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| Code | **IE500** |
| Name | **M.Sc. Graduate Seminar** |
| Hour per week | 1 (0 + 1) |
| Credit | 0 |
| ECTS | 4 |
| Level/Year | Graduate |
| Semester | Fall and Spring |
| Type | Compulsory |
| Prerequisites |  |
| Content | This course aims to keep the graduate students up-to-date with current research in industrial engineering, operations research, and related fields and to improve their skills in communicating their research. Seminars are given by the graduate students, the department faculty, and invited guest speakers on contemporary industrial engineering and operations research issues. Students register to this course in all semesters. |

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| Code | **IE501** |
| Name | **Mathematics for Optimization** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Compulsory |
| Prerequisites |  |
| Content | The course is designed to teach necessary mathematics background for optimization: methods of proof, sets, functions, series, metric spaces. Introduction to complex algebra. Systems of linear equations, Gaussian elimination. Vector spaces and their extension to complex case, linear dependence/independence, bases. Matrix algebra, determinant, inverse, factorization. Eigenvalue problem, diagonalization, quadratic forms. |

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| Code | **IE 511** |
| Name | **Modeling and Optimization** |
| Hour per week | 3(3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Compulsory |
| Prerequisites |  |
| Content | The course introduces mathematical modeling comprehensively including linear programming, integer programming, network and transportation models, nonlinear programming, Karush-Kuhn-Tucker conditions. The course focuses on abstracting real-world systems/problems conceptually, formulating and building mathematical models that are appropriate for these systems/problems, coding and solving mathematical models by using available off-the-shelf software e.g. GAMS, CPLEX, EXCEL SOLVER, EXPRESS, GUROBI and interpreting the solutions obtained from the models in terms of real-world system. |

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| Code | **IE513** |
| Name | **Linear Programming** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511 |
| Content | A comprehensive review of the theory, algorithms, and computational methods of linear programming: polyhedral theory, simplex algorithm, duality theory, weak and strong duality, sensitivity analysis, simplex variants, interior point methods. |

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| Code | **IE514** |
| Name | **Game Theory and Its Applications in Optimization** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511, IE513 |
| Content | Overview of the mathematical theory of games; non-zero sum games: strategies, Nash equilibrium, response functions; matrix games, strategic form games, Nash recursion, pure and mixed equilibria; sequential games: extensive-form representation, perfect and imperfect information, sequential equilibrium, sequential rationality, subgame perfect equilibrium; modeling games as mathematical programming problems, solution characterization, solution strategies and relevant optimization techniques; applications: auction design, oligopoly competition, manufacturer-retailer bargaining, capacity/congestion pricing, and so forth. |

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| Code | **IE515** |
| Name | **Discrete Optimization** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511 |
| Content | A thorough introduction to the theory algorithms and applications of combinatorial and integer optimization. Part I presents the fundamentals and modeling aspects. Part II deals with how to solve the resulting relaxations, including the simplex algorithm (and interior point methods like the ellipsoid algorithm if time permits) and selected topics in polyhedral theory. Part III deals with algorithms for integer optimization including both exact methods (enumerative algorithms such as dynamic programming, and branch-and-bound; cutting plane methods, branch-and-cut) and heuristics (GRASP, feasibility pump). Finally, Part IV deals with decomposition approaches like Lagrangian relaxation (and duality results for integer optimization), Benders’ decomposition and branch-and-price (delayed column generation). |

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| Code | **IE516** |
| Name | **Nonlinear Programming** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511 |
| Content | A thorough introduction to the theory algorithms and applications of constrained and unconstrained nonlinear programs. The course is composed of two parts. Part I presents the fundamentals and the theoretical aspects such as convex sets and functions, necessary and sufficient optimality conditions, constraint qualifications, duality theory, Lagrange multipliers and semidefinite optimization. Part II is on computational aspects such as algorithms for quadratic programming, Newton and Gauss-Newton methods, gradient projections, conditional gradient method, barrier methods, interior point methods, subgradient optimization and convergence analysis. |

