RUTGERS

The State University of New Jersey

Undergraduate Handbook: Industrial & Systems Engineering

Academic Year 2009-2010

RUTGERS The State University

Industrial and Systems Engineering (ISE)

Welcome to ISE!

In today's complex and competitive world, industrial engineers are in great demand to design, improve, and operate integrated *systems* of people, materials, equipment, and energy. The industrial and systems engineering discipline applies fundamentals from the mathematical, physical, and engineering sciences to efficiently design and analyze large systems that serve industry and government both in manufacturing and service sectors.

The undergraduate industrial and systems engineering program at Rutgers provides students with a broad engineering education along with specialization in the industrial engineering and manufacturing fields. We believe that a broad education is necessary to understand the impact of engineering solutions in a global/societal context. Academic strength in mathematics, physics, and basic engineering science is required. Specialization is offered in mathematical modeling, quality engineering and statistical techniques, computer-aided design, computer-aided manufacturing, simulation, manufacturing processes, engineering economics, production planning and control, design of engineering systems and information technology. Students have access to state-of-the-art laboratory facilities where hands-on instruction is emphasized in robotics, machine vision, manufacturing, automated material handling, quality engineering, electronic and sensor devices, simulation, and computer information systems.

The undergraduate program focuses on classroom instruction fostered by learning in multi-disciplinary project-teams. These teams frequently formulate and find engineering solutions to real-world industry problems. The ability to communicate effectively is emphasized by having students provide both oral and written reports.

ISE graduates work in a number of areas including electronic, pharmaceutical, and other manufacturing; health services, transportation, distribution, and communication; and computers, finance, marketing, and management. Students pursue graduate studies in engineering and in management at leading institutions.

The ISE faculty are dedicated to excellence in teaching, research, and professional service. They bring experience, real-life industrial problems, and enthusiasm to the classroom, setting a standard for students to follow in their professional careers.

WELCOME TO INDUSTRIAL AND SYSTEMS ENGINEERING!

We have carefully prepared this handbook for you. It contains information about the undergraduate program in Industrial and Systems Engineering (ISE) at Rutgers. Here, you will find descriptions of the ISE curriculum and electives. We've also enclosed information on academic policies, department facilities, faculty advisors, and student societies.

Currently, students in the classes of 2010/2011/2012/2013 require a total of 129 credit hours with major credit hours totaling 62. This change updates the curriculum and provides design-focused engineering education.

The Department of Industrial and Systems Engineering offers courses in various areas including: work design and ergonomics, optimization, simulation modeling, probability, manufacturing processes, design of engineering systems, facilities layout, production planning and control, and quality engineering and statistics.

In addition, the department gives students the opportunity to attain hands-on experiences in the ISE labs with work design, manufacturing processes; computer controlled manufacturing systems, and quality engineering and statistics. Our labs include the Automation and Computer Integrated Manufacturing Lab, the Quality and Reliability Lab, the Facilities and Layout Lab, the Manufacturing Information Systems Lab, the Microcomputer Lab, and the Manufacturing Processes Lab.

This handbook and other information about the Department of Industrial and Systems Engineering at Rutgers can be found on the web at **http://www.ise.rutgers.edu.** Our mailing address is Department of Industrial and Systems Engineering, Rutgers University, 96 Frelinghuysen Road, Piscataway, NJ 08854-8018; fax (732) 445-5467; telephone (732) 445-3654; email for the undergraduate director, Dr. J. Luxhoj, is jluxhoj@rci.rutgers.edu.

Once again, we welcome you to the Department of Industrial and Systems Engineering. If you have any questions regarding your undergraduate study please feel free to stop by the departmental office. We are located in Room 201 of the CoRE Building. We are always available to help.

Enjoy Your Studies,

Dr. H. Pham, Chairman
Dr. J. Luxhoj, Undergraduate Director
Ms. Cynthia Ielmini

What Is Industrial Engineering?

According to the Institute of Industrial Engineers (1975), the Industrial Engineering profession is described as follows:

"Industrial Engineering is concerned with the design, improvement, and installation of integrated systems of people, materials, equipment, and energy. It draws upon specialized knowledge and skill in the mathematical, physical, and social sciences together with the principles and methods of engineering analysis and design to specify, predict and evaluate the results to be obtained from such systems."

What are the educational objectives of the Industrial and Systems Engineering Department at Rutgers University?

1. *To prepare students to apply their creativity in solving complex engineering design problems, to approach unstructured problems, to synthesize and design potential solutions and to evaluate the impact of their solutions in the broader context of the organization or society.*

2. *To train students to collect, analyze, and interpret data relevant to problems arising in the industrial engineering domain.*

3. *To provide students with analytical and computational skills to operate effectively within the industrial engineering domain through training in problem representation, abstraction, and validation.*

4. *To prepare students to function as professionals in the workplace by fostering their ability to form, facilitate, lead, coordinate, and participate in teams as well as understand organizational processes and behavior. To prepare students to effectively and convincingly present their solutions and to do so in the context of written, oral, and electronic media.*

5. *To provide students with the skills and ability to apply current technology to solve industrial problems.*

6. *To sensitize students to a need for and to provide an ability to accomplish life-long growth within the field/profession of industrial and systems engineering.*

Table of Contents

1. CLASS OF 2010/2011/2012/2013

1.1. ISE Curriculum for Class of 2010/2011/2012/2013

Freshman Year	(17 cr. hrs.)		(18 cr. hrs.)
01:160:159 Gen Chem for Eng.	3	01:160:160 Gen Chem for Eng.	3
01:160:171 Intro to Experiment	1	01:640:152 Calc Math Phy Sci	4
01:355:101 Expository Writing	3	01:750:124 Analytic Physics I	2
01:640:151 Calc Math Phy Sci	4	14:440:127 Intro to Computers	3
01:750:123 Analytic Physics I	2	14:440:221 Engr Mech-Statics	3
14:440:100 Intro to Engr	1	__:___:___ Hum/Soc Elective	3
__:___:___ Hum/Soc. Elective	3		

Sophomore Year	(16 cr. hrs.)		(17 cr. hrs.)
01:640:251 Multivar Calc	4	01:220:200 Econ Prn & Prob	3
01:750:227 Analytic Phys IIA	3	01:640:244 Diff Eqns Eng & Ph	4
01:750:229 Anal Phys II Lab	1	01:750:228 Analytic Physics IIB	3
14:180:243 Mech of Solids	3M	01:750:230 Anal Physics II Lab	1
14:540:201 Work Des & Ergo	3M	14:440:222 Eng Mech-Dyn.	3
14:540:202 Work Des Lab	1M	14:540:210 Eng. Probability	3M
14:540:213 IE Lab	1M		

Junior Year	(17 cr. hrs.)		(16 cr. hrs.)
01:355:302 Sci & Tech Writing	3	14:540:303 Mfg. Processes	3M
14:180:215 Eng. Graphics	1	14:540:304 Mfg. Processes Lab	1M
14:332:373 Elements of EE	3M	14:540:311 Deter. Models in OR	3M
14:440:407 Mech. Prop Materials	3M	14:540:343 Eng. Economics	3M
14:540:338 Prob. Models in OR	3M	14:540:384 Simulat. Models IE	3M
14:540:382 Comp. Contr Mfg Sys	3M	14:540:399 Design of Eng Syst I	3M
14:540:383 Comp. Contr Lab	1M		

Senior Year	(13 cr. hrs.)		(15 cr. hrs.)
14:540:400 Design of Eng Syst. II	3M	14:540:462 Fac Layout & MH	3M
14:540:433 Quality Eng & Stat	3M	__:___:___ Dpt/Tech Elec (List A)	3M
14:540:434 Quality Eng. Lab	1M	__:___:___ Dpt/Tech Elec (List B)	3M
14:540:453 Prod Plan & Control	3M	__:___:___ Hum/Soc Elective	3
33:010:310 Account for Eng.	3M	__:___:___ Hum/Soc Elective	3

M - Course is included in major average.

Total credit hours: 129.
Major credit hours total 62.

The Dept/Tech electives (List A & List B) for Class of 2010/2011/2012/2013 are given in Section 1.2.

1.2 Departmental/Technical Electives-Class of 2010/2011/2012/2013

Class 2006 and beyond are required to take one course from the Departmental/Technical Electives List A (Design Elective) and one course from the Departmental/Technical Electives List B. These two lists are given below.

If a student has a particular interest, the advisor may approve courses not on the list. For example, a student planning to go to medical school may wish to take biology and organic chemistry. These are appropriate technical electives that do not appear on the list.

ISE and other graduate courses are possible electives for students with a 3.0 major average or greater. Students must complete a form from the Undergraduate Director in order to take a graduate course. Note: This is a good practice for many students who are interested in pursuing graduate studies.

See Dr. Luxhoj if you have any questions about ISE departmental technical electives

List A - Design Electives

10:762:315 Designing Cities
10:762:316 Physical Design & Site Planning
10:975:482 Social Aspects of Environmental Design
14:540:484 Design of a Manufacturing Enterprise
14:540:485 Manufacturing Information Systems
14:540:486 Automated Manufacturing Systems
14:540:488 Design of Decision Support Systems
14:650:342 Design of Mechanical Components
14:650:455 Design of Mechanisms
14:650:488 Computer Aided Design in Mechanical Engineering

List B

01:640:250 Introductory Linear Algebra
01:960:384 Intermediate Statistical Analysis
14:332:402 Sustainable Energy: Choosing Among Options
14:332:476 Virtual Reality **with** corequisite 14:332:478 Virtual Reality Laboratory
14:540:282 Metal Processing
14:540:382 Manufacturing Processes & Materials for Engineers
14:540:410 Linear Programming
14:540:461 Engineering Law
14:540:475 Introduction to Pharmaceutical Manufacturing
14:540:485 Industrial Information Systems
14:540:486 Automated Manufacturing Systems
33:630:368 Retail Marketing
33:799:300 Procurement and Sourcing Statistics
33:799:380 Introduction to Project Management
33:799:460 Introduction to Six Sigma & Lean Manufacturing

2. ALL CLASSES - ACCEPTABLE HUMANITIES/SOCIAL SCIENCE ELECTIVES

2.1. Below is the list of acceptable electives. It should be noted that:

1. Students may take both Microeconomics and Macroeconomics to satisfy the required courses: Economics Principles and Problems AND a General Elective. Students who take macro (but not micro) will not satisfy the Economic Principles and Problems requirement.

