Graduate Council Report  
7 December 2006 

Graduate Council approved the Department of Industrial and Systems Engineering request to have the INEN course prefix changed to ISEN.
MEMORANDUM

TO:     Dr. John R. Giardino  
        Dean of Graduate Studies

THROUGH:  Dr. N. K. Anand  
           Assistant Dean of Engineering

FROM:    Brett A. Peters  
         Department Head

SUBJECT: Changing Graduate Course Prefix from INEN to ISEN

This is to request that all graduate courses (see attached) within the Industrial and Systems Engineering Department have their prefix changed from INEN to ISEN. The reason for the change is so that our course prefix will reflect the new departmental name that became effective at the start of the Fall 2005 Semester.
Department of Industrial and Systems Engineering

A. P. Banerjee, G. K. Bennett, J. E. Bickel, S. Butenko, S. Czinkay, G. L. Curry*, B. L. Deuermeyer, Y. Ding,
N. C. Ellis, R. M. Feldman, A. Garcia-Diaz, G. M. Gauker, N. Gautam, I. V. Hicks, G.-A. Klutke, R. J. Koppa,
H. Uster, W. E. Wilhelm, M. A. Wortman

* Graduate Advisor

The department offers Master of Science (MS), Master of Engineering (MEng) and Doctor of Philosophy (PhD) degrees in industrial engineering. Facilities for study and research are excellent, and participation in research is an integral part of the PhD program.

Departmental faculty working in diverse areas of industrial engineering provide students with a wide range of opportunities to gain valuable research experience. Faculty members are presently involved in research in applied statistical analysis, mathematical optimization, stochastic processes, production and inventory control, manufacturing processes and system organization, networks, systems simulation, manufacturing system analysis, quality and reliability engineering, transportation systems and logistics.

There is no foreign language requirement for the PhD in industrial engineering. Students in the industrial engineering PhD program are required to pass a departmental qualifying exam within three semesters of starting the program, and PhD students are required to maintain a GPR of 3.50 for courses on their degree plans, in order to take the Preliminary Exam and the Final Exam.

Industrial Engineering (INEN)

601. Location Logistics of Industrial Facilities. (3-0). Credit 3. Selection of the optimal locations of industrial plants and distribution centers through analytical modeling of the costs of inventory storage, transportation, utilities, labor supply and other cost components. Prerequisites: INEN 420; INEN 416.

602. Applications of Random Processes. (3-0). Credit 3. Introduction to probability and random processes as a basis for studying topics in industrial engineering and operations research. Prerequisites: INEN 421; STAT 212 or 601.

603. Advanced Logistics. (3-0). Credit 3. Topics in logistics including measures of logistical systems performance, facilities location—allocation, production/distribution system design, transportation network design, vehicle routing, location-routing and continuous models; emphasis on mathematical modeling and analysis provided in current literature. Prerequisites: INEN 601, 622, 623, 608 or approval of instructor.

605. Material Handling Systems. (3-0). Credit 3. Analysis and design of integrated material handling systems; automatic storage and retrieval of unit loads, and identifying and establishing boundary conditions on key parameters required to specify the desired system required for equipment vendors to design appropriate hardware. Prerequisites: INEN 420; INEN 416.

608. Industrial Case Analysis. (3-0). Credit 3. Practice in applications of principles to the solution of actual case problems involving broad management decisions. Prerequisites: INEN 303, 315, 404 or approval of instructor.

612. Design by Reliability. (3-0). Credit 3. Quantitative reliability analysis in engineering design. Reliability methods applicable to risk based design, component reliability and degradation, static and dynamic system reliability modeling and analysis, life testing, stress/strength analysis, and fault tree analysis. Prerequisites: INEN 602, STAT 414.

613. Engineering Data Analysis. (3-0). Credit 3. Selected topics in probability and data analysis for quality in engineering problems; measurement principles, data collection and data analysis to solve quality engineering problems. Introduction to courses in the assurance sciences—reliability, maintainability, quality control and robust design. Prerequisite: INEN 616 or 614.

614. Advanced Quality Control. (3-0). Credit 3. Advanced methods applied to quality control; classical treatments and recent developments in statistical process control; evaluation, design and maintenance of quality control programs; focus on monitoring, root cause identification and compensation of quality degradation. Prerequisite: STAT 212 or 601.
615. Production and Inventory Control. (3-0). Credit 3. Model development for inventory management and for production planning; production control models for line balancing, lot sizing, dispatching, scheduling, releasing, kitting, MRP, and just-in-time with treatment of flexible manufacturing and assembly. Prerequisites: INEN 420, INEN 421.

616. Design and Analysis of Industrial Experiments. (3-0). Credit 3. Fundamental theory, concepts and procedures required for industrial experimental design, statistical data analysis, and model building, with emphasis on engineering formulations and applications. One-factor experiments with and without restrictions on randomization, treatment comparison procedures, Latin and other squares, factorial experiments, full and fractional two-level factorial experiments, blocking in factorial designs, response surface methodologies and introduction to Taguchi methods. Prerequisite: STAT 212 or 601.

