn about the basics and in-depth of drilling engineering related to coiled-tubing drilling (CTD) and fishing jobs during oil and gas operations. The course content is designed for students who are enrolled in diploma or undergraduate/graduate program(s), early career professionals, professionals and interested in learning coiled-tubing (CT) and fishing operations while drilling. The course covers an overview of coiled-tubing engineering, key elements of a CT unit, applications, benefits, advantages and disadvantages, CT safety, and a detailed overview of equipment related to CTD and fishing jobs. The different CTD models such as sinusoidal and helical buckling, buckling in horizontal and inclined sections, buckling in vertical section and buckling in curved wellbores covered in detail. The critical selection criteria for designing the CT unit along with locked-up situations are described. When it comes to the fishing operations, critical buckling criteria and locked-up, background of fishing jobs, backing off the string, and stuck pipe, how to avoid fishing operations and hazards while drilling, a guideline on preparation of fishing jobs and finally economics of fishing are extensively discussed in this course. In addition, an in-depth calculation related to bucking of CT are highlighted for well planning and design. Further, numbers of workout examples related to CTD field operations are covered. The course contains only one module with nine lectures. Students are strongly advised to complete the courses titled “Basics of Drilling Engineering I”, “Drilling Engineering II” and “Horizontal and Multilateral Drilling” by Prof. M. Enamul Hossain at NSRIC Platform to understand more about the course content.

## 5.0 Course Captions/Keywords

Coiled-tubing (CT), coiled tubing drilling (CTD), sinusoidal buckling, helical buckling, buckling in horizontal sections, buckling in inclined sections, buckling in vertical section, buckling in curved wellbores, coiled-tubing, coiled tubing drilling, tubing reel, injector head, control cabin, power pack, remedial works, treatment fluids, fishing job, well logging, fill materials, cleanout, well perforation operations, nitrogen gas, cementing operations, stimulation fluids, measurement-while-drilling (MWD), history of CT, CT safety, CT surface equipment, coiled tubing subsurface equipment, downhole tools, pumping operations, mechanical operations, permanent coiled tubing installations, non-standard CT operations, equipment for CT operations, injector drive, tubing guide, chain and gripper blocks, hydraulic tensioning, level-wind assembly, critical buckling criteria and locked-up, background of fishing operations, backing off the string, and stuck pipe, how to avoid fishing operations and hazards while drilling, a guideline on preparation of fishing jobs, coiled tubing buckling, coiled tubing buckling models and economics of fishing jobs.

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## 6.0 Course Learning Outcomes (CLO)

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

- CLO1: Become familiar with coiled-tubing drilling technology for oil and gas industry.
- CLO2: Understand the different terminologies related to coiled-tubing drilling.
- CLO3: Ability to understand the applications, advantages, and disadvantages of coiled-tubing drilling.
- CLO4: Become familiar with the basics of coiled-tubing equipment and related drilling devices and parts.
- CL05: Ability to understand the different coiled-tubing buckling theories, models, and in-depth calculations for better design of the coiled-tubing drilling.
- CL06: Ability to understand the critical selection criteria for designing the coiled-tubing unit along with locked-up situations.
- CL07: Ability to identify the which one of the buckling models should be used to design and analyze the coiled-tubing.
- CL08: Become familiar with fishing operations while drilling for oil and gas industry.
- CL09: Understand the different terminologies related to fishing jobs.
- CL10: Become familiar with the basics of fishing jobs equipment and related retrieving devices and parts.
- CL11: Ability to understand the applications, advantages and disadvantages of fishing operations.
- CL12: Ability to understand critical buckling criteria and locked-up in fishing jobs, background of fishing operations, backing off the string, and stuck pipe.
- CL13: Understand on how to avoid fishing operations and hazards while drilling, how to prepare a guideline on preparation of fishing jobs and finally economics of fishing jobs.
- CL14: Ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental and safety.
- CL15: Ability to use techniques, skills and modern engineering tools necessary for engineering practices.

