

## Curriculum(Graduate Course)

Classification	Subject No.	Subject Code	Subject Name	Lecture:Lab.: Credit (Homework)	Semester	Remark
Elective Courses	IE511	31.511	Human Centered Systems Design	2:3:3(2)	Spring	◎
	IE522	31.522	Advanced Topics in Engineering Economy & Cost Analysis	3:0:3(6)	Spring	◎
	IE523	31.523	Production System Design	3:1:3(5)	Spring	◎
	IE524	31.524	Optimal Location of Facilities	2:3:3(5)	Fall	◎
	IE531	31.531	Linear Programming	3:1:3(6)	Spring	◎
	IE532	31.532	Simulation and System Modeling	3:1:3(6)	Spring	◎
	IE533	31.533	Systems Engineering	3:0:3(4)		◎
	IE535	31.535	Network Theory and Applications	3:1:3(4)	Spring	◎
	IE536	31.536	Scheduling Theory and Applications	3:0:3(4)	Fall	◎
	IE537	31.537	Business Telecommunication Systems	3:1:3(3)	Fall	◎
	IE538	31.538	Genetic Algorithms and Applications	3:1:3(3)	Fall	◎
	IE539	31.539	Convex Optimization	3:1:3(6)	Fall	◎
	IE540	31.540	Dynamic Programming and Reinforcement Learning	3:1:3	Fall	◎
	IE541	31.541	Advanced Engineering Statistics	3:0:3(8)	Spring	◎
	IE542	31.542	Regression Analysis: Theory and Practice	3:0:3(6)	Spring	◎
	IE551	31.551	Manufacturing System and Supply Chain	3:1:3(6)	Spring	◎
	IE552	31.552	CAD/CAM and Geometric Modeling	3:1:3(6)	Spring	◎
	IE553	31.553	Product Lifecycle Management	3:1:3(6)	Spring	◎
	IE554	31.554	Knowledge-Based Design System	3:1:3	Spring	◎
	IE561	31.561	Advanced Information System Engineering	3:0:3	Fall	◎
	IE565	31.565	Information Security Policy and Management	3:0:3	Fall	◎
	IE566	31.566	Human-Computer Interaction: Theory and Design	3:0:3		◎
	IE570	31.570	Military Operations Research Theory and Applications	3:1:3(4)	Spring	
	IE571	31.571	War Game Modeling	3:1:3(4)	Fall	◎
	IE572	31.572	Analysis of Weapon Systems	3:1:3	Fall	◎
	IE573	31.573	Healthcare Service Delivery Systems	3:1:3	Spring	◎
	IE574	31.574	Portfolio management and Financial Optimization	3:0:3	Fall	◎
	IE575	31.575	Structuring and Pricing of Financial Products	3:1:3	Spring	◎
	IE576	31.576	Risk Management	3:0:3	Fall	◎
	IE577	31.577	Fundamentals of Systems Engineering	3:1:3	Fall	◎
IE578	31.578	Research in Financial Economics	3:0:3	Spring	◎	
IE624	31.624	Analysis of Inventory	3:1:3(6)			

Classification	Subject No.	Subject Code	Subject Name	Lecture:Lab.: Credit (Homework)	Semester	Remark
			Management Systems			
	IE631	31.631	Integer Programming	3:1:3(6)	Fall	
	IE632	31.632	Stochastic Modeling I	3:1:3(5)	Fall	
	IE633	31.633	Queueing Theory	3:0:3(6)	Spring	
	IE635	31.635	Combinatorial Optimization	3:0:3(4)	Fall	
	IE636	31.636	Intelligent Systems & Soft Computing	3:0:3(3)	Fall	
	IE638	31.638	Wireless and Cellular Communication Systems	3:1:3(3)	Spring	
	IE639	31.639	Supply Chain Optimization	3:0:3(4)	Fall	
	IE642	31.642	Forecasting and Time Series Analysis	3:1:3(6)		
	IE643	31.643	Design and Analysis of Experiments	3:1:3(4)	Fall	
	IE644	31.644	Life Testing and Survival Analysis	3:0:3(4)	Spring	
	IE645	31.645	Quality Engineering	3:0:3(6)	Spring	
	IE646	31.646	Data Mining	3:1:3(4)	Spring	
	IE661	31.661	Applications of AI/DM Technology	3:0:3	Fall	
	IE671	31.671	Stochastic Modeling II	3:0:3	Fall	
	IE722	31.722	Material Storage & Handling Systems	3:0:3(5)	Fall	
	IE761	31.761	Cognitive Engineering	3:0:3(6)		
	IE801	31.801	Special Topics in Industrial Engineering II	3:0:3		
	IE802	31.802	Invited Lecture I	1:0:1		
	IE803	31.803	Invited Lecture II	2:0:2		
Research	IE960	31.960	Thesis (Master's Course)			
	IE965	31.965	Individual Study (MS)	1:0:1		
	IE966	31.966	Seminar in MS	1:0:1		
	IE980	31.980	Thesis (Doctoral Course)			
	IE985	31.985	Individual Study (Ph.D.)	1:0:1		
	IE986	31.986	Seminar in Ph.D	1:0:1		

