

Assignment 1
ECO-132 Engineering Economics
Economics vs. Engineering
Economics:

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A Comprehensive Guide

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Introduction

When we think about making decisions in our daily lives or in business, we're often dealing with economic questions. But did you know that there are different ways to approach these questions depending on the context? Economics and Engineering Economics are two related but distinct fields that help us make better decisions about resources, money, and projects. While they share some common ground, they serve different purposes and use different tools. Let's explore what makes each field unique and how they complement each other.

1 What is Economics?

Economics is the broad social science that studies how societies make choices about producing, distributing, and consuming goods and services when resources are limited. It examines everything from individual consumer behavior to national and global market trends. Economics tries to answer fundamental questions like: What should be produced? How should it be produced? Who gets what is produced?

Authoritative Definition #1:

Paul A. Samuelson and William D. Nordhaus define economics as:

"Economics is the study of how societies use scarce resources to produce valuable commodities and distribute them among different people."

Source: Samuelson, P. A., & Nordhaus, W. D. (1998). *Economics* (16th ed.). McGraw-Hill.

Economics can be divided into two main branches: **Microeconomics**, which looks at individual consumers and businesses, and **Macroeconomics**, which examines entire economies including topics like inflation, unemployment, and economic growth. Economists study market forces, government policies, international trade, and how people respond to incentives. The field is both theoretical and empirical, using mathematical models and real-world data to understand economic behavior.

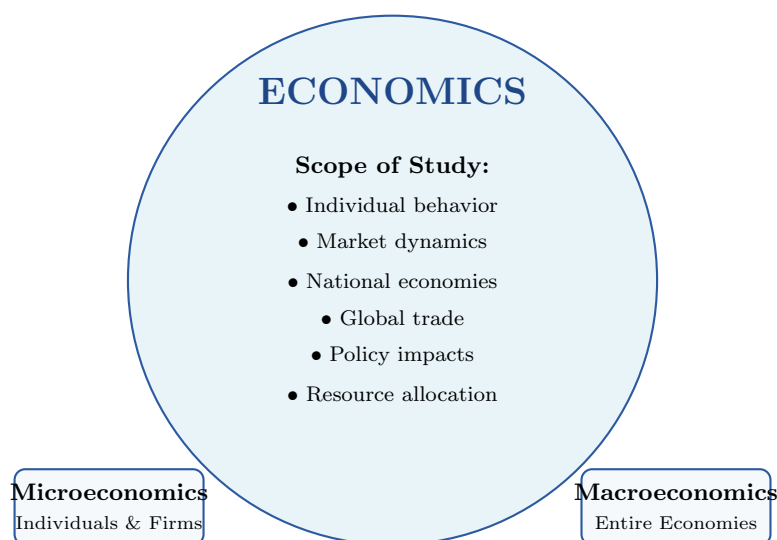


Figure 1: The Broad Scope of Economics

2 What is Engineering Economics?

Engineering Economics, on the other hand, is a specialized subset of economics that focuses specifically on making financial decisions for engineering projects and technical investments. It's all about evaluating the economic viability of different engineering alternatives. When an engineer needs to decide between two different machines, determine if a project is worth pursuing, or figure out the best time to replace equipment, they turn to engineering economics.

Authoritative Definition #2:

According to academic literature and the Institute of Industrial Engineers:

“Engineering economics is a subset of economics concerned with the use and application of economic principles in the analysis of engineering decisions. It is focused on the branch of economics known as microeconomics in that it studies the behavior of individuals and firms in making decisions regarding the allocation of limited resources.”

Source: Engineering Economics literature and Wikipedia

Engineering Economics is highly practical and forward-looking. It emphasizes the **time value of money** — the concept that money today is worth more than the same amount in the future. Engineers use specific mathematical formulas and techniques like Net Present Value (NPV), Internal Rate of Return (IRR), and payback period analysis to compare different project alternatives. The field considers factors like depreciation, taxes, inflation, and risk when evaluating capital investments.

Engineering Economics Decision Process

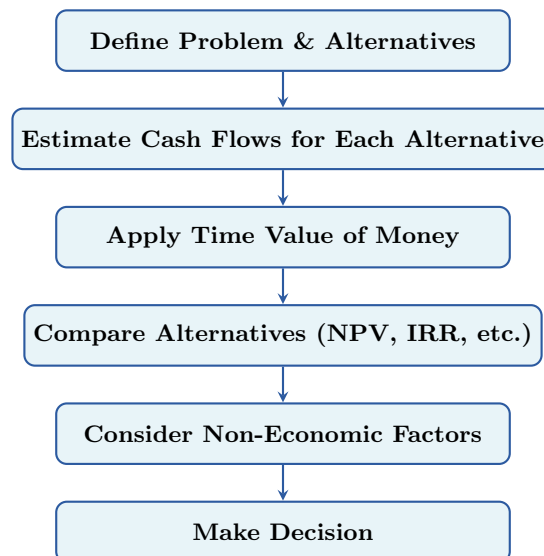


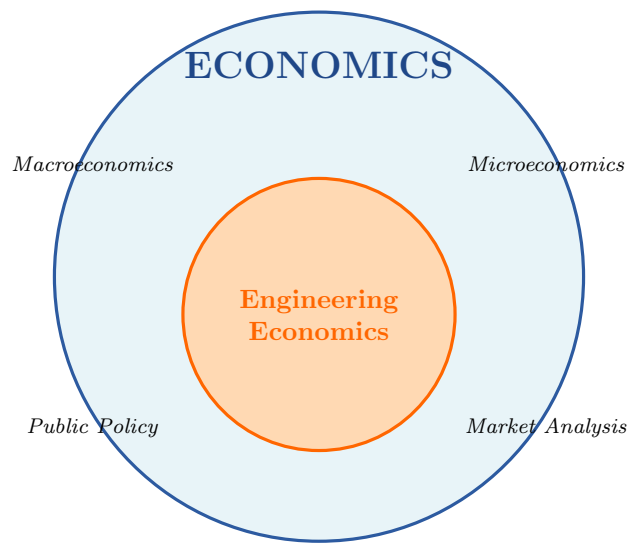
Figure 2: Systematic Approach in Engineering Economics