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| Code | **IE517** |
| Name | **Heuristic Methods in Optimization** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511 |
| Content | Heuristics are methods that seek a fine, but not necessarily optimal solution in a reasonable amount of time. This course will survey a wide range of advanced heuristic methods (greedy heuristics, improvement heuristics constructive heuristics, metaheuristics: simulated annealing, tabu search, genetic algorithms, ant colony optimization, and hybrid algorithms), emphasizing their generic characteristics and limitations, and the types of problems to which they are best adapted. |

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| Code | **IE518** |
| Name | **Network Models and Optimization** |
| Hour per week | 3(3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511 |
| Content | This course provides a comprehensive knowledge of network design and network flow problems including the shortest path problem, the maximum flow problem, the minimum cost flow problem, assignment and travelling salesperson problems in telecommunication, logistics, social and computer networks. Solution methodologies for these problems such as network simplex algorithm, Lagrange relaxation, column generation and other decomposition methods are taught within the course. |

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| Code | **IE519** |
| Name | **Multiobjective Optimization** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | **IE 513, E 511** |
| Content | Multi-objective optimization has been applied in many fields of science, including engineering, economics and logistics where optimal decisions need to be taken in the presence of trade-offs between two or more conflicting objectives. This course systematically presents several multi-objective optimization methods accompanied by many analytical examples. Sample topics to be covered are pareto-optimality, weighting method, constraint method, goal programming, NISE method, and evolutionary methods. |

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| Code | **IE521** |
| Name | **Probability Theory** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Compulsory |
| Prerequisites |  |
| Content | This course provides a comprehensive knowledge on the fundamentals of probability theory. The course provides a rigorous development of the subject. The course also covers sample space, random variables, expectations, transforms, Bernoulli and Poisson processes, finite Markov chains, limit theorems but at a faster pace and in more depth. There are also a number of additional topics, such as language, terminology, and key results from measure theory. |

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| Code | **IE522** |
| Name | **Simulation** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE521 |
| Content | Simulation models, input data modeling, variance reduction techniques, model validation and verification, output data analysis, comparison of alternatives, ranking and selection methods, simulation optimization |

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| Code | **IE523** |
| Name | **Systems Theory** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites |  |
| Content | This course provides an introduction to the philosophy and tools of systems theory. This course is designed to analyze of the complex dynamic systems using mathematical and quasi-mathematical techniques. Dynamic feedback models from socio-economic, socio-technical, biological, and physical systems are also covered using necessary simulation software. |

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| Code | **IE524** |
| Name | **Data Mining** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE521 |
| Content | A number of successful applications of data mining have been reported in areas such as credit rating, fraud detection, database marketing, customer relationship management, and stock market investments. The field of data mining has evolved from the disciplines of statistics and artificial intelligence. This course examines methods that have emerged from both fields and proven to be of value in recognizing patterns and making predictions from an applications perspective. Applications will be surveyed and an opportunity for hands-on experimentation with algorithms for data mining using easy-to- use software and cases will be provided. |

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| Code | **IE526** |
| Name | **Big Data Analytics** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511, IE521, IE513 |
| Content | This course is an introduction to concepts of machine learning and big data analytics. The course blends methods from information retrieval, statistical data analysis, data mining, machine learning, and other big-data related fields. Students work on semester-long projects involving industry-scale data sets to solve real-world problems. Students gain ability to work with very large transactional, text, network, behavioral, and/or multimedia data sets. |

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| Code | **IE531** |
| Name | **Stochastic Processes** |
| Hour per week | 4 (4 + 0) |
| Credit | 4 |
| ECTS | 6 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE521 |
| Content | This course is designed to teach Wiener process, Poisson process, nonhomogeneous and compound Poisson processes, independent increments, discrete time Markov chains, continuous time Markov chains, Kolmogorov differential equations, birth-death processes and queuing applications, non-Markovian processes, regenerative processes, ergodic theorems, semi-Markov processes, Martingales, applications to reliability and inventory control. |

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| Code | **IE532** |
| Name | **Stochastic Programming** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511, IE521 |
| Content | This course is designed to teach optimization in the face of uncertainty. Specifically, it presents a thorough introduction to modeling, and computational methods of stochastic programming. The course also provides how to formulate and solve the deterministic equivalent of stochastic programming problems. The course is designed to discuss extensions to problems with probabilistic constraints, stochastic integer programs and multi-stage stochastic programs. The solution methods to those problems are also discussed such as the L-Shaped method. This course also provides stochastic decomposition and variance reduction techniques. |

