

Department of Industrial Engineering

Industrial Engineering (International Program)

Program Master of Engineering Program in Industrial Engineering (International Program)

Degree Master of Engineering (Industrial Engineering), M.Eng. (Industrial Engineering)

Plan A Option 2:

Total credits required: minimum 36 credits

(1) Major courses: minimum 24 credits

- Seminar: 2 credits

01206597 Seminar 1,1

- Major requirements: 1 credit

01206591 Research Methodology in Industrial Engineering 1(1-0-2)

- Major electives: minimum 21 credits

Choose graduate electives at least 21 credits from the list below.

01206513 Applied Quantitative Sciences in Industrial Engineering 3(3-0-6)

01206521 Linear Optimization 3(3-0-6)

01206522 Non-Linear Optimization 3(3-0-6)

01206523 Dynamic Optimization 3(3-0-6)

01206524 Network Flows Optimization 3(3-0-6)

01206525 Integer and Combinatorial Optimization 3(3-0-6)

01206526 Multiple Criteria Optimization 3(3-0-6)

01206527 Fuzzy Decision Analysis and Optimization 3(3-0-6)

01206531 Stochastic Modeling and Analysis 3(3-0-6)

01206533 Reliability Theory 3(3-0-6)

01206534 Simulation Modeling and Analysis 3(3-0-6)

01206536 Game and Decision Theory 3(3-0-6)

01206541 Engineering Experimental Designs 3(3-0-6)

01206542 Applied Data and Regression Analysis 3(3-0-6)

01206543 Applied Statistics in Quality Control 3(3-0-6)

01206551 Design of Facility Layout and Locations 3(3-0-6)

01206552 Sequencing and Scheduling 3(3-0-6)

01206554 Modern Production and Industrial Systems 3(3-0-6)

01206555 Engineering Project Management 3(3-0-6)

01206562	Production Planning and Inventory Control	3(3-0-6)
01206563	System Engineering and Life Cycle Management	3(3-0-6)
01206565	Maintenance Management	3(3-0-6)
01206567	Operational Flow Analysis and Control	3(3-0-6)
01206572	Computer Numerical Control for Manufacturing Processes	3(3-0-6)
01206596	Selected Topics in Industrial Engineering	3(3-0-6)
01206598	Special Problems	1-3
01222521	Total Quality Management	3(3-0-6)
01222522	Supply Chain Design and Management	3(3-0-6)
01222523	Manufacturing Systems Management	3(3-0-6)
01222531	Performance Measurement, Assessment, and Analysis	3(3-0-6)
01222542	Management for Engineers	3(3-0-6)
01222543	Economic Analysis for Engineering and Managerial Decision Making	3(3-0-6)
01222544	Financial and Managerial Accounting for Engineers	3(3-0-6)
01222545	Cost Management for Engineers	3(3-0-6)

(2) Thesis: minimum 12 credits

01206599	Thesis	1-12
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Plan B:

Total credits required: minimum 36 credits

(1) Major courses: minimum 30 credits

- Seminar: 2 credits

01206597	Seminar	1,1
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- Major requirements: 1 credit

01206591	Research Methodology in Industrial Engineering	1(1-0-2)
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- Major electives: minimum 27 credits

Choose graduate electives at least 27 credits from the list below.

01206513	Applied Quantitative Sciences in Industrial Engineering	3(3-0-6)
01206521	Linear Optimization	3(3-0-6)
01206522	Non-Linear Optimization	3(3-0-6)
01206523	Dynamic Optimization	3(3-0-6)
01206524	Network Flows Optimization	3(3-0-6)
01206525	Integer and Combinatorial Optimization	3(3-0-6)
01206526	Multiple Criteria Optimization	3(3-0-6)
01206527	Fuzzy Decision Analysis and Optimization	3(3-0-6)
01206531	Stochastic Modeling and Analysis	3(3-0-6)
01206533	Reliability Theory	3(3-0-6)
01206534	Simulation Modeling and Analysis	3(3-0-6)