2. At least two electives must be in one subject area to form a sequence. One of these must be at the 300 level or higher. One additional elective must be at the 300 level or higher.

College Requirements: All candidates for the B.S. degree must complete a minimum of 18 credits of humanities/social science courses including the following:

01:355:101;
01:220:200;
Four free electives chosen from courses listed below;
Free electives must be selected in a manner such that at least two courses are at the 300/400 (upper) level, at least two courses, including one upper-level, are from the same subject area; and at least two different subjects are represented.

Since 220:200 and 355:101 are considered part of the H/SS requirements, students may satisfy the requirement of one upper/lower combination by taking a 300/400 level course in either economics or English.

Questions or appeals regarding course acceptability should be directed to the Associate Dean.

Rationale for H/SS Electives in the Curriculum: A good undergraduate education should provide more than the development of technical skills. Properly chosen, H/SS electives can complement your technical courses by helping you to develop an understanding of the problems facing our society, a historical consciousness, a sense of values, a knowledge of other cultures, an appreciation of the fine arts, and an ability to think logically and communicate effectively. Think seriously about your choices, and use them to enhance your educational experience. You might even wish to earn a minor. See the Associate Dean for details.

013 AFRICAN LANGUAGES AND LITERATURES
131,132,205,227,228,235,236,301,311,327,328.

014 AFRICANA STUDIES
All courses EXCEPT: 140,223,224,341,342,460,490 through 498.

050 AMERICAN STUDIES
All courses EXCEPT: 281,282,283,284,390,398,490.

070 ANTHROPOLOGY
All courses EXCEPT: 291,292,293,294,334,335,347,354,355,391-395,495-498.

080 ART
200,203,204,207-210,301,319,367,369,370,400,420,493.

082 ART HISTORY
All courses EXCEPT: 291,292,293,294,345,462,473,491 through 498.

098 ASIAN STUDIES
241,242,321,322,444.

165 CHINESE
All courses EXCEPT: 101,102,111,112,121,210,361,362,401,490 through 498.

190 CLASSICS
All courses EXCEPT: 101,102,309,431,432,491 through 496.

195 COMPARATIVE LITERATURE
All courses EXCEPT: 399,481 through 496.

220 ECONOMICS
All courses EXCEPT: 102,103,322,326,386,393,394,401-410,415,419,421,436-496.

350 ENGLISH
350-354, All courses

420 FRENCH
All courses EXCEPT: 101 through 121,171,210,275,299,493 through 498.

450 GEOGRAPHY
100,102,103,205,211,222,240,262,311,331,332,334-338,
341,342,361,363,370,380,405,411,470.

470 GERMAN
All courses EXCEPT: 101 through 122;
281,282,299,320,393-396.

489 MODERN GREEK
201,202,241,305,306,493,494.

490 GREEK
207,208,304,305,306,308-312,315,335,391,392,400,402.

500 HEBRAIC STUDIES
All courses EXCEPT: 101-104,299.

506 HISTORY
506-512 All courses

535 HUNGARIAN
201,202,259,260,321,355,360,460.

556 INTERDISCIPLINARY STUDIES
220,300,397.

560 ITALIAN
All courses EXCEPT: 101 through 124;
283,284,299,317,318,383,384.

.

565 JAPANESE

131,132,241,242,250,301,302,313,314,317,350,360,370,401,402,411,470,483.

574 KOREAN
131,132,301,302.

667 MEDIEVAL STUDIES
281,282,481.

685 MIDDLE EASTERN STUDIES
350,355,451,452,455.

700 MUSIC
100-122,203-222,226-238,301-322.
(For Music **ONLY** 200 and above counts as upper level).

730 PHILOSOPHY
All courses

787 POLISH
259,370,470,475,493,494.

790 POLITICAL SCIENCE
All courses EXCEPT: 250,251,300,392 through 400, 481 through 498.

810 PORTUGUESE
All courses EXCEPT: 101,102,301,302.

830 PSYCHOLOGY
101,201,211,246,271,272,301,303,305,307,311,315,321,326,
330,331,335,338,346,351-353,361-365,371-377,381,393,394,472.

836 PUERTO RICAN & HISPANIC CARIBBEAN STUDIES
All courses EXCEPT: 354,356,494-496.

840 RELIGION
All courses EXCEPT: 171 through 178.

860 RUSSIAN
All courses EXCEPT: 101,102,105,106,351,352, 491 through 497.

861 SLAVIC & EASTERN EUROPEAN STUDIES
259,264,360,370,391,455,460,470,475.

920 SOCIOLOGY
All courses

940 SPANISH
All courses EXCEPT: 100-
105,121,139,150,201,287,288,299,317,318,379,380,387,388,394,470 through 498.

965 THEATRE ARTS
211-214,311,312,343,398,400,401.

975 URBAN STUDIES
101,103,206,222,231,250,305,321,324,413,416,441,473,475,477,478,485.

988 WOMENS STUDIES
All courses.

COOK COLLEGE COURSES

372 ENVIRONMENTAL RESOURCES
202,427.

373 ENVIRONMENTAL & BUSINESS ECONOMICS
361,363,381.

374 ENVIRONMENTAL POLICY, INSTITUTIONS and BEHAVIOR
101,102,175,211,220,223,269,279,301,308,312,313,314,315,322,331,
335,336,341.

554 INTERDISCIPLINARY STUDIES
228,301,305.

2.2. General Electives: List of Unacceptable General Electives

At the present time, the ISE curriculum only requires **ONE** general elective. Students can take additional courses of their own choice on a voluntary basis.

Note: This list of unacceptable General Elective Courses is based on the current New Brunswick Undergraduate Catalog. Any new courses added after this publication of the catalog are subject to review.

CHEMISTRY 01:160
110 through 140

COMPUTER SCIENCE 01:198
110,170

ENGLISH 01:355
096 through 099

EXERCISE SCIENCE 01:377
171 through 180

MATHEMATICS 01:640
011 through 115

OR Any University Course with an "E" Credit Prefix.

3. ACADEMIC STANDING

PROBATION: Do not take probation lightly. Each semester, students' grades are reviewed. The IE policy is that students may be on academic probation for any of the following reasons: if the term average falls below 1.7 for sophomores, below 1.8 for both juniors and seniors; if the major average falls below 1.9 for students with 5 semesters, below 1.9 for students with 6 semesters, below 2.0 for students with 7 or more semesters; or the university average falls below 1.0.

DISMISSAL: If you have been on probation twice during your Rutgers Engineering career, you have no chances left. If your grades are such that you would be eligible for probation again, you will be dismissed. These do not have to be consecutive terms on probation. If you have been on probation twice, you will be dismissed unless you get off probation. **Do not take probation lightly.** In addition, a student may be dismissed if the term average falls below 1.4 or if the major average falls below 1.6 in semester 5, 1.8 in semester 6, and 1.9 in semester 7.

4. SUMMARY OF ACADEMIC PROGRAMS

4.1 Five Year Dual Degree Program

The School of Engineering in cooperation with the liberal arts colleges at Douglass, Livingston, Rutgers, Camden and Newark offers cooperative five year programs leading to a BS in Engineering and a BA in a liberal arts major. The current Rutgers University Catalog gives the details of the program.

To receive both degrees, it is necessary for the student to satisfy the following three requirements: (1) take all the courses required for the ISE degree; (2) take all courses required for the liberal arts major; and (3) make sure the total number of credits is the required number of ISE credits plus 30.

Some courses may satisfy both IE and liberal arts requirements. For example, an ISE and Economics double major can satisfy engineering and liberal arts requirements with the sequence of courses Engineering Probability and Intermediate Statistics. In fact, it may be possible to fulfill the requirements for both degrees with fewer credits than the total ISE credits plus thirty. If that occurs, the student must take additional courses to satisfy item (3) above.

4.2. James J. Slade Scholar (Honors Program)

In the Junior year, students with a GPA of 3.2 or better may apply for admission to this program. The program requires that you write a senior thesis. This program gives a student the opportunity to do independent research while still an undergraduate. Also, this program gives the student recognition (at graduation and with a certificate) for outstanding achievement.

4.3 Five Year BS/MBA Program *

A joint program exists between The Rutgers Business School in New Brunswick and the Department of Industrial and Systems Engineering. A student can receive an MBA within 12 months of receiving the BS in engineering. Students should apply early in the junior year. Careful course scheduling is required to fit several business courses in the junior and senior years. To apply, students need a GPA of 3.2 or better and a rank in the top quartile in the GMAT. The BS/MBA Program of study is provided on p. 14 of this Handbook. See Dr. Luxhoj for details.

4.4. Study Abroad

There are two programs that are suitable for Industrial and Systems Engineering students. The first program is at the City University of London. It is possible to create a program of study there such that a student will not lose time in finishing ISE degree requirements. It is not a straightforward transfer of credit though. For information see Dean Bernath. The second is at Technion University in Israel. The courses match our ISE courses. In addition, instruction is in English. For information, see Dr. Luxhoj. More information is available from the Rutgers Study Abroad Office at http://studyabroad.rutgers.edu

* See more information on next pages and Dr. Luxhoj for additional details.

