Master of engineering program in engineering technology (international program)

Curriculum Title

Master of Engineering in Engineering Technology (International Program)

Degree Title

Master of Engineering (Engineering Technology)

Applicant's Qualifications

1. The applicant must hold a bachelor's degree in engineering, science, or a related field that is accepted by the SIIT Academic Committee.
2. The applicant must have a top 20% class rank for a bachelor's degree, or a cumulative GPA of at least 2.75, or 2.50 with sufficient relevant research or work experience as specified by SIIT Academic Committee.
3. The applicant must submit an official score of one of the following English language tests:
   - TOEFL score of not less than 400 (paper-based) or 97 (computer-based), or 32 (internet-based)
   - IELTS score of not less than 4.5
   - TU-GET score of not less than 400

   The score must not be older than two years from the date on which it was issued, to the date of the application for admission to the program.

   In the case of no English score or a score less than the above requirements, the applicant may be admitted with conditions that he/she must take SIIT English remedial courses and/or SIIT English proficiency test, and meet the requirement set by the institute.

Admission Requirements

1. Two letters of recommendation.
2. The applicant must pass a selection process which may include an interview conducted by an SIIT Committee consisting of at least 3 faculty members.
3. Admission to the program requires approval by the SIIT Academic Committee.

Remark: Students who have inadequate knowledge in some areas may be required to take additional courses in those areas.

Academic System

1. All courses are conducted in English. An academic year is divided into 2 semesters. Each semester consists of 15 weeks. Courses may be offered for a summer semester of at least 8 weeks duration. The total number of lecture hours required for the summer semester is the same as that for the regular semester. Enrollment for summer courses is optional.
2. Curriculum

   2.1 Study Plan
   The syllabus consists of prescribed coursework (24 credits) and thesis (15 credits). A total of 39 credits is required for completion of the program.

   2.2 Thesis

   2.2.1 A student can register for a thesis after he or she has studied for at least 1 regular semester or has gained 12 credits with a minimum cumulative GPA of 3.00.

   2.2.2 Thesis Committee

   The Thesis Committee consists of at least 3 members:

   One principal advisor, faculty members of SIIT or Thammasat University, and at least one member who is not affiliated with Thammasat University and serves as an external committee member.

- The principal advisor must be an SIIT faculty member with a doctoral degree or equivalent or an academic rank of at least associate professor in the program or a related program.
- The external committee member must be an expert outside Thammasat University with a doctoral degree and holding an academic rank of at least assistant professor or equivalent, or without a doctoral degree but holding an academic rank of at least associate professor or equivalent. The specialization of the external committee member must be in a field related to the thesis.
- A co-advisor (if any) must be a faculty member of SIIT or Thammasat University, or an expert outside Thammasat University with a doctoral degree or equivalent, or with an academic rank of at least associate professor in the program or a related program.
- The number of the committee members who are not the thesis advisor or co-advisor must not be less than the number of committee members who are the thesis advisor and co-advisor. The number of Thesis Committee members who are faculty members of SIIT or Thammasat University should not be less than that of the Thesis Committee members from outside.

2.2.3 Thesis Final Defense Committee

The Thesis Final Defense Committee consists of the same members as the Thesis Committee. However, the defense must be chaired by a thesis committee member who is not the advisor or co-advisor

Period of Study

The minimum period of study to complete the program is 2 academic years and the maximum is 5 academic years.

Registration

The student must enroll in courses and/or register for a thesis totalling at least 6 credits but not more than 15 credits per semester for a regular semester and not more than 6 credits for a summer semester.

Academic Performance Evaluation and Graduation

1. Evaluation of Academic Performance

1.1 A credit will be earned only if the grade is "S" or not lower than grade "C". Grade "D" or "F" will be included in the calculation of the grade point average of each semester and for the cumulative grade point average.

1.2 Any student, who gets grade "U","D", or "F" in a compulsory course, can re-enroll in that course only one more time. His or her student status will be terminated if he or she still fails to obtain grade "S" or at least "C" for the course in the second enrollment.

1.3 Thesis assessment is divided into 2 grades:

- S (Satisfactory)
- U (Unsatisfactory)

Students must get grade "S" for their theses.

1.4 Additional course assessment and English proficiency requirements are graded as follows:

- P (Pass)
- N (Not Pass)

2. Graduation Requirements

To graduate, students must meet the following minimum requirements:

2.1 Twenty-four credits of taught courses required by the curriculum with a cumulative GPA of at least 3.00. In addition, the grade of each of these courses must be at least "C."

2.2 Fifteen credits of thesis work and passing a thesis defense

2.3 Approval of the thesis by the Thesis Committee

2.4 At least one paper on thesis findings has been accepted for publication in an international journal, or a national journal approved by the Academic Review and Rank Assessment Committee of SIIT, or at least one paper has been accepted for publication in international conference proceedings.

2.5 Having satisfied one of the following English proficiency requirements:

- A TOEFL (official or institutional) score of at least 550 (paper-based), or 213 (computer-based), or 79 (internet-based)
- An IELTS score of at least 6.0
- A TU-GET score of at least 550

Transferred Credits

A maximum of 9 credits of courses with all grades B or better can be transferred.

Curriculum

1. Total Credits Requirement

A total of 39 credits is required for completion of the program.

2. Structure and Components

2.1 Compulsory Courses	**6**	**Credits**
2.2 Compulsory Elective Courses	**15**	**Credits**
2.1.1 General Compulsory Elective Courses	3	Credits
2.1.2 Specialized Compulsory Elective Courses	12	Credits

from one of the following seven majors of study, i.e.,

1. Chemical Engineering
2. Civil Engineering
3. Electrical Engineering
4. Industrial Engineering and Manufacturing Systems
5. Mechanical Engineering
6. Sustainable Energy and Environment
7. Materials Science and Engineering

2.3 Elective Courses	**3**	**Credits**
2.4 Master's Thesis	**15**	**Credits**
Total	**39**	**Credits**

3. Course Coding System

Sirindhorn International Institute of Technology sets up the course coding system as follows:

3.1 Subject code consists of letters and numbers.

3.2 ES indicates basic subjects.
ET indicates subjects in Engineering Technology.
ICT indicates subjects in Information and Communication Technology for Embedded Systems.
SE indicates subjects in Logistics and Supply Chain Systems Engineering.

3.3 Numbers are composed of 3 digits.

- The first unit-place-digit indicates the subject order.
- The tenth-place-digit indicates the subject group.

0 General
1 Chemical Engineering
2 Civil Engineering
3 Electrical Engineering
4 Industrial Engineering and Manufacturing Systems
5 Mechanical Engineering
6-7 Sustainable Energy and Environment
8 Materials Science and Engineering

- The hundredth-place-digit indicates the graduate program.

4. List of Courses in the Curriculum

Credits (lecture-practice-self study hours)

4.1 Compulsory Courses, 6 Credits

ES605 Research Methodology	2(2-0-6)
ES606 Research Seminar	1(1-0-3)
ET601 Computer Applications for Engineers	3(3-0-9)

4.2 Compulsory Elective Courses, 15 credits

4.2.1 General Compulsory Elective Courses, 3 credits

Select one of the following courses:

ES601	Advanced Engineering Mathematics	3(3-0-9)
ES612	Advanced Business Statistics	3(3-0-9)
ET600	Numerical Methods for Engineers	3(3-0-9)
ICT600	Computational Mathematics	3(3-0-9)
SE600	Decision Making and Optimization	3(3-0-9)

4.1.2 Specialized Compulsory Elective Courses, 12 credits from one of the following majors

1) Chemical Engineering

ET610	Special Topic in Chemical Engineering	3(3-0-9)
ET611	Current Topics in Chemical Engineering	3(3-0-9)
ET61x	Technical Elective	3(3-0-9)
ET61x	Technical Elective	3(3-0-9)

2) Civil Engineering

ET620	Special Topic in Civil Engineering	3(3-0-9)
ET621	Current Topics in Civil Engineering	3(3-0-9)
ET62x	Technical Elective	3(3-0-9)
ET62x	Technical Elective	3(3-0-9)

3) Electrical Engineering

ET630	Special Topic in Electrical Engineering	3(3-0-9)
ET631	Current Topics in Electrical Engineering	3(3-0-9)
ET63x	Technical Elective	3(3-0-9)
ET63x	Technical Elective	3(3-0-9)

4) Industrial Engineering and Manufacturing Systems

ET640	Special Topic in Industrial Engineering and Manufacturing Systems	3(3-0-9)
ET641	Current Topics in Industrial Engineering and Manufacturing Systems	3(3-0-9)
ET64x	Technical Elective or SE611-7	3(3-0-9)
ET64x	Technical Elective or SE611-7	3(3-0-9)

5) Mechanical Engineering

ET650	Special Topic in Mechanical Engineering	3(3-0-9)
ET651	Current Topics in Mechanical Engineering	3(3-0-9)
ET65x	Technical Elective	3(3-0-9)
ET65x	Technical Elective	3(3-0-9)

6) Sustainable Energy and Environment

ET660	Special Topic in Sustainable Energy and Environment	3(3-0-9)
ET661	Current Topics in Sustainable Energy and Environment	3(3-0-9)
ET66x	Technical Elective or ET67x	3(3-0-9)
ET66x	Technical Elective or ET67x	3(3-0-9)

7) Materials Science and Engineering

ET680	Special Topic in Materials Science and Engineering	3(3-0-9)
ET681	Current Topics in Materials Science and Engineering	3(3-0-9)
ET68x	Technical Elective	3(3-0-9)
ET68x	Technical Elective	3(3-0-9)

4.3 Elective Course, 3 credits

ET6xx or SE611-7 or ICTxxx	Technical Elective	3(3-0-9)

4.4 Master's Thesis, 15 credits

ET800 Thesis	15

Course Descriptions

Compulsory Courses

ES605 Research Methodology 2(2-0-6)

Concept of scientific and technological research; Statistics for research planning and research study; Data collection and data analysis; Interpretations, conclusions and recommendations of research results.

ES606 Research Seminar 1(1-0-3)

Student-faculty interaction on advanced research topics.

ET601 Computer Applications for Engineers 3(3-0-9)

Use of computers. High level programming languages and tools. Equation solving and optimization tools. Statistical applications. Tools for visualizing and analyzing graphs and images. Computer applications for engineering problems.

General Compulsory Elective Courses

ES601 Advanced Engineering Mathematics 3(3-0-9)

Mathematics for solving engineering problems; ordinary differential equations of higher order; partial differential equations; integral equations; numerical analysis; optimization techniques.

ES612 Advanced Business Statistics 3(3-0-9)

This course exposes students to the application of statistical techniques used to address business and economic problems. Topics include linear regression and correlation, multiple regression, model building, analysis of variance, multivariate statistics, time series analysis, and chi-square test of significance.

ET600 Numerical Methods for Engineers 3(3-0-9)

Programming concepts and techniques; Modern programming languages and computational tools for engineering problems; Numerical methods as applied to practical engineering problems; Introduction to finite element methods.

ICT600 Computational Mathematics 3(3-0-9)

Set theory; Relations; Formal proof methods; Finite automata; Regular expressions; Context-free grammar; Pushdown automata; First order logic; Theories related to counting, graphs, and networks; Interplay between continuous models and their solution via discrete processes; Vector spaces, basis, dimension, eigenvalue problems, diagonalization, inner products, unitary matrices; Introduction to applied statistics and its application to intelligent systems; Introduction to supervised statistical learning including discrimination methods.

SE600 Decision Making and Optimization 3(3-0-9)

Fundamental optimization tools for quantitative analysis to develop modeling and decision-making skill in management sciences; Linear programming; Integer programming; Nonlinear programming; Goal programming; Game theory; Markov chains; Queuing theory and decision analysis techniques; Advanced topics in optimization.