©: stands for courses open to both undergraduate and graduate students

## Substitutable Course List

Substitutable subjects in Department of Industrial & Systems Engineering					
Classification	opened course		unopened course		
	Subject No.	Subject Name	Subject No.	Subject Name	Remark
Mandatory Major Courses	IE260	Data Structure and Analysis	IE362	Programming & practices for Industrial Information System	subject number and name were changed
				Applied Data Structures and Algorithms	
Mandatory Major Courses	IE221	Production Management I	IE321	Production Management I	subject number was changed
Mandatory Major Courses	IE232	Operations Research : Stochastic Model	IE332	Operations Research II	subject number and name were changed
Mandatory Major Courses	IE242	Engineering Statistics II	IE341	Engineering Statistics II	subject number was changed
Elective Courses	IE343	Statistical Machine Learning	IE442	Statistical Data Analysis	subject number and name were changed
Elective Courses	IE541	Advanced Engineering Statistics	IE641	Mathematical Statistics	subject number and name were changed

Substitutable subjects from other departments					
Classification	IE courses		courses from other departments		
	Subject No.	Subject Name	Subject No.	Subject Name	Remark
Mandatory Major Courses	IE362	Applied Data Structures and Algorithms(unopened)	CS206	Data Structure	one-way substitution
Mandatory Major Courses	IE260	Data Structure and Analysis			
Elective Courses	IE231	Applied Real Analysis and Probability	FEP321	Analysis and Probability for Finance	Two-way substitution
Elective Courses	IE421	Engineering Economy and Cost Analysis	CC513	Engineering Economy and Cost Analysis	one-way substitution
Elective Courses	IE471	Introduction to Financial Engineering	FEP311	Introduction to Financial Engineering	Two-way substitution
Elective Courses	IE565	Information Security Policy and Management	IS532	Information Security policy and management	Two-way substitution
Elective Courses	IE566	Human-Computer Interaction: Theory and Design	KSE531	Human-Computer Interaction: Theory and Design	Two-way substitution
Elective Courses	IE577	Fundamentals of Systems Engineering	AE500	Synthetic Design of Aerospace Systems	one-way substitution
Elective Courses	IE636	Intelligent Systems & Soft Computing	KSE622	Soft-computing in Intelligent System Design	Two-way substitution
Elective Courses	IE646	Data Mining	KSE525	Data Mining and Knowledge Discovery	Two-way substitution
Elective Courses	IE761	Cognitive Engineering	KSE641	Cognitive Engineering	Two-way substitution

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# Descriptions of Courses

## IE 511 Human Centered Systems Design

This course covers the application of information on man's capabilities and limitations in the design process. Also included in the course are mechanical and physical environments and their effects on man as well as his performance. Emphasis is placed on the use of the Human Engineering data in the design of man-machine system. The topics covered include: Man-machine systems; human sensory processes; anthropometry; arrangement of work space; work environments (thermal, noise, vibration, light, pressure, dusts, ventilation); displays; controls.

## IE 522 Advanced Topics in Engineering Economy & Cost Analysis

Following on the basic course in engineering economy and cost analysis, this course develops further sophistication in economic decision making within an industrial environment. The principal purpose is to indicate how engineering economy analysis can be utilized to cast light on the process of managerial decision-making and to help improve the quality of these decisions. Topics include: Application of computer simulation techniques to engineering economy problems; application of statistical techniques and model construction to industrial financial activities; principles and methods of capital budgeting decisions; current techniques in capital investment analysis; depreciation policies in the management of capital assets; use of cost information in the decision-making process; the role of costs in pricing decisions; capital investment analysis, and other decision areas.

