

The Masters of Science in Information Systems & Technology

College of Engineering and Computer Science

University of Michigan-Dearborn

A Rackham School of Graduate Studies Program

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The Program:

This **30 credit hour** degree program is for engineers, computer scientists, business people, and other professionals who have responsibility for using, designing, improving, installing, managing, and evaluating integrated enterprise wide information systems. Specializations are available in the areas of:

- Information Management Applications
- Supply Chain and Information Systems Design
- Information Security and Quality
- Web Information Management
- Information Systems Engineering

The Goals:

The MS in IS&T program is a response to the need of students who want to complement, extend, and integrate technical and organizational knowledge on information systems. The proposed program will also satisfy the need of the industry to incorporate enterprise wide information systems to be competitive in the global market place. Students who possess either technical knowledge about computers and information systems, or knowledge about information needs and information system requirements in organizations, but who want to expand their knowledge in a constructive way, constitute an important part of the intended audience. The specialization on the design of specific types of information systems such as those used primarily in manufacturing and service organizations, among others, sets the stage for the constructive integration of technical and organizational knowledge.

The degree aims to achieve simultaneously the following educational goals.

1. Provide access to advances in the information systems field. This will allow the students to acquire additional depth in specific areas of information systems and information technology.
2. Address the need of effectively integrating information technology in organizations. The concern here is with general issues stemming from the need to combine technical expertise together with an understanding of organizational issues and problems.
3. Provide training in specific areas of specialization. This will permit students to focus on the development of information system support for a particular type of organization or functional area.

The degree is offered through the Rackham School of Graduate Studies. As in the cases of existing MS degree programs in the College of Engineering and Computer Science and in the College of Business, the course offerings for the MS in IS&T program are mainly in late afternoon and evening hours to enable students to earn the degree through part-time study. **The program is also available though the web in a distance learning mode.**

Program Prerequisites:

- A bachelor's degree in engineering, a physical science, computer science, applied mathematics, business administration, or liberal arts.
- Knowledge of computer programming, such as C++ and Java (IMSE 255, IMSE/CIS 150, CIS 205 or equivalent).
- Data structures (IMSE 350/351, CIS 350/352 or equivalent)

These course requirements may be completed after admission into the program on a “conditional/lack of preparation” basis. Three letters of recommendation, with at least one from someone familiar with the candidates’ academic performance, are also required. The average undergraduate GPA required is 3.0/4.0 or better to be accepted as a regular graduate student to the program. An applicant with a lower GPA may be granted conditional/probationary admission consistent with Rackham guidelines.

1. Required Core Courses (9 credit hours):

- IMSE 556/CIS 556 Database Management Systems
- IMSE 570 Enterprise Information Systems
- IMSE 5725/CIS572 Object Oriented Systems Design

2. Concentration Area: (15 credit hours):

Six concentration areas exist in the program. Five of the concentration areas are specifically identified in the table below while the sixth one is an individual concentration area that is developed jointly with the student and the IST Program Advisor. Each concentration area includes

- One Concentration Core Course (3 credit hours)
- One Cognate Course (3 credit hours) selected from one of the four remaining concentration areas in the program
- Three Concentration Electives (9 credit hours)

3. The remaining credit hours may be selected with the approval of the graduate advisor. With the approval of their graduate advisor, students may substitute a master's thesis for no more than six credit hours of graduate course work or select the IMSE 592 Capstone Project in IST course with another elective course.