Specialized Compulsory Elective Courses /Elective Courses

ET610 Special Topic in Chemical Engineering 3(3-0-9)

An in-depth study on a topic of interest in the field of Chemical Engineering such as advanced reactor design, advanced process analysis, biochemical process design, principles of coal-fired power plant, advanced transport phenomena, advanced thermodynamics, and automatic control processes.

ET611 Current Topics in Chemical Engineering 3(3-0-9)

A study on current interests in the field of Chemical Engineering such as nanotechnology, genetic engineering, biochemical engineering, polymer science and engineering, fuel cell and solar cell design, and alternative chemical energy resources.

ET612 Advanced Thermodynamics for Chemical Engineering 3(3-0-9)

Review on basic concepts and definitions, the first-law and energy, the second law and entropy; Availability equation for control mass/energy applications; Energy analysis of engineering cycles and Thermoeconomics; Thermodynamics of multi component and multiphase chemical system, chemical reaction equilibrium, non-ideal solution systems.

ET613 Advanced Transport Phenomena 3(3-0-9)

Review on the constitutive equations of momentum, energy and mass transfer; Development of microscopic and macroscopic of momentum, energy and mass transfer equations for chemical engineering applications including non Newtonian fluid flow and unsteady state system for momentum, energy, and mass transfer.

ET614 Advanced Chemical Kinetics and Reactor Design 3(3-0-9)

Modeling and design of batch and continuous reactors via the concept of chemical kinetics and mass and energy balances including multiphase reactor design; Concept of catalysis including homogeneous and heterogeneous catalysis, support material synthesis, and enzyme catalysis.

ET617 Petrochemical Technology 3(3-0-9)

Primary raw materials for petrochemistry; Fundamental chemistry, reactions and separations involved in the value-added processing of refinery products such as ethylene, butylenes, sulfur, medium heating value gas, etc; Use of petrochemical properties in the engineering design and operation of petroleum value-added processes; Chemistry and concerns of petrochemical pollutants.

ET618 Biochemical Engineering Fundamentals 3(3-0-9)

Overview of biological basics; Major metabolic pathways; Metabolic stoichiometry and energetics; Kinetics of substrate utilization, product formation, and biomass production in cell cultures; Transport phenomena in bioprocess systems; Selection, scale-up, operation, and control of bioreactors; Recovery and purification of products.

ET620 Special Topic in Civil Engineering 3(3-0-9)

An in-depth study on a topic of interest in the field of Civil Engineering such as computational methods in civil engineering, advanced structural analysis and design, advanced foundation engineering, maintenance of structures, construction materials.

ET621 Current Topics in Civil Engineering 3(3-0-9)

A study on current interests in the field of Civil Engineering.

ET622 Finite Element Methods 3(3-0-9)

Review of variational principles; The Ritz method; Weighted residual methods; Interpolation and shape functions; Natural coordinate systems; Generic finite element formulation for linear elasticity; Numerical integrations; Standard element shape functions; Applications of finite element methods; Programming of finite element methods.

ET623 Advanced Structural Analysis 3(3-0-9)

Structural modeling concepts; Static and kinematic requirements for structural systems; Discrete modeling of structural systems; Matrix force and matrix displacement methods; Direct stiffness method; Numerical methods and solution techniques appropriate to discrete structural systems; Numerical techniques for large-scale structural systems.

ET624 Advanced Structural Design 3(3-0-9)

Structural design concepts; Advanced topics on ultimate limit state design and serviceability design of structures; Fatigue design of structures; Design of high-rise buildings; Design of long-span bridges.

ET625 Foundation Design and Analysis 3(3-0-9)

Site Investigation; Immediate settlements; Bearing capacity of footings; Eccentric foundations; Settlement analysis; Piled foundations; Foundations on difficult soils; Earth pressure problems including retaining walls and sheet pile structures.

ET626 Inspection, Maintenance and Retrofit of Concrete Structures 3(3-0-9)

Damage of concrete structures; Types of damage: mechanisms of deterioration; Inspection: inspection methods, visual inspection; Tests: nondestructive tests, partially destructive tests, chemical tests, corrosion tests, cores, load tests; Protection and repair: materials and methods for protection and repair, special techniques; strengthening.

ET627 Engineering Cost and Financial Management 3(3-0-9)

Economic decisions; Capital Rationing for investment in projects; Cost estimation: design cost estimation, construction cost estimation, total cost of engineering projects; Cash flow forecasting and budgetary control; Business financing and financial performance; Advanced financial management; Project Financing.

ET628 Construction Management Information Systems 3(3-0-9)

Information systems; Information technology; Information generation and utilization for the management of construction projects; Integration of construction management software; Conceptual modeling and knowledge-based models.

ET630 Special Topic in Electrical Engineering 3(3-0-9)

An in-depth study on a topic of interest in the field of Electrical Engineering such as digital communication systems, telecommunication networks, network planning and design.

ET631 Current Topics in Electrical Engineering 3(3-0-9)

A study on current interests in the field of Electrical Engineering.

ET632 Data Communication Networks 3(3-0-9)

Fundamentals of data communications and networking; Layered network architectures and protocols; Data transmission and coding; Error detection and correction; Local and wide area networks; Internetworking, routing, and switching; Queuing theory; Cryptography and network security.

ET633 Network Planning and Management 3(3-0-9)

Fundamentals of computer and communication network planning, design, and management; Graph theory and queuing theory for network design; Network design problems and optimization; Network planning and design tools; Network management standards and protocols.

ET634 Optical Communication Systems 3(3-0-9)

Fundamentals of optical signals and modern optical devices; Wavelength division multiplexing; Optical communication systems and networks; Optical network architectures; Analysis and design of optical communication systems.

ET635 Digital Signal Processing in Communication Systems 3(3-0-9)

Multirate signal processing; QMF filter bank design; LPC speech coding; Subband image coding; Channel estimation/equalization; Power spectral estimation; Fundamental of adaptive filtering; Basic DSP hardware implementation.

ET636 Digital Communication System Design 3(3-0-9)

Digital transmission principles; Digital modulation techniques: ASK, FSK, PSK; Channel coding design: convolutional code, turbo code; Channel modeling; Synchronization; Transceiver design; Fundamentals of multiple access systems: CDMA, OFDM.

ET637 Special Topics in Smart Grid Technology 3(3-0-9)

An in-depth study on a topic of interest in the field of Smart Grid Technology such as autonomous power grid systems, power networks, superconducting power devices, and network planning and design.

ET638 Current Topics in Smart Grid Technology 3(3-0-9)

A study on current interests in the field of Smart Grid Technology.

ET639 Power Distribution 3(3-0-9)

This course is designed to provide an overview of the design of transmission and distribution networks. Starting with the fundamental principles of a three-phase electric power system, the course considers such matters as power and reactive power flows, load flow of various industrial loads and power utilities. Transmission and distribution system calculations for steady state and faults will be explored in some depth and illustrated by practical examples. The main objective of this course is to give students a basic understanding of a transmission/ distribution system, the equipment used, power cables, and overhead transmission lines. It also provides the analytical tools to enable design calculations to be performed.

ET640 Special Topic in Industrial Engineering and Manufacturing Systems 3(3-0-9)

An in-depth study on a topic of interest in the field of Industrial Engineering and Manufacturing Systems such as fundamental planning and control concepts for production management and supply chains, organization of the planning, scheduling and control functions, inventory management & control systems and methodologies (MRP, MRPII, ERP, OPT, JIT).

ET641 Current Topics in Industrial Engineering and Manufacturing Systems 3(3-0-9)

A study on current interests in the field of Industrial Engineering and Manufacturing Systems such as design, automation, and integration of supporting systems in the manufacturing environment including flexible manufacturing systems, robotics, automated material handling systems, and automated inspection systems.

ET642 Quality Management 3(3-0-9)

Concept of advanced quality management theory; Tools and techniques for quality improvement including SPC, six sigma, measurement system analysis, FMEA, QFD, design of experiment; Quality management system (ISO 9000): auditing and certification; Quality economic and performance measures.

ET643 Manufacturing Strategy 3(3-0-9)

Role and context of manufacturing strategy; Interaction of manufacturing strategy and other company strategies; Strategic decisions within operations; System approach to strategy formulation and manufacturing system design; Cellular manufacturing concept; Make/buy analysis, sourcing and subcontracting; Manufacturing control and information systems; Company performance evaluation.

ET644 Simulation Modeling and Analysis 3(3-0-9)

Understanding the role of modeling and simulation in the development and improvement of business processes; Methodology and modeling; Conduct of a simulation study; Hands-on exercise of a particular software package and its application in a practical context.

ET645 Advanced Manufacturing Processes 3(3-0-9)

Fundamental knowledge, principles, applications, and economics of advanced manufacturing processes including electrical-discharge machining, electrochemical machining, high speed machining, laser beam machining, and water-jet machining; Adhesive and elastic bonding technologies; Principles and applications of rapid prototyping.

ET646 Design of Operations Facilities and Systems 3(3-0-9)

Strategic issues in the location of business in a global environment; Modern methods applied to facility layout and location design; Material handling and integrated production systems; Warehousing and logistics; Quantitative approaches to location and layout modeling; Computer-aided layout design; Personnel issues in layout design; Design for next generation manufacturing and services.

ET650 Special Topic in Mechanical Engineering 3(3-0-9)

An in-depth study on a topic of interest in the field of Mechanical Engineering such as advanced refrigeration and cryogenics, solar design methods and applications, energy resources and technologies, principles of gas-fired power plant, air-conditioning system design, steam boiler and furnace technology, fuzzy and neural control, mechatronics, and automatic control.

ET651 Current Topics in Mechanical Engineering 3(3-0-9)

A study on current interests in the field of Mechanical Engineering such as advanced technologies for energy management in buildings, energy-economic modeling and policy analysis, bio-energy conversion, and applied soft computing in mechanics.

ET652 Power Plant Engineering and Emissions 3(3-0-9)

Fossil fuels: properties, classification, world reserves; Fossil fuel-fired power plants; Fuels and combustion; Combustion methods and boiler classifications; Boiler and power plant efficiencies and fuel consumption; Formation of major pollutants (CO_2, NO_x, SO_x and PM) in boiler furnaces: effects of fuel properties, boiler design, and operating conditions; Trace elements and PAHs from firing fossil fuels; Emission control in power plants; Assessment of major emissions from boilers and power plants.

ET653 Optimization Methods in Mechanical Engineering 3(3-0-9)

Principles and algorithms in development of optimization problems in mechanical engineering; Methods of solving optimization problems: conventional multi-variable techniques, genetic algorithm, simulated annealing method, linear programming, etc.; Computer-aided optimization and applications.

ET654 Advanced Heat Transfer 3(3-0-9)

Laminar forced convection in circular, non-circular, annular cross-sectioned conduits; Turbulent forced convection over ducts and flat plates; Boiling and condensation; Analytical techniques and numerical methods for solving heat conduction problems; Conduction problems including heat sources and geometric factors; Radiation heat transfer-radiation from clouds and gases.

ET655 Biomass for Heat and Power 3(3-0-9)

Biomass characteristics and availability; Potential for biomass utilization in heat and power generation; Biomass combustion analysis; Boilers and gasifiers; Power generating equipment and processes; Cogeneration; Performance analysis; Financial evaluation of biomass projects; Emissions calculation and control methods.

ET656 Computational Fluid Dynamics 3(3-0-9)

The basic concept of fluid flow; Introduction to numerical analysis-finite difference methods, finite volume methods, techniques for solving linear equation systems, etc.; Application of CFD methods to solving the wave equation, the heat equation, Laplace's equation, Burgers' equation and simple forms of the Navier-Stokes equations; Commercial CFD software.