01206536	Game and Decision Theory	3(3-0-6)
01206541	Engineering Experimental Designs	3(3-0-6)
01206542	Applied Data and Regression Analysis	3(3-0-6)
01206543	Applied Statistics in Quality Control	3(3-0-6)
01206551	Design of Facility Layout and Locations	3(3-0-6)
01206552	Sequencing and Scheduling	3(3-0-6)
01206554	Modern Production and Industrial Systems	3(3-0-6)
01206555	Engineering Project Management	3(3-0-6)
01206562	Production Planning and Inventory Control	3(3-0-6)
01206563	System Engineering and Life Cycle Management	3(3-0-6)
01206565	Maintenance Management	3(3-0-6)
01206567	Operational Flow Analysis and Control	3(3-0-6)
01206572	Computer Numerical Control for Manufacturing Processes	3(3-0-6)
01206596	Selected Topics in Industrial Engineering	3(3-0-6)
01206598	Special Problems	1-3
01222521	Total Quality Management	3(3-0-6)
01222522	Supply Chain Design and Management	3(3-0-6)
01222523	Manufacturing Systems Management	3(3-0-6)
01222531	Performance Measurement, Assessment, and Analysis	3(3-0-6)
01222542	Management for Engineers	3(3-0-6)
01222543	Economic Analysis for Engineering and Managerial Decision Making	3(3-0-6)
01222544	Financial and Managerial Accounting for Engineers	3(3-0-6)
01222545	Cost Management for Engineers	3(3-0-6)

(2) Independent Study: 6 credits

01206595	Independent Study	3,3
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Course Description

01206513 Applied Quantitative Sciences in Industrial Engineering 3(3-0-6)

Mathematical models and methods for decision making in analysis, design and control of industrial production systems, mathematical programming models, probabilistic and stochastic models, basic industrial data analysis and forecasting using statistical methods and manufacturing simulation under uncertainty.

01206521 Linear Optimization 3(3-0-6)

Theory of the simplex method, duality, sensitivity analysis, degeneracy, revised simplex method, bounded variables problems, generalized upper bounded technique, decomposition, parametric analysis, multiple objectives linear programming, linear complementary, case studies with computer solutions.

01206522	Non-Linear Optimization	3(3-0-6)
	Analysis of convex programming including convergence, duality, general procedures for unconstrained and constrained problems, Kuhn-Tucker theorem, Lagrangian method, quadratic programming, geometric programming, separable programming, fractional programming, and on-convex programming.	
01206523	Dynamic Optimization	3(3-0-6)
	Bellman's principle of optimality, integer optimization, path problems, equipment replacement, knapsack, assignment, production scheduling and facility location problems, stochastic optimization, Markov decision processes, calculus of variation and optimal control with major emphasis on algorithmic development and curse of dimensionality.	
01206524	Network Flows Optimization	3(3-0-6)
	Conservations of flows, definition and linear network flows modeling, shortest path, maximal flows, minimum cut, graphs and tree diagram, out-of kilter algorithm, minimum cost network flows algorithms, basic concepts of non-linear and time varying network.	
01206525	Integer and Combinatorial Optimization	3(3-0-6)
	Examples of integer programming models, primal and dual plane method, all integer cutting planes, branch and bound algorithms, 0-1 programming, group theory, NP-completeness, cutting stock problems, traveling salesman problems, vehicle routing problems, quadratic assignment problems, solving non-linear integer programming using dynamic programming.	
01206526	Multiple Criteria Optimization	3(3-0-6)
	Multiple criteria examples, multi attribute decision analysis, linear multiple Objectives programming, objective rows parametric programming, goal and compromising programming, concepts of utility function, non-dominated solution, efficient points, optimal weighting and human judgment, non-linear and integer case studies.	
01206527	Fuzzy Decision Analysis and Optimization	3(3-0-6)
	Fuzzy aspects of set theory, set operations, numbers and arithmetic, system and logic, relations, regression events, decision analysis, optimization and clustering, case studies.	
01206531	Stochastic Modeling and Analysis	3(3-0-6)
	Modeling of basic stochastic processes including random walks, Poisson process, discrete and continuous Markov chains, birth-death process, renewal phenomena, semi-Markov process, regenerative process, branching, Diffusion and stationary processes, brownian motion and martingales	

