



# Master of Science in Technology, Industrial Systems Analytics (ISA)

The Master's Programme in Industrial Systems Analytics (ISA) is a modular education programme built on strong mathematical and technical foundation. The programme contains various industrial engineering modules that focus on different aspects of energy systems, and allow for tailored education solutions for individuals who target diverse technologically demanding tasks in the surrounding energy cluster technology companies.

The Master's Programme in Industrial Systems Analytics provides content, models and methods within the field of industrial engineering to design, develop, implement and operate complex processes and systems in the energy sector organizations. Energy systems are complex systems that require a holistic understanding and thus multiple perspectives of research and education. Energy systems can be seen as socio-technical systems, and the new ISA programme is built from Technology, Organization and People perspectives (TOP). Systems dynamics and systems thinking are the connecting elements necessary for the programme. It is important to understand how the technology and people are organized to achieve the goals.

The programme prepares the students to develop and manage product and service innovation for industrial energy systems, delivery and use. The courses consist of lectures, teamwork assignments, projects, presentations and final exams.

The general objectives of the Master's Programme are:

- To provide up-to-date and high quality education in industrial systems design and analytics
- To provide competent work force for the Ostrobothnia region energy companies
- To educate students to have such technical industrial and systems engineering skills and competence required by today's diverse and demanding industrial work.
- To strengthen the ties between the School of Technology and Innovations and energy sector companies in the region
- To attract competent students to the new programme
- To strengthen ties with international academics and industrial partners
- To teach Finnish language to international students so they can better get employed to energy sector companies in the region; Finnish language courses, optional projects in Finnish on courses

## Learning outcomes

Depending on the major modules chosen, a student who has completed Master's Degree in Industrial Systems Analytics will be able to

- produce knowledge and insights from energy system data
- develop and operate high quality standard for energy operations
- design and operate successful energy systems
- include quantitative and qualitative input streams for decision making
- plan and manage projects in energy field

**MASTER OF SCIENCE (TECHNOLOGY),  
MASTER'S PROGRAMME IN INDUSTRIAL SYSTEMS ANALYTICS  
120 ECTS**

Head of Programme: Ari Sivula

**COMPLEMENTARY STUDIES 20-21 ECTS**

OPIS0039	Personal Study Plan	0
OPIS0025	Searching for Scientific Information 1 (former Information Skills I, if not completed in earlier University of Vaasa studies)	1
KENG9212	Writing Academic English	5
KSUO5111	Finnish for Foreigners I 5 ECTS or an optional language course for native Finnish speakers	5

**Method Studies 10 ECTS**

*Choose courses in mathematics, statistics and physics worth of 10 ECTS, for example:*

MATH1170	Probability and Statistics	5
MATH2020	Discrete Mathematics (self-study, book exam)	5
ORMS1020	Operations Research (in English every second year)	5
STAT1010	Statistical Analysis of Contingency and Regression	5
STAT2020	Econometrics I	5
STAT3130	Mathematical Statistics (self-study, book exam)	5
STAT3120	Probability and Stochastics Processes	5

**TECHNOLOGY STUDIES 20 ECTS**

SATE2020	Energy Production	5
----------	-------------------	---

*This course is compulsory unless completed in Bachelor's degree / previous studies. If so, choose another technology course instead.*

*Choose enough courses to reach 20 ECTS*

ICAT3090	Fuzzy Systems	5
ICAT3180	Applied Signal Processing	5
ICAT3030	Computer Simulations	5
SATE3130	Smart Grid Communication	6
SATE3090	Uusiutuivat energialähteet	6
TUTA3230	Product and Service Design in Practice	5
TUTA2230	Innovative Product Development and Product Lifecycle Management	5
TUTA3050	Advanced Course in Quality and Reliability Management	5
ICAT3020	C and Embedded C Programming	3
ICAT3190	Special Topics in ICT and Automation	1-5

**INDUSTRIAL PROJECT WORK 5-10 ECTS**

During the 2nd year of studies, the students will learn project work in real industrial / organizational settings. They will learn to work in teams having members from industry and university, and they will learn to apply the content of industrial systems analytics courses in real case.

ISAN3030	Industrial Project Work	5-10
----------	-------------------------	------

**MODULES IN MAJOR STUDIES 30 ECTS**

*Choose two modules (2 x 15 ECTS)*

**Project Module 15 ECTS**

JOHT3019	Project Management	5
ISAN3040	Project Portfolio Management	5
ISAN3010	Analytics in Project Management	5

**Systems Module 15 ECTS**

ISAN3070	Systems Engineering	5
ICAT3060	Energy Chains Optimisation	5
ISAN3020	Architecture of Complex Systems	5

**Analytics Module 15 ECTS**

ICAT3120	Machine Learning	5
STAT3140	Applied Multivariate Analysis	5
STAT3120	Probability and Stochastic Processes	5

**Service Module 15 ECTS**

STAT3150	R Programming	5
ISAN3060	Lean Six Sigma Statistical Control	5
ISAN3050	Service Design	5

**MASTER'S THESIS AND MATURITY EXAM 30 ECTS**

ISAN3995	Research Plan and Presentation	10
ISAN3996	Master's Thesis	20
ISAN3991	Master's Thesis Presentation	0
KNÄY300X	Maturity Exam	0

**OPTIONAL STUDIES 9-15 ECTS**

*Choose other university courses to complete the degree (120 ECTS) according to your interests.*

*For example:*

ISAN3950 Industrial Internship 1–10 ECTS (The degree may include practical training / internship improving the student's professional expertise. A two-week (á 40 hours) training period is equivalent to 1 ECTS. The student must also write a report about the training.)

The students can choose from a variety of studies to complete their degree, both on bachelor and master level. We recommend that you complete business studies or a minor subject (25 ECTS) if possible. If this is not possible due to the fact that most minors are in Finnish, your optional studies may include several subjects according to your own interests. These studies may include e.g. optional Master level courses in ISA, language studies, mathematics and many other topics.

Note: Those Finnish students who have not completed studies in second national language in their previous degree, have to complete studies in second national language. These studies will be supplementary and not included in the degree.

Please note that individual courses may not be available every year.