Design and Implementation of Pilot of a TVET Renewable Energy Course

DELIVERABLE #5 - TRAINING COURSES & PROFESSIONAL DEVELOPMENT

Session 36 (28 October 2022) – Term 2
C 22 – Energy Modeling and Analysis

For Today:

1. Energy Efficiency Courses in 2 year RE EE Program
2. What “success” looks like at program completion
3. Content within context of other ITVET Belize Courses
4. Description of Course 8 in Term 2 of Year 1
5. Development of Course 8

1. Communications Courses in 2 Year Program

2 Year (~32 Course) RE EE Program Overview

1st Year	Term 1	Communi-cations 1 Comm 1	Applied Math 1 Math 1	Intro to Ener. Sci. Ener Sci	PV Applications PV Appl	Elec. and Circuits 1 Elec. Cir. 1	Integrated Lab 1 Int Lab 1
	Term 2	Communi-cations 2 Comm 2	Energy Model. and Analysis Ener M A	Electricity and Circuits 2 Elec. Cir. 2	PV Grid Tied Design PV GT De		Integrated Lab 2 Int Lab 2
	Term 3	Communi-cations 3 Comm 3	Applied Math 2 Math 2	Solar Hot Water Systems Sol H W S	PV Solar Panel Installations PV Instal		Technical Drawing Tec Dwg
2nd Year	Term 4	Audits 1 – Customer Relations Audits 1	Energy Eff. Measure. & Verification E E M V	PV Stand Alone System Design PV SASD	PV Battery Based Installations PV Bat In		Sm. Wind Design & Operation Sm Wind
	Term 5	Projects and Comms 1 Pro Comm	Audits 2 – Load Analysis Audits 2	Econ Analysis of Energy Systems Econ A E S	Elec. Codes and Regulations Elec C A R		Project Planning Proj Plan
	Term 6	Adv. Energy System Design AES Des	Final Project (Classroom) Fin Proj	Bus. Operations & Entrepreneurs. Bus O & E	PV Sys. Maint. & Operation PV M & O		Final Proj. (Lab) Fin Pro

1. Program Overview

Term02: Course Calendar Year 1 Short Term (Jan – Mar) (5 Courses x 10 Weeks)				
240 Hours	Day 1 (Mon)	Day 2 (Tue)	Day 3 (Wed)	Day 4 (Thur)
8:10 – 8:50	C 21: Comm 2	C 22: Ener M A	C 21: Comm 2	C 22: Ener M A
8:50 – 9:30	C 21: Comm 2	C 22: Ener M A	C 21: Comm 2	C 22: Ener M A
9:30 – 10:10	C 21: Comm 2	C 22: Ener M A	C 21: Comm 2	C 22: Ener M A
10:10 – 10:25	15 minutes	15 minutes	15 minutes	15 minutes
10:25 – 11:05	C 23: Elec Cir 2	C 24: PV GT De	C 23: Elec Cir 2	C 25: PV GT De
11:05 – 11:45	C 23: Elec Cir 2	C 24: PV GT De	C 23: Elec Cir 2	C 25: PV GT De
11:45 – 13:00	Lunch & HR	Lunch & HR	Lunch & HR	Lunch & HR
13:00 – 13:40	Lab 1 (2:40)	Lab 1 (2:40)	C 25: PV GT De	C 23: Elec Cir 2
13:40-14:20	C 23: Elec Cir 2	C 24: PV GT De	C 25: PV GT De	C 23: Elec Cir 2
14:20 - 15:00	C23 = 6 Labs	C24 = 10 Labs	C 25: PV GT De	C 23: Elec Cir 2
15:00 - 15:40	C25 = 4 Labs	C25 = 0 Labs	C 25: PV GT De	C 22: Ener M A
C 21: Comm 2	40 hours	10 x 6 CP x 2/3	C 21: Communications 2 (LC 2)	
C 22: Ener M A	46.7 hours	10 x 7 CP x 2/3	C 22: Energy Modeling and Analysis (EE 3)	
C 23: Elec Cir 2	62.7 hours	((10x7 CP) + (6 x 4 LP)) x 2/3	C23: Electricity and Circuits 2 (AS 2) Labs (6 x 4 periods) on Weeks 3, 4, 5, 7, 8, 9	
C 24: PV GT De	80 hours	((10x8 CP) + (10 x 4 LP)) x 2/3	C 24: Grid tied PV Design (PV2) Labs (10 x 4 periods) on Weeks 1 – 10	
C25: Int Lab 2	10.7 hours	(4x4 LP) x 2/3	C 25: Integrated Laboratory 2 (NL 2) Labs (4 x 4 periods) on Weeks 1, 2, 6, 10)	

