

COURSE OUTLINE

**Industrial Technology 156  
Advanced Metering Technology**

**I. Catalog Statement**

Industrial Technology 156 is an introduction to Automated Meter Infrastructure (AMI)/Smart Grid technology. This includes increased use of information controls, optimization of grid operations and resources, and use of distributed resources and renewable energy. Additionally included is the development and integration of demand response, energy efficient resources, smart metering, transfer of information to consumers and standards for the communication and interoperability of appliances and equipment connected to the electric grid.

Units – 4.0

Lecture Hours – 3.0

Lab hours – 3.0

(Faculty Laboratory Hours 3.0 + Student Laboratory Hours 0.0 = 3.0 Total Laboratory Hours)

Prerequisite: None

**II. Course Entry Expectations**

Skill Level Ranges: Reading 5; Writing 5; Listening/Speaking 5; Math 3.

**III. Course Exit Standards**

Upon successful completion of the required coursework, the student will be able to:

1. describe metering and metrology concepts;
2. describe real-time response and conservation;
3. explain different methods of data communication;
4. describe home area networks and required devices;
5. explain smart grid functionality and systems;
6. identify laws and regulations regarding Greenhouse Gas;
7. explain the impact of smart grid technology on improving the efficiency of the distribution system.

<b>IV.     <u>Course Content</u></b>	<b>TOTAL CONTACT HOURS = 96</b>
A.     Overview of the Energy Utility Industry	3 hours
1.   Electric	
2.   Gas	
3.   Water	
B.     Basic Concepts of Metering and Metrology	3 hours
C.     Meters, Consumption and the Billing Processes	3 hours
1.   Meter reads	
2.   Validation of the consumption data	
3.   Discussion of the billing process and systems used	
4.   Billing exceptions, special reads, and customer inquiries	
D.     Automated Meter Infrastructure	3 hours
1.   What is AMI?	
2.   Components, technologies, and applications	
E.     Communications Media and Modes	3 hours
1.   Different types of data communications from meter to office	
2.   Modes, equipment, and performance	
F.     Data, Security and the Back Office	2 hours
G.     Home Area Networks and Devices	3 hours
1.   Applications for using AMI data	
2.   Information available and types of conservation programs	
3.   Applications for the homeowner	
4.   Devices required	
H.     Consumer Education and Conservation Programs and Impact on the Environment	3 hours
1.   Types of education and conservation programs possible with AMI data availability	
2.   AMI and the environment	
3.   Laws concerning Greenhouse Gases (GHG)	
4.   AMI and the reduction of GHG	
I.     What is Smart Grid?	3 hours
1.   Explanation of smart grid	
2.   Functionality, devices, and systems	
J.     The Electric Delivery System (from Power Source to Home)	3 hours
1.   Fundamentals of power delivery	
2.   Transmission system	
3.   Distribution system	
K.     Smart Grid Functionality	6 hours
1.   Fundamentals of smart grid functions	
2.   Self healing grid	
3.   Optimizing electric grid performance	
L.     Using AMI to Support the Smart Grid	4 hours
1.   How AMI supports smart grid functions	
2.   Factors to consider, performance, and issues	
M.     Utility Distribution Systems	4 hours

1. Impact of smart grid technology on the distribution system
2. Electric, gas, water
3. Installation, maintenance, and support requirements
- N. Electric and Gas Water Network Operations 4 hours
  1. Outage management
  2. Load analysis
  3. Power quality
- O. Employment Opportunities in Industry 1 hour
  1. Energy and water utilities
  2. Conservation organizations
  3. Manufacturers and service providers
- P. Laboratory 48 hours

**V. Methods of Presentation**

The following instructional methodologies may be used in the course:

1. lecture/discussion;
2. multimedia presentations;
3. demonstration;
4. simulated field work.

**VI. Assignments and Methods of Evaluation**

1. Midterm examination.
2. Final examination.
3. Manipulation Skills Evaluation.

**VII. Textbook**

Strzelecki and Benysek, Power Electronics in Smart Electrical Energy Networks, Current Edition. New York, N.Y.; Springer, 2008.  
10<sup>th</sup> Grade Textbook Reading Level. ISBN 978-1848003170

**VIII. Student Learning Outcomes**

1. Students will describe electric utility metering and metrology concepts.
2. Students will explain different methods of data communication used when monitoring electric meters.
3. Students will explain the functionality of a “Smart Grid,” of home area networks and devices in relation to an electrical grid.
4. Students will explain the impact of smart grid technology on an electrical distribution system.