

10.2 Engineering Economics

Engineering economics is a specialized branch of economics that applies economic principles to engineering decision-making. It helps engineers evaluate the financial feasibility of projects, optimize resource allocation, and assess the long-term economic impact of technical solutions. One of the fundamental aspects of engineering economics is understanding project cash flow, which involves analyzing the inflow and outflow of money over a project's duration. A positive cash flow indicates that a project is financially sustainable, while a negative cash flow may suggest the need for financial restructuring.

The discount rate, interest, and time value of money are essential concepts in engineering economics. The discount rate is the rate used to convert future cash flows into present value, considering factors like inflation and opportunity cost. Interest represents the cost of borrowing money or the return on investment, and it can be categorized into simple interest, where interest is calculated on the principal amount, and compound interest, where interest is accrued on both the principal and accumulated interest over time. The time value of money states that a certain amount of money today is worth more than the same amount in the future due to its potential earning capacity.

Several methodologies are used for economic analysis in engineering projects. The discounted payback period measures the time required to recover the initial investment while considering the time value of money. The net present value (NPV) method calculates the total present worth of future cash flows, determining whether a project is financially viable. A positive NPV indicates profitability, while a negative NPV suggests a loss. The internal rate of return (IRR) is the discount rate at which the NPV of a project becomes zero, serving as a useful metric for comparing different investment opportunities. The minimum attractive rate of return (MARR) is the lowest rate of return that an investor or organization is willing to accept for a project to be considered viable.

Comparison of alternatives involves selecting the best project or investment option based on financial, technical, and operational criteria. This process includes cost-benefit analysis, life cycle cost analysis, and break-even analysis. Depreciation is another critical factor in engineering economics, representing the reduction in value of assets over time. Various depreciation methods, such as straight-line depreciation, declining balance depreciation, and sum-of-the-years' digits, are used to calculate asset depreciation in Nepal. The taxation system in Nepal includes income tax, corporate tax, and value-added tax (VAT), all of which impact project budgeting and financial planning.