MS in IS&T Program Structure

Concentration Areas	Information Management Applications	Supply Chain and Information Systems Design	Information Security and Quality	Web Information Management	Information Systems Engineering
Concentration Focus	<i>Applications</i>	<i>Design and Modeling</i>	<i>Specialized Area</i>	<i>Specialized Area</i>	<i>System Layer Implementation</i>
Prerequisite courses	IMSE 351 or CIS 350				
Required Core Courses (3 courses or 9 credits)	IMSE/CIS 556 IMSE 570 IMSE 5725 / CIS 572				
Concentration Core Course (1 course or 3 credits)	IMSE 5715	IMSE 5655	CIS 544/IMSE 562	CIS 562	CIS 586
Cognate Course (1 course or 3 credits)	Any course drawn from remaining four concentration areas that complements knowledge acquired in a specific “concentration area”.				
Concentration Electives (3 courses or 9 credits)	IMSE 5585/CIS 560 IMSE 564 EM 510, IMSE 525 EM 535, IMSE 526 EM 541, IMSE 5275 EM 545, IMSE 5285 CIS 555/IMSE 555	IMSE 538 IMSE 555/CIS 555 IMSE 5585/CIS 560 IMSE 559 IMSE 5715 IMSE 574 IMSE 579 CIS 544/IMSE 562	CIS 553 CIS 565 CIS 576 IMSE 555/CIS 555 IMSE 557/CIS 527 IMSE 560/CIS 568/ECE 537 IMSE 5715	IMSE 557/CIS 527 IMSE 5585/CIS 560 IMSE 560/CIS 568/ ECE 537 CIS 525 CIS 550 CIS 577 CIS 586 CIS 590	IMSE 555/CIS 555 IMSE 557/CIS 527 IMSE 560/CIS 568/ECE 537 IMSE 562/CIS 544 IMSE 5715 CIS 550 CIS 562 CIS 577 CIS 578/ECE 578
Approved Electives, Project, or Thesis (6 credit hours)	IMSE 699/ CIS 699 (6 credits) or IMSE 592, Capstone Project in IST (3 credit hours) and a 3 credit hour elective with approval of Advisor or 6 credit hours of electives with approval from Advisor.				

Examples of Course Selection

In this section, we outline a sample course selection for Manufacturing Information Systems Track for students taking (a) one course per semester for Fall, Winter and Spring or Summer semester, (b) two courses per semester for the Fall and Winter semesters, and one course for the Spring or Summer semester, and (c) three courses for Fall and Winter semesters and two courses for the Spring and Summer semesters. Note that the time to complete the program may be 3.3, 2, or 1 year respectively based on the three scenarios described above. (The table below assumes IMSE prefixes for the course numbers if no prefix is given)

	(a)	(b)	(c)
Fall	570	570, 555	570, 555, EM 541 & 5275 or 525
Winter	5725	5725, 556	5725, 556, 5
Summer	557	557	557, EM 535 & 526, 520, EM 545 & 5285
Fall	556	EM 541 & 5275 or 525, CIS 569	
Winter	5715	5715, 559	
Summer	EM 535 & 526	579	
Fall	EM 541 & 5275		
Winter	565		
Summer	579		
Fall	CIS 569		

Titles and brief descriptions of the courses are given below:

CIS 527 Computer Networks (3 credit hours)

Prerequisite: Graduate standing, CIS 450 or IMSE 450, or ECE 478

Study of the technical and management aspects of computer networks and distributed systems. Topics include communication hardware, communication protocols, network architectures, local area networks, distributed database systems. Case studies and research projects will be assigned for additional insights.

CIS 537 Theory of Networking (3 credit hours)

Prerequisite: Graduate standing, CIS 527

Technical and management aspects of computer networks. Covers one or more advanced topics in the area of networking, performance models in networking, analysis of ARQ and MAC protocols, routing algorithms, flow and congestion control, wireless network, ISDN, multimedia networking

CIS 555 Decision Support and Expert Systems (3 credit hours)

Prerequisite: Graduate standing, CIS 350 or equivalent

To study the application of artificial intelligence in building decision support and expert systems for management and other applications. Topics include: fundamentals of artificial intelligence, knowledge representation and knowledge processing, tools for building expert systems and decision support system design. (Cross-listed as IMSE 555)

CIS 556 Database Systems (3 credit hours)

Prerequisite: Graduate standing CIS 350 or IMSE 350 or CCM 350

An examination of the database approach to data management in computer systems. Topics include database fundamentals, the relational network, and hierarchical database models, normalization of data, distributed databases, and current trend and issues. (Cross-listed as IMSE 556)

CIS 560 Electronic Commerce (3 credit hours)

Prerequisites: Graduate standing, IMSE 570, and IMSE 571

This course examines how new information technologies and networks affect the exchange of goods and services between buyers and sellers in firms? What are economics of different electronic commerce models for firms? The course combines critical evaluation of business strategies with hands-on experience in building supporting electronic commerce systems utilizing electronic data interchange (EDI) software. (Cross-listed as IMSE 558)

CIS 563 Modeling of Computer-Based Systems (3 credit hours)

Prerequisite: Graduate standing

The use of computer-based modeling and simulation is an essential part of computer applications, especially those related to problem solving, decision making, product design, and the design and evaluation of computer networks and computer-based systems. An important objective of this course is to expose the students to the use of models for the analysis and evaluation of processes and functions in organizations, as well as for the development of their computer-based information- system support. The synergy between these two uses of the models is of particular interest.

