Report

Project 1 – MIOH-UTC SC1

Supply Chain/Transportation Efficiency Systems Graduate Degree Program

University of Detroit Mercy

Shahram Taj
Utpal Dutta
Maryam Salehabadi

University of Toledo

Subba Rao
Paul Hong
Mark Vonderembse

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1. Abstract

Supply Chain/Transportation Efficiency Systems graduate degree program covers all areas in supply chain and transportation efficiency. Supply chain system integrates global information and processes across all functions including supply management, operations and logistics – for both internal and external partners. Supply chain system professional are the agents of change for e-business, manufacturing, high-tech, service and consulting companies. Transportation system analysis and planning stress conceptual and quantitative approaches to the analysis of transportation and related systems. Our objective is to prepare students to identify, analyze, and solve complex transportation and supply chain problems, and communicate those solutions towards their successful implementation.

This project covers feasibility and scope of the program by investigating overall demand for programs in this area and benchmarking similar programs at other universities.
A "Board of Advisors" from industry and universities has been selected to discuss possible curricula for the program. A survey that contains a list of topics to be covered in the courses in the program was created and was sent to BOA and others to obtain their inputs. Finally, the survey's findings and results were discussed with the BOA in a formal meeting and their suggestions are taken for the curriculum development in Project 2.

2. Introduction

The Michigan – Ohio (MIOH) University Transportation Center (UTC) was recently created through a grant from the United States Department of Transportation. The MIOH-UTC mission is to significantly improve transportation efficiency, safety and security in Michigan and Ohio and across the nation by increasing the effective capacity of existing transportation infrastructure, reducing transportation energy dependence through alternative fuels, and enhancing supply chain performance**.** The MIOH mission will be accomplished through

- The development and organization of new knowledge, technology and management systems;
- The effective transfer of new and existing knowledge to commercial enterprises and educational communities;
- The development of a cadre of transportation professionals that is larger, more diverse and better prepared to address the challenges and opportunities of 21st century transportation systems.

Therefore, the development of a graduate degree in Supply Chain/Transportation Efficiency Systems will bring MIOH-UTC closer to above goals by effective transfer of new and existing knowledge to educational communities and the development of a cadre of transportation graduates prepared to address the challenges and opportunities of 21st century transportation systems.

Master of Science in Transportation/Supply Chain integrates global information and processes across all functions including supply management, operations and logistics for both internal and external partners. SCM professionals are the agents of change for e-business, manufacturing, high tech, service and consulting companies. Transportation Systems Analysis and Planning stress conceptual and quantitative approaches to the analysis of transportation and related systems. Our objective is to prepare our students to identify, analyze, and solve complex transportation and supply chain problems, and to communicate those solutions toward their successful implementation.

The vision is to develop a Supply Chain/Transportation Efficiency Systems graduate degree program that covers all areas in supply chain, and transportation efficiency. Therefore, a team of interdisciplinary faculty from Colleges of Business Administration and Engineering from the University of Detroit Mercy and the University of Toledo who have worked on many projects related to transportation efficiency and supply chain will develop the curriculum with direct input from an advisory board consisting of industry leaders and academicians.

This is an interdisciplinary M.S. degree in Supply Chain/Transportation Systems Efficiency and would be one of only a few truly interdisciplinary transportation/supply chain degrees nationwide. It includes two core fields: Transportation Efficiency (through the Department of Civil and Environmental Engineering and the College of Business Administration), and supply chain design and management (through the College of Business Administration).

Students develop a cohesive curriculum from the core fields. The degree program would have a minimum of core requirements and, under the direction of an advisor; students design a program to meet their academic and career objectives.

The degree program will be a select program that accepts only the most qualified students. The program could be research oriented, requiring students to write a thesis or do a capstone-project based on their research interests and self-designed program of courses. The number of students will be limited to ensure all students have an opportunity to work closely with a faculty member on research. The MIOH-UTC could enhance student research opportunities by sponsoring student work on research projects.

3. Feasibility

3.1. The overall demand for programs in this area:

The demand rate for people in supply chain and transportation are either stable or growing according to Michigan Employment Forecasts by Occupational Groups (2002 – 2012). Demands for logisticians are growing between 9 to 17% in United States fro 2004 to 2014 according to U.S. Department of Labor - Bureau of Labor Statistics - Occupational Outlook Handbook. Logisticians are defined as occupation that analyzes and coordinates the logistical functions of a firm or organization. They are responsible for the entire life cycle of a product, including acquisition, distribution, internal allocation, delivery, and final disposal of resources. This same definition is now used to describe the supply chain. The following two tables show detail information from these sources.

Table 1: Michigan Employment Forecasts by Occupational Groups (2002 – 2012)

Website: http://www.milmi.org/?PAGEID=67&SUBID=201

Area	Code	Occupation	Est Yr-Proj Yr	Estimated Emp	Projected Emp	Numeric Change	% Change	Grow Code	Annual Growth	Annual Replacements	Total Openings
Michigan	5300001032	Transportation and Material Moving Occupations	2002 - 2012	312,760	339,260	26,500	8.5	Stable	2,674	6,971	9,645
Michigan	5360511078	Transportation Inspectors	2002 - 2012	584	622	38	6.5	Stable	4	14	18
Michigan	5360991079	Transportation Workers, All Other	2002 - 2012	934	1,091	157	16.8	Growing	16	28	44

Table 2: "U.S. Department of Labor - Bureau of Labor Statistics - Occupational Outlook Handbook"

Website: http://www.bls.gov/oco/
Website: http://www.bls.gov/oco/ocos023.htm

Logisticians

Analyze and coordinate the logistical functions of a firm or organization. Responsible for the entire life cycle of a product, including acquisition, distribution, internal allocation, delivery, and final disposal of resources.

- 2004 employment: 53,000
- Projected 2004-14 employment change: About as fast as average
- Most significant source of postsecondary education or training: Bachelor's degree

Transportation, storage, and distribution managers

Plan, direct, or coordinate transportation, storage, or distribution activities in accordance with governmental policies and regulations. Includes logistics managers.

- 2004 employment: 92,000
- Projected 2004-14 employment change: About as fast as average
- Most significant source of postsecondary education or training: Work experience in a related occupation

Key phrases in the Handbook

Website: http://www.bls.gov/oco/oco20016.htm

This table explains how to interpret the key phrases used to describe projected changes in employment. It also explains the terms used to describe the relationship between the

number of job openings and the number of jobseekers. The descriptions of this relationship in a particular occupation reflect the knowledge and judgment of economists in the Bureau's Office of Occupational Statistics and Employment Projections.