BS in Industrial & Systems Engineering (ISE) / MBA PROGRAM

A Unique Opportunity

The Rutgers BS in Industrial & Systems Engineering/ MBA program is a customized study plan that allows you to earn both a bachelor's degree and a Master's of Business Administration degree within five years and one summer. The MBA concentration is in Supply Chain Management, a very exciting and emerging field. Normally, the sequence of degrees requires six years. This dual degree program offers you a unique opportunity to develop your engineering interest, as well as prepare yourself for a career in management or business.

If accepted into the program, during your Senior year, you could take 4 courses towards your MBA degree which will be offered at the Rutgers Business School's New Brunswick's campus. At the end of your Senior year, you must have successfully completed all undergraduate requirements for the Bachelor's Degree. Enrollment in the Graduate business program will begin the summer after graduation. During your fifth year, you will complete your graduate studies and receive your MBA degree.

Source:

Next Steps?

Talk with the ISE Undergraduate Director Dr. James T. Luxhøj regarding the ISE undergraduate college requirements and major requirements.
jluxhoj@rci.rutgers.edu

Maintain a 3.2 or better grade point average.

Take the GMAT during your junior year.

Apply to the program in the spring semester of your junior year by June 15.

For more information about the Rutgers ISE Program, go to:

http://www.ise.rutgers.edu

Admissions Requirements:

GPA of 3.2 or better.

Enrollment in Graduate business courses after your Senior year requires awarding of your Bachelor's degree from the Rutgers School of Engineering.

For more information about the Rutgers Business School (RBS), go to:

http://business.rutgers.edu

BS/MBA Curriculum for Class of 2010/2011/2012/2013

Freshman Year		(17 cr. hrs.)			(18 cr. hrs.)
01:160:159	Gen Chem for Eng.	3	01:160:160	Gen Chem for Eng.	3
01:160:171	Intro to Experiment	1	14:440:127	Intro to Computers	3
01:355:101	Expository Writing	3	01:640:152	Calc Math Phy Sci	4
14:440:100	Intro to Engr	1	14:440:221	Engr Mech-Statics	3
01:640:151	Calc Math Phy Sci	4	01:750:124	Analytic Physics I	2
01:750:123	Analytic Physics I	2	__:___:___	Hum/Soc. Elective	3
__:___:___	Hum/Soc Elective	3			

Sophomore Year		(16 cr. hrs.)			(17 cr. hrs.)
14:540:213	IE Lab	1M	01:220:200	Econ Prn & Prob	3
14:540:201	Work Des & Ergo	3M	14:540:210	Eng. Probability	3M
14:540:202	Work Des Lab	1M	01:640:244	Diff Eqns Eng & Ph	4
14:180:243	Mech of Solids	3M	14:440:222	Eng Mech-Dyn.	3
01:640:251	Multivar Calc	4	01:750:228	Analytic Physics IIB	3
01:750:227	Analytic Phys IIA	3	01:750:230	Anal Physics II Lab	1
01:750:229	Anal Phys II Lab	1			

Junior Year		(17 cr. hrs.)			(16 cr. hrs.)
01:355:302	Sci & Tech Writing	3	14:540:343	Eng. Economics	3M
14:540:338	Prob. Models in OR	3M	14:540:384	Simulat. Models IE	3M
14:440:407	Mech. Prop Materials	3M	14:540:311	Deter. Models in OR	3M
14:332:373	Elements of EE	3M	14:540:303	Mfg. Processes	3M
14:540:382	Comp. Contr Mfg Sys	3M	14:540:304	Mfg. Processes Lab	1M
14:540:383	Comp. Contr Lab	1M	14:540:399	Design of Eng Syst I	3M
14:180:215	Eng. Graphics	1			

Senior Year		(16 cr. hrs.)			(18 cr. hrs.)
14:540:453	Prod Plan & Control	3M	14:540:462	Fac Layout & MH	3M
14:540:433	Quality Eng & Stat	3M	__:___:___	Dpt/Tech Elec (List A)	3M
14:540:434	Quality Eng. Lab	1M	__:___:___	Dpt/Tech Elec (List B)	3M
14:540:400	Design of Eng Syst. II	3M	__:___:___	Hum/Soc Elective	3
33:010:310	Account for Eng.	3M		RBS course	3
__:___:___	Hum/Soc Elective	3		RBS course	3

Senior Summer (12 cr. hrs.)

RBS courses 12

Fifth Year		(15 cr. hrs.)		(15 cr. hrs.)
	RBS courses	15	RBS course	15

M - Course is included in major average.
RBS – Rutgers Business School
Total ISE credit hours: 129.
ISE Major credit hours total 62.

Note: Some courses in the ISE curriculum will count towards the Rutgers MBA.

5. ACADEMIC POLICIES

This handbook has been compiled for undergraduate Industrial and Systems Engineering students. The department wants you to be aware of your degree requirements and of changes in college and university rules. We welcome suggestions for new material for the handbook and clarifications of material already included.

When you declare an engineering major, a check-list of course requirements is put into your folder. As you complete courses, the Dean's staff crosses the courses off the list. The folders are kept in the Dean's Office in the Engineering Building (Room B100). During registration periods the folders are given to the class advisor and students have the opportunity to see their folders.

Each class has a departmental faculty advisor as indicated on the list on page 32 of this handbook. Your advisor will post special office hours during registration periods. At other times during the semester, you may make an appointment with your advisor if the need arises. It is really sensible to make appointments (and appear on time) to save your own time. Faculty members are busy and have irregular schedules so it may be inefficient to just "stop by".

EACH STUDENT **MUST** BE AWARE THAT HE OR SHE IS ULTIMATELY THE PERSON RESPONSIBLE FOR COMPLETING THE BS DEGREE REQUIREMENTS.

Keep track of your own progress through the ISE program and speak with your advisor when you run into academic or other problems. During registration, look at the check-list of courses in your folder to make sure your understanding of your status agrees with the view of the college. It is especially important for graduating seniors to check their folders with their advisors to ensure that summer courses, transfer credits, and electives have been recorded as expected.

Before meeting with your advisor each student should be well informed. Please be sure to read this handbook and the current New Brunswick Undergraduate Catalog. In particular, students should be familiar with the sections regarding ISE degree requirements, ISE courses, Academic Policies and Procedures, and University Policies and Procedures.

5.1. Recent Changes in ISE Curriculum

When the department or the college makes significant changes in the curriculum, these changes apply to entering students. For example, if you enter in the class of 2009, you are required to satisfy the requirements on the curriculum labeled 2009. If you are delayed and graduate in 2010, the 2009 curriculum still applies to you.

5.2. Major Average

The courses that are included in the major average are marked "M" on the ISE curriculum. To graduate, your major average must be 2.0 or greater. If you fail a course and then repeat it, both grades are computed into your major average.

Every semester, compute your major average. Keep track of it carefully.

When you register, be sure to put an "M" next to your Dept/Tech elective on the registration card. The computer system cannot keep track of all the possible Dept/Tech electives.

5.3. Courses Included In Major Average

BIORESOURCE ENG. (127/128/129)

All 127 courses except 127:100
All option required
All option electives
155:204, 303, 304, 308, 411
180:243, 318, 331, 345, 387, 389, 431
332:373, 375
375:405
400:201, 202, 402, 411, 419
460:101
530:211, 321
650:351
704:351
780:382
930:266

APPLIED SCIENCE (073)

All engineering electives
All technical electives
All math/science electives

CERAMIC ENGINEERING
(150/151180:243)

All 150 courses **except:**
150:201, 202, 205, 206, 270
271, and 150:
010:310
332:373, 375
440:407
460:301
540:343
630:301
960:401, 490
All technical electives
One 150 may be used to
satisfy one Dept/Tech

CHEMICAL ENGINEERING (155/156)

All 155 courses
115:301, 313
119:390
160:307, 308, 311, 323, 324
325, 341, 342
332:373
All technical electives

CIVIL ENGINEERING (180/181)

All 180 courses
440:407
All technical electives

ELECTRICAL ENGINEERING (332/331)

All 332 courses
All technical electives

INDUSTRIAL & SYSTEMS ENGINEERING
(540/541)
All 540 courses

33:010:310
332:373
440:407

All technical electives

MECHANICAL ENGINEERING(650/651)

All 650 courses
332:373,375
540:343
640:421
655:407

Note: All departmental and technical electives must be approved by the student's advisor.

5.4. Withdrawal From Courses

It happens, unfortunately, that students encounter major problems during their college years. Don't wait to be dismissed from the School of Engineering to seek help. Take responsibility for your situation. If you know you are unable to do the required work, you must do what is necessary to let the college know of your difficulty. Further, there are many resources at Rutgers that can help you with your situation - from substance abuse to the death of a parent or friend.

Here are the rules: If you fail a course, it is computed into your university and major averages. If you drop a course, it is **not** computed into these averages.

You may withdraw from courses up to the 8th week without permission. Between the 8th and 12th weeks you may withdraw with the permission of Dean Bernath. If you are severely behind in your course work, you may get permission from the Dean. After the 12th week, permission from the Dean is required and your reason for withdrawal must be significant and beyond your control.

5.5. Course Substitution

As a matter of policy, there are no course substitutions for ISE courses. If there is an excellent reason, with the permission of the Undergraduate Director, students may substitute courses from other schools for electives or for required courses not given in the ISE department.