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| Code | **IE534** |
| Name | **Risk Modeling, Assessment, and Management** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Compulsory |
| Prerequisites | IE511, IE521 |
| Content | The course introduces the state of the art of risk analysis, a rapidly growing field with important applications in engineering, science, manufacturing, business, healthcare, homeland security, management, and public policy. How to quantify risk and construct probabilities for real-world decision-making problems, including a host of institutional, organizational, and political issues are discussed with real-world case studies. Sample issues to study are risk management and assessment process, decision making with single and multiple objectives, fault trees, terrorism and extreme event risk modeling. |

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| Code | **IE542** |
| Name | **Decision Analysis** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites |  |
| Content | This course presents decision theory, risk and uncertainty, value of information, preference measurements, prioritization of alternatives, multiple objectives and hierarchical decisions, multi-criteria decision making, utility theory, analytic hierarchy process (AHP) and analytic network process (ANP) methodologies, and various case studies. |

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| Code | **IE544** |
| Name | **Financial Engineering** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE521 |
| Content | Study of the mathematical theory and financial concepts for investment, hedging, portfolio management, and asset pricing used to model and analyze financial derivatives. Topics include time value of money, fundamental concepts of arbitrage, replication and completeness, cash flows, utility theory, value at risk, mean-variance portfolio theory, martingales, Brownian motion, Geometric Brownian motion and stochastic differentials (Itô calculus), with applications to discrete and continuous time stochastic models of asset prices, option pricing, the Black-Scholes pricing model, and hedging. |

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| Code | **IE552** |
| Name | **Industrial Ecology** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511 |
| Content | The course will provide you with analytical tools and methods for implementing principles of industrial ecology. The practical applications covered in the course will be based largely on current research in the area of life cycle assessment (LCA) and life cycle design. This methodology is used for comparative analyses of alternatives including materials (biobased vs petroleum based), energy systems (renewable and fossil fuels), consumer products and packaging, automotive component designs, and residential construction methods. Life cycle design focuses on integrating environmental considerations into product design. The challenge is to meet performance, cost, legal, and cultural requirements while achieving environmental improvements. |

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| Code | **IE554** |
| Name | **Sustainable Energy Systems** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511, IE521 |
| Content | Grand challenges in energy systems; current trends in energy demand and supply and greenhouse gas emissions; a review of incumbent technologies (fossil fuels, hydro and nuclear power generation) and renewable technologies (solar, wind, biomass, hydrogen and fuel cells); optimization applications in the above subjects. |

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| Code | **IE556** |
| Name | **Operations Research in Sustainability** |
| Hour per week | 3(3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511, IE534, IE521 |
| Content | The course focuses on operation research methods to address problems in issues where sustainability is substantial. Forestry, mining, water resources or energy related industries such as large-scale networks of gas and electricity, renewable energy systems, organic agriculture, green chemistry, sustainable mobility, sustainable development issues such as fair trade and microfinance, and advanced systems for energy management such as smart grids; design of markets for electricity, gas, or other resources, market-based approaches for environmental issues such as emissions trading are examples of topics studied within this course. |

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| Code | **IE562** |
| Name | **Disaster/Emergency Management** |
| Hour per week | 3(3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511, IE534, IE521 |
| Content | This course provides a comprehensive knowledge of fundamental principles and main problems of disaster/emergency management. Disaster trends, hazards, risk, and vulnerability as well as management structures and advancements together with recent national and international initiatives around the world are discussed in dept. Processes which help to reduce disaster vulnerabilities and increase resilience at every stage of the disaster management cycle, namely, disaster mitigation, preparation, response, and recovery are addressed. |

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| Code | **IE563** |
| Name | **Humanitarian Logistics** |
| Hour per week | 3(3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE 511, IE 521, IE 534 |
| Content | The course explores how logistics management principles apply when responding to humanitarian crises and how operations research and management science tools can be used in addressing the problems in humanitarian logistics. The key issues in humanitarian logistics, e.g., forecasting, needs assessment, procurement, inventory management, transportation, warehousing, and coordination, are discussed within with case studies and how operations research and management science can address those key issues are investigated. |

