

SHORT COURSE: ENERGY EFFICIENCY AND AUDIT

Overview

This short course is designed to provide capacity building and training support to energy management professionals for energy auditing to make sure that a core of qualified and certified professionals are available in the market who can assist public/private institutions, industrial and commercial customers in the implementation of cost-effective energy-saving measures.

This course also fits a new professional who is just entering the job market, a student completing studies, or looking to further a career in energy efficiency.

Opportunities

This tailor-made course provides a unique opportunity for considering Energy Efficiency and Demand Side Management (EEDSM) as a strategy for reduction of energy cost for consumers as well as improving the financial condition of the Utilities. Implementation of EEDSM projects is seen as a measure to reduce GHG emission thus making a useful contribution to the Intended Nationally Determined Contributions (INDC) target and as such companies and organizations are embracing the concept. There is a lot of market for energy efficiency projects in the corporate world. Trained participants of the course can carry out market assessment studies for providing policy advisory services to the Governmental bodies including regulators, provide technical services to the consumers for energy audit and project development & implementations services, risk assessment services to bankers, and financing companies for the development of appropriate financing mechanisms and consulting services to global development agencies in design and implementation of Sustainable Energy market transformation programs and projects.

Objectives

The objective of the course is to

- ✓ Expose participants to the principles, systems, codes, and regulations that govern energy efficiency,
- ✓ Gain a well-rounded knowledge of energy management and auditing
- ✓ Understand the basics of how to calculate energy, benchmark, and audit
- ✓ Identify where energy savings can be found in a building or facility
- ✓ Gain knowledge on how to collect data using appropriate energy auditing instruments

Course Outcomes

At the end of the course participants will be able conduct energy audits in a facility and identify energy conservation opportunities for implementation.

Target Audience

- ✓ Professionals interested in a career in energy efficiency
- ✓ Professionals in career transition
- ✓ Professionals seeking to upgrade their skills
- ✓ New graduates
- ✓ Energy management professionals

Course Content

Unit (Volume)	Course	Lesson topic	Lesson Plan
Energy systems equipment and measurement campaign	Energy Systems Equipment	1. Basics of Energy	Energy forms, Energy, work and power, Electricity basics, and Thermal energy basics.
		2. Heating, Ventilating, and Air Conditioning systems	HVAC Basics, HVAC types, heating, and cooling load estimation, vapor compression refrigeration cycle, refrigerants, coefficient of performance. Factors affecting Air conditioning system performance, energy efficiency opportunities in Air-conditioning system. Factors affecting refrigeration, energy efficiency opportunities in a refrigeration system, performances evaluation of chillers and AHUs
		3. Motors and Motor-Driven Systems	Types, losses in induction motors, motor efficiency, factors affecting motor performance, issues of rewinding and motor replacement, energy-efficient motors, motor survey, voltage unbalance, types of starters and soft starters with energy saver, variable speed drives, opportunities for energy efficiency in motors.

		<p>4. Electrical Appliances</p>	<p>Lighting: Light source, choice of lighting, luminance requirements, light-emitting diodes, metal halides, fluorescent tube lights, compact fluorescent lamps; Labelling scheme, electronic ballast; lighting controls: occupancy sensors, daylighting options; Performances evaluation of Lighting system; Energy efficiency opportunities in lighting system Air conditioners: Types, EER, labeling, and energy-saving opportunities</p> <p>Ceiling fans: Selection guide, air volume, and relative efficiency and energy savings opportunities</p> <p>Refrigerators: Market share, performance evaluation, energy-saving opportunities</p> <p>Microwave ovens: Principle, performance evaluation, energy-saving opportunities</p> <p>Kitchen appliances: Tips for energy savings Electric Geysers</p>
		<p>5. Renewable Energy</p>	<p>Concept of renewable energy, solar energy, biomass, and gasifiers, biogas, biofuels, wind energy, hydro, energy from wastes, bio- methanation, tidal, wave.</p>
<p>Energy systems equipment and measurement campaigns</p>	<p>Laboratory courses on measurement</p>	<p>6. Portable instruments for energy audit</p>	<p>Portable Instruments for Energy Audit: Power analyzer, Fyrite, Fuel efficiency monitor, combustion gas analyzer, Manometer with Pitot tube, Anemometer, Contact and Non-Contact Thermometer, Ultrasonic flow meters, speed measurement (tachometer, stroboscope), Psychrometer, Lux meter, Ultrasonic leak detector, Thermography</p>

Investment grade energy audit	Energy audit process	7. ISO 50001, 50002, 14001 & 14002 management processes	ISO 50001: Benefits, how does it work, concepts, key requirements; ISO 50002: Scope, terms, and conditions, audit procedure; ISO 14001: How does it work, benefits, key elements, concept, key requirements.
		8. Walk-through and investment-grade energy audit	Definition of energy audit, types of energy audit, Energy audit approach, benchmarking, energy performance, components and principle of material and energy balance, methods for preparing process flow, material, and energy balance diagrams.
		9. Planning for energy audit	Plan energy audit, define required audit procedures, select the project team, determine appropriate audit level, define pre-audit tasks, define data required for energy analysis, plan a pre-audit interview, communicate procedures and data gathering, identify operations and maintenance team and create pre-audit O&M interview questions, define audit report format and requirements.
		10. Data collection	Define pre-site data collection, collect pre-site data, define on-site data collection, collect on-site data, data harvesting, and analysis, calculate energy savings
		11. Techno Economic Analysis	Calculate payback, evaluate energy management opportunities, financial analysis, perform savings calculations, preparation of PPT presentations and investment grade energy audit reports
		12. Performance evaluation of Buildings	Detailed step wise procedure to conduct performance evaluation of a building with case study

		13. Electrical safety audit	Methodology, contents of safety audit report, lighting protection system evaluation, electrical hazards and control measures, electrical maintenance review and safety measures.
Strategic energy management	Policy and regulatory	14. Energy conservation information system	Methodology for prioritizing SE markets, Information requirement to assess energy conservation status, develop framework for data collection, analysis and assessment of EC status for each product category or SE market, development of key performance indicators for each market /product, ongoing methods for data collection, harvesting and use for decision making
		14. Utility tariffs	Tariff audit, Tariff structure
		15. Energy Scenario, Policy and Regulations in Ghana	Fundamentals of sustainable energy systems, Energy Scenario-Global and Ghana, Current Energy related Policy in Ghana, Role of Energy Commission (EC) and Notifications under the Act, Electricity Supply and Demand, Renewable energy policy in Ghana, Ghana's action plan on climate change, energy strategy for the future
	Financing	16. Risk Analysis and mitigation measures	Need for risk analysis, framework for risk analysis and mitigation measures.
	Energy audit	17. Practical	Practical on how to use the various energy audit instruments