## IE 523 Production System Design

This course is an introduction to the design, evaluation, and control of production systems using mathematical, computational, and other modern analytical techniques. Areas investigated will include costs, theory of production systems, forecasting, mathematical models for production planning, inventory control, material requirements planning, in-plant material flow systems, and project scheduling techniques.

## IE 524 Optimal Location of Facilities

This course covers theory and methodology for determining an optimal location of production and service facilities. Area and point location problems in discrete and continuous space are examined. Private and public sector applications are considered.

## IE 531 Linear Programming

This course will intensively cover the theoretical, computational and application-directed aspects of linear programming problems. Also covered will be the solution methods and applications of large scale linear programming problems. Major topics include: Simplex method, revised simplex method, dual simplex method, duality theory, sensitivity analysis, Danzig-Wolfe decomposition method, numerical implementation, introduction to computational complexity, and introduction to polyhedral theory.

## IE 532 Simulation and System Modeling

An advanced course on complex system modeling and simulation. Major topics include: system modeling formalism, world views, network system modeling, next-event simulation methodology, random number generation, input modeling, output analysis and variance reduction techniques, etc. Application case studies will be conducted using commercial simulation languages.

## IE 533 Systems Engineering

This class involves analytical work on optimal design and management in system integration activities. Major topics include feasibility study, system analysis, conceptual and preliminary system design, system optimization, system evaluation, system reliability, and system supportability.

## IE 535 Network Theory and Applications

This course covers network models for industrial logistics systems, transportation systems and other applications. Emphasis is put on algorithms for shortest routes, minimum cost flow, the traveling salesman problem, facility location and network design.

#### IE 536 Scheduling Theory and Applications

Various prototypes of scheduling problems in production systems, project management, and computer systems are discussed in view of resources and tasks, problem structure, performance measures, and complexity. Complexity analysis, specialized solution algorithms for each prototype, and the use of general solution techniques like mixed integer programming, network and combinatorial optimization techniques, dynamic programming, branch and bound techniques, and other recent search techniques are explained. Also, queueing theory, stochastic analysis, and simulation techniques for dynamic or stochastic scheduling problems are also introduced.

#### IE 537 Business Telecommunication Systems

This course provides an introduction to business data communications including wide-area networks, local-area networks, protocols and network survivability. Transmission, media, signal encoding, link control and multiplexing are discussed. Network topologies, switching, and protocol fundamentals are presented and compared using the OSI model. Interconnectivity issues are discussed including circuit and packet switching, X.25, frame relay, and ATM. Integration of computer assets using LAN is covered. Internet-working and transport protocols (TCP/IP) are also examined.

#### IE 538 Genetic Algorithms and Applications

Heuristic procedures for optimization are studied. Theories and computer implementation of Genetic Algorithm and Tabu search are covered. Encoding / representation, operators, selection methods, schema and parallel GA are included for the Genetic Algorithm. Fundamentals, short-term and long-term memory are examined in Tabu search.

#### IE 539 Convex Optimization

We consider the convex optimization problem which is a special case of nonlinear optimization. We study the theoretical backgrounds, duality, interior point methods, conic programming, semidefinite programming. Applications in engineering, communications, financial engineering, data mining, and other areas will be examined.

#### IE540 Dynamic Programming and Reinforcement Learning

This course provides the mathematical formulation of dynamic decision making as MDP(Markov decision process), then dynamics programming is introduced as a solution to MDP. Also, for the cases where state transition or reward function is unknown, model-free reinforcement learning methods which allows to learn from interactions with environment will be introduced. Students will have a chance to look into case studies using DP & RL for manufacturing industry.

#### IE 541 Advanced Engineering Statistics

This course covers the theoretical foundations for statistical machine learning. Topics include: probability and distribution, convergence, maximum likelihood, hypothesis testing, Bayesian inference, nonparametric statistics and bootstrap resampling.

#### IE 542 Regression Analysis: Theory and Practice

This course reviews general theories of linear regression models with applications to industrial engineering problems. Topics include: Principles of least squares method; multivariate normal distribution and quadratic forms; estimation and hypothesis testing; residual analysis; polynomial regression and ridge regression; regression model building; response surface methodology, etc. Computational aspects of regression analysis are also emphasized.

#### IE 551 Manufacturing System and Supply Chain

This course aims to provide analysis and design methodologies for manufacturing system and supply chain, as well as planning and execution of various manufacturing processes. Also included are the trend of manufacturing industry transformation and efficient management of supply chain. Main topics are taxonomy of manufacturing systems, evolution of manufacturing system, manufacturing and supply system modeling methodology, manufacturing information system framework, supply chain management.