ET657 Energy Modeling 3(3-0-9)

Energy consumption and supply balance; Energy matrix; Thailand sectorial energy consumption; Energy supply and intermediate energy forms; Principles of model building; Model types; Construction of projection functions; Data requirements; Sensitivity and model verification; Policy analysis and choice of models; Linkage with other national models-macro-economic, population planning, and agricultural models.

ET660 Special Topic in Sustainable Energy and Environment 3(3-0-9)

An in-depth study on a topic of interest in the field of Energy and Environment such as biomass energy, fossil fuels, geothermal energy, nuclear power, wind power, solar energy, hydrogen fuel, fusion energy, biodegradation and bioremediation, waste treatment technologies, and waste disposal technologies.

ET661 Current Topics in Sustainable Energy and Environment 3(3-0-9)

A study on current interests in the field of Energy and Environment such as bio-energy conversions, clean energy resources, low carbon economy and technology, energy-environmental-sustainable-economic development, greenhouse gas mitigation technologies.

ET662 Energy and Environmental Impact Assessment 3(3-0-9)

EIA objectives and principles; EIA process; Types of EIA; Impact assessment methods; Impacts on various sectors of environment; Energy system and its environmental impacts; Baseline data collection; Modeling of facility combined with existing baseline conditions; Analysis of potential effects and mitigation measures; Issues in social and health impact assessment.

ET664 Sustainable Energy 3(3-0-9)

Current and potential future energy systems: resources, extraction, conversion, and end-use; Meeting regional and global energy needs in the 21st century in a sustainable manner; Different renewable and conventional energy technologies will be presented including biomass energy, fossil fuels, geothermal energy, nuclear power, wind power, solar energy, hydrogen fuel, fusion energy, and their attributes within a framework that aids in evaluation and analysis of energy technology systems in the context of political, social, economic, and environmental goals.

ET665 Energy Planning and Policy 3(3-0-9)

Energy flows in the economy; Energy accounting framework; Basic econometric Methods; Methodology for energy demand analysis; End-use method of energy; Demand analysis; Energy demand forecasting methodologies; Planning in electricity; Demand side management; Energy policy and institutions; Environmental regulations of energy.

ET667 Cleaner Production 3(3-0-9)

Sustainable waste treatment; Industrial ecology; Green chemistry; Life cycle assessment; Waste and cleaner production audits; Cleaner production technologies, applications, implementation, and success case studies; Roles of international standards; ISO14000.

ET668 Pollution Control and Management 3(3-0-9)

Physical, chemical and biological processes influencing the extent of air, water and soil pollution; Methods of treatment and control of air and water pollution; Treatment, reuse, recycle, and management of solid and hazardous wastes; Monitoring; Standards.

ET680 Special Topic in Materials Science and Engineering 3(3-0-9)

An in-depth study on a topic of interest in the field of Materials Science and Engineering such as advanced material synthesis, development and application of high technology materials, sustainable development of materials for industrial applications.

ET681 Current Topics in Materials Science and Engineering 3(3-0-9)

A Study on current interests in the field of Materials Science and Engineering.

ET682 Polymeric Materials 3(3-0-9)

Manufacture of polymeric materials, especially industrially significant polymers together with discussion of their major chemical, physical, thermal, and mechanical properties; Industrial production of polymeric materials; Processing methods and applications of polymeric materials, and their blends and composites.

ET683 Materials Characterizations 3(3-0-9)

Fundamental theoretical and applications of materials characterization techniques, including Thermal analysis (TGA, DMA, DSC), Microscopy (AFM, SEM, TEM), XRD, XRF, Spectroscopy (FTIR, Raman, UV-Vis, NMR, MS), and mechanical testing of materials.

ET684 Materials for Advanced Applications 3(3-0-9)

Various advances in material applications such as eco-and biological friendly materials, materials for medical and pharmaceutical applications, nanomaterials and sensors, materials under extreme conditions, nuclear materials, materials for energy and environmental applications.

ET685 Materials Deterioration 3(3-0-9)

Basic science of deterioration of materials, which includes effects of chemical, physical and mechanical properties of materials as well as environmental conditions on the deterioration; Deterioration of cementitious materials, polymers, and metals; Preventive measures such as surface treatments and coatings to prolong service life of materials.

ICT700 Software Concepts for Embedded Systems 3(3-0-9)

Software programming, embedded operating systems and middlewares, verification and testing for embedded systems, software concepts on microcontroller architectures and peripherals, compilers and debuggers, timer and interrupt systems, interfacing of devices, software issues in design of embedded systems, communications and networking, real-time system design for embedded systems, Data Structures, Sequential and Binary searches, Merging and Sorting.

ICT710 Software Designs for Embedded Systems 3(2-3-7)

Hardware and software development tools, software project management techniques and tools, embedded operating systems, software development project: requirement analysis, software detailed and test case design, software coding and testing, software documentation. FPGA prototype board using sample application; FPGA logics; VHDL/Verilog programming. Project planning, system specification design, software coding, software implementation and verification on a prototype board.

ICT720 Hardware Concepts for Embedded Systems 3(3-0-9)

Basic digital system design, processor architecture design, VLSI design methodologies, hardware concepts on microcontroller architectures and peripherals, device interface, hardware for communications and networking.

ICT730 Hardware Designs for Embedded Systems 3(2-3-7)

Hardware development tools, hardware description language, VHDL/Verilog programming; FPGA design flow: input and output pin assignment, synchronous and asynchronous logic design, logic simulation and optimization, verification of design constraints, hardware development project, software and hardware implementation and verification on FPGA prototype board, practical issues on microcontroller and FPGA.

ICT740 Communication Theory 3(3-0-9)

Information theory, signal processing, communication systems, data and digital communication concepts, theory and techniques in data communications: transmission, encoding, decoding, error detection, error correction, link control, networking and standards, communication software and hardware, synchronization subsystems, time division multiple access systems, code division multiple access systems, wireless communications. Cryptography and security in Mobile communication.

ICT750 Digital Signal Processing 3(3-0-9)

Digital signal processing theory, video and audio processing, discrete-time signals and systems, linear time-invariant systems, sampling of continuous-time signals and convolution, finite and infinite impulse response filter designs, discrete Fourier transform, fast Fourier transform algorithms, relations between Fourier transform: discrete-frequency Fourier transform, Fourier series, discrete-time Fourier transform, and discrete Fourier transform. Image and speech coding and decoding, transmultiplexers, filter banks, channel estimation and equalization, synchronization, array processing, power spectral estimation, adaptive filtering, analog digital converters, and digital analog converter algorithms.

ICT760 Intelligence Processing 3(3-0-9)

Human interface, computer graphic, artificial intelligence, concept and design of human-machine interfaces, trends of human interface design, graphic user interface, interactive software design, hardware technology for human interfaces, basic descriptive geometry, methods of creating, storing, manipulating, presenting and animating two and three dimensional objects, applications of artificial intelligence, artificial intelligence languages, search techniques, knowledge representation, reasoning and inference, machine learning, expert systems. Human sensory information processing.

ICT770 Control Systems 3(3-0-9)

Control system theory, Laplace transforms, control system description and block diagrams, dynamics of typical controlled systems, development and simplification of transfer functions, analytic tools for predicting system response and performance, root locus design techniques, applications for embedded systems: control systems and environment, environment control systems, and power management systems methods, control in power electronics.

ICT780 Current Topics in Embedded Systems 3(3-0-9)

Current topics in embedded systems at the master's degree level. Topics are subject to change each semester.

ICT781 Advanced Topics in Embedded Systems 3(3-0-9)

Advanced topics in embedded systems at the master's degree level. Topics are subject to change each semester.

ICT782 Selected Topics in Embedded Systems 3(3-0-9)

Selected topics in embedded systems at the master's degree level. Topics are subject to change each semester.

ICT790 Current Topics in Information and Communication Technology 3(3-0-9)

Current topics in Information and Communication Technology at the master's degree level. Topics are subject to change each semester.

ICT791 Advanced Topics in Information and Communication Technology 3(3-0-9)

Advanced topics in Information and Communication Technology at the master's degree level. Topics are subject to change each semester.

ICT792 Selected Topics in Information and Communication Technology 3(3-0-9)

Selected topics in Information and Communication Technology at the master's degree level. Topics are subject to change each semester.

SE611 Procurement Logistics 3(3-0-9)

Overview of the procurement and purchasing activities in a supply chain; Supplier evaluation and selection; Pricing, negotiation, contracts; Outsourcing; Multiple sourcing; Just-in-time procurement; Inventory management; Buying decisions and plans; Cost analysis; Purchase agreements; E-procurement; Real-time internet-based e-supply chains; Reverse logistics and customer services; Supply chains for financing; Purchasing analysis of capital equipment; Institutional and government purchases.

SE612 Laws and Regulations in Logistics 3(3-0-9)

Logistics systems and legal framework for the domestic and international movement of goods; Operational characteristics of providers for exporting and importing services; Effects of government trade policies on global logistics.

SE613 Transportation Systems Design and Analysis 3(3-0-9)

Characteristics of various modes of domestic and international transportations; Vehicle types; Urban, air, ocean, highway, pick-up and delivery systems; Scheduling; Factors that influence transport demand; Costs; Market structures; Carrier pricing; Carrier operating and service characteristics and their influence on other supply chain costs and supply chain performance such as routes; labor; competition.

SE614 Warehouse Design and Operations 3(3-0-9)

Fundamental operations in warehousing including roles of warehousing, layout and facility design, warehouse technology such as bar codes, radio frequency identification (RFID) for inventory control systems, modern warehouse operations, classifying products, materials handling, racking and shelving, automated storage and retrieval systems (AS/RS), aisle width decision; Information technology for warehouse operations; Health and safety issues.

SE615 Operations Scheduling 3(3-0-9)

Sequencing and scheduling activities including: static and dynamic problems; deterministic and stochastic models, single machine processing; Parallel machine processing; Flow-shop and job-shop scheduling; Project scheduling; Workforce scheduling; Exact and heuristic solution methods and applications in logistics and supply chain systems.

SE616 Design of Experiments in Supply Chain Systems 3(3-0-9)

Fundamental of Design of Experiment; Simple experiment design, factorial, fractional factorial experiments; ANOVA analysis, model adequacy analysis, mixed level designs, response surface methodology and Taguchi design; Review of successful experimentation in Supply Chain Management practices.

SE617 Accounting and Financial Management for Logistics and Supply Chain Systems 3(3-0-9)

Profitability, liquidity; Analysis and interpretation of published financial statements; Cost behavior analysis; Profit, volume analyses; Budget preparation and control; Standard costing; Divisional, segmental performance measurement; Capital investment; Risk and uncertainty analysis; Effects of inflation and taxation; Introduction to computer based financial modeling; Good corporate governance.

Master's Thesis

ET800 Thesis 15 credits

This course guides students how to develop and carry out master research in the field of engineering and technology: Thesis writing, thesis presentation, publication, and research ethics.

Master of Engineering Program in Information and Communication Technology for Embedded Systems (International Program)

Curriculum Title

Master of Engineering in Information and Communication Technology for Embedded Systems
(International Program)

Degree Title

Master of Engineering (Information and Communication Technology for Embedded Systems)

Applicant's Qualifications

1. The applicant must hold a bachelor's degree in engineering or science that is related to electrical, electronics, computer, information technology, and applied mathematics, or a related field that is accepted by the SIIT Academic Committee.
2. The applicant must have a top 20% class rank for a bachelor's degree, or a cumulative GPA of at least 2.75, or 2.50 with sufficient relevant research or work experience as specified by SIIT Academic Committee.
3. The applicant must submit an official score of one of the following English language tests:
   - TOEFL score of not less than 400 (paper-based) or 97 (computer-based), or 32 (internet-based)
   - IELTS score of not less than 4.5
   - TU-GET score of not less than 400

   The score must not be older than two years from the date on which it was issued, to the date of the application for admission to the program.