CIS 568 Data Warehousing and Data Mining (3 credit hours)

Prerequisite: Graduate Standing ECE 479 or CIS 479

This course introduces students in the rapidly emerging technologies of data warehousing and data mining. Topics covered include data warehousing design (models, architectures and components, and technologies for data extraction, mapping and transformation), data warehouse management (techniques for cleansing, performance tuning, utilization tracking, recovery and manufacturing, data security, and enterprise policies), data warehouse implementation (indexing techniques, view processing), and data mining (integration with data warehousing, association rules, classification rules, clustering, time sequences, and knowledge discovery methods, visualization, online analytical processing tools). (Cross-listed as IMSE 560 and ECE 536)

CIS 572 Object Oriented Systems Design (3 credit hours)

Prerequisites: Graduate standing, advanced programming language

Students will be introduced to fundamental concepts and methods of object oriented design and development. Topics that will be covered include object oriented database concepts, data models, schema design (conceptual schemas and physical schemas), query languages, physical storage of objects and indexes on objects, version management, schema evolution and system issues such as concurrent control and recovery from failure. For application programming, a programming language such as C++ will be used for database design and query language. (Cross-listed as IMSE 572)

CIS 576 Database Security (3 credit hours)

Prerequisite: Graduate standing, CIS 556 or CIS 421

Topics will include security issues in database systems, different security models for databases, trusted database interpretation, security mechanisms for databases, secure database architectures and multilevel secure database systems, secure transaction processing, statistical database protection, inference problem integrity models and mechanisms, models for the protection of next generation database systems, commercial multilevel secure database products and research prototypes and security issues in data warehousing and data mining.

CIS 577 Software User Interface Design & Analys (3 credit hours)

Prerequisite: Graduate standing, CIS 553

Current theory and design techniques concerning how user interfaces for computer systems should be designed to be easy to learn and use. Focus on cognitive factors, such as the amount of learning required, and the information – processing load imposed on the user. Emphasis will be on integrating multimedia in the user interface.

EMGT 510 Managerial Finance and Economics (2 credit hours)

Prerequisite: EMGT 541

Co-requisite: IMSE 525 or IMSE 5275

Focus is on two related topics: first, the course covers concepts and techniques of financial management in acquiring and allocating financial resources from a strategic perspective. In addition, contents include consideration of business development in the European Economic Community, Latin America, Eastern Europe, and the Pacific Rim.

EMGT 535 Marketing Management and Policy (2 credit hours)

Prerequisite: EMGT 510

Co-requisite: IMSE 526

This course studies the salient features of technology-driven marketing and distinguishes technology-push from market-pull marketing. Highlights the technology-marketing interface in the context of strategic planning, market segmentation, product innovation, channels of distribution, promotional and pricing decisions. Particular attention will be paid to technology inventor-user interactions, process of adoption, and technological innovation.

EMGT 541 Managerial Accounting (3 credit hours)**Prerequisite: Graduate standing****Co-requisite: IMSE 525 or IMSE 5275**

This course introduces fundamental accounting concepts and applications that are useful in the evaluation of financial information and decision tools relevant to project planning. Students will achieve an understanding of basic accounting and cost management tools that are essential to decision making. Emphasis will be placed on assessing financial statement information through an understanding of accounting practice, the relationship between business activities and an organization's cash flows.

EMGT 545 Organizational Behavior and Human Resource Management (2 credit hours)**Prerequisite: Graduate standing****Co-requisite: IMSE 528**

This course encompasses key areas of human resources management and organization behavior as they relate to technical work environments. Organization design and theory will be discussed, along with motivation, leadership, employee selection skills, group and team processes, and managing diversity. Techniques for devising a personal career development plan are covered.