617. Quantitative Models for Supply Chain Coordination. (3-0). Credit 3. Concepts, complexities, and models pertaining to supply chain management and relate these to recent practical initiatives; includes channel coordination models, supply chain contracting, and vendor-managed, inventory models. Prerequisites: INEN 615, 623, and 602 or STAT 613 or approval of instructor.

618. Stochastic Processes in the Assurance Sciences. (3-0). Credit 3. Stochastic processes necessary to deal with advanced problems in reliability, maintainability and other related areas. Prerequisite: INEN 602.


621. Heuristic Optimization. (3-0). Credit 3. Focus on heuristic optimization methods that search beyond local optima; includes neighborhood search methods and advanced search strategies such as genetic algorithms, simulated annealing, neural networks, taboo search, and greedy randomized adaptive search procedures. Prerequisites: INEN 421 and 622 or approval of instructor.

622. Linear Programming. (3-0). Credit 3. Development of the mathematics and algorithms associated with linear programming; convex sets and cones, polyhedral sets, duality theory, sensitivity analysis, simplicial, revised simplex and dual simplex methods; also covered are bounded variables, column generation, decomposition, integer programming; computer assignment. Prerequisite: MATH 304.

623. Nonlinear and Dynamic Programming. (3-0). Credit 3. Understanding of algorithms for nonlinear optimization; development of optimality conditions and different types of algorithms for unconstrained and constrained problems; formulation and solution of many types of discrete dynamic programming problems. Prerequisite: MATH 304.

624. Applied Distribution and Queueing Theory. (3-0). Credit 3. Queueing theory and its applications; single and multiple channels, priorities, balking, batch arrivals and service, and selected non-Markovian topics. Prerequisite: INEN 421 or ELEN 646.

625. Simulation Methods and Applications. (2-3). Credit 3. Fundamental methodologies of simulation modeling; random number and variate generation, statistical analysis of model output, and discrete event modeling using a commercial simulation language. Prerequisite: STAT 212 or 601.

626. Model Building and Applications of Operations Research. (3-0). Credit 3. Problem-solving environment exposing students to a variety of unstructured problems in operations research requiring organization, formulation and solving an appropriate model. Selection and use of an efficient technique. Computer solution procedures. Selected readings in current literature. Prerequisite: Approval of instructor.


628. Combinatorial Optimization. (3-0). Credit 3. Formulation techniques are studied along with general approaches for solving integer and combinatorial optimization problems: basic polyhedral theory, cutting planes, branch and bound, matroids and theoretical background behind network optimization problems including the traveling salesman problem. Prerequisite: INEN 622.

629. Engineering Optimization. (3-0). Credit 3. Develops a modern framework for studying nonlinear programming problems using convex analysis; convex sets and cones, separating hyperplanes, sub-differentiability, conjugate transforms, duality theory and parametric analysis; applications of the principles and methods will be studied. Prerequisite: INEN 622; corequisite: MATH 409.
630. Human Operator in Complex Systems. (3-0). Credit 3. Basic understanding of the theory and practice of human factors engineering. Topics are presented within the framework of humans as functioning systems and their requirements when incorporated in hardware and software systems.

635. Human Information Processing. (3-0). Credit 3. Perceptual and cognitive issues as related to the design of man-machine systems; perception, central processes, decision making and other performance aspects of the human component as an information processor. Prerequisite: INEN 430 or approval of instructor.

645. Lean Thinking and Lean Manufacturing. (3-0). Credit 3. Introduces the principles of lean thinking in modern manufacturing systems; philosophical, managerial and organizational requirements studied; lean manufacturing quantitative modeling methodologies, lean manufacturing cell design and case study analysis. Prerequisites: Approval of instructor and graduate classification.

654. Manufacturing Systems Planning and Analysis. (3-0). Credit 3. The systems perspective of a computer integrated manufacturing system; manufacturing and its various levels and the planning and control of product movement through the production system in the context of using realtime control, multiprocessor systems, network architectures and databases. Prerequisite: INEN 420. Cross-listed with MEEN 648.

655. Control Issues in Computer Integrated Manufacturing. (3-0). Credit 3. Examines the nature of computer aided manufacturing systems with emphasis on control; an architecture for control of CAM systems is presented; control issues, problems and procedures to control CAM systems are studied and developed. Prerequisite: INEN 654 or approval of instructor. Cross-listed with MEEN 650.

656. Virtual Manufacturing. (3-0). Credit 3. Focus on principles of virtual reality and 3-D graphics and their application in manufacturing, automation and simulation; virtual reality modeling, motion, collision detection and networking issues studied and developed. Prerequisite: INEN 654 or approval of instructor.

659. Modeling and Analysis of Manufacturing Systems. (3-0). Credit 3. Analytical models applied to the description, design operation and control of manufacturing processes and systems; includes serial assembly, jobshops, FMS and cellular manufacturing configurations. Prerequisites: INEN 624 and 654.