2. Term 2 Course Introductions

Jan – March (10 Weeks)

1. Communications 2
2. Energy Use, Modelling and Analysis
3. Electricity and Circuits 2
4. Grid Tied Solar Photovoltaic Design
5. Integrated Laboratory

Course 22: Ener. Modelling & Analysis

1. <u>10 Week Term 2, Year 1</u>
   46.7 Classroom hours
   0 New Lab hours
   10 weeks x 7 periods/wk
   3 periods Tue am
   4 periods Thur. am + pm
2. <u>Marking Breakdown</u>
   20% Individual Tests
   30% Individual Projects
   40% Group Projects
   10% Employability Skills

Course 42: Ener. Eff. Measure. & Ver.

1. <u>12 Week Term 4, Year 2</u>
   40 Classroom hours
   0 New Lab hours
   12 weeks x 6 periods/wk
   3 periods Tue am
   3 periods Thur am
2. <u>Marking Breakdown</u>
   20% Individual Tests
   30% Individual Projects
   40% Group Projects
   10% Employability Skills

C 52: Audits 02 – Load Analysis

1. <u>12 Week Term 4, Year 2</u>
   32 Classroom hours
   0 New Lab hours
   10 weeks x 8 periods/wk
   5 periods Tue am & pm
   3 periods Thur pm
2. <u>Marking Breakdown</u>
   20% Individual Tests
   30% Individual Projects
   40% Group Projects
   10% Employability Skills

C 53: Econ. Analysis of Ener. Systems

1. <u>10 Week Term 5, Year 2</u>
   40 Classroom hours
   0 New Lab hours
   10 weeks x 6 periods/wk
   4 periods Tue am & pm
   2 periods Thurs pm
2. <u>Marking Breakdown</u>
   20% Individual Tests
   30% Individual Projects
   40% Group Projects
   10% Employability Skills

2. What does “success” look like?

- Students completing Year 1 (Installer) or 2 Year (Designer) RE EE Program Requirements at their own time and pace
- Students and Industry Qualifications NABCEP, CVQ, etc.
- Instructors with resources, achieving their desired results
- ITVET with resources for scalable, sustainable program
- Skills competently applied to a changing Green Economy
- Belize Employers – competent, adaptable team members

2. What does “success” look like?

For Employers and the “Energy Efficiency” part of Program:

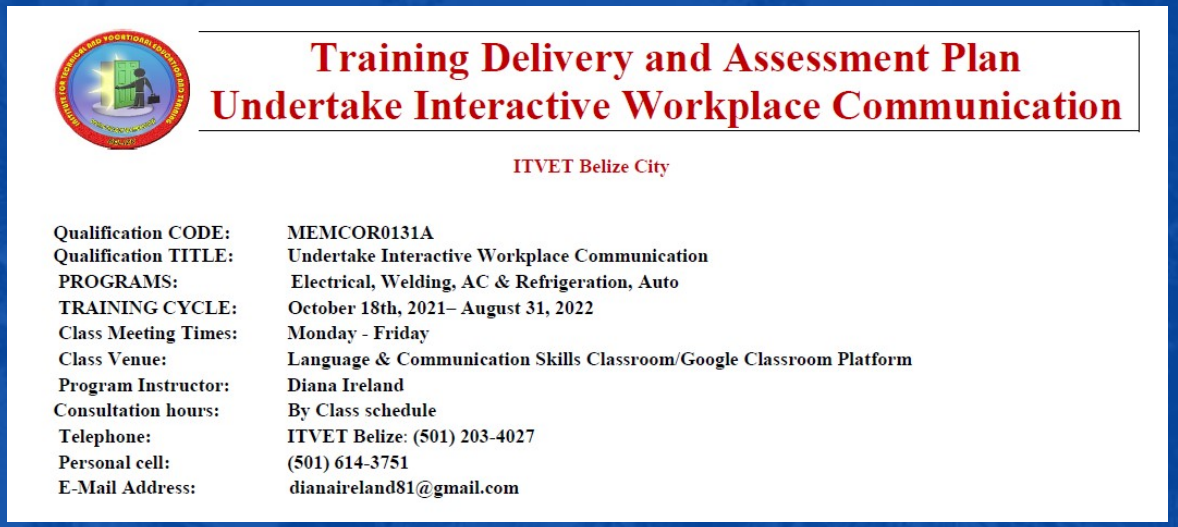
- Apply understanding of energy science to project tasks
- Capacity to model and analyze energy use within systems
- Conduct energy audits – info. gathering and load analysis
- Understand options and communicate recommendations
- Prepare project descriptions, drawings, and reports; proposals, quotes, estimates, amd invoices; as well as maintenance and monitoring reports

