Post Graduate Diploma Program

in

ENERGY MANAGEMENT and AUDIT

JADAVPUR UNIVERSITY
KOLKATA
INDIA

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ENERGY : PROSPECTS AND PROBLEMS

The promotion of worldwide sustainable development, which had its start as a result of a growing awareness, that emerge at the beginning of the past decade, on the effects of uncontrolled economic development over the environment, will continue to be the most important challenge to this century. The major critical issues are to be addressed in order to promote a sustainable development in the world include adequate management of water resources, natural ecosystems and energy resources.

Energy is the central parameter of growth and growth demands energy. It is no wonder that India with an economy expected to grow at over 7-8 percent a year for the next twenty-five years has developed a ravenous appetite for energy.

India is the world's fifth largest consumer of energy, and by 2030 it is expected to become the third largest, overtaking Japan and Russia. The country's demand for oil alone is expected to increase at an average rate of 2.9-3.2 percent annually over the next quarter century. Yet India has only 0.4 percent of the world's proven oil reserves, and domestic production is expected to remain constant, if not decline. Absent the discovery of major reserves, which most analysts view as unrealistic and it is clear that India will remain a net importer of oil. If consumption follows the current trajectory, India is also projected to run out of coal, its primary source of energy, in forty years. Its domestic natural gas reserves are limited as well. India's import dependence has intensified concerns that without reliable, affordable energy it will be unable to sustain high economic growth. India imports (to varying degrees) its three major sources of energy, and its dependence on imported oil is expected to increase even further. The situation is complicated by a number of factors:

- Major oil suppliers are in unstable regions in the Middle East and Africa;
- Oil prices are high, spurring higher gas prices;
- Geopolitical uncertainty stokes fears of a possible
- Supply disruption and volatility in oil prices;
- Slow market reform has limited investment; and
- Few or no viable energy alternatives currently exist:

India's civilian nuclear program has regularly fallen behind schedule and large-scale development of hydroelectricity generation facilities has been stymied. Development of new and renewable energy sources has progressed, but their use is currently limited.

Steady expansion of power sector is essential to balance the future energy demand and supply. The massive expansion in the power sector is becoming more uncertain due to lack of land and water. Thus a major demand on oil sector is inevitable.

Large amount coal production, use, and trade is an important element of the long term energy solution, but many obstacles hinder large-scale adoption in the short term. Coal can make significant contribution if a sizeable amount of steam coal can b developed. Solar, wind, bio-mass and other renewable, although attractive, are not likely to meet the expected demand.

Against this rather pessimistic short-term picture, conservation and proper management in the energy sector emerges as an extremely important energy alternative. The degree of success in achieving greater energy efficiency will largely influence the extent to which one can manage the energy problem successfully. In the short term, our nation must activate demand restraint policies which can reduce our demand to levels below supply availability. The recent Copenhagen Summit the members of all the participating countries to reduce carbon emission which in term implied less hydrocarbon consumption either by enhancing efficiency level or substitute by low carbon energy technologies. Adherence to these targets and the process involved with monitoring and adjustment will help ensure the conservation opportunity in the various sectors.

Over the longer term, short-term demand restraint actions must evolve into long-lasting structural alterations in the way in which energy is used. This will require replacing oil in sectors where substitutes are economically as well as technically viable, such an industry and in electrical generation. It will also have to include meaningful, sustained action that will increase standards of efficiency in the transport, residential, and commercial sectors.

The transition to an energy-efficient economy will not be an easy task. A leader in this process will have to be industry, where 35-40% of all energy is used. There are initial indications that increased prices have provided a stimulus for significant savings. Yet industry is faced with the perplexing problem that the cost of energy in some process, although important, may only be a minute part of the cost of the final product.

