GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2023-2024

Engineering Economy (E076951)

Course size *(nominal values; actual values may depend on programme)*

Credits 6.0 **Study time 180 h**

Course offerings in academic year 2023-2024

A (semester 1)	English	Gent
B (semester 1)	Dutch	Gent

Lecturers in academic year 2023-2024

Verbrugge, Sofie	TW05	lecturer-in-charge

Offered in the following programmes in 2023-2024	**crdts**	**offering**
Bridging Programme Master of Science in Industrial Engineering and Operations Research(main subject Manufacturing and Supply Chain Engineering)	6	A
Bridging Programme Master of Science in Industrial Engineering and Operations Research(main subject Transport and Mobility Engineering)	6	A
Master of Science in Electrical Engineering (main subject Communication and Information Technology)	6	A
Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)	6	A
Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)	6	A
Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)	6	A
Master of Science in Industrial Engineering and Operations Research(main subject Manufacturing and Supply Chain Engineering)	6	A
Master of Science in Electromechanical Engineering(main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering(main subject Mechanical Construction)	6	A
Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)	6	A
Master of Science in Industrial Engineering and Operations Research(main subject Sustainable Mobility Analytics)	6	A
Master of Science in Industrial Engineering and Operations Research(main subject Transport and Mobility Engineering)	6	A
Master of Science in Chemical Engineering	6	A, B
Master of Science in Chemical Engineering	6	A
Master of Science in Civil Engineering	6	A
Master of Science in Civil Engineering	6	A
Master of Science in Computer Science Engineering	6	A
Master of Science in Engineering Physics	6	A
Master of Science in Engineering Physics	6	A
Master of Science in Fire Safety Engineering	6	A
Master of Science in Industrial Engineering and Operations Research	6	B
Master of Science in Materials Engineering	6	A
Master of Science in Photonics Engineering	6	A
Master of Science in Sustainable Materials Engineering	6	A
Exchange programme in Economics and Business Administration	6	A

Teaching languages

English, Dutch

Keywords

Decision making, management and cost accounting, time value of money, investment decisions, uncertainty, private and public sector investments

Position of the course

This course in an introductory course in the master's programme in engineering. The aim of the course is to provide students with basic terminology, methodology and practical skills in the domain of engineering economy. Eventually, students should be able complement technological projects with an economic analysis in order to assess the techno-economic feasibility of these projects.

Contents

Theory part

Module 1 - cost models and cost accounting

Cost concepts

- Fixed versus variable costs
- Direct and indirect costs
- Marginal costs

Cost estimation techniques

- Work breakdown structure
- Cost and revenue classification
- Cost estimation techniques: indexes, unit and factor techniques
- Parametric cost estimating: power-sizing (economies of scale), learning curve

Cost accounting versus financial accounting

Management and cost accounting

- Standard costing (costs of goods sold, COGS)
- Activity-based costing
- Marginal costing (cost-volume–profit relationships)
- Break even and profitability analysis

Cost allocation techniques

- Purposes of cost allocation
- Incremental, stand-alone and fully allocated costs
- Cost allocation of joint costs

Module 2 – investment analysis

Time value of money

- Simple Interest and Compound Interest
- Nominal and Effective Interest Rates
- Equivalence for repeated cash flows

Investment evaluation methods for a single project

Minimum Attractive Rate of Return (MARR)

Present Worth, Future Worth, Annual Worth Method

The Internal Rate of Return Method

Payback Period

Investment evaluation methods for multiple projects

- Study period and useful life
- Comparison and Selection among Alternatives
- Comparing mutually exclusive alternatives

Replacement Analysis

- Repeatability versus co-termination

Module 3 – Uncertainty, public projects and business models

Economic Analysis in the Public sector

- Perspective and Terminology for Analyzing Public Projects
- The Benefit–Cost Ratio Method

Analysis under uncertainty

- Breakeven and Sensitivity analysis
- Risk versus return
- Simulation
- Real options

Business models for technical products and services

- Value proposition design
- Identification of customer segments
- Osterwalder Business model canvas
- Unbundled business models
- Multi-sided platforms

Practical part

Discussion of realistic cases in interactive case sessions
Online exercises in order to practice application of main concepts
Use of spreadsheet support (Excel) throughout the entire course

Initial competences

No formal requirements.

Final competences

1 Classify cost and benefits linked to engineering projects
2 Explain the purposes and main principles of management and cost accounting
3 Substantiate an investment decision for an engineering project, in the private as well as the public sector
4 Evaluate the impact of risk and uncertainty of economic parameters on a decision-making process for technological projects
5 Reason about suitable business models for technical products and services
6 Develop a spreadsheet model in order to compare different engineering alternatives from an economic perspective
7 Have the attitude to reason about real-life engineering economic projects

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture, Independent work

Extra information on the teaching methods

Cursus offered using blended learning principles. Slides, knowledge clips and learning exercises are offered via electronic learning platform Ufora and studied by the students independently in the first two weeks of every module. The course responsible is available for Q&A via Ufora Discussion Forum as well as weekly office hours. In the third week of the module the concepts are applied in realistic case in an interactive case session in class. At the end of each module there is a booster session pointing to the major concepts and encountered difficulties in this module.

Learning materials and price

- Essential course material: slides, knowledge clips and handouts, learning exercises
- Additional material: elaborated examples, articles, videos, websites
- William G. Sullivan, Elin M. Wicks, C. Patrick Koelling, Engineering Economy, 16th Edition, 2014, ISBN: 978-0133439274

References

- Alnoor Bhimani, Charles T. Horngren, Srikant Datar, Madhav Rajan, Management and Cost Accounting, Pearson, 6th edition, 2015, ISBN: 978-1292063461.
- Colin Drury, Management and Cost Accounting, Cengage Learning EMEA, 9th edition, 2015, ISBN: 978- 1408093931.
- Donald G Newman, Jerome P. Lavelle, Ted G. Eschenbach, Engineering Economic Analysis, Oxford University Press, International 12th edition, 2016, ISBN: 978-0199339280.
- Ronald A. Chadderton, Purposeful Engineering Economics, Springer, 2015, ISBN: 978-3319188478
- Alex Osterwalder, Yves Pigneur, Greg Bernarda, Alan Smith, Value Proposition Design, Wiley, 2014, ISBN: 978-1-118-96805-5
- Alex Osterwalder and Yves Pigneur, Business Model Generation, Wiley, 2010, ISBN: 978-0470-87641-1

Course content-related study coaching

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment

Examination methods in case of periodic assessment during the second examination period

Written assessment

Examination methods in case of permanent assessment

Written assessment with multiple-choice questions, Participation

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

Examination methods in case of continuous evaluation: online quizzes and participation in case sessions.

Calculation of the examination mark

Combination of continuous evaluation (online quizzes and participation in case sessions.) and periodic evaluation (exam).
Continuous evaluation amounts to 25% of the final examination mark. The exam for the remaining 75%. Participation in all course parts is required in order to be able to pass the course.
When calculating the final score after the retake exam, attendance to case sessions is no longer taken into account.

Facilities for Working Students

Case sessions can be replaced by an individual project