KHATAM UNIVERSITY

Systems Modeling and Data Analysis Specialization

The **Systems Modeling and Data Analysis** specialization is a key area of study that emerged from the **Economic-Social Systems Engineering** track, one of the oldest graduate specializations in industrial engineering. Over time, this specialization, which initially drew students from a variety of engineering and non-engineering backgrounds, evolved to focus more on management topics due to its flexible course structure. It has since come to encompass the management of economic and social systems. Moreover, with the growing relevance of **System Engineering Methods**, **Data Science**, and **Inter-disciplinary System Engineering** as bridges for scientific collaboration across different engineering disciplines, the need for a specialization that covers these areas became increasingly apparent.

The **Systems Modeling and Data Analysis** specialization focuses on the study, modeling, and analysis of systems. By considering needs, priorities, and available resources, it aims to design the optimal system. Graduates of this specialization will develop the key skill of "creative holistic thinking" to provide effective and efficient solutions to complex, large-scale problems. A comprehensive analysis of issues and the ability to offer creative solutions are core features of graduates from this specialization. From a methodological perspective, graduates will become proficient in various hard and soft problem-solving techniques, including operations research, data-driven optimization, data mining, process mining, system dynamics, soft systems methodology, non-deterministic programming, interactive planning, and postmodern systemic methods.

Key Skills Required

- Mathematical modeling
- Programming
- Data analysis
- Machine learning
- Systems thinking
- Statistics and probability
- Optimization algorithm design
- Big data processing

Commonly Used Software

- Python (NumPy, Pandas, Scikit-learn)
- R
- MATLAB
- SQL
- Power BI
- Tableau
- RapidMiner
- GAMS
- Lingo

Job Opportunities and Career Fields

- Data analysis in technology companies
- Management of complex systems within organizations
- Operations research
- Design of predictive models
- Optimization of industrial and service systems
- Consulting in decision-making and strategic planning