The cost trade-offs may lead to accepting higher energy prices rather than re-optimizing the production process under the new circumstances.
More efficient energy use by the industries will not only help cost effectiveness, but will also contribute substantially to improved prospects for the economy. Inaction by industries now can results in oil shortfalls in the coming years, negatively affect the macroeconomic growth over the medium term.
There are challenges for the future and we will have to face the situation and find out the path for survival. It requires proper human resource to overcome the situation. We are really at the beginning to understand the extent to which energy savings can be made in a practical and economic way.

AIM AND SCOPE OF THE COURSE

Demand for the energy sectors is increasing day by day. There is also a sustainable and growing interest in the renewable energy technologies worldwide. In a recent report from the European Commission and World Energy Council indicated that the limited contribution towards electricity generation made at present by renewable will increase substantially over the coming decades. Factors driving this increase are the environmentally benign nature of renewable, and their increasing cost effective ness due to the recent technological advances.
The development and effective integration of energy systems into electricity supply networks of industrial or developing countries poses new challenges, which will require expert knowledge. As a consequence subject of energy science & technology is of increasing interest to the mature students and employment opportunities are expanding day by day. There is now un-serviced demand for graduates with expertise in this area. The purpose of this course is to meet this demand.

Thus the aim of the present course is

- To provide an intensive education and training in the field of Energy Management & Audit to meet the demand of the Nation.
- To integrate this education to backup the industries for energy conservation and to develop consultants for the sake of the industries and service of the Nation.
- To develop the graduate engineers and science post graduates degree holders to cater this specialized inter disciplinary subject to the society.
- Participate in the Certified Energy Manager's & Auditor's Examinations

COURSE STRUCTURE

One year, two semesters evening course will lead to a certificate in Energy Management & Audit is now running at 3rd campus (National Instruments Ltd.) of the University from 6.00 – 9.00 pm in the evening. The program is highly interdisciplinary in nature and requires basic knowledge in Physics, Chemistry and Mathematics is very essential. In addition to these, knowledge in Electrical & Electronics, Chemical and Mechanical engineering will add advantage. These conditions may be full filled by the postgraduate degree holders in the above discipline as well as the graduates in Chemical, Electrical, and Electronics, Mechanical, civil, Architecture and related areas.

SYLLABI & COURSE CONTENT

First Semester

Paper	Code & Nos. of Pds.	Content	Marks
Basics of Energy Conversion and use	I/PGD/EMA/1 60	Forms of Energy, Terms & definitions used in various energy systems**,** Energy – Units & Conversion methodologies**,** Conventional systems & Renewable systems, Details of thermal and electrical energy systems. Use of thermal and electrical energy in industries, service sectors and transportation sectors	100
Economics, Planning & Optimization Methodologies	I/PGD/EMA/2 30	Anatomy of Finance**,** Basic Instrument of Finance debt & equity**,** Financing & Investment Decisions**,** Capital Budgeting**,** Goals objects of Finance function**,** Profit maximization, and Wealth maximization, Details of optimization procedures, computational methods for optimizations.	100
Instrumentations for Energy and Waste Assessment	I/PGD/EMA/3 30	Instruments for thermal, electrical chemical energy assessment, Flue gas analyzer, measurement of waste heat and process for recovery, assessment on excess air, stack temperature, waste-heat-steam generation, assessment of steam and condensate efficiency, load balancing, boiler blow down, condense return, fuel quality, waste heat survey, waste heat exchangers, economics of waste heat recovery	100
Energy Management in process Industries	I/PGD/EMA/4 60	Energy Conservation and the laws of thermodynamics, Process energy conservation, Energy conversion systems in process industries, Energy use in the process industries and saving opportunities, Procedure for plant energy studies in process industries.	100