Changing employment between 2004 and 2014	
If the statement reads:	**Employment is projected to:**
Grow much faster than average	Increase 27 percent or more
Grow faster than average	Increase 18 to 26 percent
Grow about as fast as average	Increase 9 to 17 percent
Grow more slowly than average	Increase 0 to 8 percent
Decline	Decrease any amount

3.2. The Uniqueness of the Proposed Program

This program would be a collaborative educational and interdisciplinary M.S. degree in Supply Chain/Transportation Systems Efficiency program. This graduate degree program will be one of only a few truly interdisciplinary transportation/supply chain degrees nationwide. It includes two core fields: Supply Chain Design and Management (through the College of Business Administration) and Transportation Efficiency (through the Department of Civil and Environmental Engineering).

Students could have backgrounds as varied as the program itself. These students would have bachelor degrees in Business Administration, Science, Engineering, Sociology, Political Science, and Urban Planning. Because transportation is inherently interdisciplinary, the perspective of many disciplines is needed to solve the complex transportation questions facing the next generation of transportation professionals. The diversity of students and faculty participating in the Supply Chain and Transportation Efficiency Systems program enriches the academic experience and allows the student to see the strength of interdisciplinary approaches to planning, operating, managing and maintaining the next generation of transportation and supply chain systems.

3.3. The Board Of Advisor

Another uniqueness of this program is the use of an advisory board in the development of the curriculum. The following table shows the list of the advisory board that have been selected among the industry leaders and academicians who are expert in supply chain and transportation systems efficiency.

Table 3: Board of Advisor for Supply Chains and Transportation System Efficiency Gr

	NAME	POSITION	ORGA
1	Hossein Nivi	Dean, College of Business Administration	University
2	Leo Hanifin	Dean, College of Engineering and Science	University
3	Hokey Min	Professor	Bowling Gre
4	Ed Sprock	Executive-in-Residence	UDM & I
5	Louis Lambert	Senior Associate	Cambrid
6	May Leng Yau-Patterson	Director, Advanced Supply Procurement & Supply	Daim
7	Doug Hepfer	Partner, Deloitte Consulting LLP	Deloitt
8	Pamela Stec	Director Material Planning and Logistics for Ford North America	
9	Paul Hong	Professor	University of To
10	Christopher Kaiser	Manager	TKS Logistics, T

4. Define Scope of Program

4.1. Benchmarking Similar Programs in U.S.

We have done benchmarking supply chain and transportation programs at the following universities

- Iowa State University
- Michigan State University
- MIT
- Ohio State University
- University of Wisconsin

We have identified the following characteristics for these programs:

Iowa State University:

"Interdisciplinary Master Degree in Transportation", 2-year program, three core fields:

1. transportation engineering (through the Department of Civil, Construction, and Environmental Engineering),
2. community and regional planning (through that department in the College of Design), and
3. transportation and logistics (through the Department of Logistics, Operations, and Management Information Systems in the College of Business).

See Appendix A for detailed description.

Michigan State University:

"The Master of Science in Logistics Degree Program", 19-month program, highly technical logistics program

See Appendix A for detailed description.

Massachusetts Institute of Technology:

" Master of Engineering in Logistics", Begun in September 1998, the MLOG program is a **professional degree program** preparing graduates for careers in logistics and supply chain management — in manufacturing, distribution, retail, transportation, consulting, software and/or logistics organizations. The program takes **only nine months**, start to finish. The program is multidisciplinary with core courses in logistics systems, supply chain context, logistics facilities, operations, system dynamics, and a course in database, internet, & system integration technologies.

Ohio State University:

This an MBA-Based program with majors in logistics, operations, and supply chain management. See Appendix B for program details.

University of Wisconsin:

This is also MBA-based program that blends courses in core business functions such as accounting, finance, operations, marketing, and strategy with supply chain management courses such as marketing channels, operations research, procurement and supply management, logistics management, and strategic outsourcing to complete the objective of offering a cross-functional educational experience. See Appendix C for program details.

4.2. Survey Design

A survey that contains a list of topics to be covered in the courses in the program is created using courses from the following institution:

- Iowa State University
- Michigan State University
- MIT
- University of Toledo

Courses are then grouped into following categories:

1. Strategic/Organizational (SO) - Courses that deal with strategic and organizational system issues including design/planning issues

2. Behavioral/Managerial (BM) - Courses that deal with managerial and behaviors practices including general management issues

3. Technical/Technological (TT) - Courses that deal with Technical/Technological issues

4. Operational/ Process (OP) - Courses that deal with operational/manufacturing and business process practices

5. Others/International Issues (OI) - Courses that deal with international/global, or other issues not considered above.

Appendix D contains the Courses Descriptions from Benchmarked Universities. The teams designed a survey based on these groupings. This survey is shown in Table 4 with an additional grouping for transportation planning and modeling. The surveys were sent to BOA and a few other experts. A total of 12 responses were received.

Table 4 also shows the topics that has been sorted by their average scores. The scoring was done using a likert-scale, with 5 as the highest and 1 as the lowest.

4.3. Survey Results and Findings

In strategic and organization section, five topics scored above 4. These are

Items	Score
Distribution and logistics	4.73
Global supply chain strategies	4.58
transportation planning	4.45
Supply chains and transportation planning	4.40
Demand forecasting and planning	4.00

In Behavioral and Managerial section, two topics scored above 4.

Items	Score
Critical problem solving skills	4.25
Leadership skills	4.08

In Technical and Technological section, also two topics scored above 4.

Items	Score
Information technology in logistics and supply chain management	4.50
Supply chain management process analysis	4.00

In Operational and Processes section, two topics scored above 4.

Items	Score
ERP systems in supply chains.	4.18
Decision-making in manufacturing and supply chain systems	4.09
Models, methods and software tools for logistics network design	4.00

In International Issues section, six topics scored above 4.

Items	Score
Logistics systems for the international movement of goods.	4.42
Understanding logistics and supply chain management in a global environment	4.25
Global purchasing and sourcing of materials and services	4.09
Cross-border issues in global supply chains and logistics	4.09

Negotiating in an international environment	4.09
Impact of international trade agreements and organizations such as the WTO, NAFTA, CAFTA, IMF, the EU and Mercosur.	4.08

In Transportation Planning and Modeling section, no items scored above 4.