661. Network-Based Planning and Scheduling Systems. (3-0). Credit 3. Fundamental theory, algorithms and applications of network flow models; linear programming and its relationship to network analysis; algorithms for various kinds of shortest path models and cost minimization flow models; out-of-kilter algorithm; pure and generalized network specializations of the primal simplex method; introduction to multi-commodity networks; analytical procedures for a special class of stochastic networks (GERK). Prerequisite: INEN 622.

663. Engineering Management Control Systems. (3-0). Credit 3. Integration of human relations, planning and control concepts, systems analysis and design, and principles of management oriented toward engineering functions within an organization; organizational design and administration as they impact along the product life cycle, i.e., research, design, development, production and use.

664. Principles of Scheduling. (3-0). Credit 3. Scheduling and sequencing for single machines, parallel machines, flowshops, job shops, flexible manufacturing systems and assembly; relevant solution methods including algebraic, branch and bound, Lagrangian relaxation, facet generation, branch and price, heuristics and simulation; computational complexity issues. Prerequisite: INEN 622 or approval of instructor.

667. Engineering Economy. (3-0). Credit 3. Fundamental concepts and advanced techniques of engineering economic analysis; evaluation of alternative capital investments considering income taxes, depreciation and inflation; discounted cash flow analysis of competing projects, break-even analysis and determination of rate of return on investment. Risk and uncertainty in engineering analysis. Prerequisite: INEN 303 or equivalent.

668. Integer Programming. (3-0). Credit 3. Formulation techniques and general approaches for solving integer (and mixed, integer linear) programs including preprocessing, cutting plane methods, branch and bound, branch and cut, branch and price, Lagrange relaxation, Benders decomposition and heuristics; classical problem structures with special-purpose solution algorithms; fundamental theory of polyhedra, valid inequalities and computational complexity reviewed. Prerequisite: INEN 622.

681. Seminar. (1-0). Credit 1. Opportunity to present research in a professional atmosphere. Presentations are not restricted to thesis or problem research. Acquaints the student with departmental research activities and procedures in documenting research.

684. Professional Internship. Credit 1 or more each semester. On-the-job training under supervision of practicing engineers in settings appropriate to professional objectives. Prerequisite: Approval of committee chair and department head.

685. Directed Studies. Credit 1 to 12 each semester. Special topics not within scope of thesis research and not covered by other formal courses. Prerequisite: Graduate classification in industrial engineering.

689. Special Topics in... Credit 1 to 4. Selected topics in an identified area of industrial engineering. May be repeated for credit. Prerequisite: Approval of instructor.
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691. Research. Credit 1 or more each semester. Research in industrial engineering field; content and credit dependent upon needs of individual student.

692. Professional Study. Credit 1 to 9. Approved professional study or project. May be taken more than once, but not to exceed 6 hours of credit toward a degree. Must be taken on a satisfactory/unsatisfactory basis. Prerequisite: Approval of instructor.

Department of Information and Operations Management


* Doctoral Student Advisor

The Department of Information and Operations Management offers graduate studies leading to MS and PhD degrees and course work supporting the Mays Business School's MBA degree and the Professional Program in Information Systems. It provides programs for students interested in the management and use of information systems and technologies, and in supply chain management.

The MBA degree program includes a certificate in Supply Chain Management and the option to pursue a combined MBA/MS-INFO degree. The MBA degree also offers specializations in e-commerce, information technology, and operations, among other options.

The MS degree requires 36 credit hours (non-thesis option) with coursework in e-commerce, business intelligence, enterprise development, data communications and security, supply chain management, and IT consulting and Professional Services. Prerequisites for the MS degree include a knowledge of one widely used programming language and statistics. Graduates of this program are heavily recruited by businesses in manufacturing, distribution, energy, transportation, utilities, telecommunications, retailing and professional services.

The department offers a five-year integrated Professional Program in Management Information Systems (PPMIS) in cooperation with the Department of Accounting. Students enter the PPMIS program in the junior year of the BBA program. Graduates receive a Bachelor of Business Administration degree in accounting and a Master of Science degree in management information systems.

The PhD program in information and operations management allows the student to concentrate in supply chain management. The program's goal is to develop professionals who are well trained in the underlying theory and who have problem solving capabilities within business areas. The program is research oriented and is comprised of courses dealing with current research in each area above, research methodology, advanced course work in the selected area of concentration and dissertation research.

Additional information, including specific departmental requirements, may be obtained by contacting the department graduate advisors or the Office of the Dean, Graduate School of Business.

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(INFO)

601. Fundamentals of Business Programming. (3-0). Credit 3. Business Application Development using both procedural and object-oriented programming techniques; use of component-based software design and development for distributed business software systems. Prerequisite: Graduate business classification or instructor approval.

610. Quantitative Analysis for Business Decisions. Credit 1 to 3. Formulation and structuring of business problems using selected quantitative techniques; modeling and statistical analysis using computer applications. May be repeated for up to 3 hours credit. Classification 6 students may not enroll in this course. Prerequisite: Enrollment is limited to MBA students.

612. Management Information Systems. Credit 1 to 3. Concepts, theories, and the strategic role of information systems as applied to business organizations will be covered; course is to be highly interactive/cross functional in nature. Classification 6 students may not enroll in this course. Prerequisite: Enrollment is limited to MBA students.