

Scandinavian Academy
Training Center

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# Course: Economic & Technical Evaluations in Engineering & Maintenance

| Code | City | hotel | Start | End | price | Language - Hours |
|---|---|---|---|---|---|---|
| MA-362SA | Dammam | Hotel Meeting Room | 2027-11-14 | 2027-11-18 | 12950 SR | En - 25 |

## Introduction

Engineering and maintenance projects call for complex engineering and business tradeoffs with due regard to compliance with regulatory and code requirements. A sound understanding of the key aspects of project objectives, drivers, constraints, and profitability is crucial for the success of a project. Fast-track schedules demand faster, more accurate technical and economic decisions earlier in the design process, when engineers and business managers least understands project costs. Consequently, many process facilities cost more than they should.

Using the appropriate evaluation techniques and skills, engineering and economic decisions can be reached faster, more accurately, and with greater confidence, avoiding costly project delays and potential rework.

In cases where there is competition for resources between several technically viable projects, cost and schedule factors play a key role in ranking the projects based on their profitability. Similarly, costs and schedules have a major impact on the selection of the most cost effective maintenance option from among several alternatives such as repair/replace or long/short term repairs.

The course covers the basics of project development and management. It begins with Project initiation and development phases and progresses through the project execution and control phase. It highlights the cost considerations and the degree of influence on costs in each phase.

Technical viability of a project, whether it involves new facilities or a repair method, must be ensured before the economic evaluation starts. The course presents the

technical fundamentals and provides guidelines and procedures for conducting technical evaluations.

The time value of money and life cycle cost concepts are essential aspects of economic evaluations. These topics will be covered in detail with the use of a number of worked examples.

The course will comprise lectures and workshops that incorporate a number of short exercises to reinforce the key techniques discussed to maximize your benefits. Additionally, an optional “Question and Answer” period will provide you with opportunities to get expert answers on your specific questions.

## Objectives

**To provide you with:**

- A fundamental understanding of financial and accounting principles, terms, techniques, and best practices,
- The tools you need to perform financial evaluations and justify your own project to corporate management, and
- A fundamental understanding of the technical aspects that should be considered in technical evaluations of projects to ensure their technical viability, mechanical integrity and compliance with applicable regulations, codes, and standards.

## Training Methodology

- The course combines presentations and discussions of topics covered with relevant examples.
- It combines sound engineering and economic principles, methods, and best industry practices and enforces the learning’s with Case Studies and Question & Answer workshops to maximize the benefits to the participants. Participants will work in groups to perform practical technical and economic evaluations.
- Participants will be provided with comprehensive course notes and copies of

presentation material that will be very valuable for detailed study and future reference.

## Organizational Impact

- The company will be able to implement fit-for-purpose projects solutions that are both technically sound and cost-effective.
- Technical and financial resources can be allocated to projects based on their ranking and cost effectiveness.
- Heightened business focus among staff will result in operational and financial performance improvement

## Personal Impact

- Participants will enhance their understanding of the time value of money and life cycle cost principles.
- Participants will learn how to perform key project analyses including technical, economic, and environmental evaluations.
- Participants will add to their ability to evaluate the economic and technical impacts of alternative maintenance strategies and methods on maintenance projects and to select the optimum alternative for the specific application while complying with regulatory requirements.
- Participants will gain a working knowledge of the various cost estimating methods and how to prepare timely cost estimates that are fit for purpose.
- Participants will broaden their technical knowledge base and understand the economic impact of their technical decisions leading to increased contributions in project profitability, technical integrity and reduced downtime.
- Participants will enhance their competence and productivity thereby improving their performance level and making additional value added contributions to their organizations.

## Who Should Attend?

The course is pitched to appeal to professionals with a large range of technical and industrial backgrounds and varying levels of experience seeking to broaden their skills and abilities in economic and technical valuation techniques required across industry.

Design, project, maintenance, and plant engineers, supervisors and professionals in the manufacturing, chemical processing, petrochemical, power, food, and other process industries. New graduates will benefit within the short period of two days from the extensive practical experience of the instructor.