Table 4: Survey for the Curriculum Development on Supply Chain and Transportation

CURRICULUM DEVELOPMENT SURVEY ON SUPPLY CHAIN AND TRANSPORATION	
Strategic and Organizational (1)	
Items	**Score**
Distribution and logistics	**4.73**
Global supply chain strategies	**4.58**
transportation planning	**4.45**
Supply chains and transportation planning	**4.40**
Demand forecasting and planning	**4.00**
Procurement and purchasing	**3.92**
Operating issues in contemporary logistics and integrated supply chain management.	**3.92**
Strategies for sustainable competitive advantages of supply chains	**3.91**
inventory theory,	**3.64**
Customer service	**3.64**
Behavioral issues in supply chain	**3.50**
Supply chain restructuring	**3.09**
Behavioral and Managerial (2)	
Items	**Score**
Critical problem solving skills	**4.25**
Leadership skills	**4.08**
Building teams and working in teams	**3.83**
Oral, written and communication skills in business settings	**3.67**
Six sigma problem solving methodologies	**3.64**
Use of appropriate technology for management presentations	**3.27**
Effective interpersonal communication skills	**3.17**

Technical and Technological (3)

Items	Score
Information technology in logistics and supply chain management	4.50
Supply chain management process analysis	4.00
Implementation of RFID technologies and systems	3.33
value and productivity performance measurement of IT investments, legal, policy and regulatory aspects of auto-identification, and the impact of RFID on business strategy.	3.17
Database modeling, design, and implementation	3.08
Geographic Information Systems (hardware, software, data structures, data acquisition)	3.00
Geographic data manipulation and analysis.	3.00
IT benchmarking including performance measures	2.83
Internet technologies such as XML and SOAP	2.82
IT security	2.82
Geo-relational database concept and design	2.60
Data networking protocols and technologies	2.55

Operational and Processes (4)

Items	Score
ERP systems in supply chains.	4.18
Decision-making in manufacturing and supply chain systems	4.09
Models, methods and software tools for logistics network design	4.00
Order fulfillment and distribution operations in logistics and transportation	3.92
Customer service issues in logistics and transportation	3.91
Managing quality across supply chains	3.91
ERP systems for transportation and logistics systems	3.91
Purchasing and sourcing of transportation services, third-party logistics providers	3.83
Models, methods and software tools for capacity planning and flexibility	3.82
Operational tools such as MRP, JIT, TOC (theory of constraints)	3.75
Internet and e-commerce issues for transportation and supply chains	3.64
Models, methods and software tools for make-buy decisions and product development	3.64

International Issues (5)

Items	Score
Logistics systems for the international movement of goods.	4.42
Understanding logistics and supply chain management in a global environment	4.25
Global purchasing and sourcing of materials and services	4.09
Cross-border issues in global supply chains and logistics	4.09
Negotiating in an international environment	4.09
Impact of international trade agreements and organizations such as the WTO, NAFTA, CAFTA, IMF, the EU and Mercosur.	4.08
Economics of international air, ocean carriers and intermodal operations	3.92
Legal framework for the international movement of goods.	3.82
National and international trade policies and global logistics.	3.82
Purchasing and materials management in a global context	3.82

Economics of international air and ocean carriers	**3.64**
Providers of exporting and importing services such as custom brokers, freight agents.	**3.58**
Outsourcing	**3.55**
International marketing/supply chain interface	**3.55**
Role of ports and airports in international product movements	**3.55**
Global sourcing and product specifications	**3.55**
The effects of government trade policies on global logistics.	**3.45**
Advantages of exporting and importing services.	**3.27**

Transportation Planning and Modeling (6)

Items	Score
Intermodal transportation systems	**3.92**
Transportation system management;	**3.92**
Transportation forecasts and analyses.	**3.82**
Transportation data sources and cost analysis;	**3.73**
Intelligent transportation systems planning;	**3.73**
Sustainable transportation concepts	**3.73**
Optimization of transportation systems.	**3.67**
Policy issues explored include safety, environmental impact, sustainable communities, and economic development.	**3.64**
Focus on Freight Transportation	**3.60**
Carrier management issues involving ownership, mergers, routes, competition and labor.	**3.58**
Analysis of transport users' requirements	**3.55**
Transport legislation and financing;	**3.55**
Policy issues for transportation planning and investment in the US and abroad.	**3.50**
Travel planning, network modeling, and analysis	**3.45**
Safety, environmental impact, sustainable communities, and economic development.	**3.27**
Statewide, regional, and local transportation system planning.	**3.18**
Travel studies and analysis of data.	**3.00**
Public transportation forecasts and analyses.	**2.91**
Corridor travel planning.	**2.91**
Travel projections.	**2.73**

5. Discussion with the Board of Advisor

The team met with the BOA on April 27, 2007 and here are the highlights of this meeting.

Curriculum:

- The program should be designed in a way to be helpful (from industry standpoint not academic standpoint) - Great difference between Industry and Academy - Productive employee - Student might not adapt to the real world
- Be careful in generalizing the program
- Knowledge of manufacturing systems and procurement would be valuable
- Make the students ready with practical attributes
- Technology – Student's weakness. We need the combination of IT and transportation system
- The focus for this program will be Engineering and Business with strong knowledge
- It should be different from Undergraduate program that many schools offer.
- Some companies are restructuring supply chains
- Six Sigma should rate high – As part of the program we should teach students how to do solving methodology based on data. Six Sigma is a very important tool.
- Demand forecasting and planning can be another important thing. Translation of Demand forecasting and planning into Logistics.
- how to forecast the transportation system demands as driven by the logistics requirements
- Assets management. Overall management of transportation system? Communicate with the system is very important.

Competition:

- Top logistics schools like Ohio State, Penn State and Tenn. graduate theorists that don't stay as logistics leaders in industry.
- Top five universities in Logistics Program and Supply Chain management (undergraduate Students):
    - Central
    - Michigan State
    - Western
    - Reno
    - Arizona State

Delivery:

- Consortium is very important
- We can delivery some of these courses into the existing program such as MPD or MBA program
- And then build it into a new separate program
- Courses could be shared between the universities

Market:

- Who will come to this program . . . people from manufacturing companies who will create and manage logistics systems ; People from logistics companies who will create and manage logistics systems.
- What is the market demand for this program? We should define the knowledge skills and link them to specific functions
- If we identify our target market then we know what our expectations are and then we can project it and have some different answers
- The curriculum might be different if the student want to work for government or transportation or so on
- We need to spend some time to define WHO IS OUR CUSTOMER? For Chrysler might be diff than UPS. We have to spend more times on this in future to identify this element.
- Ford would be interested in sending some of their engineers to a masters program that we are developing

On the Job:

- It takes 5 to 6 years to keep students up to speed
- Ford: bringing in recruits with engineering degrees with interest in supply chain logistics; engineers have the analytical perspective; haven't been recruiting anyone with specific supply chain logistics degrees;

Assessment:

- What is the outcomes of the specific courses right after graduation and 5 years after the graduation
- What is the outcome they are looking for? Then we can go back and start designing it.
- We need to define the specific competencies that graduates possess at graduation
- As we design it then we know what they need to be able to do in case of competency

Survey:

- We need to take this survey in different industry and see how we can target it
- The survey might be a very helpful tools for us to identify the program
- Get more advisor from shipping industry and not just automotive industry so it will be very valuable for us to identify
- Take the top scores item in Survey and send it to new people for their inputs
- Get more feedbacks from Wall Mart or Meijer
- Same survey should be sent to additional people to be consistent
- Pam from Ford can get the logistic providers to participate in this; we need at least one or two logistics providers from other companies such as Dell. Or Procter and Gamble. Also need companies like Motorola.
- Dick Beaubien may be helpful from MIITS.