Second Semester

Paper	Code & Nos. of Pds.	Content	Marks
Energy Auditing and project preparation methodologies	II/PGD/EMA/5 30	Management procedures for energy audit, details of energy audit and identification of energy management opportunities, details of utility energy bill analysis, studies on lighting, heating, ventilation and air-conditioning systems. Project definition and details of preparation methodologies	100
Environment & Pollution Auditing	II/PGD/EMA/6 30	Man made systems and the environment, emission assessment from the energy conversion systems, lifecycle analysis on the plant machineries and process systems, pollution level estimation, pollution control devices and systems, risk and safety aspects of energy systems, carbon auditing and carbon footprint estimation	100
Quality assessment on Energy Conservation	II/PGD/EMA/7 40	Quality of fuel and energy used in industrial systems, correlation between the fuel quality and emission level, thermal and electrical energy conservation opportunities in various sectors, quality assessment of materials and systems used for energy conservation, quality assessment on the performances of heating, cooling, ventilation, refrigeration and air-conditioning systems	100
Measurement & Auditing technique of Energy conversion systems	II/PGD/EMA/8 30	Detailed of plant energy studies, power and energy measurement methodologies at the site, fluid flow measurement, chemical and electrical method for analysis of line gases, Data collection methodologies of various sectors, computation methods for data analysis, evaluation of saving opportunities, preparation of project report on the plant energy studies	100
Internship / Assignment	II/PGD/EMA/I 30		200

Total Marks: 1000
First Semester: 400
Second Semester: 600 [400 + 200 on Internship / Assignment]

FACULTIES & FACILITIES

University has its full fledges four faculty members and supporting staff to run the program. Moreover University will organize the experts from the industries, and other academic institutions in conducting program. The participants may be integrated with the School of Energy Studies where related infrastructures are available.

School of Energy Studies has the following facilities for conducting advanced studies and research and these are;

i. Advanced Materials and Solar Photovoltaic Division
ii. Wind Tunnel Setup for testing wind energy conversion devices
iii. Bio-Energy Laboratory
iv. Building Energy Laboratory
v. Regional Test Center for Solar Thermal Devices

School already received support from Ministry of Human Resource Development, All India Council for Technical Education, University Grants Commission, Department of Science & Technology, Ministry of New and Renewable Energy, Govt. of India, Oil & Natural Gas Corporation Ltd. British Council in the form of research projects, exchange program and infrastructure development. Moreover School has linkage with the industries related to energy activities.

ADMISSION REQUIREMENTS

Essential Qualification for obtaining admission is

a. Master Degree in any of the subject like Physics, Chemistry and Applied Mathematics.
b. Engineering Degree / or equivalent in any of the branches of Architecture, Civil, Electrical, Mechanical, Chemical, Electronics, Instrumentation and related disciplines.

Selection may be made on the basis on basis of Marks in the last examinations & interview

INTAKE CAPACITY

At the present moment minimum will be 10 and maximum 16.

JOB OPPORTUNITIES

Energy Management certificate holders are likely to find assignment in the following areas, which are at presents expanding day by day. Moreover, the course will help the participants in sitting the Energy Auditor's examinations.

- **Industries in general and Energy intensive Industries in particular, which are expanding day by day**
- **Government Department, Energy Agencies and Institutions dealing with forecasts, costs and assessment of technological developments and research funding in the area of Energy & Environment**
- **Consulting Offices in Engineering and Architecture**
- **Independent Developers of Energy Projects**
- **Central & State Electricity Authorities**
- **Bank & Financial Institutions**
- **Colleges, Universities and related Institutions**

FEES STRUCTURE

It is a self-finance course. Thus income generated from the tuition fees of the participants will mate all the expenditure of the course. At the present moment tuition fees per student per year is recommended Rs. 50,000/ (Fifty thousand) per year. This should be deposited in two installments at the University.
The course fees were decided as Rs. 25,000/- per semester with Rs. 260.00 as processing charge at the time of admission and the examination fees as per University rule for both the semesters.

Application form can be downloaded from the website: www.jadavpur.edu and submitted at the office of the Director, School of Energy Studies with a Demand Draft of Rs. 350/- drawn in favor of "JADAVPUR UNIVERSITY" payable at Kolkata as the application enrolment fees.

Last date for submission of Application form: 8th June-2012.