

ITT Technical Institute  
**DT1325T**  
**Sustainability in Design**  
**Onsite and Online Course**

# **SYLLABUS**

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**Credit hours:** 4.5


**Contact/Instructional hours:** 67 (41 Theory Hours, 26 Lab Hours)

**Prerequisite(s) and/or Corequisite(s):**

Prerequisites: DT1230T CAD Methods or equivalent

**Course Description:**

In this course, students investigate the challenges of implementing sustainability in a variety of contexts, from the perspectives of climate change, energy use, natural resource use and ecosystems/land use. Students explore current trends of sustainability as it applies to design, manufacturing and building. Topics include materials, manufacturing techniques, new technologies, renewable resources and product life cycle analysis.



## COURSE SUMMARY

### COURSE DESCRIPTION

In this course, students investigate the challenges of implementing sustainability in a variety of contexts, from the perspectives of climate change, energy use, natural resource use and ecosystems/land use. Students explore current trends of sustainability as it applies to design, manufacturing and building. Topics include materials, manufacturing techniques, new technologies, renewable resources and product life cycle analysis.

### MAJOR INSTRUCTIONAL AREAS

1. Integrated Building Design Process
2. How Sustainable Design Impacts the Environment
3. Historical Development of the Field of Sustainability As Applied in Design
4. Using the Whole Systems Approach to Design Sustainable Projects
5. Current Materials and Production Techniques That Aid in Sustainable Design
6. How a Sustainable Design Project Affects the User and the Environment
7. How a Product Can Make a Building Sustainable Through Product Life Cycle Analysis

### COURSE LEARNING OBJECTIVES

By the end of this course, you should be able to:

1. Describe historical developments and sustainable trends that influence design and the processes that make up the foundations of sustainability.
2. Design a sustainable construction project by using the concept of whole systems thinking.
3. Design a sustainable construction project using a built environment charrette and LEED Criteria for New Construction.
4. Analyze how the placement of building orientation, renewable energy, and HVAC systems impact building operations, energy use, and quality of personal life.
5. Explain how location and transportation are used to determine site selection and how they affect LEED certification.
6. Analyze and apply materials and resources in the design of a green building.

7. Analyze and apply indoor quality of air, light, and views in the design of a green building as specified by the LEED criteria.
8. Analyze and apply water efficiency in sustainable design.
9. Explain the concept of Life Cycle Assessment.
10. Explain the concept of Embodied Energy.

## COURSE OUTLINE

### MODULE 1: INTRODUCTION TO SUSTAINABILITY

#### COURSE LEARNING OBJECTIVES COVERED

- Describe historical developments and sustainable trends that influence design and the processes that make up the foundations of sustainability.
- Design a sustainable construction project by using the concept of whole systems thinking.

#### TOPICS COVERED

- Integrated Building Design
- Energy and Resource Usage in Buildings
- Basic Concept of Green Building

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
<b>Reading:</b> Keeler, M., & Burke, B. Chapter 1.	No	1.5 hr
<b>Lesson:</b> Study the lesson for this module.	No	1.5 hr
<b>Lab:</b> Complete the lab titled “Green Building.”	Yes	N/A
<b>Exercise:</b> Submit the exercise titled “Resource Map.”	Yes	2 hr
<b>Quiz:</b> Prepare for Quiz 1.	No	2 hr
<b>Project:</b> Read and begin the project.	No	2 hr

Total Out-Of-Class Activities: 9 Hours

## MODULE 2: INDOOR ENVIRONMENTAL QUALITY (IEQ) ISSUES

### COURSE LEARNING OBJECTIVES COVERED

- Design a sustainable construction project by using the concept of whole systems thinking.
- Design a sustainable construction project using a built environment charrette and LEED Criteria for New Construction.
- Analyze and apply indoor quality of air, light, and views in the design of a green building as specified by the LEED criteria.

### TOPICS COVERED

- Environmental Factors Impacting Building Design
- IEQ Resource Mapping
- Charrette Collaboration

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
<b>Reading:</b> Keeler, M., & Burke, B. Chapters 7, 8, and 17 (pp. 211–215).	No	4 hr
<b>Reading:</b> ITT Tech Virtual Library> Basic Search> Malmqvist, T. (2008). Environmental rating methods: selecting indoor environmental quality (IEQ) aspects and indicators.	No	2 hr
<b>Lesson:</b> Study the lesson for this module.	No	2 hr
<b>Quiz:</b> Take Quiz 1.	Yes	N/A
<b>Quiz:</b> Prepare for Quiz 2.	No	2 hr
<b>Lab 1:</b> Complete the lab titled “IEQ and Resource Maps.”	Yes	N/A
<b>Lab 2:</b> Complete the lab titled “Building Environment Charrette.”	Yes	2 hr
<b>Project:</b> Continue work on Project Part 1.	No	4 hr

Total Out-Of-Class Activities: 16 Hours

## MODULE 3: SUSTAINABLE AND ENERGY EFFICIENT CONSTRUCTION

### COURSE LEARNING OBJECTIVES COVERED

- Design a sustainable construction project using a built environment charrette and LEED Criteria for New Construction.
- Analyze how the placement of building orientation, renewable energy, and HVAC systems impact building operations, energy use, and quality of personal life.
- Explain how location and transportation are used to determine site selection and how they affect LEED certification.