IMSE 525 Finance and Economics Software Application (1 credit hour)**Prerequisite: Graduate standing IMSE 570 and IMSE 571****Co-requisite: EMGT 510**

This course applies concepts and techniques of financial management on business and engineering systems case studies. Specifications for some of these systems will be developed utilizing ERP software such as SAP R/3 application development software suite.

IMSE 526 Marketing Software Application (1 credit hour)**Prerequisite: Graduate standing IMSE 570 and IMSE 571****Co-requisite: EMGT 535**

This course applies concepts and techniques of marketing management on business and engineering systems case studies. Specifications for some of these systems will be developed utilizing ERP software such as SAP R/3 application development software suite.

IMSE 5275 Managerial Accounting Software Application (1 credit hour)**Prerequisite: Graduate standing IMSE 570 and IMSE 571****Co-requisite: EMGT 540**

This course applies concepts and techniques of managerial accounting on business and engineering systems case studies. Specifications for some of these systems will be developed utilizing ERP software such as SAP R/3 application development software suite.

IMSE 5285 Human Resource Software Application (1 credit hour)**Prerequisite: Graduate standing IMSE 570 and IMSE 571****Co-requisite: EMGT 545**

This course applies concepts and techniques of human resource management on business and engineering systems case studies. Specifications for some of these systems will be developed utilizing ERP software such as SAP R/3 application development software suite.

IMSE 532 Information for Manufacturing (3 credit hours)**Prerequisite: Graduate standing**

Acquiring and organizing design and manufacturing information (including geometric modeling, group technology, and automated data acquisition). Identifying kinds needed, sources, and recipients. Ensuring information quality, establishing criteria for selecting processing modes and media. Designing, installing, commissioning, and operating information-handling systems. Handling information in production systems.

IMSE 538 Intelligent Manufacturing (3 credit hours)**Prerequisite: Graduate standing****Prerequisite: IMSE 317**

A comprehensive and integrated approach to topics associated with the science of artificial intelligence and their role in today's manufacturing environments. Design and management issues including information systems in an automated and integrated manufacturing environment.

IMSE 555 Decision Support and Expert Systems (3 credit hours)**Prerequisite: Graduate standing, IMSE 350**

Decision support process and decision support systems, development tools, executive support systems, expert systems and their development processes, expert shells, integration of decision support and expert systems. (Cross-listed as CIS 555)

IMSE 556 Database Management Systems (3 credit hours)**Prerequisite: Graduate standing**

An examination of the database approach to data management in computer systems. Topics include database fundamentals, the relational, network, and hierarchical database models, normalization of data, distributed databases, and current trends and issues. (Cross-listed as CIS 556)

IMSE 557 Computer Networks and Communication (3 credit hours)**Prerequisite: Graduate standing, IMSE 454**

Study of the nature of computing communication and distributing processing techniques, compare networking options, introduce specific business applications that require data communication and networks, and examine the role of communication software in the system and discuss the related management issues.

IMSE 5585 Electronic Commerce (3 credit hours)**Prerequisites: Graduate standing, IMSE 570, and IMSE 571**

This course examines how new information technologies and networks affect the exchange of goods and services between buyers and sellers in firms? What are economics of different electronic commerce models for firms? The course combines critical evaluation of business strategies with hands-on experience in building supporting electronic commerce systems utilizing electronic data interchange (EDI) software. (Cross-listed as CIS 560)

IMSE 559 System Simulation (3 credit hours)**Prerequisite: Graduate standing, IMSE 510**

The modeling and simulation of discrete-change, continuous-change and combined-change stochastic systems. Conducting simulation studies using contemporary software such as WITNESS and ARENA. Random number and variate distribution, input and output data analysis, model verification and validation, and variance reduction techniques.