## Seminar outline

**Project Initiation and Development**

• Overview
- Definitions of terms used in project development, analysis, and management
- Project types and sizes –
  ▪ Capital projects – Evergreen, expansions/additions, revamps
  ▪ Maintenance projects – Shutdowns; repairs; alterations; replacements and improvements
- Project definition, scope and drivers
  ▪ Project mission and drivers
  ▪ Phase 1: Concept generation – potential ways of achieving project mission
  ▪ Phase 2: Project definition - one option is selected and developed
  ▪ Phase 3: Project implementation – continues through construction to the hand-over of the completed project
- Project Management Process
  ▪ Project Planning
  ▪ Project Scheduling
  ▪ Feasibility study - Is the project feasible? How feasible are the alternatives under consideration; feasibility report
  ▪ Cost, timing, performance, effect of organization
- Key issues in project analysis

• Models of Project Development
- Project evolution and life cycle
- Basic seven phases of a project
- Common three main phases of a project
  ▪ Front End Loading -FEL (or Front End Definition - FEED) which includes development of the entire detailed plan and project approvals
  ▪ Execution Phase - Detailed engineering; procurement, construction
  ▪ Commissioning, Handover and Start-up phase
- Project definition
  ▪ Design Basis Document (DBD) – Development guidelines
  ▪ Implementation strategy – owner involvement
  ▪ Procurement policies, procedures and practices
  ▪ Spare parts policies, procedures and practices
  ▪ Detailed (definitive) cost estimate
- Project development
  ▪ Project Development Plan (PDP) – Preparation Guidelines
  ▪ Conceptual design alternatives
  ▪ Preliminary cost estimates for alternatives
  ▪ Responsibility charting for stakeholders
  ▪ Selection guidelines for final design alternative
  ▪ Preliminary feasibility analysis – technical and economic feasibility
  ▪ Preliminary schedule
- Project execution and control
  ▪ Project Execution Plan (PEP) – How to develop an effective execution plan
  ▪ Coordination and Control Procedures
  ▪ Detailed Schedule
  ▪ Detailed Engineering
  ▪ Safety Process Hazard Analysis
  ▪ Construction - Logistics, work Permits, Safety
  ▪ Quality Control / Quality Assurance
  ▪ Project Change management System
  ▪ Progress Monitoring and reporting
  ▪ Project Management Tools
- Workshop 1 - Key principles and guidelines for successful projects
  ▪ Best practices for project success
  ▪ Common causes of project failures
  ▪ Case study – Anatomy of a project
  ▪ Capturing key learnings

**Technical Evaluation Analysis**

• Project Risk and Contingency Analysis
- Key issues in project analysis
  ▪ Market analysis – Supply and demand
  ▪ Technical analysis – Technical viability; sensible choices
  ▪ Financial analysis – financial viability; return on investment; risk
  ▪ Economic analysis – social cost-benefit
  ▪ Environmental analysis – likely ecological damage; restoration measures/costs
  ▪ Risk analysis – Levels of risk associated with the project
- Analysis of project technical and engineering aspects
  ▪ Purpose of technical analysis
  ▪ Technical viability
    • Design basis
    • Existing and proven technologies
    • New and developmental technologies
    • Regulatory approvals – lead time, resources
    • Risk considerations – obsolescence, continuous technical support,
  ▪ Sensible choices
    • Location
    • Process, equipment, methods, procedures
    • Size - optimal scale of operation
    • Constructability, operability and maintainability
    • Availability of human resources, power, and other inputs
    • Realistic work schedule
- Applicable regulations, codes, standards - design and construction, HSE
- Mechanical integrity, management of change

• Environmental Analysis
- Consideration on environmental aspects
  ▪ What is the likely damage caused by the project to the environment?
  ▪ What is the cost of restoration measures required to ensure that the damage in the environment is contained within acceptable limits?
- Applicable regulations and specifications
- Due diligence

• Project Risk Considerations
- Types of Risks Associated with Projects
  ▪ Market risk
  ▪ Human resource
  ▪ Financial resources
  ▪ Technology risk
  ▪ Management risk
  ▪ Timing
  ▪ Intellectual property right issues
  ▪ Regulation risks
- Risk assessment methods and recommended practices
- Risk Management and Contingency
  ▪ Level of uncertainty in project life cycle
  ▪ Risk analysis and mitigation measures
  ▪ Contingency

• Workshop 2 – Technical Evaluation of Projects
- Case study – Technical evaluation of a capital project