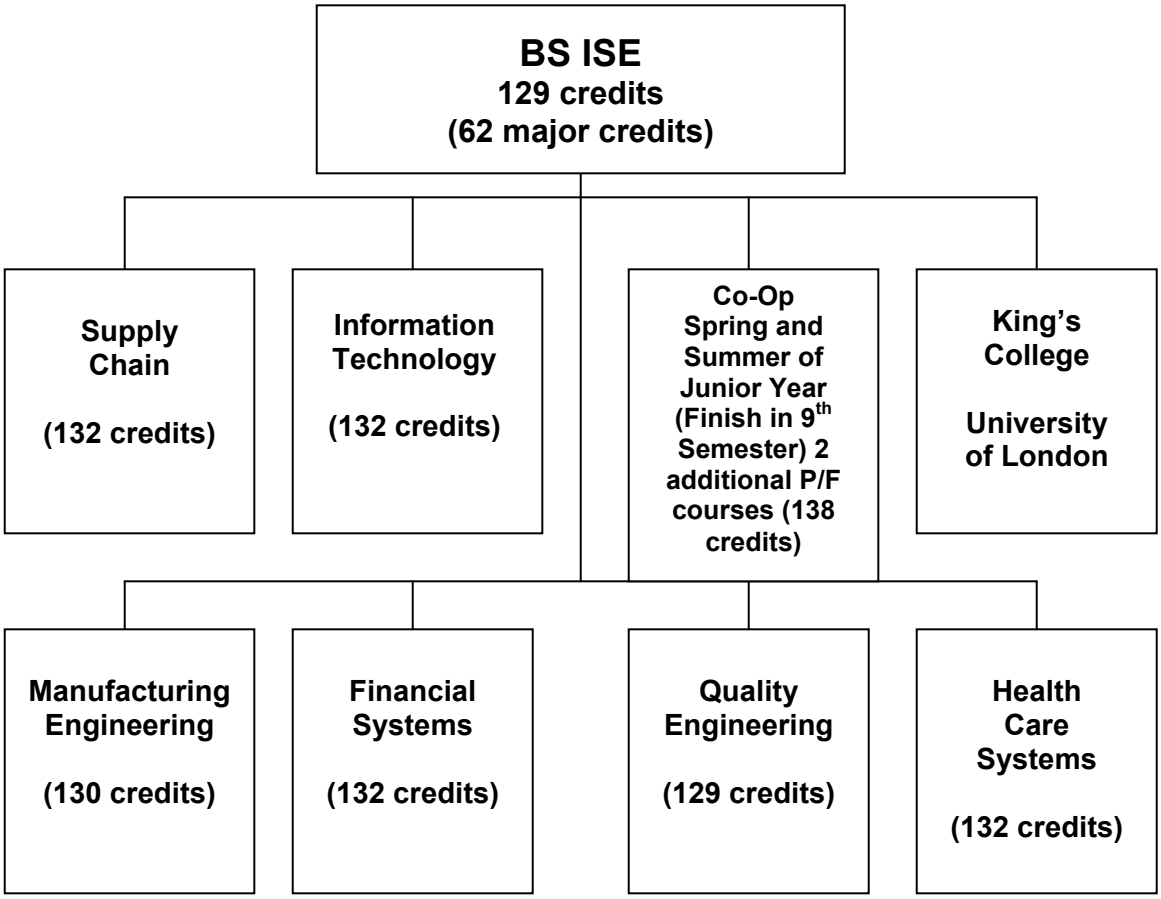
5.6 Academic Dishonesty

The Industrial and Systems Engineering Department expects each student to conduct him or herself in a professional manner. The policy of the ISE Department is as follows: we do not hesitate to report offenses of cheating to the college or the university. An engineer starting out a career cannot afford to have this kind of report on his or her record. A student who gives information is considered guilty as well as a student who receives information.

The University Policy on Academic Dishonesty is carefully spelled out in your catalog. Note that copying from or giving others assistance or using forbidden material on an hourly or final examination is a level three violation. The recommended sanction is suspension from the university for one or more terms with a notation of academic disciplinary suspension placed on the student's transcript.

6. INDUSTRIAL AND SYSTEMS ENGINEERING UNDERGRADUATE TRACKS

The ISE program provides tracks that enable students to choose a specialization area in order to emphasize specific areas of interest. The ISE curriculum offers six tracks as shown and explained below:



ISE Undergraduate Tracks

Supply Chain Track

Requires (9) credit hours.

LIST A: (Select two)
14:540:484 Design of an Enterprise- Spring
16:540:520 Supply Chain Eng. (3.0 GPA or with the instructor's permission) -Fall
16:540:530 Forecasting and Time-Series Analysis (3.0 GPA or with instructor's permission) -Fall

LIST B (Select one)
14:180:538 Freight Transportation Systems-Spring W-6:40-9:30
22:010:623 Enterprise Resource Planning Systems-Spring-Th-6:40-9:30

Financial Systems Track

Requires (9) credit hours.

(2) required courses:
16:540:530 Forecasting and Time Series Analysis (Fall)

33:390:300 Introduction to Financial Management (Fall, Spring, Summer)

Select one:
33:390:380 Investment Analysis (Spring, Summer)
33:390:400 Corporate Finance (Spring, Summer)

****

IMPORTANT:

In order to complete the ISE Financial Systems Track, you must complete certain prerequisites and follow prescribed administrative processes.

NOTES:

33:390:300 Introduction to Financial Management (Fall, Spring, Summer)

The *prerequisites* for this course are calculus, economics (either 01:220:200 Economic Principles and Problems or 14:540:343 Engineering Economics), 33:010:310 Accounting for Engineers, statistics, and computer programming. The statistics prerequisite will be met when you successfully complete 14:540:210 Engineering Probability.

Note that with the ISE Financial Systems Track, you must take 33:010:310 Accounting for Engineers some time before the Fall semester of your senior year. If you are following the prescribed ISE undergraduate curriculum and have completed 33:010:310 Accounting for Engineers in the Fall semester of your junior year (at least prior to the Fall semester of senior year), then you may register for 33:390:300 Introduction to Financial Management in the Fall semester of your senior year (or Summer after your junior year). Note that taking the 33:010:310 Accounting for Engineers in the Fall semester of your junior year is an exception to the base ISE curriculum.

33:390:300 Introduction to Financial Management is a prerequisite for both:

33:390:380 Investment Analysis (Spring, Summer)
33:390:400 Corporate Finance (Spring, Summer)

After completing 33:390:300 Introduction to Financial Management in the Fall semester of your senior year (or Summer after your junior year), you are then able to register for 33:390:380 Investment Analysis and 33:390:400 Corporate Finance in the Spring semester of your senior year.

Special Permission Numbers for the ISE Financial Systems Track:

The *process* for obtaining a special permission # for the Rutgers Business School courses is that the ISE Undergraduate Director will verify that the ISE students have met the prerequisites for 33:390:300 (and 33:390:380 and 33:390:400 as well) and then send a confirmation e-mail to the Undergraduate Program Coordinator at the Rutgers Business School. The ISE students will then be advised to contact the Rutgers Business School Undergraduate Program Coordinator directly for the special permission #.

Manufacturing Engineering Track

Requires a total of (7) credit hours.

14:540:486 Automated Manufacturing Systems

Select one:
14:540:485 Industrial Information Systems
14:540:475 Introduction to Pharmaceutical Manufacturing
14:150:330 Introduction to Nanomaterials Science and Engineering (*open to school 14*)

Quality Engineering Track

Requires a total of (6) credit hours.

01:960:384 Intermediate Statistical Analysis (offer every Fall, Spring)

Select one
01:960:463 Regression Methods (offer Fall semester)
01:960:490 Introduction to Experimental Design (offer Spring semester)
14:540:530 Forecasting and Time Series Analysis (for 3+ students or permission of instructor)
14:540:580 Quality Management (for 3+ students or permission of instructor)

Healthcare Systems Track

Requires a total of (9) credit hours.

01:220:316 Health Economics
HSAP 0519 Managing Health Care Delivery Organizations
14:540:485 Information Systems

Prerequisites for 220:316

01:220:200 Econ Prn can be used as pre-req. for 220:316
14:540:343 Eng. Economics
Engineering Calculus
Undergraduate Engineering Probability & Statistics.

No prerequisites for HSAP 0519.

Information Technology Track

Requires a total of (6) credit hours.

List A (Select one)

14:540:485 Manufacturing Information Systems
14:540:542 Enterprise Integration (3+ students or Instructor's consent)

List B (Select one)

04:547:331 Networking and Internet Technologies
04:547:410 Electronic Commerce
04:547:420 Economics of Information Technology
14:332:423 Telecommunications Networks
14:332:452 Introduction to Software Engineering
22:010:622 Internet Technology for Business
22:010:623 Enterprise Resource Planning

Co-op in ISE – See Dr. Luxhoj for approval

The co-op internship provides the student with the opportunity to practice and/or apply knowledge and skills in various industrial and systems engineering environments. This co-op internship is intended to provide a practical engineering experience to the student's undergraduate education by integrating prior course work into a working engineering environment. In addition to receiving compensation for their on-site job experience, students earn credits for the educational benefits of the experience. **The 6 co-op credits are in addition to the 129 credit hours required for graduation**. Students who choose the co-op internship option will complete their undergraduate degree requirements in the 9th semester. See page 26 for more details.

ISE Curriculum for Class of 2010/2011/2012/2013 (Coop Option)

If you plan to pursue a co-op, it is important that you make an appointment with the ISE Undergraduate Director, Dr. Luxhoj, prior to the start of your co-op to discuss implementation details. All ISE co-ops must be approved by Dr. Luxhoj.

