MSOR 400. Linear Algebra. 1 Unit.
The objective of this one-credit hour course is to provide a basic working knowledge of material in linear algebra that is relevant to the MSM-OR/SC and MSM-BA programs. This background material includes geometric and algebraic properties of vectors and matrices together with operations that can be performed on them. The use of vectors and matrices in solving systems of linear equations is taught. Offered as MSOR 400 and MSBA 400. Prereq: For ORSC-MSM students only.

MSOR 402. Stochastic Models with Applications. 1.5 Unit.
This course surveys fundamental methods and models in operations research and operations management that incorporate random elements. Topics discussed will include basic results from the theory of stochastic processes, especially Markov chains; an introduction to stochastic dynamic programming; and models in the control of queues and inventories. Offered as OPRE 402 and MSOR 402. Prereq: For ORSC-MSM students only.

MSOR 406. Operations Management. 3 Units.
Operations managers, ranging from supervisors to vice presidents, are concerned with the production of goods and services. More specifically, they are responsible for designing, running, controlling and improving the systems that accomplish production. This course is a broad-spectrum course with emphasis on techniques helpful to the practice of management at the analyst level. Its goal is to introduce you to the environments, to help you appreciate the problems that operations managers are confronted with, and provide you with the tools to address these problems. Operations Management spans all value-adding activities of an organization including product and process design, production, service delivery, distribution network and customer order management. As global competition in both goods and services increases, a firm’s survival depends upon how well it structures its operations to respond quickly to changing consumer needs. Thus, it is essential for all business managers to acquire an understanding of operations management to maintain their competitive advantage. This course provides students with the basic tools needed to become an analyst in Supply Chain and Operations Management. This course provides an overview of Process analysis, Capacity management, Queuing system, analysis, Forecasting, Quality management, Material Requirements planning, Inventory management, and Supply Chain management. The emphasis of the course is on both real world applications and technical problem solving. Several manufacturing and non-manufacturing environments will be discussed explicitly, like health care, insurance, hotel-management, airlines and government related operations. Also we will explore the interface of operations management with other functional areas such as marketing, finance, accounting, etc. This coursework includes individual and group assignments, case analyses and experiential learning through simulations and educational games. Offered as: MSOR 406 and MSBA 406. Prereq: Course limited to students in Program=OPRMS, Plan=ORSC-MSM.

MSOR 407. Managerial Marketing. 3 Units.
This course will emphasize how to analyze data to support and guide strategic and tactical marketing decisions relevant for supply chain managers for understanding and contributing to marketing decision-making within the firm. Many firms have extensive information, but far fewer have the expertise to act intelligently on such information. Data must be synthesized, analyzed, and interpreted before sound marketing strategies and tactical plans can be developed. The course will emphasize three key themes: (1) Market Opportunity Analysis including competitive analysis, context assessment, and customer analytics (e.g. customer profitability and lifetime value, retention and loyalty), (2) Marketing Mix Analytics including test marketing, pricing, segmentation, and response modeling, and (3) Marketing ROI including the impact of marketing decisions and plans on fundamental financial measures such as return on marketing investment and net contribution to profit. The course uses a combination of lectures, cases, and exercises. Prereq: For students only in the MSM-OR/SC program.