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| Code | **IE 564** |
| Name | **Operations Research Models in Disaster Management** |
| Hour per week | 3(3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511, IE521 |
| Content | The course provides basic conceptual understanding of disasters, types and categories of disaster, disaster management operations. The main objective of the course is to investigate application of operation research methods to address problems in disaster operations management. The models span issues in different phases of disaster management namely mitigation, preparedness, response, and recovery. Different types of several published papers are discussed with specific emphasis on future research directions. |

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| Code | **IE565** |
| Name | **Operations Research and Homeland Security** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511, IE521, IE534 |
| Content | The course addresses the state of the art in the application of operations research (OR) for homeland security. How OR techniques can be used in homeland security problems such as in preventing terrorist attacks, planning and preparing for emergencies, and responding to and recovering from disasters is discussed through several real-world problems. Several OR models and methods, e.g., interdiction models, game-theoretic approaches, risk and decision analysis, data mining, and optimization, are studied. |

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| Code | **IE566** |
| Name | **Supply Chain Risk and Vulnerability** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511, IE521, IE534 |
| Content | The course discusses current trends affecting supply chains and offers detailed guidance on how to identify and analyze the various risks to supply chain. Published operations research and management science studies addressing supply chain disruptions are studied. |

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| Code | **IE567** |
| Name | **Critical Infrastructure Planning** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511, IE521, IE534 |
| Content | Sustainable and resilient critical infrastructure systems are an emerging paradigm in an evolving era of depleting assets in the midst of natural and man-made threats to provide a sustainable and high quality of life with optimized resources from social, economic, societal and environmental considerations. In this course, recent advances in simulation, modeling, sensing, communications/ information, and intelligent and sustainable technologies that have resulted in the development of sophisticated methodologies and instruments to design, characterize, optimize, and evaluate critical infrastructure systems, their resilience, and their condition and the factors that cause their deterioration are discussed. |

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| Code | **IE572** |
| Name | **Inventory Planning** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites |  |
| Content | This course is designed to teach the context and importance of inventory management. This course includes basic economic order quantity model, quantity discounts, single item inventory models: time variant demand, stochastic demand, newsvendor model, stochastic lead times, continuous and periodic review: (s, Q), (s, S), (R, S), and (R, s, S) models, ABC inventory management, models with perishable goods, coordinated replenishment, multi-echelon inventory systems. |

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| Code | **IE574** |
| Name | **Supply Chain Management** |
| Hour per week | 3 (3 + 0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511, IE521 |
| Content | This course deeply focuses on stochastic inventory models, multi-echelon inventory systems, risk pooling, value of information in supply chains, bullwhip effect, designing logistic networks, distribution strategies, centralized and decentralized control, contracts, strategic alliances. |

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| Code | **IE576** |
| Name | **Scheduling** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites |  |
| Content | Theory of machine scheduling, single machine deterministic models, flow shop scheduling, job shop scheduling, stochastic scheduling, models, robust scheduling |

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| Code | **IE582** |
| Name | **The Economics of Healthcare** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE501 |
| Content | Healthcare markets: demand, production and costs of healthcare, and supply side of healthcare; evaluation of the market: market failures, the role of the government; healthcare financing: supply, demand, and failures of healthcare insurance; evaluating value in healthcare: cost-benefit analysis and cost-effectiveness analysis, health outcome measurements. |

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| Code | **IE 584** |
| Name | **Operations Research in Healthcare Systems** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511 |
| Content | Review and critical assessment of the literature that involves application of operation research methods to address problems in planning, control, analysis of operations and design issues arising in all areas of health and healthcare including public health, hospitals, primary care, telemedicine, disparities, community health, disease modeling, clinical management, and so forth. |

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| Code | **IE 586** |
| Name | **Healthcare Operations Management** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE521 |
| Content | The course addresses application domains including inpatient and outpatient services, public health networks, supply chain management, and resource constrained settings in developing countries. Specific examples or case studies illustrating the applications of operations research methods across the globe, including Africa, Australia, Belgium, Canada, the United Kingdom, and the United States are discussed. |