Freshman Year		(17 cr. hrs.)			(18 cr. hrs.)
01:160:159	Gen Chem for Eng	3	01:160:160	Gen Chem for Eng	3
01:160:171	Intro to Experiment	1	01:640:152	Calc Math Phy Sci	4
01:355:101	Expository Writing	3	01:750:124	Analytic Physics I	2
01:640:151	Calc Math Phy Sci	4	14:440:127	Intro to Computers	3
01:750:123	Analytic Physics I	2	14:440:221	Engr Mech-Statics	3
14:440:100	Intro to Engr	1	__:___:___	Hum/Soc Elective	3
__:___:___	Hum/Soc Elective	3			

Sophomore Year		(16 cr. hrs.)			(17 cr. hrs.)
01:640:251	Multivar Calc	4	01:220:200	Econ Prn & Prob	3
01:750:227	Analytic Phys IIA	3	01:640:244	Diff Eqns Eng & Ph	4
01:750:229	Anal Phys II Lab	1	01:750:228	Analytic Physics IIB	3
14:180:243	Mech of Solids	3M	01:750:230	Anal Physics II Lab	1
14:540:201	Work Des & Ergo	3M	14:440:222	Eng Mech-Dyn	3
14:540:202	Work Des Lab	1M	14:540:210	Eng Probability	3M
14:540:213	IE Lab	1M			

Junior Year		(17 cr. hrs.)	
01:355:302	Sci & Tech Writing	3	
14:180:215	Eng Graphics	1	
14:332:373	Elements of EE	3M	CO-OP – 6 Credits
14:440:407	Mech Prop Materials	3M	Spring and Summer
14:540:338	Prob Models in OR	3M	
14:540:382	Comp Contr Mfg Sys	3M	
14:540:383	Comp Contr Lab	1M	

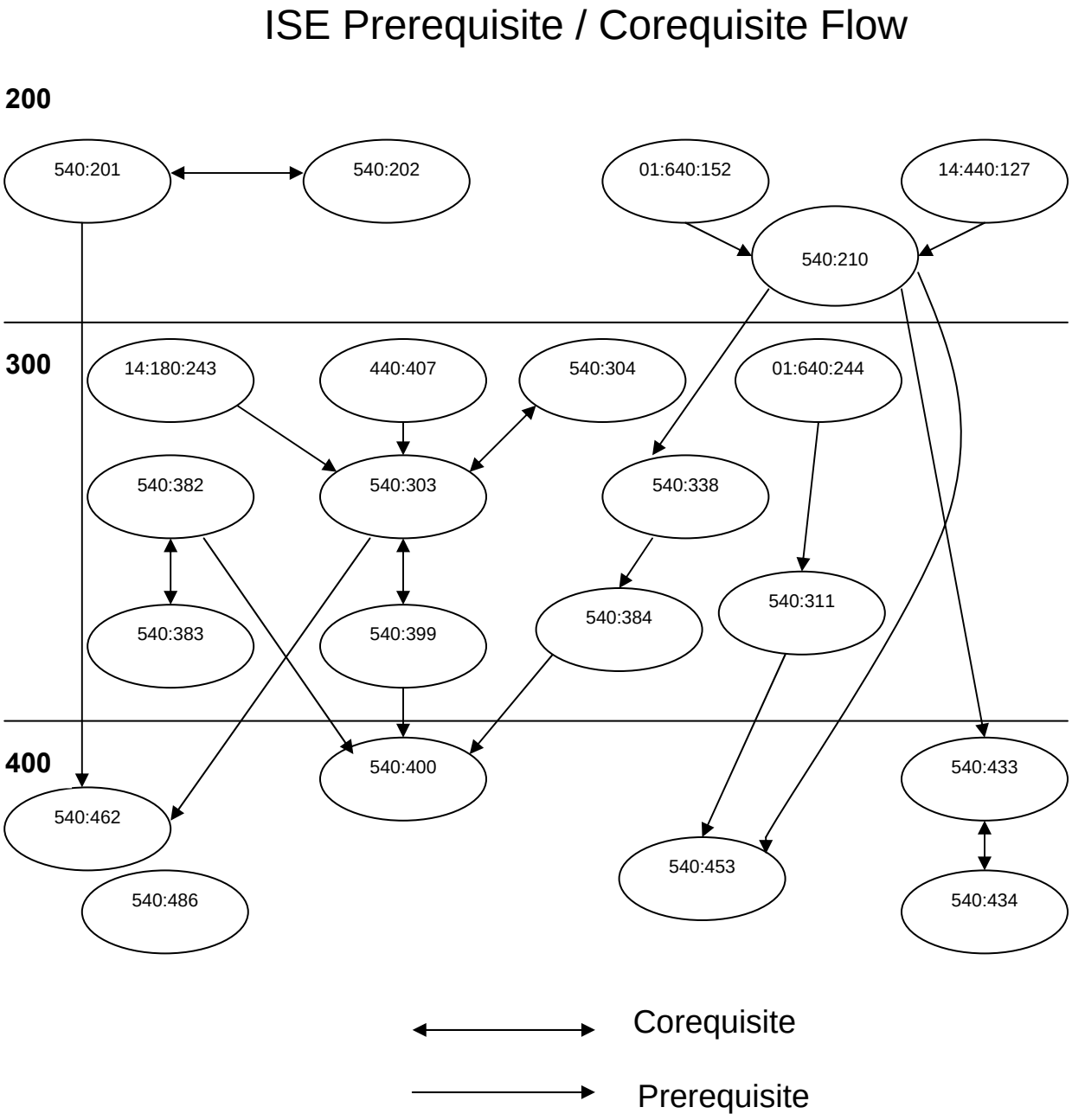
Fourth Year		(16 cr. hrs.)			(16 cr. hrs.)
14:540:343	Eng Economics	3M	14:540:303	Mfg Processes	3M
14:540:433	Quality Eng & Stat	3M	14:540:304	Mfg. Processes Lab	1M
14:540:434	Quality Eng Lab	1M	14:540:311	Deter Models in OR	3M
__:___:___	Dpt/Tech Elec (List A)	3M	14:540:384	Simulat Models IE	3M
__:___:___	Dpt/Tech Elec (List B)	3M	14:540:399	Design of Eng Sys I	3M
__:___:___	Hum/Soc Elective	3	14:540:462	Fac Layout & MH	3M

Fifth Year		(12 cr. hrs.)
14:540:400	Design of Eng Syst II	3M
14:540:453	Prod Plan & Control	3M
33:010:310	Account for Eng	3M
__:___:___	Hum/Soc Elective	3

M – Course is included in major average.
Total credit hours: 135.
Major credit hours total: 62.

The Dept/Tech electives (List A & List B) for Class of 2010/2011/2012/2013 are given in Section 1.2 of this handbook.

7. ISE PREREQUISITE/COREQUISITE



8. UNDERGRADUATE COURSE DESCRIPTIONS

Note: M denotes course is included in major average

14:540:201 Work Design and Ergonomics (3M)
Corequisite: 14:540:202
Man-machine analysis, motion economy, time study, predetermined time systems, work sampling; introduction to robotics, facilities layout, material handling; introduction to ergonomics and anthropometric, biomechanical, and human-machine interface models.

14:540:202 Work Design and Ergonomics Laboratory (1M)
Corequisite: 14:540:201
Experiments in robotics, time study, work measurement, workplace design and the human-machine interface, facilities layout.

14:540:210 Engineering Probability (3M)
Prerequisite: 01:640:152 or 01:640:144 AND 14:440:127 or 01:640:154 or 01:640:192 and 14:440:127 or 21:640:136 or 50:640:122 AND 14:440:127
Probability problems in engineering, conditional probability, discrete and continuous distributions, functions or random variables, interval estimates.

14:540:213 Industrial Engineering Laboratory (1M)
Introduction to C programming, fundamental data types, flow control, and functions; arrays, pointers, and strings; algorithms and flow charts; application of dynamic memory allocation in simulation of queueing systems.

14:540:242 Metal Processing (4M)
Lec. 3 hrs, lab. 3 hrs.
Properties of engineering materials, casting, forming, and machining; basic machine tools processes, laser machining, waterjet cutting, micromachining, and tolerancing. Experimental work, microscopic analyses of metals, chip formation, and tool life.

14:540:303 Manufacturing Processes (3M)
Corequisite: 14:540:304, Prerequisite: 14:440:407, 14:180:243
Properties of materials, phase diagrams, metal forming and cutting. Basic and computerized machine tools. Process planning. Control charts.

14:540:304 Manufacturing Process Laboratory (1M)
Corequisite: 14:540:303
Experiments on machine tools: lathes, drilling machines, milling machines, and CNC milling machines; robot workplace design and computer control of machine tools.

14:540:305,306 Honor Candidacy Problems
Prerequisite: Permission of departmental chairperson. Prerequisite for industrial engineering students who wish to be James J. Slade Scholars.
Extensive reading and study in a particular problem area of industrial engineering under the guidance of a faculty member.

14:540:311 Deterministic Models in Operations Research (3M)
Prerequisite: 01:640:244
Elements of modeling and problem solving. Use of a software package like LINDO, EXCEL to solve real life industrial engineering problems. Linear programming, duality, sensitivity analysis, integer programming, transportation and assignment problems.

14:540:338 Probability Models in Operations Research (3M)
Prerequisite: 14:540:210
Modeling and decision making under uncertainty. Markov chains, poisson processes, inventory models and queueing systems.

14:540:343 Engineering Economics (3M)
Open only to junior and senior engineering students.
Economic decisions involving engineering alternatives, annual cost, present worth, rate of return, and benefit-to-cost; before and after tax replacement economy; organizational financing; break-even charts; unit and minimum-cost public sector studies.

14:540:382 Computer Control of Manufacturing Systems (3M)
Corequisite: 14:540:383
Programmable automation applied to manufacturing. Computer architecture, sensors and automatic data acquisition, computer control of actuators, continuous and discrete control of processes, computer integration, and local areas networks.

14:540:383 Computer Control of Manufacturing Systems Laboratory (1M)
Corequisite: 14:540:382
Use of microcomputers and industrial controllers in controlling machines and processes. Assembly language programming, ladder logic programming, and interfacing controllers to sensors and actuators. Experiments in manufacturing applications.