MSOR 410. Accounting and Financial Management. 3 Units.
This course focuses on learning the language of business, how basic accounting information is reported and analyzed, and how basic financial principles can be applied to understanding how value is created within an enterprise. This course is intended for individuals who have a limited background in accounting, finance and business. Most of the exercises will involve evaluating and building models in Excel. Teaching objectives are fairly straightforward: 1. Provide you with a basic understanding of the key principles of accounting and finance. We will quickly cover material that is typically covered in a three-course sequence (Introductory Accounting and Finance I and II). We will fly at a fairly high level, but we want to make sure you understand the basic concepts. 2. Apply these concepts to real (but straightforward) business situations, to gain a better understanding of how companies utilize accounting and financial information. 3. Time permitting, explore how these concepts can be applied to securities, mergers and acquisitions and leveraged buyout transactions, with a specific emphasis on how these concepts are likely to surface in your role in such transactions. Offered as MSBA 410 and MSOR 410. Prereq: Course limited to students in Program=OPRMS, Plan=ORSC-MSM.
MSOR 411. Optimization Modeling. 3 Units.
The first half of the course provides a practical coverage of linear programming, a special type of mathematical model. The art of formulating linear programs is taught through the use of systematic model-building techniques. The simplex algorithm for solving these models is developed from several points of view: geometric, conceptual, algebraic, and economic. The role and uses of duality theory are also presented. Students learn to obtain and interpret a solution from a computer package and how to use the associated output to answer "What-happens-if..." questions that arise in post-optimality analysis. Specific topics include: problem formulation, geometric and conceptual solution procedures, the simplex algorithm (phase 1 and phase 2), obtaining and interpreting computer output, duality theory, and sensitivity analysis. The second half of this course provide a practical approach to formulating and solving combinatorial optimization problems in the areas of networks, dynamic programming, project management (CPM), integer programming, and nonlinear programming. The art of formulating problems, understanding what is involved in solving them, and obtained and interpreting the solution from a computer package are shown. A comparison with formulating and solving linear programming problems is provided as a way to understand the advantages and disadvantages of some of these problems and solutions procedures. Recommended preparation: Knowledge of Excel, one semester each of undergraduate linear algebra and undergraduate calculus (derivatives); or consent of instructor. Offered as MSOR 411 and OPRE 411. Prereq: For ORSC-MSM students only.

MSOR 420. Six Sigma and Quality Management. 3 Units.
The Six Sigma process is the standard for quality improvement in organizations around the globe. In this course, we study the details of the five steps in the Six Sigma process: DEFINE, MEASURE, ANALYZE, IMPROVE, and CONTROL (DMAIC). Many tools, concepts, and processes that are often an integral part of Six Sigma projects in companies are included in the course content. They range from the very basic tools of quality (such as cause-and-effect diagrams for brainstorming) to complete processes (such as benchmarking, quality function deployment, failure mode and effects analysis-FMEA). Statistical concepts with software applications that are central to Six Sigma including statistical process control and introduction to design of experiments are also included. Once the Six Sigma process and its various components are understood, we study quality management including quality control, quality planning, quality improvement, strategic quality management, and quality strategy. A major requirement of the course is an action learning component in which the students are assigned in groups to work on unpaid real projects of Six Sigma in local industries. Students meeting the required standards of performance will earn a Green Belt Certification in Six Sigma and Quality Management from the Weatherhead School of Management. Offered as MSOR 420 and OPMT 420. Prereq: MSOR 406 and MSOR 433 and enrolled in OPRMS Program/ORSC-MSM Plan or requisites not met permission.

MSOR 422. Lean Operations. 3 Units.
In this course, students will be taught how to identify inefficiencies associated with overproduction, waiting, transport, extra processing, inventory, motion and defects. One-by-one, areas of inefficiencies are to be identified and improved while educating the workforce towards continual improvement. Similarly, participants will be trained to reduce lead times in areas such as engineering design, order entry, purchasing, order fulfillment, receiving, production, packaging, shipping, invoicing and collection. The above improvements will lead to cost reductions. Students will be trained in costing techniques, target pricing, and cost maintenance. The course will be delivered along the following themes: 1) Mapping the Value Stream (current and future state) 2) Workplace Organization: SS & Safety, 3) Defect Reduction and Error Proofing, 4) Quick Changeover, 5) Standard Operations, 6) Total Productive Maintenance, 7) Visual management, 8) One-piece flow, 9) Lean Metrics. This course is not oriented toward specialists in operations management. Its goal is to introduce you to the environments and help you appreciate the problems that operations managers are confronted with and the key issues in their management. Offered as MSOR 422 and OPMT 422. Prereq: For ORSC-MSM students only.