Other:

- What we rank last might be the things that Detroit's companies struggle the most.
- We need to obtain input specific to industry (or from shipping customer vs the transportation providers) - How much it is common between them or how much it is not common.
- Ask people what are the competency. What are the 5 most important job or task they do that can be fulfill in this program. What is the title can be?

6. Conclusion

We are facing economic downturn and huge job lost in northern Ohio and southeastern Michigan. Improving transportation efficiency and design and managing of robust supply chains will help to revitalize this depressed region and would make it more competitive to attract economic investments in this area. Over the past decade, few topics have received more attention in the business world than supply chain management (SCM). Integrated supply chain management is now recognized as a core competitive strategy. As organizations continuously seek to provide their products and services to customers faster, better and cheaper than the competition, managers have come to realize that they cannot do it alone. Organizations are now taking a broad "systems" view of the entire supply chain required to design, produce, and deliver their products and services. Businesses are working more closely with both their suppliers and customers to meet the needs of the ultimate consumer. This represents a major change for many organizations. By creating information visibility through the innovative use of information technology, developing collaboration and trust among supply chain member organizations, and integrating and improving supply chain process performance, organizations can transform their supply chains into high-performing value systems. These value systems provide a real competitive advantage in the marketplace.

We need to train and educate professional who would bring their expertise and knowledge to address these critical needs, challenges and opportunities in our region.

Appendix A:
Benchmarking Comparative Analysis Chart

Comparison Factors	IOWA State U	Michigan State University
Program Offered	"Interdisciplinary Master Degree in Transportation"	"The Master of Science in Logistics Degree Program"
GMAT	Required (min 550)	Required
GPA	• A cumulative GPA of at least 3.0 is required by the graduate college	Min 3.0 in the last two years of undergraduate work
Years of Experiences	Not specified	Minimum 3 years of experiences
Recommendation Letters	3 letters of recommendation	3 letters of recommendation
Dead Line	• Domestic students: One month prior to beginning of term • International students: 6 months prior to beginning of term	Submit the complete application by Apr 1st of the year for admission
Interview	Not specified	Not specified
Others	Not specified	Receive a written commitment from his/her employer indicating release time for each module
Structure	Not specified	• 12 days of in-residence classes at the James B. Henry (24 credits) • E-learning classes (6 credits) • A field study/research project (6 credits)
Class Size	Not specified	Not specified
Work Load	Not specified	Not specified
Location	City of Ames, near the center of the state, 35 miles north of the state's capitol city, Des Moines.	Lansing , Michigan
Credit Hours	36 Credits	36 Credits
Length of Program	Approximately 2 years	19-month program 31-month program
Academic Program	Transportation	Logistics
Program Structure	The First Year: • All first year Transportation degree candidates should take all or most of the required core courses After the First Year: • Students should fulfill remaining credit hours of coursework (Summer and Fall). • Establish the direction of their thesis research • Complete thesis research and composition (Final Semester)	• Module 1: May in-residency • Module 2: Aug in-residency • Module 3: E-Learning • Module 4: May in-residency • Module 5: Aug in-residency • Module 6: E-Learning
Program Cost	Not specified	• $32,000 in-state • $34,000 out-of-state
Tuition	Not specified	Included in program cost
Laptop	Not specified	Required: configuration requirements are available upon request.
Books & required course material	Not specified	Included in program cost
Meals & refreshments for class sessions	Not specified	Included in program cost

Orientation activities & academic residency	Graduate Student Orientation offered by the Graduate College. Incoming graduate students will receive information concerning this orientation in the weeks preceding the start of classes. This is a time to become acquainted with the University, its policies, and requirements. This is also a time for incoming students to familiarize themselves the Transportation program, its faculty, students, and to prepare for registration and the start of classes.	Not specified
Graduation fees & cost	Not specified	Not specified
Scholarship	The award may be given twice to the same student if the student continues for a PhD in civil engineering (transportation emphasis). Carstens Award: • $4000* • undergraduate GPA requirement: 3.6 Ring Award • $2000* • undergraduate GPA requirement: 3.3 Grants for Research: • The Graduate Student Senate provides funds to support graduate student research. The Senate provides up to a maximum of $300 to each person submitting a research proposal. The projects for these proposals must be unrelated to a student's thesis or dissertation research.	Not specified
Financial Aid & private loans	Research assistantships Graduate research assistantships are available through the Center for Transportation Research and Education (CTRE), the Transportation Scholars program, and research directed by individual faculty. Other assistance Other financial assistance may be available through the Carstens and Ring Scholarships.	Loans available to applicants.
Honorary Societies	Not specified	Not specified
Other Affiliations	Not specified	Not specified
Courses	**Core courses:** • **STAT 401:** Statistical Methods for Research Workers • **CE 551:** Urban Transportation Planning and Modeling • **TRANS 691:** Seminar in Transportation Planning **Other approved courses:** **Area A** • **CE 550:** Advanced Highway Design. • **CE 552:** Traffic Safety, Operations, and Maintenance.	• **MSC 870:** Introduction to Logistics and Supply Chain Management • **MSC 871:** Applied Data Analysis • **MSC 872:** Distribution Fulfillment • **MSC 873:** Procurement and manufacturing Management • **MGT 875:** Change Management • **COM 874:** Communication in Logistics • **MSC 876:** Logistics Operations Methods and Systems • **MSC 877:** Logistics Information Technology

	• **CE 553:** Traffic Engineering. • **Trans 555:** Economic Analysis of Transportation Investments. • **CE 557:** Transportation Systems Analysis. • **CE 558:** Transportation Systems Development and Management Laboratory. • **CE 559:** Transportation Infrastructure/Asset Management. **Area B** • **CRP 511:** Introduction to Community and Regional Planning. • **CRP 521:** Land Use Planning. • **CRP 525:** Growth Management. • **CRP 542:** Site Development. • **CRP 545:** Transportation Policy Planning. • **CRP 551:** Introduction to Geographic Information Systems. • **CRP 552:** Geographic Data Management and Planning Analysis. • **CRP 590:** Special Topics. **Area C (Logistics and Supply Chain Management)** • **LSCM 461:** Principles of Transportation. • **LSCM 462:** Transportation Carrier Management. • **LSCM 466:** International Transportation and Logistics. • **LSCM 469:** Transportation and Logistics Issues. • **LSCM 487:** Strategic Supply Chain Management.	• **MSC 878:** Logistics System Analysis • MSC 879: Supply Chain Logistics • **MSC 881:** Global Logistics • **MSC 882:** Logistics Field Study

Source of information:

1. IOWA State U:
   - http://www.ctre.iastate.edu/education.htm
2. Michigan State University:
   - http://www.bus.msu.edu/msc/msscm

Appendix B: Ohio State University
Logistics, Operations & Supply Chain Management

Within our Department of Marketing and Logistics and our Department of Management Science, we have faculty with expertise in logistics management, operations management, and supply chain management. Our logistics faculty has expertise in inventory management, customer service and network modeling. The operations faculty includes renowned experts in areas such as lean management, six-sigma, purchasing, and manufacturing scheduling. And in the area of supply chain management, we have developed a comprehensive framework that addresses the need for managing relationships in the supply chain in a process-oriented and cross-functional way. This comprehensive framework provides the basis of our coursework in supply chain management and is also being implemented at major corporations such as Coca-Cola.