#### IE 552 CAD/CAM and Geometric Modeling

The purpose of this course is to deliver the fundamental theory of geometric modeling and CAD / CAM required for product design and manufacturing. Main topics are definition / classification of geometric models, curve / surface / solid representations, 3D CAD, 3D CAM, CAPP, feature extraction, and reverse engineering.

#### IE 553 Product Lifecycle Management

The purpose of this course is to provide concepts, state-of-the-art, and research trend in Product Lifecycle Management (PLM). In the early half of the course, various aspects and techniques of product lifecycle management will be covered. In the latter half, selected research papers in PLM will be discussed and the practice of the commercial PLM system will be provided. Furthermore, the product knowledge management issues will be covered as a future technology.

#### IE 554 Knowledge-Based Design System

Computers are replacing more of human work which require low level of intelligence. This class covers methodologies and systems for knowledge-based design, which can be used for engineering design such as rule-based approach, ontology, hybrid approach, TRIZ, expert system, knowledge-based design system, KMS, and configuration design. By applying basic principles, commercial systems are used for the term project.

#### IE 561 Advanced Information System Engineering

The course teaches professional knowledge and methodologies for design and development of various complex information systems, which utilize data, information, and knowledge for system operation and decision, such as business information systems, manufacturing information systems, service operation systems, distributed simulation systems, and decision support systems. The topics are state-of-art system engineering and SW engineering methods and tools including customer and user identification, user requirement definition, functional requirement specification and functional design, SW architecture design and functional specification, process/object/service/scenario/data modeling, model-based architecture & engineering, BPM(Business Process Management), web services, SOA(Service Oriented Architecture), communication architecture and application services, real-time and distributed applications, interoperability, verification and testing, middleware, knowledge engineering processes for large-scale system modeling & design, standards, and so on. Cases and labs for some of BPMS, geometric modeling systems, PLM(Product Life Cycle Management) systems, semiconductor fab planning and control system, automation SW systems, real-virtual integrated distributed simulation systems, user interfaces, etc are included. The focus and cases can be accommodated.

#### IE 565 Information Security Policy and Management

In this lecture, we will discuss national cyber security issues and policies, various managerial issues and methods related to information security in an organization, and information security business strategy.

#### IE 566 Human-Computer Interaction: Theory and Design

This course acquaints the students to principles and practice in human-computer interaction design. The context of computer supporting of human decision-making tasks is emphasized. Based on relevant background knowledge from the perspectives of cognitive science, information design, and human factors engineering, more specific topics including task-based design methodologies, cognitive task analysis, strategy analysis, and information aiding and

visualization are taught.

#### IE 570 Military Operations Research Theory and Applications

The course objective is to introduce the students to military operations research theory (such as Target detection and allocation theory, Target kill probability and damage assessment theory, System reliability, game theory, etc.). This course will increase the student's capability to analyse military decision problems.

#### IE 571 War Game Modeling

This course covers the basic tools and concepts of ground combat modeling which is both large scale and high resolution ground combat operations. The primary course objective is for the student to understand the enduring fundamentals of how ground combat models are built and used to support decision-making.

#### IE 572 Analysis of Weapon Systems

This course aims to introduce the students the theory and case studies related with the military operations research and to develop the capability of OR application in military analysis problems. Main contents are the cost and operational effectiveness analysis of weapon systems, the reliability, availability and maintainability of weapon systems, etc.

#### IE 573 Healthcare Service Delivery Systems

A healthcare service system is one of the most interesting, complex systems in the modern society. The concepts underlying this course are to deal with technical and socio-economic issues in delivery of healthcare services, and to consider how systems perspectives and methods can be used to address them. The course presents growing body of research literature on related topics and incorporate practical considerations about how to improve the performance of complex healthcare delivery organizations.

#### IE 574 Portfolio management and Financial Optimization

We will study various topics relevant to portfolio management including but not limited to: traditional portfolio selection, asset pricing, financial optimization, stock analysis, equity derivatives, and stock portfolio management strategies.

#### IE 575 Structuring and Pricing of Financial Products

This course provides the mathematical background and efficient implementation skills required for the quantitative jobs in financial industry. We introduce the risk-neutral pricing models (through binomial and Black-Scholes frameworks) , and guide the financial software design in step-by-step manner. The students will have a chance to design their own financial derivatives. Finally, we study portfolio management and optimization.