MSOR 432. Computer Simulation. 3 Units.
Computer Simulation is a process of designing and creating a computerized model that mimics an existing or proposed system so as to better understand the behavior of the system. Many studies have shown that in Industry, simulation is most frequently used Operations Research tool due to its ability to deal with complex systems. The first half of this course is designed to give students a basic idea of simulation methodology with the aid of population simulation software. The emphasis of the course is in simulating business processes, however, the versatility of the technique will be demonstrated with applications from finance, health care, etc. The second half of the course covers the statistical design and analysis of simulation models. The topics include random number generation, input data analysis, statistical analysis of simulation outputs, variance reduction techniques, and design of simulation experiments. Offered as OPRE 332, OPRE 432, and MSOR 432. Prereq: For ORSC-MSM students only.

MSOR 433. Foundations of Probability and Statistics. 3 Units.
Data of many kinds are typically available in practice, but the challenge is to use those data to make effective professional decisions. This software-intensive course begins with useful descriptions of data and the probability theory foundation on which statistics rests. It continues to statistics, including the central limit theorem, which explains why data often appear to be normally distributed, and the Palm-Khintchine theorem which explains why data often appear to have a Poisson distribution. The remainder of the course focuses on regression and forecasting, including detecting and overcoming some of the deadly sins of regression, and the surprising flexibility of regression models. Recommended preparation: One semester of undergraduate calculus or consent of instructor. Offered as MSOR 433, OPRE 433 and MSBA 433. Prereq: For ORSC-MSM students only.

MSOR 435B. Integrated Problem Solving in OR and SC. 1.5 Unit.
This project-oriented course uses a variety of software to involve the student in the complete problem-solving process in OR and OM. This process includes problem definition and formulation, data collection, and storage in a database, connecting the database to the solution algorithm, designing and implementing an appropriate user interface, and presenting the final solution. Offered as OPRE 435B and MSOR 435B Prereq: For ORSC-MSM students only.
MSOR 450. Project Management. 3 Units.
Project management is concerned with the management and control of a group of interrelated tasks required to be completed in an efficient and timely manner for the successful accomplishment of the objectives of the project. Since each project is usually unique in terms of task structure, risk characteristics and objectives, the management of projects is significantly different from the management of repetitive processes designed to produce a series of similar products or outputs. Large-scale projects are characterized by a significant commitment of organizational and economic resources coupled with a high degree of uncertainty. The objective of this course is to enhance the ability of participants to respond to the challenges of large-scale projects so that they can be more effective as project managers. We study in detail up-to-date concepts, models, and techniques useful for the evaluation, analysis, management, and control of projects. Offered as MSOR 450, OPMT 350 and OPMT 450. Coreq: MSOR 433 or requisites not met permission.

MSOR 451. Project Quality Management. 3 Units.
This course examines various methods used to ensure the project meets the stakeholder needs for which it was undertaken, including quality planning, quality assurance, and quality control. The coursework integrates the project requirements with the project plan, the reporting of its performance, and marking its closure. The Project Planning Process clarifies the project’s objectives and plans as well as all of the activities necessary in order to meet the project’s objectives and scope. It includes the Change Management Plan, Communications Management Plan, Configuration Management Plan, Cost Management Plan, Human Resource Plan such as roles charts, how resources will be acquired, time when each resource will be needed and any specialized training requirements. Project assurance includes the processes that ensure continual project improvement and learning throughout the organization. It includes the steps for analyzing processes with the purpose of improving the process by setting boundaries, process configuration, process metrics and targets for improved performance. Continuous improvement in projects requires determining Relationship Management, Requirements Management, Risk Management and Scope Management Plans. By having a customer management plan you and your customer can have a proven approach to the relationship. Requirements and Risk management plans are necessary to ensure project success as changes take place during the project lifetime. And Scope Management Plans are needs to align scope expectations with project success. The Project Control Group includes the processes to ensure that the project is managed and executed according to the Project Plan. Project Controlling includes tracking, reviewing and managing the progress and performance of the project along with managing changes when required. The use of Project Status Reports and Root Cause Analysis help identify and resolve problems during project execution. Upon project completion, the Project Closing Process group consists of the processes to formally closeout the project. Once the closing process is completed the project manager receives acceptance from the project sponsor; conducts a post project review, documents the lessons learned and archives all project related documents. A Post-project Review provides a 30,000 feet view of the projects; actual versus planned performance and is meaningful input to future projects. Offered as OPMT 451 and MSOR 451.