01206533	Reliability Theory	3(3-0-6)
	Deterministic and probabilistic reliability models and its applications, reliability analysis with emphasis on modeling time to failures with exponential, Weibull, gamma, and normal distributions, single and multiple elements, redundancy, reliability optimization.	
01206534	Simulation Modeling and Analysis	3(3-0-6)
	Discrete event simulation, development of computer simulation models, model validation and verification, random number generation, input data analysis, estimation theory and goodness of fit test.	
01206536	Game and Decision Theory	3(3-0-6)
	Definition of matrix game and min-max theorem, search of optimal policy for discrete and continuous games, relationships between linear programming and game theory, infinite game, analysis and basic solution techniques using case studies and decision theory under uncertain information.	
01206541	Engineering Experimental Designs	3(3-0-6)
	Analysis of variance, single factor experiment with block, completely randomized and Latin square design, fixed and random effect, factorial design, fractional factorial design, nested and split plot design, experimentations in regression analysis and response surface methodology.	
01206542	Applied Data and Regression Analysis	3(3-0-6)
	Reviews of descriptive statistics, simple linear least squares, multiple regression, polynomial regression, stepwise regression, multicollinearity, correlation, nonlinear, least squares and transformations, techniques of application, with use of computer packages.	
01206543	Applied Statistics in Quality Control	3(3-0-6)
	Sampling and life testing procedures in evaluating product quality with emphasis to optimal sample size, performance specifications, military standards and federal regulations, review of recent research in applied probability and statistics in quality control, applied optimization in quality assurance, Taguchi method.	
01206551	Design of Facility Layout and Locations	3(3-0-6)
	To develop an understanding of the principles of manufacturing, facility layout and location, material handling systems, warehouse and storage systems, the course emphasizes on modeling, design, analysis and problem solving techniques, a mini research experience will be provided.	

01206552	Sequencing and Scheduling	3(3-0-6)
	Deterministic/probabilistic nature of sequencing and scheduling problems, single and multiple machine scheduling, modern industrial scheduling environments such as flexible shop system, computerized material handling systems, measurement of solution technique effectiveness, project scheduling with emphasis on time/cost tradeoff and resource leveling and constraints.	
01206554	Modern Production and Industrial Systems	3(3-0-6)
	Comprehensive knowledge of the functional activities that typically occur within manufacturing facilities, information associated with these manufacturing activities, modeling techniques and problem-solving methodologies for manufacturing systems.	
01206555	Engineering Project Management	3(3-0-6)
	Organization structures of project management, applying network analysis in planning and scheduling of each project activity with consideration of total time, cost, labor and other related resources, data base systems for project administration, capital budgeting, control and operations techniques for meeting project due dates, project management standard, virtual project management and global project management.	
01206562	Production Planning and Inventory Control	3(3-0-6)
	Overview and importance of production planning and control, modeling techniques, problem-solving methodologies, alternative production systems, real-world manufacturing planning and control cases.	
01206563	Systems Engineering and Life Cycle Management	3(3-0-6)
	Principles of system engineering, system life cycle, system design process, designs affecting operational feasibility, life cycle costing, designs for reliability, maintainability, human factors supportability and economic feasibility, application of quantitative methods for system engineering management.	
01206565	Maintenance Management	3(3-0-6)
	Principles and models of maintenance, processes for analyzing requirements of business environments, safety and quality standards, system analysis, maintenance failure and condition monitoring, planning and control, inventory selection and control, human factors and organization, information flows and computer control, overall equipment effectiveness, total productive maintenance., information system for maintenance.	
01206567	Operational Flow Analysis and Control	3(3-0-6)
	Operational flow on organizational performance, operational flow design in different working conditions, performance measurement of operational flow, operational flow analysis, operational flow simulation.	