3. Content within context of ITVET

- Vision of “energy efficiency” skill sets, experiences, and potential of people completing the new RE EE Program
- ITVET Belize (1 year) Air Conditioning Program
- Some energy efficiency course content may be similar to the AC and other technical programs but differ with
  - Applications presented through assignments and projects
  - Scenarios based on expected potential work place conditions

3. Content within context of ITVET

- 2021 – 2022
- Diana Ireland
- ITVET Belize
- Typical at ITVET?



Training Delivery and Assessment Plan
Undertake Interactive Workplace Communication

ITVET Belize City

Qualification CODE:	MEMCOR0131A
Qualification TITLE:	Undertake Interactive Workplace Communication
PROGRAMS:	Electrical, Welding, AC & Refrigeration, Auto
TRAINING CYCLE:	October 18th, 2021– August 31, 2022
Class Meeting Times:	Monday - Friday
Class Venue:	Language & Communication Skills Classroom/Google Classroom Platform
Program Instructor:	Diana Ireland
Consultation hours:	By Class schedule
Telephone:	ITVET Belize: (501) 203-4027
Personal cell:	(501) 614-3751
E-Mail Address:	dianaireland81@gmail.com

- Training Delivery and Assessment Plan
  - Profile of the Trainee / Portfolio of the Trainee
  - Program Policies & Regulations / Technology Requirements
  - Instructional Methods / Modes (Face to Face and Online)
  - Resources (Technical; Underpinning Knowledge and Skills)
  - Delivery Schedule (week / Instructional Methods (IM)
  - Practical Grading Criteria and Theoretical Grading Criteria

3. Content within context of ITVET

- 2021 – 2022
- Diana Ireland
- ITVET Belize
- Typical at ITVET?

Training Delivery and Assessment Plan
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- Delivery Schedule (Is it equivalent to a Lesson Plan?)
  - For each Week or 2 week period, the Course Outline Topic (e.g. Parts of Speech) and Tasks (e.g. Define, Identify, Use)
  - Instructional Methods (IM) (e.g. Collaborative Discussions)
  - Promotional Action (PA) (e.g. Practice work sheets, games)
  - Assessment Method (e.g. Test 1, Assignment 1, Project 1)
  - Resources (e.g. Textbook, Videos, Worksheet, Powerpoint)

4. Description of Course 22

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4. Description of Course 22

- Energy Use, Modeling and Analysis (Term 2, Year 1)
- 46.7 Classroom Hours as 10 weeks x 7 periods / week
- 3 periods Tue. am and 4 Periods Thursday am + pm

Marking Breakdown

20% Individual Tests

30% Individual Projects

40% Group Projects

10% Employability Skills



4. Description of Course 22

C 22; Energy Use Modelling & Analysis

- Ener M A (in Calendar Table)
- Understand energy consumption in building systems
- Energy use in res. building systems and applications
- Prepare opinions on cooling energy loads using hand calculations and available software models
- Understand typical building designs, common building materials, and their impact on associated comfort
- Identify energy efficient upgrades for existing buildings