3 Key Differences Between Economics and Engineering Economics

Table 1: Comprehensive Comparison of Economics and Engineering Economics

Aspect	Economics	Engineering Economics
Scope	Broad — entire economies, markets, and societies	Narrow — specific engineering projects and investments
Primary Focus	Understanding how economies function and allocate resources	Making optimal financial decisions for technical projects
Time Horizon	Both short-term and long-term economic trends	Project-specific timeframes (typically 5–30 years)
Key Concepts	Supply & demand, inflation, unemployment, GDP, market structures	Time value of money, NPV, IRR, depreciation, capital budgeting
Users	Policymakers, economists, business strategists, researchers	Engineers, project managers, technical decision-makers
Approach	Theoretical and empirical analysis of economic behavior	Practical application of economic principles to technical choices
Decision Context	Policy decisions, market analysis, economic forecasting	Equipment selection, project feasibility, replacement analysis

As you can see from Table 1, while both fields deal with economic questions, they operate at different levels of specificity. Economics casts a wide net, examining everything from individual purchasing decisions to international trade policies. Engineering Economics, by contrast, zooms in on the financial aspects of technical projects, providing engineers with the tools they need to justify investments and choose between competing alternatives.



Engineering Economics is a specialized application of economic principles to technical decision-making

Figure 3: How Engineering Economics Relates to Economics

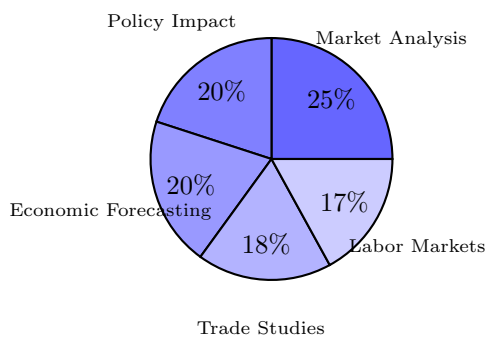
4 Real-World Applications and Examples

4.1 Economics in Action:

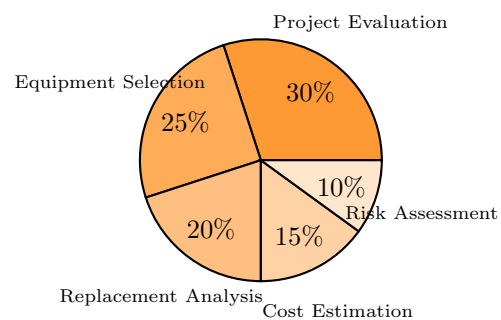
1. **Example 1:** A government economist analyzes how raising the minimum wage might affect employment levels, consumer spending, and overall economic growth. They study labor market data, inflation trends, and compare outcomes from other countries.
2. **Example 2:** A central bank uses economic models to decide whether to raise or lower interest rates, considering factors like inflation, unemployment, and GDP growth to maintain economic stability.
3. **Example 3:** A market researcher examines how changes in consumer preferences affect demand for electric vehicles, studying pricing elasticity and market competition.

4.2 Engineering Economics in Action:

1. **Example 1:** A manufacturing plant needs to choose between two machines. Machine A costs \$50,000 with annual operating costs of \$8,000, while Machine B costs \$75,000 with annual operating costs of \$5,000. Using engineering economics methods (NPV analysis with a 10% discount rate over 10 years), the engineer determines which investment provides better value.
2. **Example 2:** A civil engineer evaluates whether to build a new highway or expand an existing one. They calculate the present value of construction costs, maintenance expenses, and expected benefits over 25 years, including factors like toll revenues and reduced traffic congestion.
3. **Example 3:** A company must decide when to replace aging equipment. Using engineering economics techniques, they analyze the trade-off between increasing maintenance costs and the capital investment required for new equipment.



(a) Economics: Typical Focus Areas



(b) Engineering Economics: Typical Focus Areas

Figure 4: Typical Application Areas

5 Why Both Fields Matter

Understanding both economics and engineering economics is valuable because they complement each other. Economics provides the broader context — understanding market conditions, economic trends, and policy environments that affect all business decisions. Engineering economics takes those principles and applies them with precision to specific technical choices.

For instance, an economist might predict that interest rates will rise next year based on inflation trends. An engineering economist would then use that prediction to adjust their discount rate when evaluating a long-term infrastructure project, potentially changing which alternative appears most economical.

Both fields share common ground in their emphasis on rational decision-making, efficient resource allocation, and the recognition that resources are scarce and must be used wisely. However, they differ in scale, specificity, and application. Economics helps us understand the forest; engineering economics helps us choose the best trees.

6 Conclusion

In summary, economics is the comprehensive study of how societies manage scarce resources, encompassing everything from individual choices to global trade patterns. Engineering economics is a focused application of economic principles to evaluate and compare technical alternatives for engineering projects. While economics provides the theoretical framework and broad understanding of economic systems, engineering economics offers the practical tools that engineers need to make sound financial decisions about projects, equipment, and investments.

Both disciplines are essential in today's complex world. Economists shape policy and help us understand market dynamics, while engineering economists ensure that technical projects are not just technically sound but also financially viable. Together, they help organizations and societies make better decisions about how to use their limited resources to maximum effect.

References

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