As today's global environment has ushered in major changes, large multinational corporations are increasingly looking for outstanding individuals who specialize in these areas. Fisher's programs, regarded highly among top business schools, provide a unique opportunity to advance in the field by learning from accomplished Fisher College faculty. This talented group comprises experts with proven successes and skills in the business with such global leaders as 3M, Hewlett Packard and GE.

Operations & Logistics Management Major

By combining operations and logistics, students learn how the total flow of goods, services and information within and between firms can be managed effectively and efficiently. Faculty in this area teaches students how to develop processes that facilitate efficient and cost-effective flow through a variety of supply chains. The operations portion of this major teaches students general management and technical skills in areas such as quality, operations planning and control systems, and operations strategy. For example, an operations manager might be responsible for inventory management, production scheduling, and service delivery. The logistics segment of this major addresses current issues and topics in the management of the flow of product through the supply chain. This includes the movement of goods and services from raw material through production, packaging, and ultimately, delivery. This integrated focus mirrors the approach that successful firms use to manage their businesses.

In addition to the foundational curriculum in logistics and operations, Fisher offers innovative coursework in lean management, six-sigma principles, and supply chain management. For the firm to be successful, the skilled manager must clearly understand the interrelated nature of procurement, production, and distribution activities to be able to make intelligent trade-offs in terms of cost, responsiveness, flexibility, and customer service. Our curriculum provides an ideal blend of theory and principles, tools and techniques, and hands-on experience that will equip you to deal with management challenges in this quickly evolving field. You'll experience lectures, case analyses, computer-based exercises, executive guest lecturers, on-site

visits and field study projects.

Supply Chain Management

Fisher students have an opportunity to take courses in supply chain management. Increasingly, supply chain management is being viewed not as a business function, but as a business approach used to transcend traditional functional boundaries. Supply chain management focuses on the management of the relationships between firms in the supply chain. Because these relationships can be complex, all business functions need to be involved. We focus our curriculum on a cross-functional, process oriented framework that was developed by academics and executives associated with the Global Supply Chain Forum here at Fisher. We offer an introductory course that teaches the principles behind supply chain management and emphasizes why organizations need to take a cross-functional view. Then students can take an advanced course that focuses more heavily on implementation issues and allows them to work with a company to perform a process assessment. [More]

Course Options (including number of credit hours)

Required:

M&L 880 Logistics Management (4)

And select one of the following two courses:

MGT 835 Operations Planning and Control for Supply Chain Management (4)

M&L 881 Analysis & Design of Logistics Systems (4)

Minimum of three of the following elective courses:

MGT 830 Service Quality Management (4)

MGT 832 Operations Management Information Systems (4)

MGT 834 Strategic Design of Operations/Logistics Systems (4)

MGT 836 Customer Driven Manufacturing in the Global Market (4)

MGT 840 Lean Management Series (4)

M&L 884 Field Problems in Logistics (4)

M&L 885 Supply Chain Management (4)

MGT 894.01 Six Sigma Principles (6) – Two quarter class

Appendix C: University of Wisconsin, Madison

“Today's supply chain executives are looking for new talent that possesses a combination of relevant work experience, interdisciplinary education and a keen understanding of the cross-functional and cross-enterprise requirements of a world-class Supply Chain operation. The Grainger Center for Supply Chain Management is an excellent source for these future leaders because of the unique nature of the program.”

Brian Smith
Director of Logistics and Indirect Procurement
Harley-Davidson Motor Company

What is Supply Chain Management?

Supply chain management integrates business functions concerned with the movement of goods, services and information along the value chain with the goal of creating value for the ultimate customer. The field of supply chain management is a cross-functional discipline involving many components of business, including product development, marketing, demand/supply planning, procurement/sourcing, production, inventory management, transportation/logistics, customer service, and the management of relationships between business organizations and their channels of distribution.
In today's complex business environment there is a need to coordinate these supply chain functions, not only within the firm, but also with business partners and customers. Firms are recognizing the need for a "total cost" or "systems" approach to supply chain management. As a result, decision-making cuts across many functional areas and is an increasingly critical strategic component of successful businesses, large and small.

Supply Chain Management Curriculum

To successfully manage today’s complex supply chain environment, students need an understanding of traditional business functions and the linkage of these functions to customers and suppliers. They must understand not only the processes that drive their own organization, but also those that direct suppliers’ and customers’ businesses. To this end, the Grainger Center curriculum:

Blends courses in core business functions such as accounting, finance, operations, marketing, and strategy with supply chain management courses such as marketing channels, operations research, procurement and supply management, logistics management, and strategic outsourcing to complete the objective of offering a cross-functional educational experience.
Offers a capstone course entitled "Seminar in Supply Chain Management" to address the rapid change occurring in industry. The seminar incorporates industry-leading topics by hosting industry speakers considered innovators in their fields.
Provides electives that allow students to tailor their program toward a specific interest in marketing, production, operations research, logistics or management.

MBA Curriculum 2006-2007

Year One

First Semester		Second Semester	
Financial Accounting	3 cr	Operations Management	3 cr
Financial Management	3 cr	Economics	3 cr
Marketing Management	3 cr	Motivation/Leadership	3 cr
Data Analysis and Decision Making	3 cr	Marketing Channels	3 cr
Procurement and Supply Management	3 cr	Elective	3 cr
		Elective (optional)	3 cr

Year Two

First Semester		Second Semester	
Business Strategy	3 cr	Seminar in Supply Chain Management	3 cr
Global Outsourcing	3 cr	Ethics	1 cr
Operations Research I	3 cr	Elective	3 cr
Logistics Management	3 cr	Elective	3 cr
Managerial Accounting/Strategic Cost Management	3 cr	Elective	3 cr
Elective (optional)	3 cr	Elective (optional)	3 cr

Total Credits 60 (48 core credits plus 12 elective credits)

Suggested Electives

Select a minimum of 12 credits from any of the following approved electives:

Marketing Electives	
MKT 710 - Marketing Research	3 cr
MKT 720 - Global Marketing	3 cr
MKT 730 - Product and Price Management	3 cr
MKT 765 - Brand Strategy	3 cr
MKT 765 - New Product Development	3 cr

OTM Electives	
OTM 578 - Facility Location Models	3 cr
OTM 711 - Operations Research II	3 cr
OTM 746 - Logistics Strategy	3 cr
OTM 770 - Introduction to Quality and Productivity	4 cr

Finance/Accounting Electives	
FIN 603 - Financial Statement Analysis	3 cr
ACCT 711 - Advanced Strategic Cost Management	3 cr

MHR Electives

MHR 728 - Bargaining, Negotiating and Dispute Settlement for Managers	3 cr
MHR 731 - Managerial Consulting	3 cr

Systems Engineering Electives	
ME 549 - Product Design	3 cr
ISysE 671 - E-Business: Technologies, Strategies and Applications	3 cr
ISysE 672 - E-Business Transformation: Design, Analysis, and Justification	3 cr
ISysE 691 - RFID, Bar Code, & Other Data Capture Techniques	3 cr
ISysE 692 - Supply Chain Design and Production Planning	3 cr

Undergraduate Specialization

In addition to an MBA, the Grainger Center offers an undergraduate specialization in supply chain management to enhance a current business major.
The specialization in supply chain management is available to all undergraduate students enrolled in the School of Business. Students interested in adding this specialization to their current business major must apply to the Center for consideration.