MSOR 475. Supply Chain Logistics. 3 Units.
The focus of this course is on the effective management of a firm’s downstream processes in the supply chain that deliver goods and services to customers. Concepts, methods, and strategies are presented that can lower supply chain costs while maintaining or improving customer service. In addition, ideas for using the supply chain for competitive advantage leading to revenue enhancement are discussed. Adding value for customers is the objective. Key topics include transportation planning, inventory management, network design, and customer service goal setting. Offered as MSOR 475 and OPMT 475. Prereq: MSOR 406 and MSOR 433 and enrolled in OPRMS Program/ORSC-MSM Plan or requisites not met permission.

MSOR 476. Strategic Sourcing. 3 Units.
The primary purpose of the course is to provide a comprehensive introduction to supply issues in manufacturing and service organizations. Procurement and supply management has evolved as a strategic function across various industries. Recent volatility in commodity prices has further enhanced the challenges in procurement. This course explores sourcing strategies in global supply chains to reduce cost and enhance the competitiveness of the firm. This course will provide you with a framework for thinking about strategic sourcing and tools to procure commodities and services efficiently. Offered as MSOR 476 and OPMT 476. Prereq: For students in OPRMS Program/ORSC-MSM plan.

MSOR 477. Enterprise Resource Planning in the Supply Chain. 3 Units.
Enterprise resource planning is the dominant system by which companies translate the needs from their customers into the detailed plans that the company must perform to meet the customer needs, and the resulting support the company will need from its suppliers. As such, it is a central player in the process of supply chain management. In this course, we study both the quantitative and qualitative concepts and techniques to help manage a company's operations to perform these important translation and planning tasks in order to help the company be successful. The quantitative analysis will be supported by microcomputer software available in the Weatherhead computer lab. Student teams complete a series of integrated case studies from the same company to vividly see the relationships between various planning and control activities. A major emphasis during the course is the design of processes and procedures (algorithms) for solving very complex (wicked) problems as a part of both class discussions and while working on case studies, as well as critiquing the designs so as to clearly understand their limitations. Offered as MSOR 477, OPMT 377 and OPMT 477. Prereq: MSOR 411 and MSOR 433 and enrolled in OPRMS Program/ORSC-MSM Plan or requisites not met permission.

MSOR 485A. Individual Development. 1.5 Unit.
This course is unique in the sense that its primary focus is on the student as an individual. In this course the student will get to know themselves better by completing assessments and making sense of them, having group discussions, presenting to a group as individuals, engaging in various experiential activities, conducting career interviews, attending various individual development programs and participating in two individual coaching sessions. Offered as: MSOR 485A and MSBA 485A. Prereq: For ORSC-MSM students only.
MSOR 485B. Team Development. 1.5 Unit.
This course is unique in the sense that its primary focus is on the student working in teams. In this course the student will assess their team interaction based on team assignments simulated and action learning type projects, presenting to the class as a team, engaging in various experiential activities, participating one team coaching session, working with a team, and expanding their knowledge of team leadership and membership skills and abilities. They are also expected to engage with projects external to the university (similar to an action learning project). Offered as: MSOR 485B and MSBA 485B. Prereq: For ORSC-MSM students only.

MSOR 492. Scientific Python Programming with Applications. 0 Unit.
Python is a popular programming language and is used by all sorts of companies. It has many advantages: it is free, easy to learn, fast to learn and very versatile. This course will teach you how to read, write and understand Python scripts. You will learn good coding conventions, and be introduced to relevant resources and tools. We will move past the basics of procedural programming and explore how we can use the Python built-in data structures such as lists, dictionaries, and tuples to perform increasingly complex data analysis and we will utilize many libraries to do advanced scientific analysis, as well as data structuring and data analysis. Offered as MSOR 492 and BAFI 492. Prereq: MSOR 435B.