01206572	Computer Numerical Control of Manufacturing Processes Theory and application of computer numerical control for machine, machine structural elements, control systems and programming, manual and computer part programming.	3(3-0-6)
01206591	Research Methodology in Industrial Engineering Research principles and methods in industrial engineering, problem analysis for research topic identification, data collection for research planning, identification of samples and techniques, research analysis, result explanation and discussion, report writing, presentation and preparation for journal publication.	1(1-0-2)
01206595	Independent Study Individual study on selected topics from industrial applicable problems (for non-thesis programs only)	3,3
01206596	Selected Topics in Industrial Engineering Selected topics in industrial engineering at the master's degree level, topics are subject to change each semester.	3(3-0-6)
01206597	Seminar Presentation and discussion on current interesting topics in Industrial Engineering at the master's degree level.	1,1
01206598	Special Problems Study and research in industrial engineering at the master's degree level and compile into a written report.	1-3
01206599	Thesis Research at the master degree level and compile into thesis.	1-12
01222521	Total Quality Management Introduction to quality management, leadership in quality, information and data analysis, strategic quality planning, leadership through quality, human resource development and management, keys to continuous quality improvement, statistical process control, benchmarking, customer focus and satisfaction, buyer-supplier relationship in TQM.	3(3-0-6)
01222522	Supply Chain Design and Management Distribution strategy, procurement and manufacturing strategies, information network, planning and scheduling, inventory management, transportation management, warehousing, material handling, performance and financial assessment.	3(3-0-6)
01222523	Manufacturing Systems Management Introduction to manufacturing systems, types of manufacturing systems, design and operations of manufacturing systems, planning and control of manufacturing systems, group technology, computer integrated manufacturing, Toyota production system, internet applications in manufacturing.	3(3-0-6)

01222531	Performance Measurement, Assessment, and Analysis	3(3-0-6)
	Emphasis on measurement and assessment of performance at the organizational, functional, and individual level, applications of tools and techniques to establish a set of performance, measures of key performance indicators in a ratio format, discussion includes auditing into quality of measures used to reflect the performance level, presentation of performance analysis.	
01222542	Management for Engineers	3(3-0-6)
	Planning, coordination, and analysis in management, understanding of pragmatic aspects of key theories and concepts for better management, performing management functions and designing a management process.	
01222543	Economic Analysis for Engineering and Managerial Decision Making	3(3-0-6)
	Decision making in engineering and management, cost concepts for decision making, engineering economic analysis including discounted cash flows methods, application of optimization techniques as in equipment replacement, capital budgeting, and capacity expansion, cost and profit relationships, effects of inflation and tax consequences, and analysis of risk and uncertainty for managerial decision making.	
01222544	Financial and Managerial Accounting for Engineers	3(3-0-6)
	Introduction to accounting, principles of accounting, financial reports, financial-transactions analysis, financial-statement analysis, budgeting, variance analysis, and economic analysis of short-term decisions.	
01222545	Cost Management for Engineers	3(3-0-6)
	Reliability and risk assessment, decision and cost-benefit analysis. Decision making under uncertainty, Balancing risks and involving human safety, potential environmental effects, and large financial and technological uncertainties. Introduction on cost management and its concepts, activity-based costing and management, cost management planning, including cost estimation, cost-volume-profit analysis, master budgeting and capital budgeting, cost management systems, including job costing, process costing, and cost allocation, operational control through flexible budgeting and standard costing, and management control through performance evaluation including design of management control systems for evaluation.	