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| Code | **IE 588** |
| Name | **Operations Research and Healthcare Policy** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511 |
| Content | The course explores how Operations Research can be used for providing solutions and insights for the many problems that health policy-makers face. The research in this field is often multi-disciplinary, being conducted by teams that include not only operations researchers but also clinicians, economists, and policy analysts. A group of papers that showcases the current state of the field of Operations Research applied to health-care policy is discussed. A variety of techniques, including classical operations research tools, such as optimization, queuing theory, and discrete event simulation, as well as statistics, epidemic models, and decision-analytic models is studied. |

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| Code | **IE 589** |
| Name | **Optimization in Medicine and Biology** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 10 |
| Level/Year | Graduate |
| Semester | Fall or Spring |
| Type | Elective |
| Prerequisites | IE511 |
| Content | The course explores how optimization can be used for solving complex problems in medical research. The course begins with mathematical programming techniques for medical decision-making processes and demonstrates their application to optimizing pediatric vaccine formularies, kidney paired donation, and the cost-effectiveness of HIV programs. It also presents recent advances in cancer treatment planning models and solution algorithms, including three-dimensional conventional conformal radiation therapy (3DCRT), intensity modulated radiation therapy (IMRT), tomotherapy, and proton therapy. The course also discusses computational algorithms for genomic analysis; probe design and selection, properties of probes, and various algorithms and software packages to aid in probe selection and design. |

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| Code | **IE597** |
| Name | **M.Sc. Special Topics** |
| Hour per week | 4 (4 + 0) |
| Credit | 0 |
| ECTS | 5 |
| Level/Year | Graduate |
| Semester | Fall and Spring |
| Type | Compulsory |
| Prerequisites |  |
| Content | The course aims to promote research interest in various areas of industrial engineering, operations research, and related fields. Thesis related and state-of-the art papers as well as research methods, academic and professional ethics in general are discussed. Students register to this course in all semesters starting from the beginning of their second semester. |

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| Code | **IE599** |
| Name | **M.Sc. Thesis** |
| Hour per week | 2 (0 + 2) |
| Credit | 0 |
| ECTS | 25 |
| Level/Year | Graduate |
| Semester | Fall and Spring |
| Type | Compulsory |
| Prerequisites |  |
| Content | A research program leading to M.Sc. degree. Research program is arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress. |

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| Code | **IE600** |
| Name | **Ph.D. Graduate Seminar** |
| Hour per week | 1 (0 + 1) |
| Credit | 0 |
| ECTS | 4 |
| Level/Year | Graduate |
| Semester | Fall and Spring |
| Type | Compulsory |
| Prerequisites |  |
| Content | This course aims to keep the graduate students up-to-date with current research in industrial engineering, operations research, and related fields and to improve their skills in communicating their research. Seminars are given by the graduate students, the department faculty, and invited guest speakers on contemporary industrial engineering and operations research issues. Students register to this course in all semesters. |

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| Code | **IE697** |
| Name | **Ph.D. Special Topics** |
| Hour per week | 4 (4 + 0) |
| Credit | 0 |
| ECTS | 5 |
| Level/Year | Graduate |
| Semester | Fall and Spring |
| Type | Compulsory |
| Prerequisites |  |
| Content | The course aims to promote research interest in various areas of industrial engineering, operations research, and related fields. Thesis related and state-of-the art papers as well as research methods, academic and professional ethics in general are discussed. Students register to this course in all semesters starting from the beginning of their second semester. |

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| Code | **IE699** |
| Name | **Ph.D. Thesis** |
| Hour per week | 2 (0 + 2) |
| Credit | 0 |
| ECTS | 30 |
| Level/Year | Graduate |
| Semester | Fall and Spring |
| Type | Compulsory |
| Prerequisites |  |
| Content | A research program leading to Ph.D. degree. Research program is arranged between the student and a faculty member. Students register to this course in all semesters starting from the beginning of their second semester while the research program or write-up of thesis is in progress. |