#### IE 576 Risk Management

This course covers modeling and analytical tools for many risk factors that appear in finance, insurance, and other operations. By introducing concepts and quantitative methods, we aim to provide students with practical skills which are desirable in this field.

#### IE 577 Fundamentals of Systems Engineering

In this course, we discuss system design and engineering process for large, complex system design and development. Specifically, procedures and techniques from the "V" model in traditional system engineering will be presented to enhance the students' capability as a system designer&engineer. This course is offered in collaboration with Aerospace Engineering Department, and diverse cases from aerospace, manufacturing, logistics, defense systems will be discussed.

\* This course is designated as a departmental Design Course for Renaissance Program, and as such, students in the ISysE department's Renaissance Program are required to take this course.



#### IE 578 Research in Financial Economics

The course will discuss the basic role of financial markets, the types of financial assets and how they are traded. We will introduce a number of technical tools for valuing risk, pricing financial assets and creating portfolios. Finally, we will employ these insights to discuss issues of broader relevance for the macro economy, with special emphasis on the current financial and economic crisis.

#### IE 624 Analysis of Inventory Management Systems

This is an introduction to the design, planning, and control of inventory management systems using mathematical, computational and other modern analytical techniques. Topics include analytical structures of inventory systems; static inventory systems under risk and uncertainty; dynamic inventory systems under risk and uncertainty; multi-product inventory systems; perishable goods; lot-sizing; etc.

#### IE 631 Integer Programming

Formulation, Theory and Algorithmic aspects of Integer Programming are discussed. We study how to formulate the real problems as integer programming models and discuss computational complexity, the description of the convex hull of feasible solutions. For computational methods, we study branch-and-bound, Lagrangian relaxation, strong cutting-plane method, etc. (Prerequisite: IE531 Linear Programming or permission of the Instructor).

#### IE 632 Stochastic Modeling I

The course deals with stochastic modeling and performance analysis methods for system design and operation of complex engineering systems such as production / manufacturing systems, computer / communication systems, and service systems. The course covers more advanced mathematical modeling and analysis than OR-II. Topics include basic concepts, modeling and analysis, and applications for fundamental stochastic models, including Poisson processes, renewal processes, Markov chains, stationary processes, Brownian and diffusion processes, stochastic Petri nets, basic queueing models and queueing networks, and Markov decision processes. Advanced topics like Markov renewal processes, Martingales, large deviation theories, and advanced traffic models can be introduced depending on the class.

#### IE 633 Queueing Theory

Waiting phenomena that occur in service systems, manufacturing systems, communication systems, and computer systems are modeled and analyzed. Basic single queue models ( $M / M / s$  and other Markovian queues,  $M / G / 1$ ,  $G / M / 1$ , and  $G / G / 1$ ) and their variations (including vacation models and polling models) are studied. Theory of product form queueing networks (Jackson, Gordon-Newell, BCMP, and others), including open / closed / mixed / multi-class / multi-chain, Markov routing / general routing, reversibility and quasi-reversibility, PASTA, Norton's Theorems, are presented. Some basic algorithms and applications for scheduling, FMS, LAN, computer systems, and telecommunication systems are also introduced. Non-product form queueing networks and various approximation algorithms (including blocking approximation, renewal approximations, and diffusion approximation) are also introduced. Statistical issues, computational issues, queue control issues, and queueing networks with blocking are briefly presented.

#### IE 635 Combinatorial Optimization

This course covers theories and applications of various combinatorial optimization problems. Topics include the matching problem, the traveling salesman problem and their variations, other combinatorial optimization problems in graphs, integrality of polyhedra, matroid and sub-modular functions, and the applications of semidefinite programming to combinatorial optimization.

#### IE 636 Intelligent Systems & Soft Computing

The first objective is to learn what kind of role precision and imprecision have in engineering and engineering system design. The second objective is to understand the need to use

soft-computing in designing intelligent systems. The third objective is to have a basic understanding of different kinds of soft-computing methodologies as well as hybrid methodologies. The fourth objective is to design and build a fully functional Fuzzy Logic Controller / fuzzy application in a real world project case.

#### IE 638 Wireless and Cellular Communication Systems

This course provides an overview of wireless communication with an emphasis on cellular communication. The goal is to cover the basics of radio, duplexing and multiple access, cellular, mobile systems, standards, and applications.