   In the case of no English score or a score less than the above requirements, the applicant may be admitted with conditions that he/she must take SIIT English remedial courses and/or SIIT English proficiency tests, and meet the requirement set by the institute.

Admission Requirements

1. Two letters of recommendation
2. The applicant must pass a selection process which may include an interview conducted by an SIIT Committee consisting of at least 3 faculty members.
3. Admission to the program requires approval by the SIIT Academic Committee.

Remark: Students who have inadequate knowledge in some areas may be required to take additional courses in those areas.

Academic System

1. All courses are conducted in English. An academic year is divided into 2 semesters. Each semester consists of 15 weeks. Courses may be offered for a summer semester of at least 8 weeks duration. The total number of lecture hours required for the summer semester is the same as that for the regular semester. Enrollment for summer courses is optional.
2. Curriculum

   2.1 Study Plan

   The syllabus consists of prescribed coursework (24 credits) and thesis (15 credits). A total of 39 credits is required for completion of the program.

2.2 Thesis

2.2.1 A student can register for a thesis after he or she has studied for at least 1 regular semester or has gained 12 credits with a minimum cumulative GPA of 3.00.

2.2.2 Thesis Committee

The Thesis Committee consists of at least 3 members:

One principal advisor, faculty members of SIIT or Thammasat University, and at least one member who is not affiliated with Thammasat University and serves as an external committee member.

- The principal advisor must be an SIIT faculty member with a doctoral degree or equivalent or an academic rank of at least associate professor in the program or a related program.
- The external committee member must be an expert outside Thammasat University with a doctoral degree and holding an academic rank of at least assistant professor or equivalent, or without a doctoral degree but holding an academic rank of at least associate professor or equivalent. The specialization of the external committee member must be in a field related to the thesis.
- A co-advisor (if any) must be a faculty member of SIIT or Thammasat University, or an expert outside Thammasat University with a doctoral degree or equivalent, or with an academic rank of at least associate professor in the program or a related program.
- The number of the committee members who are not the thesis advisor or co-advisor must not be less than the number of committee members who are the thesis advisor and co-advisor. The number of Thesis Committee members who are faculty members of SIIT or Thammasat University should not be less than that of the Thesis Committee members from outside.

2.2.3 Thesis Final Defense Committee

The Thesis Final Defense Committee consists of the same members as the Thesis Committee. However, the defense must be chaired by a thesis committee member who is not the advisor or co-advisor.

Period of Study

The minimum period of study to complete the program is 2 academic years and the maximum is 5 academic years.

Registration

The student must enroll in courses and/or register for a thesis totalling at least 6 credits but not more than 15 credits per semester for a regular semester and not more than 6 credits for a summer semester.

Academic Performance Evaluation and Graduation

1. Evaluation of Academic Performance

1.1 A credit will be earned only if the grade is "S" or not lower than grade "C". Grade "D" or "F" will be included in the calculation of the grade point average of each semester and for the cumulative grade point average.

1.2 Any student, who gets grade "U","D", or "F" in a compulsory course, can re-enroll in that course only one more time. His or her student status will be terminated if he or she still fails to obtain grade "S" or at least "C" for the course in the second enrollment.

1.3 Thesis assessment and independent study assessment are graded as follows:

- S (Satisfactory)
- U (Unsatisfactory)

Students must receive grade "S" for their theses/independent studies.

1.4 Additional course assessment and English proficiency requirements are graded as follows:

- P (Pass)
- N (Not Pass)

2. Graduation Requirements

To graduate, students must meet the following minimum requirements:

2.1 Twenty-four credits of taught courses required by the curriculum with a cumulative GPA of at least 3.00. In addition, the grade of each of these courses must be at least "C."

2.2 Fifteen credits of thesis work and passing a thesis defense

2.3 Approval of the thesis by the Thesis Committee

2.4 At least one paper on thesis findings has been accepted for publication in an international journal, or a national journal approved by the Academic Review and Rank Assessment Committee of SIIT, or at least one paper has been accepted for publication in international conference proceedings.

2.5 Having satisfied one of the following English proficiency requirements:

- A TOEFL (official or institutional) score of at least 550 (paper-based), or 213 (computer-based), or 79 (internet-based)
- An IELTS score of at least 6.0
- A TU-GET score of at least 550

Transferred Credits

A maximum of 9 credits of courses with all grades B or better can be transferred.

Curriculum

1. Total Credits Requirement

A total of 39 credits is required for completion of the program.

2. Structure and Components

2.1 Core Courses	**24**	**Credits**
2.1.1 Compulsory Courses	15	Credits
2.1.2 Compulsory Elective Course	3	Credits
2.1.3 Technical Elective Courses	6	Credits
2.2 Master's Thesis	**15**	**Credits**
Total	**39**	**Credits**

3. Course Coding System

Sirindhorn International Institute of Technology sets up the course coding system as follows:

3.1 Subject code consists of letters and numbers.

3.2 ES indicates basic subjects.
ET indicates subjects in Engineering Technology.
ICT indicates subjects in Information and Communication Technology for Embedded Systems.
SE indicates subjects in Logistics and Supply Chain Systems Engineering.

3.3 Numbers are composed of 3 digits.

- The first unit-place-digit indicates the order of subject.
- The tenth-place-digit indicates the subject group.
- The hundredth-place-digit indicates the graduate program.

4. List of Courses in the Curriculum

Credits (lecture-practice-self study hours)

4.1 Core Courses, 24 Credits

4.1.1 Compulsory Courses, 15 credits

ES605	Research Methodology	2(2-0-6)
ES606	Research Seminar	1(1-0-3)
ICT700	Software Concepts for Embedded Systems	3(3-0-9)
ICT710	Software Design for Embedded Systems	3(2-3-7)
ICT720	Hardware Concepts for Embedded Systems	3(3-0-9)
ICT730	Hardware Design for Embedded Systems	3(2-3-7)

4.1.2 Compulsory Elective Course, 3 credits

Select one of the following courses:

ES601	Advanced Engineering Mathematics	3(3-0-9)
ES611	Theory of Computation	3(3-0-9)
ES612	Advanced Business Statistics	3(3-0-9)
ET600	Numerical Methods for Engineers	3(3-0-9)
ET601	Computer Applications for Engineers	3(3-0-9)
ICT600	Computational Mathematics	3(3-0-9)
SE600	Decision Making and Optimization	3(3-0-9)

4.1.3 Technical Elective Courses, 6 credits

Select two courses from the following courses:

ICT740	Communication Theory	3(3-0-9)
ICT750	Digital Signal Processing	3(3-0-9)
ICT760	Intelligence Processing	3(3-0-9)
ICT770	Control Systems	3(3-0-9)

		Credits (lecture-practice-self study hours)
ICT780	Current Topics in Embedded Systems	3(3-0-9)
ICT781	Advanced Topics in Embedded Systems	3(3-0-9)
ICT782	Selected Topics in Embedded Systems	3(3-0-9)
ICT790	Current Topics in Information and Communication Technology	3(3-0-9)
ICT791	Advanced Topics in Information and Communication Technology	3(3-0-9)
ICT792	Selected Topics in Information and Communication Technology	3(3-0-9)

4.2 Master's Thesis, 15 credits

ICT800	Thesis	15

Course Descriptions

Compulsory Courses

ES605 Research Methodology 2(2-0-6)

Concepts of scientific and technological research; Statistics for research planning and research study; Data collection and data analysis; Interpretations, conclusions and recommendations of research results.

ES606 Research Seminar 1(1-0-3)

Student-faculty interaction on advanced research topics.

ICT700 Software Concepts for Embedded Systems 3(3-0-9)

Software programming, embedded operating systems and middlewares, verification and testing for embedded systems, software concepts on microcontroller architectures and peripherals, compilers and debuggers, timer and interrupt systems, interfacing of devices, software issues in design of embedded systems, communications and networking, real-time system design for embedded systems, Data Structures, Sequential and Binary searches, Merging and Sorting

ICT710 Software Designs for Embedded Systems 3(2-3-7)

Hardware and software development tools, software project management techniques and tools, embedded operating systems, software development project: requirement analysis, software detailed and test case design, software coding and testing, software documentation. FPGA prototype board using sample application; FPGA logics; VHDL/Verilog programming. Project planning, system specification design, software coding, software implementation and verification on a prototype board.

ICT720 Hardware Concepts for Embedded Systems 3(3-0-9)

Basic digital system design, processor architecture design, VLSI design methodologies, hardware concepts on microcontroller architectures and peripherals, device interface, hardware for communications and networking.

ICT730 Hardware Designs for Embedded Systems 3(2-3-7)

Hardware development tools, hardware description language, VHDL/Verilog programming; FPGA design flow: input and output pin assignment, synchronous and asynchronous logic design, logic simulation and optimization, verification of design constraints, hardware development project, software and hardware implementation and verification on FPGA prototype board, practical issues on microcontroller and FPGA.

Compulsory Elective Courses

ES601 Advanced Engineering Mathematics 3(3-0-9)

Use of computers. High level programming languages and tools. Equation solving and optimization tools. Statistical applications. Tools for visualizing and analyzing graphs and images. Computer applications for engineering problems.

ES611 Theory of Computation 3(3-0-9)

Set theory; relations; formal proof methods; finite automata; regular expressions; context-free grammar; pushdown automata; Turing machines; uncomputability; computational complexity; first-order logic.

ES612 Advanced Business Statistics 3(3-0-9)

This course exposes students to the application of statistical techniques used to address business and economic problems. Topics include linear regression and correlation, multiple regression, model building, analysis of variance, multivariate statistics, time series analysis, and chi-square test of significance.

ET600 Numerical Methods for Engineers 3(3-0-9)

Programming concepts and techniques; Modern programming languages and computational tools for engineering problems; Numerical methods as applied to practical engineering problems; Introduction to finite element methods.

ET601 Computer Applications for Engineers 3(3-0-9)

Use of computers. High level programming languages and tools. Equation solving and optimization tools. Statistical applications. Tools for visualizing and analyzing graphs and images. Computer applications for engineering problems.

ICT600 Computational Mathematics 3(3-0-9)

Set theory; relations; Formal proof methods; Finite automata; Regular expressions; Context-free grammar; Pushdown automata; First order logic; Theories related to counting, graphs and networks; Interplay between continuous models and their solution via discrete processes; Vector spaces, basis, dimension, eigenvalue problems, diagonalization, inner products, unitary matrices; Introduction to applied statistics and its application to intelligent systems; introduction to supervised statistical learning including discrimination methods.

SE600 Decision Making and Optimization 3(3-0-9)

Fundamental optimization tools for quantitative analysis to develop modeling and decision-making skill in management sciences; Linear programming; Integer programming; Nonlinear programming; Goal programming; Game theory; Markov chains; Queuing theory and decision analysis techniques; Advanced topics in optimization.

Technical Elective Courses

ICT740 Communication Theory 3(3-0-9)

Information theory, signal processing, communication systems, data and digital communication concepts, theory and techniques in data communications: transmission, encoding, decoding, error detection, error correction, link control, networking and standards, communication software and hardware, synchronization subsystems, time division multiple access systems, code division multiple access systems, wireless communications. Cryptography and security in Mobile communication.

ICT750 Digital Signal Processing 3(3-0-9)

Digital signal processing theory, video and audio processing, discrete-time signals and systems, linear time-invariant systems, sampling of continuous-time signals and convolution, finite and infinite impulse response filter designs, discrete Fourier transform, fast Fourier transform algorithms, relations between Fourier transform: discrete-frequency Fourier transform, Fourier series, discrete-time Fourier transform, and discrete Fourier transform. Image and speech coding and decoding, transmultiplexers, filter banks, channel estimation and equalization, synchronization, array processing, power spectral estimation, adaptive filtering, analog digital converter and digital analog converter algorithms.