14:540:384 Simulation Models in Industrial Engineering (3M)
Prerequisite: 14:540:210, 14:540:338
Modeling and analysis of industrial and service systems using ARENA, simulation modeling prospectives, discrete event and continuous simulation, simulation languages, statistical aspects of simulation.

14:540:390 Manufacturing Processes and Materials for Engineers (3M)
Properties of engineering materials, heat treating, welding, casting, forming, machining, and basic machine tool processes; experimental work, microscopic analysis of metals, chip formation, and tool life.

14:540:399 Design of Engineering Systems I (3M)
Prerequisites or Corequisites: 14:540:303 and 14:540:304
Design principles, material selection, design for assembly, design for manufacturing, effect of environmental issues on product design.

14:540:400 Design of Engineering Systems II (3M)
Prerequisite: 14:540:303; 14:540:304; 14:540:384; 14:540:399, 14:540:382
OPEN TO 540 STUDENTS ONLY
A team approach to the redesign of a “real life” product. Alternative engineering plans for improved designs will be developed and implemented. Both written and oral reports will be completed.

14:540:410 Linear Programming (3M)
Prerequisite: 14:540:311. Open only to seniors and graduate students in engineering.
The methods and applications of linear programming, the Simplex method, the revised Simplex method, duality, transportation problems, postoptimality analysis, computer programs and solutions, decomposition and industrial application of linear programming.

14:540:433 Quality Engineering and Statistics (3M)
Prerequisite or Corequisites: 14:540:210; 540:434
Statistical methods for monitoring and improving product quality and decreasing variation. Factorial experiments, variables and attribute control charts, acceptance sampling, on- and off-line process controls.

14:540:434 Quality Engineering Laboratory (1M)
Corequisite: 14:540:433
Practical application of quality engineering methodologies, statistical software, gage studies, online process control, design of experiments to improve product design, industrial manufacturing processes, and system design.

14:50:453 Production Planning and Control (3M)
Prerequisite: 14:540:311, 338.
Coordination of activities of both manufacturing and service systems. Systems design; input and output; planning and scheduling. Decision-making problems employing mathematical techniques of linear programming. Sequencing jobs on machines and line balancing techniques.

14:540:461 Engineering Law (3M)
Prerequisite: Permission of department. Open only to seniors and graduate students in engineering.
Legal and ethical aspects of engineering; bids, awards, and negotiated contracts. Liabilities to the public and to employees, contract labor law. Contracts, patents, copyrights, trademarks, and engineering specifications.

14:540:462 Facilities Layout and Materials Handling (3M)
Prerequisites: 14:540:201, 303
Fundamentals of the design, layout, and location of industrial and nonmanufacturing facilities. Selection of machines and material handling equipment and their efficient arrangement. Emphasis on quantitative methods. Warehouse layout. Facility location theory.

14:540:470, 471 Industrial Engineering Seminar (1M)
The broad aspects of current engineering practices. Individual investigation and reports by students. Participation by representatives from industry.

14:540:475 Introduction to Pharmaceutical Manufacturing (3M)
Generic issues in pharmaceutical drug development and manufacturing processes such as regulatory issues including safety requirements (OSHA), the Good Manufacturing Practice (FDA) and others such as validation, quality control and automation. Sterile and non sterile manufacturing operations and packaging applications will be studied. Design and performance analysis of pharmaceutical production systems will be emphasized using analytical as well as simulation techniques. Case studies will be emphasized.

14:540:484 Design of an Industrial Enterprise (3M)
Open only to senior industrial engineering majors.
Senior-level capstone course. Students in small groups select product(s) to be manufactured, and design and justify the enterprise.

14:540:485 Industrial Information Systems (3M)
Design of information systems for integrated manufacturing. Modeling, specification, and implementation of factory information systems. Relational database model and structured query language. Methods of automatic data acquisition and integration of factory floor information with factory host database for production planning and control.

14:540:486 Automated Manufacturing Systems (3M)
Introduction to computer-aided design and computer-aided manufacturing (CAD/CAM), numerical control, hardware and programming, robotics hardware and programming, and machine vision with applications in manufacturing.

14:540:488 Design of Decision Support Systems (3M)
Pre*requisite: 14:540:485*
Designing, building and testing computer systems that emulate human thinking and can draw conclusions based on incomplete and fuzzy data. Design and implementation of user interfaces. Students are required to design and build a decision support system. Students will use various test tools to validate their systems.

14:540:491, 492 Special Problems
Studies in phases of industrial engineering of special interest.

14:540:496, 497 Co-op Internship in Industrial Engineering (3,3)
Prerequisite: Permission of department, Graded Pass/No credit.
Intended to provide a capstone experience to the student's undergraduate studies by integrating prior course work into a working industrial engineering professional environment. Credits earned for the educational benefits of the experience and granted only for a continuous, six-month, full-time assignment.

CO-OP INTERNSHIP

540:496/497 CO-OP INTERNSHIP IN INDUSTRIAL AND SYSTEMS ENGINEERING (3,3 CREDITS, PASS/NO CREDIT BASIS ONLY)

CATALOG DESCRIPTION:

The co-op internship provides the student with the opportunity to practice and/or apply knowledge and skills in various industrial and systems engineering environments. This co-op internship is intended to provide a practical engineering experience to the student's undergraduate education by integrating prior course work into a working engineering environment. The credits earned are for the educational benefits of the experience.
Prerequisite: 90 credits completed with a cumulative grade point average of at least 2.5

Course Outline: The students must satisfy the following criteria to be eligible for an internship:

The co-op internship must be with the same company for the spring and the summer semester.

Note that the 6 credits are in addition to the 129 credit hours required for graduation. Students who choose the co-op internship option will complete their undergraduate degree requirements in the 9th semester.

The following are the requirements to satisfy the undergraduate activities for credit:

1. A suitable project must be formulated as a self-contained individual effort under the supervision of a practicing professional and a faculty member.
2. A written proposal must be submitted to the Department by the student. The proposal must be approved by the Undergraduate Director and the faculty advisor. The written proposal should include educational benefits, engineering related responsibilities at the work site, project tasks, and the plan for evaluation.
3. The registration is by special permission only, obtained from the Undergraduate Director.
4. Students hired as technicians within the Department cannot use this to fulfill the Co-op Internship requirement.
5. All internship work will be documented in a daily/weekly logbook, progress report, and a final report. The final report and the semester grade must be signed by the supervising practicing professional and the faculty member.
6. Students on co-op must be registered during the semesters that they are working.

9. STUDENT SOCIETIES

ALPHA PI MU

Alpha Pi Mu is the Industrial Engineering Honor Society. Both academic excellence and leadership in service activities is emphasized for membership. Scholarship opportunities are also available. Faculty Advisor: Dr. Albin

INSTITUTE OF INDUSTRIAL ENGINEERS (IIE)

The student chapter of IIE at Rutgers University is committed to the promotion of the industrial engineering profession. Professional activities include plant tours, industry speakers, alumni night, technical paper contests, and an engineering outreach program. Social activities include fall and Spring picnics, Freshman night, and a holiday mixer. By joining this society, each student receives a complimentary copy of Industrial Engineering with dues payment. Faculty Advisor: Dr. Luxhoj

SOCIETY OF MANUFACTURING ENGINEERS (SME)

The student chapter of SME at Rutgers University is committed to the promotion of manufacturing engineering. There are plant tours, industry speakers, professional development conferences, certification and scholarship opportunities. Social activities include joint picnics with IIE student chapter and meetings. Upon joining this society, each student receives a free subscription to Manufacturing Engineering with dues payment. Faculty Advisor: Dr. Ozel

TAU BETA PI

Tau Beta Pi is the National Engineering Honor Society. Academic excellence and service to the University community are stressed. Membership is open to juniors and seniors who rank near the very top in their respective classes. Faculty Advisor: Dr. Luxhoj

10. FACULTY

Susan L. Albin is Professor and Director of the Graduate Program in the Department of Industrial and Systems Engineering. She teaches and does research in the areas of quality engineering, on-line process control, multivariate statistics, and stochastic modeling. Her work has been applied in semiconductor manufacturing, plastics recycling, food processing, and medical devices. The NSF, FAA, DOD, Exxon, and the United States Army have supported Dr. Albin's research. Dr. Albin received her Ph.D. from Columbia University in 1981. She is President-Elect of INFORMS, the Institute for Operations Research and the Management Sciences. She is also Editor-in-Chief for *IIE Transactions*, the flagship journal for the Institute of Industrial Engineers. She is a Fellow of IIE. She received the Excellence Teaching Aard from the Rutgers Engineering Governing Council, the Exxon Education Foundation Award and is listed in American Men and Women of Science and Who's Who in Science and Engineering.

Professor **Tayfur Altiok** received his Ph.D. from North Carolina State University at Raleigh. He spent the 1992-1993 academic year in Universite Pierre et Marie Curie in Paris, France. He was awarded a Fulbright Fellowship in 1993 to teach performance analysis/queueing theory in Turkey. Dr. Altiok's research has been supported by the NSF, The United Nations, NATO, and a number of industrial sponsors. His research interests are in the areas of queueing theory, performance analysis of manufacturing systems, distributed computer systems as well as marine terminals and transportation systems. Dr. Altiok has published in numerous scientific journals. His book entitled "Performance Analysis of Manufacturing Systems" was published in 1997, New York and "Simulation Modeling and Analysis with Arena" was published in 2001. His research has been applied in the areas of continuous-flow mineral handling systems, bulk port marine terminals, and client/server type transaction processing systems.