Seven classes, six required and one elective, must be completed in order to receive a specialization in supply chain management.

Required Courses

MKT 365 **Fundamentals of Supply Chain Management**
P: None

MKT 365 **Procurement and Supply Management**
P: OIM 350 (Management of Service and Manufacturing Operations)
MKT 300 (Marketing Management)

MKT 425 **Marketing Channels**
P: MKT 300 (Marketing Management)

OIM 410 **Operations Research I**
P: Math 210 (Finite Mathematics) or Math 222 (Calculus II)

OIM 640 **Business Logistics Analysis**
P: Econ 101 (Introduction to Microeconomics)

OIM 654 **Production Planning and Control**
P: OIM 350 (Management of Service and Mfg. Operations)

Electives

Select one of the following four classes:

MKT 310 **Marketing Research**
P: MKT 300 (Marketing Management)
Gen Bus 303 (Business Statistics)

MKT 640 **Retail Management**
P: MKT 300 (Marketing Management)

Appendix D: Course Description from Benchmarked Universities

Key to Groupings:

Strategic/Organizational (SO)
Behavioral/Managerial (BM)
Technical/Technological (TT)
Operational/ Process (OP)
Others/International Issues (OI)
Not applicable for our consideration (N/A)

Ref#	Course	Topics	Groupings
MIT/ESD.260J	Logistics Systems	Introduces supply chain management from both analytical and practical perspectives. Stressing a unified approach Develop a framework for making intelligent decisions within the supply chain. Demand forecasting and planning, procurement, inventory theory, transportation planning, and flexible contracting.	**SO**
MIT/ESD.261J	Case Studies in Logistics and Supply Chain Management	Strategic Management Operating issues in contemporary logistics and integrated supply chain management. Logistics strategy Supply restructuring and change management Distribution Customer service Inventory policy	**SO**
MIT/5.871	System Dynamics for Business Policy	Why do so many business strategies fail? provides an introduction to system dynamics modeling as applied to corporate strategy A mixture of simulation models, role-playing games, and case studies are used to develop principles for successful management of complex strategies in a dynamic world. business cycles market growth and stagnation the diffusion of new technologies the misuse of forecasts the rationality of managerial decision making	**SO**
MIT/ESD.267	Supply Chain Planning	effective supply chain strategies for companies that operate globally, with emphasis on how to plan and integrate supply chain components into a coordinated system. Students are exposed to concepts and models important in supply chain planning with emphasis on key tradeoffs and phenomena. Lectures, computer exercises, and case discussions introduce various models and methods for supply chain analysis and	**SO**

		optimization.	
MIT/ESD.273	Logistics and Supply Chain Management	a survey of operations research models and techniques developed for a variety of problems arising in logistical planning of multi-echelon systems focuses on planning models for production/ inventory/ distribution strategies in general multi-echelon, multi-item systems	**SO**
MIT/15.769	Operations Strategy	This case-based course provides a unifying framework for analyzing strategic issues in manufacturing and service operations It analyzes relationships between manufacturing and service companies and their suppliers, customers, and competitors decisions in technology, facilities, vertical integration, human resources and other strategic areas explore various means of competition such as cost, quality, and innovation provides an approach to make operations decisions in the era of outsourcing and globalization	**SO**
IOWA/ TRANS 691	Seminar in Transportation Planning	Provides an overview of current transportation issues; lecturers provide seminars on a variety of timely transportation topics.	**SO**
IOWA/ CE 557.	Transportation Systems Analysis.	(3-0) Cr. 3. Prereq: 355, 3 credits in statistics or probability. Travel studies and analysis of data. Travel projections. Public transportation forecasts and analyses. Statewide, regional, and local transportation system planning. Corridor travel planning. Optimization of systems.	**SO**
IOWA/ CRP 545.	Transportation Policy Planning	(Dual-listed with 445.) (3-0) Cr. 3. F. Prereq: Graduate classification. Comprehensive overview of key policy issues related to transportation planning and investment in the United States and abroad. Policy issues explored include safety, environmental impact, sustainable communities, and economic development. Tools like policy analysis and planning are studied in conjunction with each policy issue explored. Issues of concern to state, metropolitan, and local governments.	**SO**
MSU/MSC 879	Supply Chain Logistics: Strategy and Applications	Total Credits: 3 Lecture/Recitation/Discussion Hours: 3 Prerequisite: (MSC 876 and MSC 877 and MSC 878 or concurrently) Analysis and solution of supply chain management cases and simulations Teamwork, communication, and job skills Situations involving purchasing, manufacturing, logistics and transportation as an integrated supply chain.	**SO**
UT/BUAD 6600	Supply Chain Management	deals with the current issues in supply chain management heavily case oriented and deals with issues such as trust in supply chains, global outsourcing, partnerships, virtual supply chains, decision making in supply chains, vendor relations, and the interaction of supply chain management with other functional	**SO**

		areas in the firm	
MIT/1.221J/11.527J/ESD.201J	Transportation Systems, Fall 2004	strives to be an interdisciplinary systems subject in the "open" sense introduces qualitative modeling ideas and various techniques and philosophies of modeling complex transportation enterprises introduces conceptual frameworks for qualitative analysis, such as frameworks for regional strategic planning, institutional change analysis, and new technology development and deployment covers transportation as a large-scale, integrated system that interacts directly with the social, political, and economic aspects of contemporary society Fundamental elements and issues shaping traveler and freight transportation systems are covered, along with underlying principles governing transportation planning, investment, operations, and maintenance	**SO**
IOWA/LSCM 461.	Principles of Transportation	(3-0) Cr. 3. *Prereq:* LSCM 360. Economic, operating, and service characteristics of the various modes of transportation, with a special emphasis on freight transportation. Factors that influence transport demand, costs, market structures, carrier pricing, and carrier operating and service characteristics and their influence on other supply chain costs and supply chain performance. Nonmajor graduate credit.	**SO**
IOWA/LSCM 487.	Strategic Supply Chain Management.	(Same as OSCM 487.) (3-0) Cr. 3. *Prereq:* LSCM 485 and 486; OSCM 422 or LSCM 460. Capstone course in supply chain management. Integrating and applying the theories, concepts, and methods covered in the Prerequisite courses through the use of readings, case studies, projects, and industry speakers. Nonmajor graduate credit.	**SO**
MSU/MSC 881	Global Logistics	Total Credits: 3 Lecture/Recitation/Discussion Hours: 3 Requirements for global operations and strategy development Similarities and differences of international and domestic operations	**SO/OI**
MIT/ESD.262	Supply Chain Context	supply chain concepts develops practical management and teamwork skills The focus is on practical, rather than theoretical, tools, methodologies, and approaches that students will use throughout their supply chain career. The course will include traditional lectures, team-based projects, practitioner run workshops, and a largescale, team-based simulation game. The lectures and workshops will cover problem solving techniques and team-based leadership skills. A number of six sigma and lean problem solving methodologies will be discussed and used.	**BM**
MIT/ESD.931	Know Thyself Leadership Skill Building	consists of discussions, self-assessment instruments, role-playing exercises, and case studies that help to enhance the students' ability to manage and lead in challenging times	**BM**