### TOPICS COVERED

- Energy Use and Standards
- Energy Efficiency and Renewable Energy
- Energy Use Areas in Building
- Sustainable Communities

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
<b>Reading:</b> Keeler, M., & Burke, B. Chapters 9, 10, 11, and 12.	No	4 hr
<b>Reading:</b> ITT Tech Virtual Library> Basic Search> Porrás-Amores, C., Vinas-Arrebola, C., Rodríguez-Sánchez, A., & Villoria-Saez, P. (2014). Assessing the potential use of strategies independent from the architectural design to achieve efficient ventilation: A Spanish case study.	No	2 hr
<b>Lesson:</b> Study the lesson for this module.	No	2 hr
<b>Quiz:</b> Take Quiz 2.	Yes	N/A
<b>Quiz:</b> Prepare for Quiz 3.	No	2 hr
<b>Lab:</b> Complete the lab titled “Energy Standards.”	Yes	N/A
<b>Exercise:</b> Submit the exercise titled “Sustainable Design Processes.”	Yes	3 hr
<b>Project:</b> Submit Project Part 1.	Yes	4 hr

Total Out-Of-Class Activities: 17 Hours

## MODULE 4: RESOURCES USED IN SUSTAINABLE CONSTRUCTION

### COURSE LEARNING OBJECTIVES COVERED

- Analyze and apply materials and resources in the design of a green building.
- Analyze and apply water efficiency in sustainable design.
- Explain the concept of Embodied Energy.

### TOPICS COVERED

- Material Selection for Green Building
- LEED Certification
- Resource Efficiency
- Sustainable Neighborhoods

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
<b>Reading:</b> Keeler, M., & Burke, B. Chapters 13, 14, 15, and 16.	No	7 hr
<b>Reading:</b> ITT Tech Virtual Library> Basic Search> Browse> Browse by Format> Magazines and journals> ProQuest Science Journals> Yohanis, Y. G., & Norton, B. (2006). Including embodied energy considerations at the conceptual stage of building design. <i>Proceedings of the Institution of Mechanical Engineers, 220(3), 271-288.</i>	No	2 hr
<b>Lesson:</b> Study the lesson for this module.	No	1 hr
<b>Quiz:</b> Take Quiz 3.	Yes	N/A
<b>Quiz:</b> Prepare for Quiz 4.	No	2 hr
<b>Lab 1:</b> Complete the lab titled “Sustainable Communities.”	Yes	N/A
<b>Lab 2:</b> Complete the lab titled “Water Efficiency.”	Yes	N/A
<b>Exercise:</b> Submit the exercise titled “LEED Neighborhood Development.”	Yes	N/A
<b>Project:</b> Begin work on Project Part 2.	No	4 hr

Total Out-Of-Class Activities: 16 Hours

## MODULE 5: LIFE CYCLE ASSESSMENT

### COURSE LEARNING OBJECTIVES COVERED

- Explain the concept of Life Cycle Assessment.

### TOPICS COVERED

- International Rating Systems
- Standards and Methodology Used in LCA
- LCA Tools

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
<b>Reading:</b> Keeler, M., & Burke, B. Chapters 18 and 19.	No	5 hr
<b>Reading:</b> ITT Tech Virtual Library> Basic Search> Saunders, C. L., Landis, A. E., Mecca, L. P., Jones, A. K., Schaefer, L. A., & Bilec, M. M. (2013). Analyzing the Practice of Life Cycle Assessment. <i>Journal Of Industrial Ecology</i> .	No	2.5 hr
<b>Lesson:</b> Study the lesson for this module.	No	2 hr
<b>Quiz:</b> Take Quiz 4.	Yes	N/A
<b>Lab:</b> Complete the lab titled “LifeCycle Assessment.”	Yes	N/A
<b>Exercise:</b> Submit the exercise titled “LCA Tools.”	Yes	N/A
<b>Project:</b> Continue work on Project Part 2.	No	4 hr

Total Out-Of-Class Activities: 13.5 Hours



## MODULE 6: PROJECT SUBMISSION AND FINAL EXAM

### COURSE LEARNING OBJECTIVES COVERED

- Describe historical developments and sustainable trends that influence design and the processes that make up the foundations of sustainability.
- Design a sustainable construction project by using the concept of whole systems thinking.
- Design a sustainable construction project using a built environment charrette and LEED Criteria for New Construction.
- Analyze how the placement of building orientation, renewable energy, and HVAC systems impact building operations, energy use, and quality of personal life.
- Explain how location and transportation are used to determine site selection and how they affect LEED certification.
- Analyze and apply materials and resources in the design of a green building.
- Analyze and apply indoor quality of air, light, and views in the design of a green building as specified by the LEED criteria.
- Analyze and apply water efficiency in sustainable design.
- Explain the concept of Life Cycle Assessment.
- Explain the concept of Embodied Energy.