ICT760 Intelligence Processing 3(3-0-9)

Human interface, computer graphic, artificial intelligence, concept and design of human-machine interface, trends of human interface design, graphic user interface, interactive software design, hardware technology for human interface, basic descriptive geometry, methods of creating, storing, manipulating, presenting and animating two and three dimensional objects, applications of artificial intelligence, artificial intelligence languages, search techniques, knowledge representation, reasoning and inference, machine learning, expert systems. Human sensory information processing.

ICT770 Control Systems 3(3-0-9)

Control system theory, Laplace transforms, control system description and block diagrams, dynamics of typical controlled systems, development and simplification of transfer functions, analytic tools for predicting system response and performance, root locus design techniques, applications for embedded systems: control systems and environment, environment control systems, and power management systems methods, control in power electronics.

ICT780 Current Topics in Embedded Systems 3(3-0-9)

Current topics in embedded systems at the master's degree level. Topics are subject to change each semester.

ICT781 Advanced Topics in Embedded Systems 3(3-0-9)

Advanced topics in embedded systems at the master's degree level. Topics are subject to change each semester.

ICT782 Selected Topics in Embedded Systems 3(3-0-9)

Selected topics in embedded systems at the master's degree level. Topics are subject to change each semester.

ICT790 Current Topics in Information and Communication Technology 3(3-0-9)

Current topics in Information and Communication Technology at the master's degree level. Topics are subject to change each semester.

ICT791 Advanced Topics in Information and Communication Technology 3(3-0-9)

Advanced topics in Information and Communication Technology at the master's degree level. Topics are subject to change each semester.

ICT792 Selected Topics in Information and Communication Technology 3(3-0-9)

Selected topics in Information and Communication Technology at the master's degree level. Topics are subject to change each semester.

Master's Thesis

ICT800 Thesis 15 credits

This course guides students how to develop and carry out master research in the field of information and communication technology for embedded system: Thesis writing, thesis presentation, publication, and research ethics.

Master of engineering program in logistics and supply chain systems engineering (international program)

Curriculum Title

Master of Engineering in Logistics and Supply Chain Systems Engineering (LSCSE) (International Program)

Degree Title

Master of Engineering (Logistics and Supply Chain Systems Engineering)

Applicant's Qualifications

1. The applicant must hold a bachelor's degree in engineering, science, or a related field that is accepted by the SIIT Academic Committee.
2. The applicant must have a top 20% class rank for his/her bachelor's degree, or a cumulative GPA of at least 2.75, or a cumulative GPA of at least 2.5 with sufficient relevant research or work experience as specified by the SIIT Academic Committee.
3. The applicant must submit an official score of one of the following English language tests:
   - TOEFL score of not less than 400 (paper-based) or 97 (computer-based), or 32 (internet-based)
   - IELTS score of not less than 4.5
   - TU-GET score of not less than 400

   The score must not be older than two years from the date on which it was issued, to the date of the application for admission to the program.

   In the case of no English score or a score less than the above requirements, the applicant may be admitted with conditions that he/she must take SIIT English remedial courses and/or SIIT English proficiency tests, and meet the requirement set by the institute.

Admission Requirements

1. Two letters of recommendation.
2. The applicant must pass a selection process which may include an interview conducted by an SIIT Committee consisting of at least 3 faculty members.
3. Admission to the program requires approval by the SIIT Academic Committee.

Remark: Students who have inadequate knowledge in some areas may be required to take additional courses in those areas.

Academic System

1. All courses are conducted in English. An academic year is divided into two semesters. Each semester consists of 15 weeks. Courses may be offered for a summer semester of at least eight weeks duration. The total number of lecture hours required for the summer semester is the same as that for the regular semester. Enrollment for summer courses is optional.
2. Curriculum

   2.1 Study Plan A

   This syllabus consists of prescribed coursework (24 credits) and thesis (15 credits). A total of 39 credits is required for completion of the program.

   2.2 Study Plan B

   This syllabus focuses on coursework (not less than 33 credits). Independent study (not less than 6 credits) and comprehensive examination are required for completion of the program.

3. Thesis (Study Plan A)

3.1 A student can register for thesis credit(s) after he or she has studied for at least 1 regular semester or has gained 12 credits with a minimum cumulative GPA of 3.00.

3.2 Thesis's Committee

The Thesis Committee consists of at least three members:

One principal advisor, faculty members of SIIT or Thammasat University, and at least one member who is not affiliated with Thammasat University and serves as an external committee member.

- The principal advisor must be an SIIT faculty member with a doctoral degree or equivalent or an academic rank of at least associate professor in the program or a related program.
- The external committee member must be an expert outside Thammasat University with a doctoral degree and holding an academic rank of at least assistant professor or equivalent, or without a doctoral degree but holding an academic rank of at least associate professor or equivalent. The specialization of the external committee member must be in a field related to the thesis.
- A co-advisor (if any) must be a faculty member of SIIT or Thammasat University, or an expert outside Thammasat University with a doctoral degree or equivalent, or with an academic rank of at least associate professor in the program or a related program.
- The number of the committee members who are not the thesis advisor or co-advisor must not be less than the number of committee members who are the thesis advisor and co-advisor. The number of Thesis Committee members who are faculty members of SIIT or Thammasat University should not be less than that of the Thesis Committee members from outside.

3.3 Thesis Final Defense Committee

The Thesis Final Defense Committee consists of the same members as the Thesis Committee. However, the defense must be chaired by a thesis committee member who is not the advisor or co-advisor.

4. Independent Study (Study Plan B)

4.1 A student can register for independent study after he or she has gained at least 18 credits with a minimum cumulative GPA of 3.00.

4.2 A student can take the final examination of an independent study only after he or she obtained "P" (Pass) for his or her comprehensive examination and satisfied English proficiency requirements.

4.3 Independent Study Examination

SIIT shall appoint a project advisor and, if required, a project co-advisor to advise the student on the independent study

4.3.1 The project advisor must be a faculty member of SIIT with a doctoral degree or equivalent, or has an academic rank of at least associate professor in the program or a related program.

4.3.2 SIIT shall appoint a project committee of at least 3 persons consisting of the project advisor, project co-advisor (if needed), faculty member(s) of SIIT, and an external member if necessary.

4.4 Comprehensive Examination

4.4.1 A comprehensive examination can be taken if the student has gained 24 credits with a minimum cumulative GPA of 3.00.

4.4.2 A student must pass the comprehensive examination within a maximum of three times. If the student cannot pass the comprehensive examination, the status of the student will be terminated. Results of all comprehensive examinations will be recorded in the student's academic record.

Period of Study

The minimum period of study to complete the program is 2 academic years and the maximum is 5 academic years.

Registration

The student must enroll in courses and/or register for a thesis totalling at least 6 credits but not more than 15 credits per semester for a regular semester and not more than six credits for a summer semester.

Academic Performance Evaluation and Graduation

1. Evaluation of Academic Performance

1.1 A credit will be earned only if the grade is "S" or not lower than grade "C". Grade "D" or "F" will be included in the calculation of the grade point average of each semester and for the cumulative grade point average.

1.2 Any student, who gets grade "U","D", or "F" in a compulsory course, can re-enroll in that course only one more time. His or her student status will be terminated if he or she still fails to obtain grade "S" or at least "C" for the course in the second enrollment.

1.3 Thesis assessment and independent study assessment are graded as follows:

- S (Satisfactory)
- U (Unsatisfactory)

Students must receive grade "S" for their theses/independent studies.

1.4 Additional course assessment and English proficiency requirements are graded as follows:

- P (Pass)
- N (Not Pass)

2. Graduation Requirements

2.1 Graduation requirements (Study Plan A)

Students must meet the following minimum requirements:

2.1.1 Twenty-four credits of courses required by the curriculum with a cumulative GPA of at least 3.00. In addition, the grade of each of these courses must be at least "C."

2.1.2 Fifteen credits of thesis work with grade "S" and passing a thesis defense.

2.1.3 Approval of the thesis by the thesis committee.

2.1.4 At least one paper on thesis findings has been accepted for publication in an international journal, or a national journal approved by the Academic Review and Rank Assessment Committee of SIIT, or at least one paper has been accepted for publication in international conference proceedings.

2.1.5 Having satisfied one of the following English proficiency requirements:

- A TOEFL score of not less than 550 (paper-based) or 213 (computer-based), or 79 (internet-based)
- An IELTS score of not less than 6.0
- A TU-GET score of not less than 550

2.2 Graduation requirements (Study Plan B)

Students must meet the following minimum requirements:

2.2.1 Thirty-three credits of courses required by the curriculum with a cumulative GPA of at least 3.00. In addition, the grade of each of these courses must be at least "C."

2.2.2 Having obtained "S" in his or her independent study for six credits and passing the comprehensive examination.

2.2.3 At least one paper on the finding of the independent study has been submitted to SIIT for consideration for publication in journal or conference proceedings.

2.2.4 Having satisfied one of the following English proficiency requirements:

- A TOEFL score of not less than 550 (paper-based) or 213 (computer-based), or 79 (internet-based)
- An IELTS score of not less than 6.0
- A TU-GET score of not less than 550

Students must satisfy one of the above English proficiency requirements before the final independent study examination.

Transferred Credits

A maximum of nine credits of courses with grades B or better can be transferred.

Curriculum

1. Total Credits Requirement

A total of 39 credits is required for completion of the program.

2. Structure and Components

2.1 Study Plan A

2.1.1 Compulsory Courses	**9**	**Credits**
2.1.2 Compulsory Elective Courses	**15**	**Credits**
2.1.3 Master's Thesis	**15**	**Credits**
Total	**39**	**Credits**

2.2 Study Plan B

2.2.1 Compulsory Courses	**9**	**Credits**
2.2.2 Compulsory Elective Courses	**24**	**Credits**
2.2.3 Independent Study	**6**	**Credits**
Total	**39**	**Credits**

3. Course Coding System

Sirindhorn International Institute of Technology sets up the course coding system as follows:

3.1 Subject code consists of letters and numbers.

3.2 ES indicates basic subjects.
ET indicates subjects in Engineering Technology.
ICT indicates subjects in Information and Communication Technology for Embedded Systems.
SE indicates subjects in Logistics and Supply Chain Systems Engineering.

3.3 Numbers are composed of three digits.

- The first unit-place-digit indicates the order of subject.
- The tenth-place-digit indicates the subject group.
- The hundredth-place-digit indicates the graduate program.

4. List of Courses in the Curriculum

Credits (lecture-practice-self study hours)

4.1 Compulsory Courses, 9 Credits

ES605	Research Methodology	2(2-0-6)
ES606	Research Seminar	1(1-0-3)
SE601	Logistics and Supply Chain Systems	3(3-0-9)
SE602	Production Logistics	3(3-0-9)

4.2 Compulsory Elective Courses, 15 Credits

4.2.1 *Option I: Supply Chain Systems Engineering*

4.2.1.1 *Study Plan A*, 15 credits

SE600	Decision Making and Optimization	3(3-0-9)
or ET600	Numerical Methods for Engineers	3(3-0-9)
or ICT600	Computational Mathematics	3(3-0-9)
and		
SE61x	Technical Elective Course*	3(3-0-9)
SE61x	Technical Elective Course*	3(3-0-9)
SE61x	Technical Elective Course*	3(3-0-9)
SE61x	Technical Elective Course*	3(3-0-9)

Credits (lecture-practice-self study hours)

4.2.1.2 *Study Plan B,* 24 credits

SE600	Decision Making and Optimization	3(3-0-9)
or ET600	Numerical Methods for Engineers	3(3-0-9)
or ICT600	Computational Mathematics	3(3-0-9)
and		
SE61x	Technical Elective Course**	3(3-0-9)
SE61x	Technical Elective Course**	3(3-0-9)
SE61x	Technical Elective Course**	3(3-0-9)
SE61x	Technical Elective Course**	3(3-0-9)
SE61x	Technical Elective Course**	3(3-0-9)
SE61x	Technical Elective Course**	3(3-0-9)
SE61x	Technical Elective Course**	3(3-0-9)

List of Technical Elective Courses for Supply Chain Systems Engineering

* For Study Plan A, select 4 courses (12 credits) from the following courses.
** For Study Plan B, select 7 courses (21 credits) from the following courses.