	Workshop	increase awareness of their strengths and weaknesses as a leader provide a battery of instruments and surveys that will help them understand the way they operate in an organizational setting offer strategies and tips on how to leverage their strengths and work on areas in need of development	
MIT/15.067	Competitive Decision-Making and Negotiation	learn tools to achieve negotiation objectives fairly and responsibly Negotiation skills are developed by active participation in a variety of negotiation settings to include a repetitive negotiation, fair division of assets, and a series of integrative bargaining cases between two and more than two parties over multiple issues participate in several complex team negotiations	**BM**
MSU/MSC 870	Introduction to Logistics and Supply Chain Management	Total Credits: 3 Lecture/Recitation/Discussion Hours: 3 3(3-0) Integrated view of procurement, operations, and logistics management. Management of the flow of products from raw material sourcing and acquisition through delivery to the final user.	**BM**
MSU/COM 874	Communication in Logistics	Total Credits: 1 Lecture/Recitation/Discussion Hours: 1 Lab Hours: 1 Development of effective interpersonal communication skills Oral communication in business settings Use of appropriate technology for management presentations	**BM**
MSU/MGT 875	Business Processes and Strategies	Organizational goals, design, and control of the global business enterprise Strategies for creating value and sustaining competitive advantage across the firm's value chain	**BM**
MIT/ESD.264	Database, Internet, & Systems Integration Technologies	provides students with a survey of information technology database modeling, design, and implementation with an emphasis on relational databases and SQL Internet technologies taught include: http, HTML, XML, SOAP, and security introduces components and middleware; design and implementation of multi-tier architectures, benchmarks, and performance; and data networking protocols and technologies	**TT**
MIT/5.521	Management Accounting and Control	examines management accounting and related analytical methodologies for decision making and control in profitdirected organizations product costing budgetary control systems performance evaluation systems for planning, coordinating, and monitoring the performance of a business defines principles of measurement develops framework for assessing behavioral dimensions of control systems examines the impact of different managerial styles on motivation and performance in an organization	**TT**
MIT/ESD.290	Business Impact of Auto-ID and RFID	how RFID systems will transform the business landscape with a particular emphasis on the supply chain takes an interdisciplinary approach to analyzing the various aspects of a modern RFID system review technical components of RFID systems, supply chain	**TT**

		management process analysis, value and productivity performance measurement of IT investments, legal, policy and regulatory aspects of auto-identification, and the impact of RFID on business strategy.	
IOWA/ CRP 551.	Introduction to Geographic Information Systems	(Dual-listed with 451.) (2-2) Cr. 3. F.S.SS. Introduction to geographic information systems, including discussions of GIS hardware, software, data structures, data acquisition, analytical techniques, and implementation procedures. Laboratory emphasized practical applications and uses of GIS.	**TT**
IOWA/ CRP 552.	Geographic Data Management and Planning Analysis	(Dual-listed with 452.) (2-2) Cr. 3. F.S.SS. *Prereq:* 551. Extensive coverage of geo-relational database concept and design, GIS database creation and maintenance, geographic data manipulation and analysis. GIS output generation and geographic data presentation. Laboratory emphasis practical applications and uses of GIS.	**TT**
IOWA/ CE 552.	Traffic Safety, Operations, and Maintenance	(2-2) Cr. 3. Prereq: 355. Engineering aspects of highway traffic safety. Reduction of accident incidence and severity through highway design and traffic control. Accident analysis. Legal implications. Safety in highway design, maintenance, and operation.	**TT/N/ A**
IOWA/ CE 553.	Traffic Engineering	(2-2) Cr. 3. Prereq: 355. Driver, pedestrian, and vehicular characteristics. Traffic characteristics; highway capacity; Traffic studies and analyses. Principles of traffic control for improved highway traffic service. Application of intersection, corridor or network analysis computer evaluation and optimization tools.	**TT**
MSU/M SC 877	Logistics Information Technology	Total Credits: 3 Lecture/Recitation/Discussion Hours: 3 Prerequisite: Role of information technology in logistics and supply chain management, planning and operations Requirements, capabilities, and considerations for using information technology applications in logistics	**TT**
MSU/M SC 878	Logistics Systems Analysis	Total Credits: 3 Lecture/Recitation/Discussion Hours: 3 Prerequisite: (MSC 876 and MSC 877) Process of solving logistics problems Applications of analysis tools and techniques to identify benefits and costs of logistics change	**TT**
MSU/M SC 871	Applied Data Analysis	Review of managerial and statistical data techniques used for logistics analysis. Hypothesis testing, regression and correlation analysis, forecasting, data mining, and statistical analysis.	**TT**
MIT/ES D.268	Manufacturing System and Supply Chain Design	decision making for system design, as it arises in manufacturing systems and supply chains Students are exposed to frameworks and models for structuring the key issues and tradeoffs	**OP**