### TOPICS COVERED

- Project Submission
- Final Exam

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
<b>Lesson:</b> Study the lesson for this module.	No	1 hr
<b>Project:</b> Submit Project Part 2.	Yes	4 hr
<b>Final Exam:</b> Prepare for the final exam.	No	5 hr
<b>Final Exam:</b> Take the final exam.	Yes	N/A

Total Out-Of-Class Activities: 10 Hours

## EVALUATION AND GRADING

### EVALUATION CRITERIA

The graded assignments will be evaluated using the following weighted categories:

CATEGORY	WEIGHT
Exercise	15%
Lab	25%
Project	25%
Quiz	15%
Final Exam	20%
TOTAL	100%

### GRADE CONVERSION

The final grades will be calculated from the percentages earned in the course, as follows:

GRADE	PERCENTAGE
A (4.0)	90–100%
B+ (3.5)	85–89%
B (3.0)	80–84%
C+ (2.5)	75–79%
C (2.0)	70–74%
D+ (1.5)	65–69%
D (1.0)	60–64%
F (0.0)	<60%

## LEARNING MATERIALS AND REFERENCES

### REQUIRED RESOURCES

#### COMPLETE TEXTBOOK PACKAGE

- Keeler, M., & Burke, B. (2009). *Fundamentals of Integrated Design for Sustainable Building*. Hoboken, NJ: John Wiley and Sons, Inc.

### RECOMMENDED RESOURCES

- Books and Professional Journals
  - Green Building Journal  
<http://www.greenbuildingpro.com>
  - International Journal of Sustainable Development and World Ecology  
<http://www.tandfonline.com/>
  - Journal of Green Building  
<http://www.collegepublishing.us/journal.htm>
  - Journal of Sustainable Development  
<http://ccsenet.org/journal/index.php/jsd>
  - Sustainability  
<http://www.mdpi.com/journal/sustainability>
  - Sustainability: Science, Practice, & Policy  
<http://sspp.proquest.com>
- ITT Tech Virtual Library (accessed via Student Portal | <https://studentportal.itt-tech.edu>)
  - School of Study> School of Drafting and Design> Recommended Links>
    - Autodesk: Sustainable Design> Sustainable design education> Autodesk Sustainability Workshop> Building Design links.
- Other References
  - Visit the following website to read about LEED:\_  
<http://www.usgbc.org/leed>
  - Visit the following website to read about zero energy buildings:  
<http://zeb.buildinggreen.com/>

- Visit the following website to access the training center used to assist building officials and plan reviewers in understanding requirements:  
<http://www.title24learning.com/>
- Visit the following website to know more about conducting a Climate Analysis utilizing BIM tools:  
<http://sustainabilityworkshop.autodesk.com/buildings/climate-analysis-bim>
- Watch the Conceptual Energy Analysis video using Revit 2013 and Project Vasari to learn more about a conceptual energy analysis using massing models:
  - <https://youtu.be/9CJAOS9Yo2Y>
  - <http://sustainabilityworkshop.autodesk.com/buildings/conceptual-energy-analysis>



## INSTRUCTIONAL METHODS AND TEACHING STRATEGIES

The curriculum employs a variety of instructional methods that support the course objectives while fostering higher cognitive skills. These methods are designed to encourage and engage you in the learning process in order to maximize learning opportunities. The instructional methods include but are not limited to lectures, collaborative learning options, use of technology, and hands-on activities.

To implement the above-mentioned instructional methods, this course uses several teaching strategies, such as case studies and charrette activities. Your progress will be regularly assessed through a variety of assessment tools including labs, quizzes, exercises, a project, and a final exam.

## OUT-OF-CLASS WORK

For purposes of defining an academic credit hour for Title IV funding purposes, ITT Technical Institute considers a quarter credit hour to be the equivalent of: (a) at least 10 clock hours of classroom activities and at least 20 clock hours of outside preparation; (b) at least 20 clock hours of laboratory activities; or (c) at least 30 clock hours of externship, practicum or clinical activities. ITT Technical Institute utilizes a “time-based option” for establishing out-of-class activities which would equate to two hours of out-of-class activities for every one hour of classroom time. The procedure for determining credit hours for Title IV funding purposes is to divide the total number of classroom, laboratory, externship, practicum and clinical hours by the conversion ratios specified above. A clock hour is 50 minutes.

A credit hour is an artificial measurement of the amount of learning that can occur in a program course based on a specified amount of time spent on class activities and student preparation during the program course. In conformity with commonly accepted practice in higher education, ITT Technical Institute has institutionally established and determined that credit hours awarded for coursework in this program course (including out-of-class assignments and learning activities described in the “Course Outline” section of this syllabus) are in accordance with the time-based option for awarding academic credit described in the immediately preceding paragraph.

**ACADEMIC INTEGRITY**

All students must comply with the policies that regulate all forms of academic dishonesty or academic misconduct. For more information on the academic honesty policies, refer to the Student Handbook and the School Catalog.

**INSTRUCTOR DETAILS**

Instructor Name	
Office Hours	
Contact Details	

*(End of Syllabus)*