SE610	Simulation Modeling and Analysis in Supply Chain	3(3-0-9)
SE611	Procurement Logistics	3(3-0-9)
SE612	Laws and Regulations in Logistics	3(3-0-9)
SE613	Transportation Systems Design and Analysis	3(3-0-9)
SE614	Warehouse Design and Operations	3(3-0-9)
SE615	Operations Scheduling	3(3-0-9)
SE616	Design of Experiments in Supply Chain Systems	3(3-0-9)
SE617	Accounting and Financial Management for Logistics and Supply Chain Systems	3(3-0-9)
SE618	Special Topic in Logistics and Supply Chain Systems	3(3-0-9)
SE619	Current Topics in Logistics and Supply Chain Systems	3(3-0-9)

4.2.2 *Option II: Services Science and Engineering*

4.2.2.1 *Study Plan A,* 15 credits

SE600	Decision Making and Optimization	3(3-0-9)
or ET600	Numerical Methods for Engineers	3(3-0-9)
or ICT600	Computational Mathematics	3(3-0-9)
and		
SE62x	Technical Elective Course*	3(3-0-9)
SE62x	Technical Elective Course*	3(3-0-9)
SE62x	Technical Elective Course*	3(3-0-9)
SE62x	Technical Elective Course*	3(3-0-9)

4.2.2.2 *Study Plan B,* 24 credits

SE600	Decision Making and Optimization	3(3-0-9)
or ET600	Numerical Methods for Engineers	3(3-0-9)
or ICT600	Computational Mathematics	3(3-0-9)
and		
SE62x	Technical Elective Course**	3(3-0-9)
SE62x	Technical Elective Course**	3(3-0-9)
SE62x	Technical Elective Course**	3(3-0-9)
SE62x	Technical Elective Course**	3(3-0-9)
SE62x	Technical Elective Course**	3(3-0-9)
SE62x	Technical Elective Course**	3(3-0-9)
SE62x	Technical Elective Course**	3(3-0-9)

Credits (lecture-practice-self study hours)

List of Technical Elective Courses for Services Science and Engineering

* For Study Plan A, select 4 courses (12 credits) from the following courses.
** For Study Plan B, select 7 courses (21 credits) from the following courses.

SE620	Services Science and Engineering	3(3-0-9)
SE621	Human Resources and Marketing Management	3(3-0-9)
SE622	Services System Simulation	3(3-0-9)
SE623	Organizational Behavior	3(3-0-9)
SE624	Enterprise Resources Management	3(3-0-9)
SE625	Intermediate Resource Economics	3(3-0-9)
SE626	Strategic Marketing Management	3(3-0-9)
SE627	IT Project Management	3(3-0-9)
SE628	Special Topic in Services Science and Engineering	3(3-0-9)
SE629	Current Topics in Services Science and Engineering	3(3-0-9)

4.2 Master's Thesis/Independent Study

Study Plan A

SE800 Thesis 15

Study Plan B

SE799 Independent Study 6

Course Descriptions

Compulsory Courses

ES605 Research Methodology 2(3-0-6)

Concepts of scientific and technological research; Statistics for research planning and research study; Data collection and data analysis; Interpretations, conclusions, and recommendations of research results.

ES606 Research Seminar 1(1-0-3)

Student-faculty interaction on advanced research topics.

ET600 Numerical Methods for Engineers 3(3-0-9)

Programming concepts and techniques; Modern programming languages and computational tools for engineering problems; Numerical methods as applied to practical engineering problems; Introduction to finite element methods.

ICT600 Computational Mathematics 3(3-0-9)

Set theory; Relations; Formal proof methods; Finite automata; Regular expressions; Context-free grammar; Pushdown automata; First order logic; Theories related to counting, graphs and networks; Interplay between continuous models and their solution via discrete processes; Vector spaces, basis, dimension, eigenvalue problems, diagonalization, inner products, unitary matrices; Introduction to applied statistics and its application to intelligent systems; Introduction to supervised statistical learning including discrimination methods.

SE600 Decision Making and Optimization 3(3-0-9)

Fundamental optimization tools for quantitative analysis to develop modeling and decision-making skill in management sciences; Linear programming; Integer programming; Nonlinear programming; Goal programming; Game theory; Markov chains; Queuing theory and decision analysis techniques; Advanced topics in optimization.

SE601 Logistics and Supply Chain Systems 3(3-0-9)

Principle of domestic and international logistics and supply chain systems, logistics, transportation, production planning, inventory control, purchasing and procurement, packaging, supply chain integration; Information technologies and management information system/development and analysis, model-based, data-based, and knowledge-based systems and knowledge engineering; Newly emerging technologies in supply chain systems such as radio frequency identification (RFID); Global supply chain models, government intervention and regulations, international transportation and risk analysis.

SE602 Production Logistics 3(3-0-9)

Design, analysis and implementation of enterprise-wide resource and production planning and control systems; Demand forecasting, aggregate planning; Decision support models for production planning; Master scheduling; Shop floor control; Inventory control and policy; Maintenance and reliability in engineering systems; Application of information technologies such as ERP and MRPII to production and operations planning and control.

Technical Elective Courses

SE610 Simulation Modeling and Analysis in Supply Chain 3(3-0-9)

Understanding the role of modeling and simulation in the development and improvement of logistics and supply chain operations; Methodology and modeling; Conducting a simulation study; Hands-on exercise of a particular software package and its application in a practical context.

SE611 Procurement Logistics 3(3-0-9)

Overview of the procurement and purchasing activities in a supply chain; Supplier evaluation and selection; Pricing, negotiation, contracts; Outsourcing; Multiple sourcing; Just-in-time procurement; Inventory management; Buying decisions and plans; Cost analysis; Purchase agreements; E-procurement; Real-time internet-based e-supply chains; Reverse logistics and customer services; Supply chains for financing; Purchasing analysis of capital equipment; Institutional and government purchases.

SE612 Laws and Regulations in Logistics 3(3-0-9)

Logistics systems and legal framework for the domestic and international movement of goods; Operational characteristics of providers for exporting and importing services; Effects of government trade policies on global logistics.

SE613 Transportation Systems Design and Analysis 3(3-0-9)

Characteristics of various modes of domestic and international transportations; Vehicle types; Urban, air, ocean, highway, pick-up and delivery systems; Scheduling; Factors that influence transport demand; Costs; Market structures; Carrier pricing; Carrier operating and service characteristics and their influence on other supply chain costs and supply chain performance such as routes; Labor; Competition.

SE614 Warehouse Design and Operations 3(3-0-9)

Fundamental operations in warehousing including roles of warehousing, layout and facility design, warehouse technology such as bar codes, radio frequency identification (RFID) for inventory control systems, modern warehouse operations, classifying products, materials handling, racking and shelving, automated storage and retrieval systems (AS/RS), aisle width decision; Information technology for warehouse operations; Health and safety issues.

SE615 Operations Scheduling 3(3-0-9)

Sequencing and scheduling activities including: static and dynamic problems; Deterministic and stochastic models, single machine processing; Parallel machine processing; Flow-shop and job-shop scheduling; Project scheduling; Workforce scheduling; Exact and heuristic solution methods and applications in logistics and supply chain systems.

SE616 Design of Experiments in Supply Chain Systems 3(3-0-9)

Fundamental of Design of Experiment; Simple experiment design, factorial, fractional factorial experiments; ANOVA analysis, model adequacy analysis, mixed level designs, response surface methodology and Taguchi design; Review of successful experimentation in Supply Chain Management practices.

SE617 Accounting and Financial Management for Logistics and Supply Chain Systems 3(3-0-9)

Profitability, liquidity; Analysis and interpretation of published financial statements; Cost behavior analysis; Profit, volume analyses; Budget preparation and control; Standard costing; Divisional, segmental performance measurement; Capital investment; Risk and uncertainty analysis; Effects of inflation and taxation; Introduction to computer based financial modeling; Good corporate governance.

SE618 Special Topic in Logistics and Supply Chain Systems 3(3-0-9)

Advanced topics in integrated logistics and supply chain operations; Procurement strategies and strategic sourcing; Dynamic pricing and revenue management tactics; Mitigation of supply chain risk through supply contracts; Risk analysis in global environment; Strategic outsourcing of supply chain functions and operations; Management and operation of third party logistics providers; Management of supply chain security.

SE619 Current Topics in Logistics and Supply Chain Systems 3(3-0-9)

A study on current interests in the field of logistics and supply chain systems and operations.

SE620 Services Science and Engineering 3(3-0-9)

Design, control, planning, and evaluation of service enterprises; Service quality management; Service performance measurement; Service supply chain management; Design and reengineering of service processes; Human Resource Management in service organizations, demand management and technology, quantitative tools for managing services.

SE621 Human Resource and Marketing Management 3(3-0-9)

Manpower planning, recruitment and selection, job analysis and design, performance management and appraisal, training and development, compensation and rewards; Marketing management; Service marketing; Market-focused culture; Customer and competitor analysis; Value delivery; Relationship management; Brand management, sales, and marketing communication; Extended marketing mix, product/service, pricing, promotion, place, people; Customer management process, and physical evidence (i.e., the serviceability and service environment).

SE622 Services System Simulation 3(3-0-9)

Discrete-event simulation using commercial simulation software; Basic statistics; Simple queuing model; Simulation model building; Data collection and analysis, Input analysis, Output analysis; Optimization of simulation model; Comparison of the scenarios using statistical analysis from simulation; Selected examples of application in service industries, such as multi-teller bank, restaurant, hotel, airport, hospital, customer service call center, and supermarket.

SE623 Organizational Behavior 3(3-0-9)

Individual behavior, attitudes and job satisfaction; Personality and values; Perception and individual decision-making; Motivation concepts; Emotions and moods; Foundations of group behavior, work teams, communication, leadership, power and politics; Conflict and negotiation; Foundations of organization structure; Organizational culture; Human resource policies and practices; Organizational change and stress management.

SE624 Enterprise Resources Management 3(3-0-9)

Operations strategy in a global environment, a global view of operations, achieving competitive advantage; Global operations strategy options; Capacity management; Applying investment analysis to strategy-driven investments; Location and layout strategy and decision, retail layout, warehousing and storage management; Material requirements planning and Enterprise resource planning; Scheduling and sequencing; Designing services, waiting line analysis for service improvement, lean services.

SE625 Intermediate Resource Economics 3(3-0-9)

Supply and demand; Consumer behavior; Individual and market demand; Profit maximization and competitive market; Uncertainty and risk management; Game theory and competitive strategies.

SE626 Strategic Marketing Management 3(3-0-9)

Strategic Management, sustainable competitive advantage; Strategy formulation, implementation, and evaluation; Corporate-level, business-level, and functional strategies; Corporate ethics and social responsibility; Marketing management, service marketing, market-focused culture, customer and competitor analysis; Value delivery, relationship management, brand management, sales, and marketing communication; Extended marketing mix, product/service, pricing, promotion, place, people, customer management process, and physical evidence (i.e., the serviceability and service environment).