IMSE 560 Data Warehousing and Mining (3 credit hours)**Prerequisites: Graduate Standing, IMSE 351, IMSE 317 or IMSE 510**

This course focuses on algorithm techniques that can be used for data mining tasks such as classification, association rule mining, clustering, and numerical prediction. This includes probabilistic and statistical methods, genetic algorithms and neural networks, visualization techniques, and mathematical knowledge discovery in databases and in particular its relationship with data warehousing. We will consider numerous case studies from both manufacturing and service industries. (Cross-listed as CIS 568, and ECE 537)

IMSE 562 Information Systems Security (3 credit hours)**Prerequisite: Graduate Standing, IMSE 450 or CIS 450 or equivalent**

The Course is an extensive introduction on security issues in information systems. Topics include security risk assessment, security policies, security models for confidentiality, integrity and availability, access control and information control. Cryptography and application, authentication management, intrusion detection, and other security mechanisms and applications in information systems. (Cross-listed as CIS 544).

IMSE 564 ABAP/4 Programming (3 credit hours)**Prerequisites: IMSE 570 and (IMSE 556 or CIS 556)**

Students will be introduced to programming concepts for building applications using SAP R/3 software suite. The course will offer an introduction to ABAP/4 development workbench, data warehouse reporting, data dictionary, data interfaces, data modeling and data warehouse dialogue programming.

IMSE 5655 Supply Chain Management (3 credit hours)**Prerequisite: Graduate standing**

This course will be a review of theory, concepts, models, methodologies and techniques for managing a supply chain. Students will be introduced to a variety of models and their applications that, a) create appropriate structure and install proper controls in the enterprise, and b) implement optimization principles utilizing value engineering, methods engineering, and behavior prediction techniques to synchronize the supply chain. Examples of supply chain of

prominent industries will be described to enhance understand of this emerging, yet highly relevant concept of our interdependent global economy.

IMSE 570 Enterprise Information Systems (3 credit hours)

Prerequisite: Graduate standing

The purpose of this course is to provide a foundation for the analysis, design and implementation of enterprise information systems. Topics include systems and organization theories, and information systems planning and evaluation. Students will be also introduced to various systems development life cycle phases of an enterprise information system. Students will acquire an understanding of the flow of information (forecasts, financial, accounting and operational data) within an enterprise and the factors that should be considered in designing an integrated enterprise information system. This includes all systems in the business cycle from revenue forecasts, production planning, inventory management, logistics, manufacturing, accounts payable, sales, accounts receivable, payroll, general ledger and report generation. Specifications for some of these systems will be developed utilizing ERP software such as SAP R/3 application development software suite.

IMSE 5715 Modeling of Integrated Information Systems (3 credit hours)

Prerequisite: Graduate standing

A review of approaches for modeling of integrated information systems. ARIS architecture. Data, control, function, and organization views of an information system. Requirements definition, design specification, and implementation definition of the different views. Process chain diagrams. Management of ERP projects.

IMSE 5725 Object Oriented Systems Design (3 credit hours)

Prerequisite: Graduate standing, advanced programming language

Students will be introduced to fundamental concepts and methods of object oriented design and development. Topics that will be covered include object oriented database concepts, data models, schema design (conceptual schemas and physical schemas), query languages, physical storage of objects and indexes on objects, version management, schema evolution and system issues such as concurrent control and recovery from failure. For application programming, a programming language such as C++ will be used for database design and query language. (Cross-listed as CIS 572)

IMSE 574 IS Based Production Planning & Control (3 credit hours)

Prerequisites: Graduate standing, IMSE 510, and IMSE 570, and IMSE 571

Students will be introduced to theories, models, methods and techniques in demand forecasting, inventory management, capacity planning, production scheduling and management components, in production planning and control for an enterprise. Application systems to model information sharing between these components will be developed using ERP software such as the SAP R/3 application development software suite.

IMSE 579 Software Integrated Manufacturing and Logistics Management (3 credit hours)

Prerequisites: Graduate standing, IMSE 510, and IMSE 570, and IMSE 571

Students will be introduced to theories, models, methods and techniques in manufacturing, logistics components and their interaction within an enterprise. Topics that will be covered include production/shop order analysis and management, capacity planning, and materials planning and inventory management. Application systems to model information sharing between these components will be developed using ERP Software such as the SAP R/3 application development software suite.

IMSE 699/CIS 699 Master's Thesis Project (6 credit hours)

Prerequisites: Graduate standing, permission of instructor

Graduate students electing this course, while working under the general supervision of a member of the department faculty, are expected to plan and conduct the work themselves, to submit a thesis for review and approval, and to present an oral defense of the thesis.