		presents and discusses new opportunities, issues and concepts introduced by the internet and e-commerce introduces various models, methods and software tools for logistics network design, capacity planning and flexibility, make-buy, and integration with product development	
MIT/ESD.71	Engineering Systems Analysis for Design	flexibility to take advantage of new opportunities while avoiding disasters develops "real options" analysis to create design flexibility and measure its value so that it can be incorporated into system optimization builds on essential concepts of system models mathematical optimization decision and utility analysis	**OP**
IOWA/ LSCM 462.	Transportation Carrier Management	(3-0) Cr. 3. *Prereq:* Credit or enrollment in LSCM 461. Analysis of transport users' requirements. Carrier management problems involving ownership and mergers, routes, competition, labor, and other decision areas. Nonmajor graduate credit.	**OP**
MSU/MSC 872	Distribution Fulfillment	Total Credits: 3 - Lecture/Recitation/Discussion Hours: 3 3(3-0) Prerequisite: (MSC 870) Recommended Background: Introductory coursework in finance, accounting, management, and economics. Management of the firm's value creation process from product development through order receipt and delivery to consumer. Alternative approaches to developing customer value and the role of the demand and supply chain in providing it.	**OP**
MSU/MSC 876	Logistics Operations Methods and Systems	Total Credits: 3 Lecture/Recitation/Discussion Hours: 3 Micro-analysis of logistics and transportation services including customer service and order fulfillment, distribution operations, purchasing or operation of transportation services, third-party logistics providers, and network design.	**OP**
UT/OPMT 6680	Total Quality Management and SPC	Introduces the students to the TQM philosophy, concepts and tools provides the students with an overall approach for the design of a system to manage quality along the entire supply chain	**OP**
UT/OPMT 6690	Supply Chain Resources Management	study methods such as MRP, JIT and bottleneck approaches used in managing supply chain activities The emphasis is on case studies study tools for managing supply chain resources such as scheduling and inventory systems	**OP**
UT/BUAD 5520	Manufacturing and Service Systems.	basic course in operations management covers topics from operations strategies to sales and operations planning to MRP, JIT and TOC, and detailed operations planning and execution Candidates who have successfully taken an equivalent course, who have passed the APICS CPIM certification exam in the Basics of Supply Chain Management, or who can demonstrate sufficient professional experience may waive this course	**OP**
MIT/15.390	New Enterprises	process of identifying and quantifying market opportunities conceptualizing planning starting a new, technology-based enterprise	**OI**

IOWA/ STAT 401	Statistical Methods for Research Workers	Methods of analyzing and interpreting experimental and survey data Statistical concepts and models estimation hypothesis tests with continuous and discrete data simple and multiple linear regression and correlation Introduction to analysis of variance	**OI**
IOWA/ CE 551	Urban Transportation Planning and Modeling	Transportation data sources and cost analysis; transportation system management; travel demand and network modeling; transport legislation and financing; intelligent transportation systems planning; Sustainable transportation concepts. Use of popular travel demand software and applications of geographic information systems and global positioning systems. Term project required for graduate credit Goals: To provide the student with an intermediate course in the theory and practice of planning, programming, and modeling of urban and statewide transportation systems; to familiarize the student with the history and status of transportation planning activities as affected by national, state and local policy formulation and recent legislation.	**OI**
IOWA/ LSCM 466.	International Transportation and Logistics	(3-0) Cr. 3. *Prereq:* LSCM 360. Logistics systems and legal framework for the international movement of goods. Operational characteristics of providers of exporting and importing services. The effects of government trade policies on global logistics. Nonmajor graduate credit.	**OI**
UT/MK TG 6080	International Supply Management	Purchasing and materials management in a global context Global sourcing, negotiations, product specifications, and global outsourcing are some of the topics covered in this course look at many of the problems encountered when a firm goes beyond its natural borders and begins operating in the global economy. study the impact of international trade agreements and organizations such as the WTO, NAFTA, IMF, the EU and Mercosur.	**OI**
IOWA/ LSCM 469.	Transportation and Logistics Issues	(3-0) Cr. 3. *Prereq:* LSCM 460, 461. An integrative course designed to study contemporary problems and issues in transportation and logistics. Nonmajor graduate credit.	
IOWA/ CE 550.	Advanced Highway Design	(3-0) Cr. 3. q: 453 Evaluation of rural and urban street and highway design theory. Establishment of design criteria, application to street and highway systems, and to intersections and interchanges; Drainage design and urban freeway design aspects. Computer applications.	**N/A**
MSU/M GT 875	Change Management	Role and process of organizational change management Types of change, identifying need for change, and change management process	**N/A**

IOWA/ Trans 555.	Economic Analysis of Transportation Investments	(3-0) Cr. 3. F. Prereq: C E 350 or 355. Application of economic analysis methodologies to evaluate transportation projects. Multi-modal approaches to evaluate impacts of transportation investments and maximize economic efficiency while considering equity and other social issues related to investment options.	**N/A**
IOWA/ CE 558.	Transportation Systems Development and Management Laboratory	(2-2) Cr. 3. Prereq: 350 or 355: Study of designated problems in traffic engineering, urban transportation planning, and urban development. Forecasting and evaluation of social, economic, and environmental impact of proposed solutions; considerations of alternatives. Formulation of recommendations and publication of a report. Presentation of recommendations in the host community.	**N/A**
IOWA/ CE 559.	Transportation Infrastructure/Asset Management	(3-0) Cr. 3. Prereq: 355 or 453, 382. Engineering management techniques for maintaining and managing infrastructure assets. Systematic approach to management through value engineering, engineering economics, and life cycle cost analysis. Selection and scheduling of maintenance activities. Analysis of network-wide resource needs. Project level analysis.	**N/A**
IOWA/ CRP 511.	Introduction to Community and Regional Planning	(3-0) Cr. 3. F. Prereq: Graduate classification. Development of planning in the United States; history and evolution of the planning profession and constructs of current practice. Theoretical basis of planning.	**N/A**
IOWA/ CRP 521.	Land Use Planning	(3-0) Cr. 3. F. Prereq: Graduate classification. Theories of the origin and growth of urban places and the dynamics of urban structure and land use. Methods and techniques for making land use plans dealing with orderly, efficient, and equitable development and arrangement of land uses within the planning process. Examination of the interrelationships among land use, transportation, environment, and infrastructure and public facilities.	**N/A**
IOWA/ CRP 525.	Growth Management	(Dual-listed with 425; same as Dsn S 525.) (3-0) Cr. 3. Alt. F., offered 2005. Prereq: Graduate classification. Review of techniques used to manage growth-related change and to implement plans. Capital investment strategies; public land acquisition and protection; development impact analysis; impact mitigation, including impact fees; phased growth systems; urban/suburban/rural relationships; and land preservation.	**N/A**
IOWA/ CRP 542.	Site Development	(Dual-listed with 442; same as Dsn S 542.) (3-0) Cr. 3. Alt. S., offered 2006. Prereq: Graduate classification. Must be taken prior to completing 12 credits in LA. Introduction to site analysis using landscape architecture and environmental principles, but drawing also on basic engineering concepts. Work will evolve from analysis to land development design based on that analysis.	**N/A**
IOWA/	Special Topics	Cr. 1 to 3. F.S.SS. *Prereq:* Graduate classification and written	

CRP 590.		approval of instructor and department chair on required form. Land Use and Transportation Planning	
MIT/ESD.265	International Logistics	an overview of globalization and the international environment international marketing/supply chain interface global strategy for logistics and supply chain management role of government intervention and regulations the role of ports and airports in international product movements the economics of international air and ocean carriers	**O+D85I**
MIT/ESD.263	Thesis Seminar	focuses on conducting academic research within the supply chain field selecting a topic writing a literature review conducting analysis synthesizing results Students will discuss and work on their own thesis topics in the class The seminar covers both technical writing and presentation skills	**OO**