SE627 IT Project Management 3(3-0-9)

Business foundation and project management concepts; Theories, and techniques, project life cycle; Organization,

planning, and controlling of projects; Defining project scope; Schedule and resources; Work breakdown structure and gantt charts; Network diagrams; Scheduling techniques, and resource allocation decisions; Hardware, software, vendor relationships, and communication mechanisms.

SE628 Special Topic in Services Science and Engineering 3(3-0-9)

Advanced topics in an integration of services science and engineering for an improvement of designing, controlling, planning, and evaluation of service enterprise, service quality management, service performance measurement, service supply chain management; Design and reengineering of service processes; Human resource management in service organizations, demand management and technology.

SE629 Current Topics in Services Science and Engineering 3(3-0-9)

A study on current interests in the field of Services Science and Engineering.

Master's Thesis

SE800 Thesis 15 credits

Students will conduct research studies in the area of logistics and supply chain systems engineering under the supervision of their thesis advisor. Research areas include production logistics analysis (production planning, inventory control, maintenance, reliability, scheduling specifically for and limited to logistics and supply chain systems), procurement logistics analysis (e-procurement, outsourcing, multiple sourcing), distribution center and warehouse system analysis, transportation systems design and analysis specifically for logistics and supply chain systems. Research output must lead to publication in international conference proceedings, or national/ international refereed journal.

Independent Study

SE799 Independent Study 6 credits

Students will conduct research studies in the area of logistics and supply chain systems engineering under the supervision of their project advisors. Progress of the research studies must be reported at the end of semester. Research output must lead to publication in international conference proceedings, or national/ international refereed journal.

Master of Science Program in Engineering and Technology (International Program)

Curriculum Title

Master of Science in Engineering and Technology (International Program)

Degree Title

Master of Science (Engineering and Technology)

Applicant's Qualifications

1. The applicant must hold a bachelor's degree in engineering, science or a related field that is accepted by SIIT Academic Committee.
2. The applicant must have a top 20% class rank for a bachelor's degree, or a cumulative GPA of at least 2.75, or 2.50 with sufficient relevant research or work experience as specified by the SIIT Academic Committee.
3. The applicant must submit an official score of one of the following English language tests:
   - TOEFL score of not less than 400 (paper-based) or 97 (computer-based), or 32 (internet-based)
   - IELTS score of not less than 4.5
   - TU-GET score of not less than 400

   The score must not be older than two years from the date on which it was issued, to the date of the application for admission to the program.

   In the case of no English score or a score less than the above requirements, the applicant may be admitted with conditions that he/she must take SIIT English remedial courses and/or SIIT English proficiency tests, and meet the requirement set by the institute.

Admission Requirements

1. Two letters of recommendation.
2. The applicant must pass a selection process which may include an interview conducted by an SIIT Committee consisting of at least 3 faculty members.
3. Admission to the program requires approval by the SIIT Academic Committee.

Remark: Students who have inadequate knowledge in some areas may be required to take additional courses in those areas.

Academic System

1. All courses are conducted in English. An academic year is divided into 2 semesters. Each semester consists of 15 weeks. Courses may be offered for a summer semester of at least 8 weeks duration. The total number of lecture hours required for the summer semester is the same as that for the regular semester. Enrollment for summer courses is optional.
2. Curriculum

   2.1 Study Plan

   2.1.1 Plan A1

   39 credits of thesis

   2.1.2 Plan A2

   - 12 credits of courses
   - 27 credits of thesis

   A total of 39 credits are required for completion of the program.

2.2 Thesis

2.2.1 Plan A1

A students can register for a thesis in the first semester.

2.2.2 Plan A2

A student can register for a thesis after he or she has studied for at least 1 regular semester or has gained 12 credits with a minimum cumulative GPA of 3.00.

2.2.3 Thesis Committee

The Thesis Committee consists of at least 3 members:

One principal advisor, faculty members of SIIT or Thammasat University, and at least one member who is not affiliated with Thammasat University and serves as an external committee member.

- The principal advisor must be an SIIT faculty member with a doctoral degree or equivalent or an academic rank of at least associate professor in the program or a related program.
- The external committee member must be an expert outside Thammasat University with a doctoral degree and holding an academic rank of at least assistant professor or equivalent, or without a doctoral degree but holding an academic rank of at least associate professor or equivalent. The specialization of the external committee member must be in a field related to the thesis.
- A co-advisor (if any) must be a faculty member of SIIT or Thammasat University, or an expert outside Thammasat University with a doctoral degree or equivalent, or with an academic rank of at least associate professor in the program or a related program.
- The number of the committee members who are not the thesis advisor or co-advisor must not be less than the number of committee members who are the thesis advisor and co-advisor. The number of Thesis Committee members who are faculty members of SIIT or Thammasat University should not be less than that of the Thesis Committee members from outside.

2.2.4 Thesis Final Defense Committee

The Thesis Final Defense Committee consists of the same members as the Thesis Committee. However, the defense must be chaired by a thesis committee member who is not the advisor or co-advisor.

Period of Study

The minimum period of study to complete the program is 3 academic semester (1.5 academic years) and the maximum is 5 academic years.

Registration

The student must enroll in courses and/or register for a thesis totalling at least 6 credits but not more than 15 credits per semester for a regular semester and not more than 6 credits for a summer semester.

Academic Performance Evaluation and Graduation

1. Evaluation of Academic Performance

1.1 A credit will be earned only if the grade is "S" or not lower than grade "C". Grade "D" or "F" will be included in the calculation of the grade point average of each semester and for the cumulative grade point average.

1.2 Any student, who gets grade "U","D", or "F" in a compulsory course, can re-enroll in that course only one more time. His or her student status will be terminated if he or she still fails to obtain grade "S" or at least "C" for the course in the second enrollment.

1.3 Thesis assessment is divided into 2 grades:

- S (Satisfactory)
- U (Unsatisfactory)

Students must get grade "S" for their theses.

1.4 Additional course assessment and English proficiency requirements are graded as follows:

- P (Pass)
- N (Not Pass)

2. Graduation Requirements

To graduate, students must meet the following minimum requirements:

2.1 Plan A1

2.1.1 Students must successfully complete 39 credits of thesis.

2.1.2 At least one paper on thesis results must have been accepted for publication in a reputable international journal approved by the Academic Review and Rank Assessment Committee (ARRAC). The following alternate requirements may be used: one national journal paper (accepted) and one national conference paper in proceedings (accepted), or one international conference proceedings paper (accepted and registered for presentation) and one international conference proceedings paper (submitted).

2.1.3 Approval of the thesis by Thesis Committee, and passing a thesis defense.

2.1.4 Satisfying one of the following English proficiency requirements: TOEFL (official or institutional) not less than 550 (or 213 for computer-based test or 79 for Internet-based test), or IELTS not less than 6.0, or TU-GET with a score of at least 550.

2.2 Plan A2

2.2.1 Twelve credits of courses (see the course descriptions) with a GPA of at least 3.00 or equivalent.

2.2.2 Twenty seven credits of thesis with grade "S".

2.2.3 At least one paper on thesis results must have been accepted for publication in a reputable international journal approved by the Academic Review and Rank Assessment Committee (ARRAC). The following alternate requirements may be used: one national journal paper (accepted) and one national conference paper in proceedings (accepted), or one international conference proceedings paper (accepted and registered for presentation) and one international conference proceedings paper (submitted).

2.2.4 Approval of the thesis by Thesis Committee, and passing a thesis defense.

2.2.5 Satisfying one of the following English proficiency requirements: TOEFL (official or institutional) not less than 550 (or 213 for computer-based test or 79 for Internet-based test), or IELTS not less than 6.0, or TU-GET with a score of at least 550.

Transferred Credits

A maximum of 9 credits of courses with all grades B or better can be transferred (For plan A2 only).

Curriculum

1. Total Credits Requirement

1.1 Plan A1, a total of 39 credits is required for completion of the program.
1.2 Plan A2, a total of 39 credits is required for completion of the program.

2. Structure and Components

2.1 Plan A1

Thesis	39	Credits

2.2 Plan A2

2.2.1	Compulsory Courses	6	Credits
2.2.2	Compulsory Elective Course	3	Credits
2.2.3	Elective Course	3	Credits
2.2.4	Thesis	27	Credits
	Total	**39**	**Credits**

3. Course Coding System

Sirindhorn International Institute of Technology sets up the course coding system as follows:

3.1 Subject code consists of letters and numbers.

3.2 ES indicates basic subjects.
ET indicates subjects in Engineering Technology.
ICT indicates subjects in Information and Communication Technology for Embedded Systems.
SE indicates subjects in Logistics and Supply Chain Systems Engineering.

3.3 Numbers are composed of 3 digits.

- The first unit-place-digit indicates the subject order.
- The tenth-place-digit indicates the subject group.
- The hundredth-place-digit indicates the graduate program.

4. List of Courses in the Curriculum

Credits (lecture-practice-self study hours)

4.1 Plan A1, 39 credits

ES800 Thesis	39

4.2 Plan A2, 39 credits

4.2.1 Compulsory Courses, 6 credits

ES603 Special Study	3(3-0-9)
ES605 Research Methodology	2(2-0-6)
ES606 Research Seminar	1(1-0-3)

4.2.2 Compulsory Elective Course, 3 credits

Select one of the following courses:

ES601 Advanced Engineering Mathematics	3(3-0-9)
ES611 Theory of Computation	3(3-0-9)
ES612 Advanced Business Statistics	3(3-0-9)
ET600 Numerical Methods for Engineers	3(3-0-9)
ICT600 Computational Mathematics	3(3-0-9)
SE600 Decision Making and Optimization	3(3-0-9)

4.2.3 Elective Course, 3 credits

ES604 Selected Topic	3(3-0-9)

4.2.4 Thesis, 27 credits

ES800 Thesis	27

Course Descriptions

Compulsory Courses

ES603 Special Study 3(3-0-9)

Each student is required to undertake an in-depth study of an approved topic which will lead to formulation of a thesis proposal. The study will be supervised by a faculty member. A written report and oral presentation have to be given at the end of the semester to the student's thesis committee.

ES605 Research Methodology 2(2-0-6)

Concept of scientific and technological research; statistics for research planning and research study; data collection and data analysis; interpretations, conclusions and recommendations of research results.

ES606 Research Seminar 1(1-0-3)

Student-faculty interaction on advanced research topics.

Compulsory Elective Courses

ES601 Advanced Engineering Mathematics 3(3-0-9)

Mathematics for solving engineering problems; ordinary differential equations of higher order; partial differential equations; integral equations; numerical analysis; optimization techniques.

ES611 Theory of Computation 3(3-0-9)

Set theory; relations; formal proof methods; finite automata; regular expressions; context-free grammar; pushdown automata; Turing machines; uncomputability; computational complexity; first-order logic.

ES612 Advanced Business Statistics 3(3-0-9)

This course exposes students to the application of statistical techniques used to address business and economic problems. Topics include linear regression and correlation, multiple regression, model building, analysis of variance, multivariate statistics, time series analysis, and chi-square test of significance.

ET600 Numerical Methods for Engineers 3(3-0-9)

Programming concepts and techniques; Modern programming languages and computational tools for engineering problems; Numerical methods as applied to practical engineering problems; Introduction to finite element methods.

ICT600 Computational Mathematics 3(3-0-9)

Set theory; relations; Formal proof methods; Finite automata; Regular expressions; Context-free grammar; Pushdown automata; First order logic; Theories related to counting, graphs and networks; Interplay between continuous models and their solution via discrete processes; Vector spaces, basis, dimension, eigenvalue problems, diagonalization, inner products, unitary matrices; Introduction to applied statistics and its application to intelligent systems; introduction to supervised statistical learning including discrimination methods.