Melike Baykal-Gursoy is an Associate Professor, in the department of Industrial and Systems Engineering at Rutgers University. She received her BS in Electrical Engineering and hr MS in Electrical Engineering with a major in Control from Bogazici University, Istanbul, Turkey. She received her doctorate in Systems Engineering from the University of Pennsylvania, Philadelphia. Her specific fields of interest include stochastic modeling, queueing, Markov decision processes, stochastic games, and their applications to transportation and supply chain systems. Dr. Baykal-Gursoy's research activities are in the areas of modeling, optimization and control of stochastic systems, such as transportation, telecommunication and supply chain networks. She is developing new models that will realistically represent complex phenomena such as congestion; traffic flow interrupted by random incidents; or retailer's behavior when selling substitutable products. She is developing optimization algorithms for adjustment of inventories in supply chains, for incident response and resource allocation in incident and emergency management, for dynamic traffic flow management under incidents, and for stochastic games. Dr. Baykal-Gursoy is currently focusing on the analysis and mitigation of congestion; on infrastructure security; on minimizing the effect of extreme weather events on human health; and on finding optimal production policies for competing retailers selling substitutable products when demand and yield are uncertain. Dr. Baykal-Gursoy teaches courses in optimization, stochastic processes, queueing theory, inventory control, supply chains and logistics, process modeling and control, and time series analysis. Her research and teaching have been supported through grants from NSF, United Nations, DOD, Rutgers Transportation Coordinating Council/Federal Transit Administration, Rutgers University Center for Disaster Preparedness and Emergency Response, and Rutgers Academic Excellence Fund. She is a member of INFORMS, and is listed in Who's Who in America. Dr. Baykal-Gursoy has received the 2008-2009 Rutgers Engineering Governing Council Excellence in Teaching Award in I&SE.

Professor **Thomas Boucher** received his BS in Electrical Engineering from the University of Rhode Island, an MBA from Northwestern University, and an MS and Ph.D. in Industrial Engineering from Columbia University. His teaching and research interests include engineering economics, manufacturing automation, and production planning and control. His research has been sponsored by NSF, the Defense Logistics Agency, the Robert Wood Johnson Foundation and industry. He is the author of "Computer Automation in Manufacturing," (Chapman-Hall, 1996) and co-author of

"Analysis and Control of Production Systems," (Prentice-Hall, 1994) and "Design of Industrial Information Systems," (Elsevier, 2006). The latter book won the 2007 Book-of-the-Year Award from the Institute of Industrial Engineers. He is a four-time winner of the Eugene L. Grant Award for his journal articles in *The Engineering Economist* and he is the 2002 recipient of the Wellington Award for outstanding contributions in the field of engineering economics. Dr. Boucher has served as a department editor for *The Engineering Economist* and *IIE Transactions*. He is currently Area Editor, Public Policy Analysis for *The Engineering Economist* and is an editorial board member of the *International Journal of Industrial and Systems Engineering*. He is a senior member of IIE, SME, and IEEE and is listed in Who's Who in Science and Engineering and Who's Who in America.

Assistant Professor **Wanpracha Chaovalitwongse** received his B.S. degree in Telecommunication Engineering from King Mongkut Institute of Technology, Bangkok, Thailand, and M.S. and Ph.D. degrees in Industrial and Systems Engineering from University of Florida, Gainesville. He previously worked as a Post Doctoral Associate in the NIH-funded Brain Dynamics Laboratory, Brain Institute and the departments of Neuroscience and Industrial and Systems Engineering at University of Florida. Before joining Rutgers, he worked for one year at the Corporate Strategic Research, ExxonMobil Research & Engineering, where he managed research in developing efficient mathematical models and novel statistical data analyses for upstream and downstream business operations. He also holds two patents in applying optimization techniques to predict seizures. In 2006, he was awarded a CAREER grant from the NSF to develop optimization models and algorithms for data mining and quantitative decision making.

Associate Professor **David W. Coit** received his BS in Mechanical Engineering from Cornell University, an MBA from Rensselaer Polytechnic Institute, and MS and PhD degrees in Industrial Engineering from the University of Pittsburgh. His research interests are in the areas of reliability, optimization and energy systems modeling. In 1999, he was awarded a CAREER grant from the NSF to develop reliability optimization strategies that consider reliability estimation uncertainty. Previously, he worked for twelve years at IIT Research Institute (IITRI), Rome, NY, where he was a reliability engineer and project manager, and then later, the Manager of Engineering at IITRI's Assurance Technology Center. He is a member of IIE, INFORMS.

Dr. Elsayed A. Elsayed is a Professor in the Department of Industrial and Systems Engineering at Rutgers University. He is also the Director of the NSF / Industry / University Co-operative Research Center for Quality and Reliability Engineering. His research interests are in the areas of quality and reliability engineering and production planning and control. He is a co-author of "Quality Engineering in Production Systems," McGraw Hill Book Company, 1989. He is the author of "Reliability Engineering," Addison-Wesley, 1996. These two books received the 1990 and 1997 IIE Joint Publishers Book-of-the-Year Award respectively. He is also the co-author of "Analysis and Control of Production Systems," Prentice-Hall, 2nd Edition, 1994. He is the author and co-author of work published in the IIE Transactions, IEEE Transactions, Naval Research Logistics, Technometrics and the International Journal of Production Research. His research has been funded by DoD, FAA, NSF, ONR, Honda Research Institute and industry. Dr. Elsayed has been a consultant for AT&T Bell Laboratories, Ingersoll-Rand, Johnson & Johnson, Personal Products, AT&T Communications, Ethicon and other companies. He was the Editor-in-Chief of the IIE Transactions and the Editor of the IIE Transactions on Quality and Reliability Engineering. He is also an Editor for the International Journal of Reliability, Quality and Safety Engineering. He serves on the editorial boards of other journals such as International Journal of Production Research, Journal of the Korean Institute of Industrial Engineers, International Journal on Quality Technology and Quantitative Management and Computers and Industrial Engineering.

Dr. **Mohsen A. Jafari** is a full professor of Industrial & Systems Engineering at Rutgers University. He has been with Rutgers University since 1987. He received his Ph.D. in Systems Engineering and Operations Research and M.S. in Computer Science from Syracuse University. His research areas of interest are in systems optimization & control, intelligent distributed systems, simulations, and data modeling in transportation, manufacturing and healthcare. He has directed or co-directed a total of over $11.5M funding from various government agencies such as the NSF, DOE, ONR, DoD/DLA, FHWA, US/NJ Department of Transportation, NJ Department of Health and Senior Services. He has also been consultant to several fortune 500 companies as well as local and state government agencies.

Assistant Professor **Myong K. (MK) Jeong** received his BS in Industrial Engineering from Han Yang University, Seoul, Korea, in 1991, MS in Industrial Engineering from Korea Advanced Institute of Science and Technology, Taejon, Korea, in 1993, MS in Statistics from Georgia Institute of Technology, Atlanta, Georgia, in 2002, and Ph.D. in Industrial and Systems Engineering from Georgia Institute of Technology, Atlanta, Georgia, in 2004. He was formerly an Assistant Professor in the Department of Industrial and Information Engineering, the University of Tennessee, Knoxville. His research interests include data mining, health monitoring, quality and reliability engineering, stochastic processes, and sensor data analysis. Dr. Jeong is a member of INFORMS, IIE, and SME. He received the Freund International Scholarship and the National Science Foundation (NSF) CAREER Award in 2002 and in 2007, respectively. Currently, he is an Associate Editor of *International Journal of Quality, Statistics and Reliability* and a Council Member of INFORMS QSR (Quality, Statistics, and Reliability) cluster.

Professor **James T. Luxhoj**, Director of the Undergraduate Program, was a Visiting Professor at Aalborg University in Denmark from 1994-1995 and Fall 2001. Dr. Luxhoj received his Ph.D. in Industrial Engineering and Operations Research from Virginia Polytechnic Institute and State University in 1986. His research interests include decision support systems, risk analysis and system safety. The Federal Aviation Administration and NASA have supported Dr. Luxhøj's research in aviation safety risk management. He is a past Chairman and Director of the engineering economy divisions of the *American Society for Engineering Education* and the *Institute of Industrial Engineers*. Dr. Luxhoj was the recipient of a SAE Ralph R. Teetor Award for Engineering Education Excellence (1989), the Rutgers University Parents' Association Teacher of the Year Awards for the College of Engineering (1997), a Sigma Chi Outstanding Professor for Rutgers University Award (1991), and the Rutgers Engineering Governing Council's Excellence in Teaching Award (2006, 2007). He currently serves as the IIE Faculty Advisor. Dr. Luxhoj is a former Department Editor for the *IIE Transactions on Operations Engineering*. He is a member of IIE, Tau Beta Pi, Alpha Pi Mu, and Sigma Xi and is the co-author of "Engineering Economy," 13th ed. (Prentice-Hall, 2006).

Tuğrul Özel is Associate Professor and Director of Manufacturing Automation Research Laboratory in the Department of Industrial and Systems Engineering at Rutgers. He received his Ph.D. degree in Mechanical Engineering from Ohio State University in 1998. Dr. Özel previously worked at NSF funded Engineering Research Center for Net Shape Manufacturing at Ohio State and taught at Cleveland State University. He was also a summer faculty fellow at NASA Glenn Research Center in 1999. His research interest includes design, modeling and optimization of manufacturing processes, computational manufacturing, physics-based process simulations, mechatronics, automation and control, micro/nano manufacturing systems. His research has been funded by National Science Foundation, NASA/New Jersey Space Grant Consortium, Rutgers Research Council and automotive, aerospace, machine tool, and medical device industry. He is the Editor of the *International Journal of Mechatronics and Manufacturing Systems* and has been serving as editorial board member and guest editor for several international journals. He is the co-author of the book "Intelligent Machining", (ISTE-Wiley, 2009). He has published over 35 articles in engineering journals such as *ASME Journal of Manufacturing Science and Engineering*, *International Journal of Machine Tools and Manufacture*, *Journal of Materials Processing Technology*, *Materials and Manufacturing Processes*, and *International Journal of Advanced Manufacturing Technology* and authored nearly 40 conference publications. Those articles have received over 280 citations (h-index: 10) in Web of Science. Dr. Özel is an active member of SME, ASME, North American Manufacturing Research Institute and CIRP- International Academy for Production Engineering member candidate. He is listed in The Marquis Who's Who in the World, Who's Who in America, and Who's Who in Science and Engineering. He received the Best Paper Award in 8th CIRP International Workshop on Modeling of Machining Operations in 2005 and Machine Tool Technologies Research Foundation Award in 2008.