4. Description of Course 22

C 22: Energy Use, Modelling and Analysis

Examples of anticipated outcomes after course completion

- Review and make calculated estimates of average and peak loads for types of residential building energy uses
- For a customer's house, consider currently used materials, designs, and habits, and reasonably potential changes
- Make reasonable technical suggestions for improving energy efficiency, and their financial effectiveness

4. Description of Course 22

From Learning Outcomes and Tasks

Task 01

<u>Understand energy consumption in building systems</u>

- Unit conversions
- Conductance, Resistance, Wall Dimensions, Thickness
- Heat, Cool, Lights, Equipment, Industrial use
- Electricity, On-site fossil fuel use, Low carbon sources

4. Description of Course 22

From Learning Outcomes and Tasks

Task 02

<u>Energy use in residential building systems & applications</u>

- BZ Bldg – Concrete, Block, Wood framed upper floors
- WUFI Software – Heat and Moisture Transiency
- Passive House Planning Package (Software)
- RetScreen (Software)

4. Description of Course 22

From Learning Outcomes and Tasks

Task 03

Prepare opinions on cooling energy loads using hand calculations and available software models

- Info. Sources, Working Assumptions, Measurements, Calculations, Conversions. And Uncertainties
- Residential (Belize) Building Scenario
- Commercial (Belize) Building Scenario

4. Description of Course 22

From Learning Outcomes and Tasks

Task 04

<u>Understand typical building designs, common building materials, and their impact on associated comfort</u>

- Belize and North American examples
- Moisture flows, humidity, vapour barriers, temperature
- BuildingScience.com information resources

4. Description of Course 22

From Learning Outcomes and Tasks

Task 05

<u>Identify energy efficient upgrades for existing buildings</u>

- Heating and Cooling
- Lighting
- Cooking
- Plug In equipment

4. Description of Course 22

Marking Breakdown

- 20% Individual Tests
- 30% Individual Projects
- 40% Group Projects
- 10% Employability Skills

4. Description of Course 22

Marking Breakdown

20% Individual Tests (Examples)

- Task 1 Understand Energy Consumption
- Task 5 Identify energy efficient upgrades

4. Description of Course 07

Marking Breakdown

30% Individual Projects (Examples)

- Task 3 Prepare opinions on cooling energy loads
- Task 2 Energy Use in Buildings
  - WUFI Software – Heat and Moisture Transiency
  - Passive House Planning Package (Software)

4. Description of Course 22

Marking Breakdown

40% Group Projects (Examples)

- Task 4 Understand typical building designs
- Task 2 Energy Use in Buildings
  - RetScreen (Software)

4. Description of Course 07

Marking Breakdown

10% Employability Skills (Examples)

- Those used in ITVET Belize communications courses
- Attendance
- Timeliness
- Attention to detail



5. Development of Course 22

Development of Course

From Theory to Practical Application

- Build on 2022 ITVET Belize communications courses
- Build on Course C 13: Energy Science
- Provide “Trade” content to fill the theoretical gaps
- Provide Course 22 Instructor with “Trade” related examples for assignments, projects, and tests
- Winter 2023 “small group” session on Course 22

5. Development of Course 22

Providing Instructor with "Trade" related Course Material Examples

- Locally inspired examples for assignments and tests
- Software Examples
  - WUFI Software – Heat and Moisture Transiency
  - Passive House Planning Package (Software)
  - RetScreen (Software)
-



Summary

Course 22: Energy Modeling

- 46.7 Classroom hours
- 10 Week Term 2, Year 1
- Build on C 13 Energy Science
- Add “Trade” related examples

1. Energy Efficiency Courses in 2 year RE EE Program
2. What does “success” look like at course completion?
3. Content within context of other ITVET Belize Courses
4. Description of Course 22 in Term 2 of Year 1
5. Development of Course 22
   - Share “Trade” related examples in Winter 2023 Sessions

For Today:

C 22: Energy Modelling & Analysis

- Instructor Comments?
- Instructor Discussion?
- Instructor Suggestions?
- "Real World" Applications?

- Session 2 of 2 (December 16, 2022)
  - WUFI Software – Heat and Moisture Transiency
  - Passive House Planning Package (Software)
  - RetScreen (Software)
  - Examples of Assignment, Test, and Project text

Questions?

Comments?

Suggestions?

Thank you