SE600 Decision Making and Optimization 3(3-0-9)

Fundamental optimization tools for quantitative analysis to develop modeling and decision-making skill in management sciences; Linear programming; Integer programming; Nonlinear programming; Goal programming; Game theory; Markov chains; Queuing theory and decision analysis techniques; Advanced topics in optimization.

Elective Course

ES604 Selected Topic 3(3-0-9)

The student may select, in consultation with the student's thesis advisor, to undertake a course or an in-depth study of an approved topic which is relevant to the student's thesis. For the latter case, a written report and oral presentation have to be given at the end of the semester to the student's thesis committee. The topic of the in-depth study has to be approved by the student's thesis.

Master's Thesis

ES800 Thesis 27 Credits

This course guides students how to develop and carry out master's level research in the field of engineering and technology: Thesis writing, thesis presentation, publication, and research ethics.

Doctor of philosophy program in engineering and technology (international program)

Curriculum Title

Doctor of Philosophy in Engineering and Technology (International Program)

Degree Title

Doctor of Philosophy (Engineering and Technology)

Applicant's Qualifications

1. A graduate of Master Degree in Engineering, Science, or related fields with very good academic record (normally with cumulative GPA of not less than 3.50 or not less than 3.00 with at least one international journal publication, or a master's degree graduate of SIIT with at least one international journal publication).
2. The applicant must submit an official score of one of the following English language tests:
   - TOEFL score of not less than 400 (paper-based) or 97 (computer-based), or 32 (internet-based)
   - IELTS score of not less than 4.5
   - TU-GET score of not less than 400

   The score must not be older than two years from the date on which it was issued, to the date of the application for admission to the program.

   In the case of no English score or a score less than the above requirements, the applicant may be admitted with conditions that he/she must take SIIT English remedial courses and/or SIIT English proficiency tests, and meet the requirement set by the institute.

Admission Requirements

1. Two letters of recommendation.
2. The applicant must pass a selection process which may include an interview conducted by an SIIT Committee consisting of at least 3 faculty members.
3. Admission to the program requires approval by the SIIT Academic Committee.

Remark: Students who have inadequate knowledge in some areas may be required to take additional courses in those areas.

Academic System

1. All courses are conducted in English. An academic year is divided into 2 semesters. Each semester consists of 15 weeks. Courses may be offered for a summer semester of at least 8 weeks duration. The total number of lecture hours required for the summer semester is the same as that for the regular semester. Enrollment for summer courses is optional.
2. Curriculum

   2.1 Study Plan

   2.1.1 Plan 1.1

   60 credits of thesis

   2.1.2 Plan 2.1

   - 12 credits of courses
   - 48 credits of thesis

   2.2 Thesis

   2.2.1 Plan 1.1

   A student can register for a thesis in the first semester.

2.2.2 Plan 2.1

A student can register for a thesis after he or she has studied for at least 1 regular semester or has gained 12 credits with a minimum cumulative GPA of 3.00 and has grade "P" (Pass) in a qualification examination.

2.3 Thesis Committee

The Thesis Committee consists of at least 5 members:

One principle advisor, faculty members of SIIT or Thammasat University, and at least one member who is not affiliated with Thammasat University and serves as an external committee member.

- The principal advisor must be an SIIT faculty member with a doctoral degree or equivalent or with an academic rank of at least associate professor in the program or a related program.
- The external committee member must be an expert outside Thammasat University with a doctoral degree or equivalent or an academic rank of at least associate professor in the program or a related program.
- A co-advisor (if any) must be a faculty member of SIIT or Thammasat University, or an expert outside Thammasat University with a doctoral degree or equivalent or an academic rank of at least associate professor in the program or a related program.
- The number of the committee members who are not the thesis advisor or co-advisor must not be less than the number of committee member who are the thesis advisor and co-advisor. The number of Thesis Committee members who are faculty members of SIIT or Thammasat University should not be less than that of the Thesis Committee members from outside.

2.4 Thesis Final Defense Committee

The Thesis Final Defense Committee consists of the same members as the Thesis Committee. However, the defense must be chaired by a thesis committee member who is not the advisor or co-advisor.

2.5 External Examiner

The external examiner must be appointed by the SIIT Academic Review and Rank Assessment Committee (ARRAC).

Period of Study

The minimum period of study to complete the program is 3 academic years and the maximum is 6 academic years.

Registration

The student must enroll in courses and/or register for a thesis totalling at least 6 credits but not more than 15 credits per semester for a regular semester and not more than 6 credits for a summer semester.

Academic Performance Evaluation and Graduation

1. Evaluation of Academic Performance

1.1 A credit will be earned only if the grade is not lower than grade "B."

1.2 Any student who gets grade lower than grade "B" in a compulsory course can re-enroll in that course only once. His or her student status will be terminated if he or she still fails to obtain at least grade "B" for the course in the second enrollment.

1.3 Thesis assessment is graded as follows:

- S (Satisfactory)
- U (Unsatisfactory)

Students must get grade "S" for their theses.

1.4 Additional course assessment and English proficiency requirements are graded as follows:

- P (Pass)
- N (Not Pass)

2. Graduation Requirements

To graduate, students must meet the following minimum requirements:

2.1 Plan 1.1

2.1.1 Students must successfully complete 60 credits of thesis.
2.1.2 Approval of the thesis by Thesis Committee and passing a thesis defense
2.1.3 Two international journal papers (accepted), with at least one journal listed in the ISI databases (JCR, SCI-EXPANDED, SSCI, or A&HCI), and one international conference proceedings paper (accepted) or one national journal paper (accepted)
2.1.4 Satisfying one of the following English proficiency requirements: TOEFL (official or institutional) not less than 550 (or 213 for computer-based test or 79 for Internet-based test), IELTS not less than 6.0, or TU-GET with a score of at least 550.

2.2 Plan 2.1

2.2.1 Students must successfully complete 60 credits comprising at least 12 credits of coursework and at least 48 credits of thesis.
2.2.2 Cumulative GPA of at least 3.00 or equivalent
2.2.3 Each required course must have at least a "B" grade.
2.2.4 Two international journal papers (accepted), with at least one journal listed in the ISI databases (JCR, SCI-EXPANDED, SSCI, or A&HCI), and one international conference proceedings paper (accepted) or one national journal paper (accepted)
2.2.5 Approval of thesis by the thesis committee and passing a thesis defense.
2.2.6 Satisfying one of the following English proficiency requirements: TOEFL (official or institutional) not less than 550 (or 213 for computer-based test or 79 for Internet-based test), IELTS not less than 6.0, or TU-GET with a score of at least 550.

Transferred Credits

A maximum of 12 credits of courses with all grades B or better can be transferred (For plan 2.1 only).

Curriculum

1. Total Credits Requirement

1.1 Plan 1.1, 60 credits of thesis

1.2 Plan 2.1, 48 credits of thesis and 12 credits of courses with a GPA of at least 3.00 or equivalent.

2. Structure and Components

2.1 Plan 1.1

Doctoral Thesis	60	Credits

2.2 Plan 2.1

2.2.1 Compulsory Courses	6	Credits
2.2.2 Compulsory Elective Course	3	Credits
2.2.3 Elective Course	3	Credits
2.2.4 Doctoral Thesis	48	Credits
Total	**60**	**Credits**

3. Course Coding System

Sirindhorn International Institute of Technology sets up the course coding system as follows:

3.1 Subject code consists of letters and numbers.

3.2 ES indicates basic subjects.
ET indicates subjects in Engineering Technology.
ICT indicates subjects in Information and Communication Technology for Embedded Systems.
SE indicates subjects in Logistics and Supply Chain Systems Engineering.

3.3 Numbers are composed of 3 digits.

- The first unit-place-digit indicates the subject order.
- The tenth-place-digit indicates the subject group.
- The hundredth-place-digit indicates the graduate program.

4. List of Courses in the Curriculum

Credits (lecture-practice-self study hours)

4.1 Plan 1.1

ES900 Doctoral Dissertation	60

4.2 Plan 2.1

4.2.1 Compulsory Courses, 6 Credits

ES803 Special Study	3(3-0-9)
ES805 Research Methodology	2(2-0-6)
ES806 Research Seminar	1(1-0-3)

4.2.2 Compulsory Elective Course, 3 Credits

Select one of the following courses:

ES801 Advanced Engineering Mathematics	3(3-0-9)
ES811 Theory of Computation	3(3-0-9)
ES812 Advanced Business Statistics	3(3-0-9)
ET600 Numerical Methods for Engineers	3(3-0-9)
ICT600 Computational Mathematics	3(3-0-9)
SE600 Decision Making and Optimization	3(3-0-9)

4.2.3 Elective Course, 3 credits

ES804 Selected Topic	3(3-0-9)

4.2.4 Doctoral Thesis, 48 or 60 credits

ES900 Doctoral Dissertation	48 or 60

Course Descriptions

Compulsory Courses

ES803 Special Study 3(3-0-9)

Each student is required to undertake an in-depth study of an approved topic which will lead to formulation of a thesis proposal. The study will be supervised by a faculty member. A written report and oral presentation have to be given at the end of the semester to the student's thesis committee.

ES805 Research Methodology 2(2-0-6)

Concept of scientific and technological research; statistics for research planning and research study; data collection and data analysis; interpretations, conclusions and recommendations of research results.

ES806 Research Seminar 1(1-0-3)

Student-faculty interaction on advanced research topics.

Compulsory Elective Courses

ES801 Advanced Engineering Mathematics 3(3-0-9)

Mathematics for solving engineering problems; ordinary differential equations of higher order; partial differential equations; integral equations; numerical analysis; optimization techniques.

ES811 Theory of Computation 3(3-0-9)

Set theory; relations; formal proof methods; finite automata; regular expressions; context-free grammar; pushdown automata; Turing machines; uncomputability; computational complexity; first-order logic.

ES812 Advanced Business Statistics 3(3-0-9)

This course exposes students to the application of statistical techniques used to address business and economic problems. Topics include linear regression and correlation, multiple regression, model building, analysis of variance, multivariate statistics, time series analysis, and chi-square test of significance.

ET600 Numerical Methods for Engineers 3(3-0-9)

Programming concepts and techniques; Modern programming languages and computational tools for engineering problems; Numerical methods as applied to practical engineering problems; Introduction to finite element methods.

ICT600 Computational Mathematics 3(3-0-9)

Set theory; relations; Formal proof methods; Finite automata; Regular expressions; Context-free grammar; Pushdown automata; First order logic; Theories related to counting, graphs and networks; Interplay between continuous models and their solution via discrete processes; Vector spaces, basis, dimension, eigenvalue problems, diagonalization, inner products, unitary matrices; Introduction to applied statistics and its application to intelligent systems; introduction to supervised statistical learning including discrimination methods.

SE600 Decision Making and Optimization 3(3-0-9)

Fundamental optimization tools for quantitative analysis to develop modeling and decision-making skill in management sciences; Linear programming; Integer programming; Nonlinear programming; Goal programming; Game theory; Markov chains; Queuing theory and decision analysis techniques; Advanced topics in optimization.

Elective Course

ES804 Selected Topic 3(3-0-9)

The student may select, in consultation with the student's thesis advisor, to undertake a course or an in-depth study of an approved topic which is relevant to the student's thesis. For the latter case, a written report and oral presentation have to be given at the end of the semester to the student's thesis committee. The topic of the in-depth study has to be approved by the student's thesis committee.

Doctoral Thesis

ES900 Doctoral Dissertation 48 or 60 Credits

This course guides students how to develop and carry out doctoral research in the field of engineering and technology: thesis writing, thesis presentation, publication, and research ethics.