**Economic Evaluation Analysis**

- Objectives of Economic Evaluation Analysis
  - Definitions and overview
  - Typical categories of engineering economic decisions
    - New Product and Product Expansion
    - Equipment and Process Selection
    - Equipment Replacement
    - Cost Reduction
    - Service Improvement
- Economic (Financial) Evaluation
  - Introduction
  - Basic concepts of economic evaluation
  - Economic evaluation methods – static and dynamic
    - Simple payback
    - Benefit-cost ratio (BCR)
    - Net Present Value (NPV)
    - Internal rate of return (IRR)
  - Capital equivalent of energy and maintenance savings
- Principles of Time Value of Money and the Discount Rate
  - Discounted cash flow (DCF) calculation - Definitions and premises
  - Project Cash Flow Components
  - Discounting and time-value considerations
  - Distinguishing cash flow and other measures of profitability
  - Cost of capital and inflation issues
  - Capital budgeting techniques and best practices
  - Methods of computing time-value of money
    - The algebraic (or formula) method
    - The financial table method
    - The financial calculator method
- Methods of Ranking Investment Proposals
  - Non-Discounted Cash Flow Methods
    - Payback method (or Payback Period)
    - Accounting rate of return (ARR)
  - Discounted Cash Flow Methods
    - Net Present Value Method (NPV)
    - Internal rate of return (IRR)
  - Profitability index (PI)
- Workshop 3 – Economic Evaluation of Projects
  - Case study – Economic evaluation of a capital project

**Business Focused Facilities**

- Business-Focused Facilities (BFF)
  - Economic interpretation of engineering work
  - Fundamental BFF principles
    - Total cost (full cycle) perspective
    - Common and clear goals
    - Adaptive process and change management
    - Teamwork
    - Continuous improvement
- Life-Cycle (Total) Cost Analysis
  - Basics of life cycle cost (LCC) analysis
  - LCC Models - SAE model
  - Life-cycle management (value management)
    - Renewal/replacement intervals,
    - Servicing costs,
    - Failure consequences,
    - Asset redundancy,
    - Maintenance strategies,
    - Energy efficiency,
    - Design life service factor
- Effective Life-Cycle Management Tools
  - Engineering economics
  - Remaining life estimates
  - Statistical analysis,
  - Opportunity costing
  - LCC Calculation Procedures
- Project Cost Estimating
  - Types of estimates, accuracy
  - Estimating methods
  - Cost indices and economic indicators
  - Direct and indirect costs
  - Computer based estimating
- Equipment Sizing and Costs
  - Power Sizing Model
  - Rough estimates
  - Semi-detailed estimates
  - Detailed estimates
- Workshop 4 – Cost Estimating
  - Case studies – Project cost estimates using different methods

**Evaluation of Maintenance Projects**

- Types of Maintenance Projects
  - Complete turnarounds – extent, frequency
  - Opportunistic minor turnarounds
  - Specialized repair methods
  - Replacement in kind and improvement opportunities
  - Specialized Inspection projects – Application and frequency
- Concept of Component Life
  - Introduction
  - Physical life
  - Economic life
  - Technical life – technical obsolescence
- Technical Evaluation of Maintenance Projects
  - Key project characteristics and special requirements
    - Significance of schedule and maintainability – optimum cost or least downtime
    - Availability of human resources
    - Constructability considerations
  - Fitness-for-service assessments (FFS
    - Basics of FFS
    - Run/repair/replace decisions
  - Alternative repair strategies and methods
    - Temporary repairs
    - Permanent repairs
    - Alternate repair technologies and procedures
  - Management of change
    - Basics of management of change
    - Impact of maintenance projects on mechanical integrity and reliability
    - Regulatory, codes and standards requirements
- Workshop 5 – Evaluation of Maintenance Projects

**The Scandinavian Academy for Training Center** adopts the latest scientific and professional methodologies in training and human resource development, aiming to enhance the efficiency of individuals and organizations. Training programs are delivered through a comprehensive approach that includes:

- Theoretical lectures supported by PowerPoint presentations and visual materials (videos and short films).
- Scientific evaluation of participants before and after the program to measure progress and knowledge acquisition.
- Brainstorming sessions and practical role-playing to simulate real-life scenarios.
- Case studies tailored to align with the training content and participants work nature.
- Assessment tests conducted at the end of the program to evaluate the achievement of training objectives.

Each participant receives the training material (both theoretical and practical) in printed form and saved on a CD or flash drive. Detailed reports, including attendance records, final results, and overall program evaluations, are also provided.

Training materials are prepared professionally by a team of experts and specialists in various fields. At the end of the program, participants are awarded a professional attendance certificate, signed and accredited by the Scandinavian Academy for Training Center.

**Program Timings:  9:00 AM to 2:00 PM**

**The program includes:**

- A daily buffet provided during the sessions to ensure participants comfort.
- A closing ceremony on the final day to distribute certificates and celebrate participants achievements.
- **Note: All prices are exclusive of 15% Value Added Tax (VAT).**

# Our Success Partners

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