ESE 838 Development and Evaluation of Energy Projects

Description

1. The Master of Energy Systems Engineering (ESE) program is 30-credit graduate degree designed for students who are motivated to take on the challenges facing society in the areas of sustainable energy generation, storage, and conversion. In this program, students will learn about alternative and conventional energy technologies, the societal and environmental impact of technology developments, and the economic benefits of those developments.

ESE-816 "Economic Evaluation of Thermal Energy Projects" course was designed to address the need for training engineering professionals fully capable for working in the field of economic evaluation of energy projects. However, the course was more focused towards thermal energy projects. **Based upon the feedback of students and faculty and to improve the curriculum of the program it has been proposed to revise course content and title of ESE-816 "Economic Evaluation of Thermal Energy Projects" to "Development and Evaluation of Energy Projects" as an elective course for MS Energy Systems Engineering, MS Thermal Energy Engineering and MS Electrical Engineering (Power).**

Objectives

2. Understanding the project cycle is important because of lumpy nature of most energy projects and their wide socio-economic and environmental impacts. Its importance has increased in the era of deregulated and privatized energy industries, and in view of global concern about sustainable development of energy projects. The main objective of this course is to provide a comprehensive understanding of the concepts and methodologies for project identification, project preparation, project evaluation and project financing.

Outcome

3. The students will be able to appreciate the entire scope of energy projects and their appraisal. The logical project design and development sequence of energy sectors projects includes technical aspects, economics, environmental and financial

considerations. Life cycle analysis is an important part of any renewable energy project. The attendees will be able to conceive and design relevant projects in the light of Kyoto Protocol inclusive of CDM credits.

Course Contents

Course Code	Credit Hours (Th-Pr)		Contact Hrs/Week (Th-Pr)	Total Contact Hrs (Th-Pr)
ESE-838	3.0-0	**Development and Evaluation of Energy Projects (Elective)**	3.0-0	45-0

Topics Covered:

No.	Topics	Text Book	Contact Hours
1.	**Introduction to energy projects** 1. Features of energy projects in comparison to other infrastructure projects 2. Project cycle 3. Differentiation of energy projects with respect to scope, size and budget 4. Context of energy projects	PS	4.5
2.	**Project preparation and Development** 1. Project Identification 2. Project proposal preparation 3. Pre-feasibility and Feasibility studies 4. Budgeting 5. Project approval and implementation 6. Institutional processes of project planning in Pakistan	PS	7.5

	7. Different phases of large energy projects in Pakistan (PC1-PCV) 8. Case studies relating to renewable and thermal energy projects		
3.	**Cost concepts and financial calculations** 1. Costs concept 2. Energy projects costs and benefits 3. Interest rate 4. Inflation 5. Depreciation 6. Impact of interest rate, inflation and depreciation on project costs	PS	4.5
4.	**Financial evaluation of projects** 1. Time value of money 2. Interest formulas and equivalence 3. Elements of financial costs 4. Financial structure and project feasibility 5. Revenue streams: Effects of assumptions and pricing 6. Sensitivity analysis	PS	4.5
5.	**Economic evaluation of energy projects** 1. Alternative methods of project evaluation 2. Economic vs. financial evaluation 3. Valuation of costs and benefits 4. Sensitivity analysis and break-even analysis 5. **Economic evaluation of energy projects in developed and developing countries**	PS	4.5

6.	**Environmental Issues in energy projects** 1. Evaluation of environmental impacts 2. Methods of economic evaluation of environmental impacts 3. Effects of environmental regulations in project evaluation	PS	4.5
7.	**Financing of energy projects** 1. Sources of funds and the cost of capital 2. Project financing 3. Raising funds in the international market 4. Financing of energy projects in Pakistan	PS	4
8.	**Risk analysis in project development** 1. Origins of project risk 2. Nature of project risks 3. Methods of describing project risk 4. Measurement of investment worth under risk	PS	4
9.	**Life cycle analysis (LCA) of energy projects** 1. Life cycle cost analysis 2. Other aspects of life cycle analysis 3. LCA applications in energy projects	PS	3
10.	**Development of projects under Clean Development Mechanism** 1. Prerequisites of a CDM project 2. CDM project cycle 3. Estimation of baseline GHG emissions and certified emission reductions	PS	4

	4. Financial Valuation of a CDM project 5. Carbon market and financing issues in CDM projects		

Recommended Books:

S. No.	Title	Author(s)	Assigned Code	Remarks
1.	Contemporary Engineering Economics	Park, C.S	PS	Text
2.	Economic Evaluation of Projects in the Electricity Supply Industry	Khatib, H	KH	Reference
3.	ADB Guidelines for the Economic Analysis of Projects	Asian Development Bank	ADB	Reference
4	*Integrated Energy Development and Economics of Energy Projects*	Heredia, J,	HJ	Reference