Hoang Pham is Professor and Chairman in the Department of Industrial and Systems Engineering at Rutgers University. Before joining Rutgers, he was a Senior Engineering Specialist with the Idaho National Engineering Laboratory and Boeing Company. Dr. Pham received his Ph.D. from the State University of New York at Buffalo. His research areas include system reliability modeling,

maintenance, and software reliability. Dr. Pham is the Editor-in-Chief of the *International Journal of Reliability*, *Quality and Safety Engineering* and an Associate Editor of the *IEEE Transactions on Systems, Man and Cybernetics*. He is also the Editor of *Springer Series in Reliability Engineering* and an editorial board member of several other journals include *IIE Transactions on Quality and Reliability Engineering*, and *International Journal of Systems and Science*. Dr. Pham is the author of 4 books, edited 10 books and has published more than 100 journal articles. He is a fellow of IEEE.

11. FACULTY ADVISORS

CLASS	ADVISOR	ROOM, EXT.
2010	Dr. D. Coit	Rm. 214, 5-2033
2011	Dr. T. Boucher	Rm. 224, 5-3657
2012	Dr. T. Ozel	Rm. 208, 5-1099
2013	Dr. M. Baykal-Gursoy	Rm. 218, 5-5465
Transfer&BS/BA	Dr. J. Luxhoj	Rm. 210, 5-3625

12. DEPARTMENTAL FACILITIES

Manufacturing Automation Laboratory: This laboratory is equipped with state-of-the-art equipment in CAD/CAM (Computer Aided Design and Computer Aided Manufacturing) and manufacturing automation systems. It includes production type CNC milling machines, a CNC lathe equipped with force dynamometers and an acoustic emission sensor, a mini-CNC laser-micro machining station, an innovative sheet folding machine, an impact testing machine, an automated storage and retrieval system, a material handling carousel and a robot assembly work station.

Manufacturing Processing Laboratory: Basic machine tools such as turning, milling, drilling, grinding, welding and measuring machines are available to help the student become familiar with metal-processing operations. The equipment is also used to perform laboratory experiments in heat treatment, tool life and chip formation assessments.

Computer Laboratory: This lab is equipped with state-of-the-art PCs. The lab has the latest simulation software such as ARENA, Matlab/Simulink, and optimization software LINDO, GINO,...etc. It has software for Quality Control, Plant Layout, Production Control, Statistical Analysis and text processing. It also has CAD/CAM/CAE software including AutoCAD, SolidWorks, ABAQUS and FeatureCAM. The laboratory is connected to a university-wide network and the Internet.

Quality and Reliability Engineering Laboratory: This lab has been developed to allow the students to have hands on experience in actual methods for quality control and reliability engineering. A variety of software for control charts, sampling plans and design of experiments is available. The laboratory has a wide array of metrology equipment such as digital calipers and micrometers, a roundness measurement equipment, surface profilometers and a coordinate measuring machine. It also has various materials testing equipment, a Rockwell hardness tester temperature chambers, vibration test stands, and failure analysis equipment such as voltage stressing equipment, and measuring microscopes. LABVIEW, Minitab and STATGRAPHICS software are available for students use.

Information Technology Laboratory. The laboratory has the state-of-the-art client/server network with Apache and WebLogic application servers, database, and middleware. This lab is mainly used for graduate dissertation research, collaborative projects with industrial partners in typical areas of logistics of supply chains, distribution systems, marine ports and port security. The lab is equipped with various simulation modeling software, SAP's IDES training system as well as software for mathematical analysis including Mathcad and Mathematica. The IT research in the lab includes operations at marine terminals, waterways, C/S transaction processing middleware design, and military ammunition supply chain operations among many others

Computer Control and Manufacturing Information Laboratory: This laboratory is used for instruction in manufacturing automation. Students learn to use programmable logic controllers (PLC's) and other electronic controllers, as well as sensors and actuator devices to control manufacturing processes and equipment. The lab includes local area networks for integrating controllers in peer-to-peer communication and with databases, as well as a Lanworks local area network for distributed control of intelligent sensors and actuators.

13. GENERAL INFORMATION

IMPORTANT OFFICES:

School of Engineering

Dean Thomas Farris, Dean, School of Engineering, Room B204, Engineering Building, 445-2214

Dean Fred Bernath, Associate Dean for Academic Affairs, Room B100, Engineering Building, 445-2212

Dean Don Brown, Assistant Dean for Special Programs, Room B110, Engineering Building, 445-2687

Dean Jeffery Rankin, Assistant Dean for First Year Students, Room B100, Engineering Building, 445-2212

The Undergraduate Registrar - Room 200F, Administrative Service Building, Davidson Road, Busch Campus, 445-3557

Career Services - 56 College Avenue, College Avenue Campus, 932-7997

Financial Aid Room - 140 Records Hall, College Avenue Campus, 932-7057

Housing - On-Campus - Taylor Road, Busch Campus General Information, 445-2992; **Off-Campus** - 445-7766

International Student Center - 180 College Avenue, College Avenue Campus, **Counselor to International Students** - 932-7015

Student Accounting Records Hall, College Avenue Campus, Room 138, 932-7581

Undergraduate Course Periods: Undergraduate courses mostly meet during the day. The time periods are as follows:

Period	1	2	3	4	5	6	7
Starts	8:40 AM	10:20 AM	12:00 AM	1:40 PM	3:20 PM	5:00 PM	6:40 PM
Ends	10:00	11:40	1:20	3:00	4:40	6:20	8:00

Class Periods - Start and End Times

14. ADDITIONAL INFORMATION

Departmental Office: The Department of Industrial and Systems Engineering office is located on the second floor of the CORE Building (Room 201). The office has copies of most forms you might need and the staff working there can answer many questions. Office hours are 8:30-4:30 PM, Monday through Friday. Closed for lunch between 12:00 - 1:00 PM.

Electronic Mail: All Rutgers students may obtain a computer account on the Eden machine in order to send and receive electronic mail. Go to the Micrographic Center in the basement of the Hill Center, Room 17, and the counselor there will show you how to create your account. The phone number is 445-2296 and they are open 10-6 PM Monday through Saturday.

Employment Opportunities: Job announcements are posted on the ISE bulletin boards. Students are encouraged to make use of the Career Development and Placement Office on Busch campus.

Bulletin Boards: In the hallways on the 1st and 2nd floors, there are bulletin boards, which list course changes, seminars, fellowships, and other miscellaneous notices.

The Telephone Number for the Department of Industrial and Systems Engineering is **(**732) 445-3654 and the fax number is (732) 445-5467. The area code and prefix is (732) 445 for all telephones - the extensions are given below.

NAME	EXT	CORE	EMAIL
Albin, Susan	2238	206	salbin@rci.rutgers.edu
Altiok, Tayfur	2829	216	altiok@rci.rutgers.edu
Boucher, Thomas O.	3657	224	tboucher@rci.rutgers.edu
Chaovalitwongse, Art	5469	212	wchaoval@rci.rutgers.edu
Coit, David	2033	214	coit@rci.rutgers.edu
Elsayed, Elsayed A.	3859	226	elsayed@rci.rutgers.edu
Gursoy, Melike B.	5465	218	gursoy@rci.rutgers.edu
Jafari, Mohsen A.	3627	220	jafari@rci.rutgers.edu
Jeong, Myong K.	5474	204	mjeong@rci.rutgers.edu
Luxhoj, James T.	3625	210	jluxhoj@rci.rutgers.edu
Ozel, Tugrul	1099	208	ozel@rci.rutgers.edu
Pham, Hoang	3654/5471	201	hopham@rci.rutgers.edu
Ielmini, Cindy	3654	201	ielmini@rci.rutgers.edu
Lippencott, Joseph	5480	114	lippen@rci.rutgers.edu
Smith-Perrillo, Helen	3654	201	helen@rci.rutgers.edu
Agrawal, Gaya			
Basily, Basily	2794	222	basily@rci.rutgers.edu
Lawrence, Sheila			
CAD/CAM Lab	5480	116	
Computer Control Lab	3671	101(WINLAB/IE Bldg)	
MicroLab	3671	106	
Reliability Lab	5480	114	
Facility Design Lab		110	
Manufacturing Processing Lab	5480	112	
Conference Room		203	

15. SECURITY AND SAFETY

Providing a secure and safe environment for all is a top priority.

Emergency Phone Number: The number is 932-7111 for university police and emergency.

CORE Building Access: The door is open weekdays from 8 AM to 6 PM.

Access to First Floor IE Corridor: The door is open weekdays from 9-12 and 1-4:30 PM For your safety, the corridor is under camera surveillance.

Access to Labs: The labs are open from 8:30 AM to 4:30 PM.

DON'T LET STRANGERS IN: Don’t open the door for people who have no entry keys. Don't keep any door ajar by placing an object in front of it.

Laboratory Rules:

- No food or beverages.
- Know the hazards of the material and equipment you are using.
- Use goggles in manufacturing laboratories.

Obtain permission of the lab director to use power.

Last Update July 02, 2009