#### IE 639 Supply Chain Optimization

This course tackles the issue of supply chain optimization in an integration approach of various operations research models for supporting industrial service and resource supply activities under e-Business environment. Major topics for the issue include flow network design of supply chain systems at strategic level, based upon which the associated sourcing, production planning, and logical routing topics are investigated at a tactical level. Therewith, scheduling, inventory, and vehicle routing topics are to be integrated together in an optimal manner at the operational level.

#### IE 642 Forecasting and Time Series Analysis

This course teaches a comprehensive treatment of current statistical forecasting techniques and their applications. Major topics include general forecasting theories, decomposition, moving averages, exponential smoothing, regression, forecasting error analysis, Box-Jenkins model, Bayesian approach, etc. (Prerequisite: CC 511, IE 641).

#### IE 643 Design and Analysis of Experiments

Theories of experimental design and analysis methods of experimental data with applications to industrial problems are taught in this course. Characteristics of various experimental designs and analysis of variance method are covered. Emphasis is put on experimental methods for the design and improvement of products or processes and on optimal experimental design considering the cost and statistical efficiency.

#### IE 644 Life Testing and Survival Analysis

This course covers statistical theory and application of survival analysis and life test methods. Topics include: lifetime distributions and their properties; parametric and nonparametric lifetime data analysis and inference; parametric regression and proportional hazard models; theory of competing risks; accelerated life testing and related topics; design of life test plans, etc.

#### IE 645 Quality Engineering

This course deals with theories and applications of advanced statistical quality control techniques. Topics include design and analysis of control charts, process capability analysis, real-time process control, design of sampling inspection plans, multivariate and bulk sampling inspection plans, screening plans, and robust design methodology.

#### IE 646 Data Mining

Topics include basic concepts, models and algorithms, case studies and deployment strategies. Major techniques are data visualization, clustering, association rules, decision trees and artificial neural networks. Web mining and CRM applications are also covered.

#### IE 661 Applications of AI/DM Technology

The discipline of Industrial engineering utilizing artificial intelligence and expert systems in diverse applications: i.e. operation planning by planners of artificial intelligence (AI), expert systems (ES) with bayesian networks, and quality control via machine learnings. This lecture introduces the basics of artificial intelligence and expert systems for students at the dept. of industrial and systems engineering.

#### IE 671 Stochastic Modeling II

This course intends to provide graduate students with necessary tools that one might find indispensable to conduct independent research in the areas of applied probability, operations research, management science, or financial engineering. The course will cover broad topics such as mathematical analysis and probability, martingale theory, Markov processes, renewal theory, regenerative processes, Brownian motion and functional limit theorems. A lot of care will be taken to make contents accessible for people with a limited background in mathematics.

#### IE 722 Material Storage & Handling Systems

Design, operation and control systems to effectively handle materials in manufacturing industries are covered in this course. Topics include systematic handling analysis, stock location in a warehouse, design and scheduling of automated storage and retrieval systems, carousel systems, palletizing, hoist, closed loop conveyor, automatic guided vehicle system, and automatic transfer lines.

#### IE 761 Cognitive Engineering

Approaches to enhance human performance in problem solving and decision making by computer and other methods are considered. Systems engineering point of view is exercised while covering models of human and machine intelligence, prescriptive and descriptive theories of human decision making, and models to combine human and machine resources. Application-oriented issues are emphasized.

#### IE 801 Special Topics in Industrial Engineering II

This course is offered to meet the ad hoc demand of students in special areas of IE which is not covered by regular courses.

#### IE 802 Invited Lecture I

The course is provided for a short course, an invited lecture, a training and lab, etc., which requires effort equivalent to 1 credit unit.

#### IE 803 Invited Lecture II

The course is provided for a short course, an invited lecture, a training and lab, etc., which requires effort equivalent to 2 credit units.

#### IE 960 Thesis (M.S.)

Master Thesis Research

#### IE 965 Individual Study (Maximum 3)

Research on a specific topic is carried out independently under the direction of a faculty member. The research results are to be submitted in a report format.

#### IE 966 Seminar (M.S.)

Regularly held seminars on up-to-date topics help M.S. students grasp the current direction of development and applications in the general IE areas.

#### IE 980 Thesis (Ph.D.)

Ph.D. Dissertation Research

#### IE 985 Individual Study (Maximum 3)

Research on a specific topic is carried out independently under the direction of a faculty member. The research results are to be submitted in a report format.

#### IE 986 Seminar (Ph.D.)

Regularly held seminars on up-to-date topics help doctoral students grasp the current direction of development and applications in the general IE areas.