## 7.0 Course Materials

### *Online course materials*

- Online PowerPoint presentation slides in pdf form
- Audio/visual recording of lectures (Optional)
- Online tutoring session(s) and meeting(s) with students upon request and needs
- Assignments and quizzes in the MLS system

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- 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.
- 3) Hossain, M.E. and Islam, M.R. (2018). Drilling Engineering Problems and Solutions: A Field Guide for Engineers and Students. John Wiley & Sons, Inc. Hoboken, New Jersey, and Scrivener Publishing LLC, Salem, Massachusetts, USA, ISBN: 978-1-118-99834-2, Jul 2018, pp. 642.

### **8.0 Target Audiences**

- Diploma and vocational training students
- University undergraduate and graduate level students
- Any students who are interested in directional and horizontal drilling, coiled-tubing drilling and fishing jobs from any disciplines
- Students who have completed the Basics of Drilling Engineering I (Module 1 – 4), Drilling Engineering II (Module 1 – 4) and Horizontal and Multilateral Drilling offered by Prof. M. Enamul Hossain

### **9.0 Requirements/Instructions**

Students are advised to register all drilling engineering modules and course(s) for becoming the master in the subject area offered by Prof. Dr. M. Enamul Hossain.

### **10.0 Course Topics**

- An overview of coiled-tubing drilling, advantages, disadvantages, applications, and basic concepts of coiled-tubing drilling.
- Different terminologies used for coiled-tubing drilling and fishing operations
- Discussions on different buckling models such as sinusoidal and helical buckling for vertical, slanted, and horizontal wells
- Critical buckling criteria and locked-up
- Background of fishing operations, backing off the string, and stuck pipe
- How to avoid fishing operations and hazards while drilling

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- A guideline on preparation of fishing jobs
- Economics of fishing jobs

## 11.0 Course Contents and Schedule

Lec. No.	Module	Topics	Remarks
<b>Horizontal and Multilateral Drilling – One Module</b>			
01	Introduction	Course overview, basics of coiled-tubing (CT) drilling – 1	
02	CT drilling	Basics of CT drilling – 2	
03	CT Equipment	CT Equipment – 1	Quiz 1
04	CT Equipment	CT Equipment – 2	Assignment 1
05	CT buckling models	CT buckling models and workout examples – 1	
06	CT buckling models	CT buckling models and workout examples – 2	
07	CT buckling models	CT buckling models and workout examples – 3	
08	Fishing job	Fishing operations – 1	Quiz 2
09	Fishing job	Fishing operations and equipment – 2	Assignment 2

## 12.0 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.

## 13. Assessment for Grade

This course contains assignment and quizzes for assessment. Student will receive a “Certificate of completion” after successful completion of the course.

### 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).  
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- 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.

### *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 assignments, quizzes, and research projects 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!!

### *Assignments*

You will be given **two assignments** during the course delivery. The due dates for assignments are specified in the course content and schedule section. The assignments will be given time to time to solve/answer during the term. Assignments will be posted through NSRIC online platform at least one week before they are due. Due dates are given in course schedule (tentative schedule). However, in case of any special circumstance, the date will be posted beforehand or announced in class.

### *Quizzes*

**A Maximum of two** quizzes (maximum of **ten MCQ @ 10** minute) will be taken based on class lectures and performance. The quiz will be taken in the beginning of the lecture through NSRIC online platform. If you miss the quiz without any valid official excuse, you will receive for the non-attended quiz. If any student fails to attend the quiz, he/she must submit a valid reason to the instructor. In such case, he/she should appear another quiz or may be averaged on the quizzes that he/she attended. It will depend on the situation and instructor.

## **14.0 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

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(pdf PowerPoint presentations, and additional materials if any).

- Students are encouraged to attend online platform classes on time because late-attendee 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 **a set** scheduled time. All students should attend this session (Need student request).
- There will be an office hour for students on Monday – Friday from 08:30 am – 09:30 am EST (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.

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

**Subtitle:** This is an extensive study of drilling engineering related to coiled-tubing drilling (CTD) and fishing jobs for the petroleum industry during oil and gas operations.

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