

**RC 431**  
**Renewable Energy On-site Lab**  
**3 Credits**

Instructor: Garnet Tozer

Original Developer: Robert Baron

Current Developer: Garnet Tozer

Reviewer: Dr. Mal Dissanayake

Created: 07/02/2008

Revised: 02/12/2020

Approval: 02/12/2020

Alternate Delivery: Yes

The Implementation Date for this Outline is 20/05/2022

Copyright©LAKELAND COLLEGE. Email: [admissions@lakelandcollege.ca](mailto:admissions@lakelandcollege.ca)  
2602 - 59 Avenue, Lloydminster, Alberta, Canada T9V 3N7. Ph: 780 871 5700  
5707 College Drive, Vermilion, Alberta, Canada T9X 1K5. Ph: 780 853 8400  
Toll-free in Canada: 1 800 661 6490



## RC 431 Version: 2



### Renewable Energy On-site Lab

#### Calendar Description

A hands-on lab component related to the wind, solar, geothermal, and system measurement and control courses are held at the Vermilion, Alberta campus of Lakeland College. This hands-on lab component is a very important part of the diploma program where students work with the equipment and practice many of the essential skills required.

#### Rationale

Most of the courses in the Sustainable Energy Technology program are offered on-line. Although the on-line format works well for acquiring theoretical and design skills, there remain physical skills that can only be acquired by hands-on activities. This lab-course builds on the content of previous on-line courses by engaging students in practical activities commonly performed by renewable energy practitioners. This tactile experience with actual renewable energy components and systems reinforces the theory learned and completes the educational experience.

#### Prerequisites

RC 320 , RC 321, RC 322, RC 325 and RC 430

This course is a cap-stone practical course and as such requires the noted courses as prerequisites covering the theoretical content without exception.

#### Co-Requisites

None

#### Course Learning Outcomes

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

1. practice safe work practices around electricity, plumbing, structures and mechanical systems.
2. perform a solar site assessment.

3. describe and perform the tasks necessary for maintaining glycol based solar thermal systems.
4. perform basic plumbing tasks such as threaded and sweat fit pipe connections.
5. describe and comply with fall protection regulatory requirements.
6. use test equipment and instrumentation to ensure renewable energy systems are commissioned and working properly.
7. make lab-scale batches of high quality biodiesel from vegetable oil.
8. perform the physical tasks necessary to layout and mount solar collectors on a roof.
9. inspect installed solar photovoltaic and micro wind generator systems for Canadian Electrical Code compliance.
10. inspect and test the operation of an electric geo-exchange heating system.
11. inspect free standing and guy wired towers used for small wind turbines and wind monitoring equipment.

## **Resource Materials**

### ***Required Materials:***

### **What to Bring**

Please bring the following with you.

- A copy of your fall safety certificate – from the ASTEC course you completed after registering for this course.
- Suitable work clothes for outside work – could be warm, raining or cold, clothes (hat) should be tight fitting to not catch on anything. Flame resistant coveralls are helpful for some tasks but not mandated.
- Steel toe work boots. CSA approved, ideally with the  $\Omega$  symbol for electrically non-conductive.
- Work gloves
- Eye protection will be provided, but if you have your favorite safety glasses, please bring them
- Hard hats will be provided when necessary
- Clipboard-type notebook with blank paper for notes
- Calculator

## **Conduct of Course**

This course is offered on-site at Lakeland College's Centre for Sustainable Innovation where students work directly with solar photovoltaic and thermal systems, geo-exchange systems, micro wind turbines, on and off-grid renewable systems, and a combined heat and power unit. Before taking this course students are required to complete an approved on-line fall protection course. RC431 activities are scheduled from 8:00 a.m. to 5:00 p.m. daily for one week. A one-hour break is allowed for lunch each day. Each lab activity requires a morning or afternoon to complete and may require a written submission at the end of the period.

## Evaluation Procedures

There are 13 lab activities as well as completion of a fall-safety course. Students receive marks for the labs completed and are graded based on the quality of the tasks completed which includes attention to safety, professionalism, documentation of work, and following instructions and craftsmanship. In some cases a written submission is required.

Lab Activity	Marks
Complete Fall Safety Training Course	5
LA 1.0 Solar Site Assessment	10
LA 2.0 GeoExchange Conductivity Testing	5
LA 3.0 Solar PV Demo Install Lab	15
LA 4.0 Biodiesel Chemistry Lab	10
LA 5.0 Biomass Gasification Lab	5
LA 6.0 Battery Service Lab	5
LA 7.0 GeoExchange Pipe Fusion Lab	10
LA 8.0 Solar PV Electrical Inspection Lab	5
LA 9.0 Solar PV IV Curve Lab	5
LA 10.0 Solar Thermal Installation Lab	10
LA 11.0 Solar Concentrator Demo Lab	5
LA 12.0 Solar Thermal System Service Lab	5
LA 13.0 System Monitoring and Control Demo	5
	100%

## Grade Equivalents and Course Pass Requirements

*A minimum grade of D (50%) (1.00) is required to pass this course.*

Letter	F	D	D+	C-	C	C+	B-	B	B+	A-	A	A+
Percent Range	0-49	50-52	53-56	57-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100
Points	0.00	1.00	1.30	1.70	2.00	2.30	2.70	3.00	3.30	3.70	4.00	4.00

**Students must maintain a cumulative grade of C (GPA - Grade Point Average of 2.00) in order to qualify to graduate.**

## Attendance

Since this is the main in-person component of the Sustainable Energy Technology diploma program, attendance for all lab activities is mandatory to receive credit for this course.

## Course Units/Topics

1. Workplace and Fall Safety
2. Solar site assessments
3. GeoExchange thermo-conductivity testing
4. Solar photovoltaic system installation techniques and testing
5. Biodiesel chemistry lab
6. Biomass gasifier demonstration
7. Off-grid battery maintenance
8. Plumbing and pipe fusion skills
9. Solar PV inspections
10. Solar PV module characteristics
11. Solar thermal system installation and inspection
12. Solar thermal system maintenance
13. Energy Monitoring and Control Systems



Copyright©LAKELAND COLLEGE.  
2602 - 59 Avenue, Lloydminster, Alberta, Canada T9V 3N7. Ph: 780 871 5700  
5707 College Drive, Vermilion, Alberta, Canada T9X 1K5. Ph: 780 853 8400  
Toll-free in Canada: 1 800 661 6490 E-mail: [admissions@lakelandcollege.ca](mailto:admissions@lakelandcollege.ca)