

# SUPPLY CHAIN MANAGEMENT (SCMG)

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## **SCMG 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 Master of Supply Chain Management and Master of Business Analytics & Intelligence 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 BUAI 400 and SCMG 400. Prereq: For Master of Supply Chain Management students only.

## **SCMG 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. Prereq: For Master of Supply Chain Management students only.

## **SCMG 411A. Optimization Analytics for Supply Chain. 1.5 Unit.**

The objective of this course is to enable you to use mathematical models to help make better decisions for organizations, which is a goal of the Master of Supply Chain Management program. General model building techniques are provided and illustrated with many Supply Chain decision problems. You will also learn to classify your model based on its mathematical properties so that you can identify an appropriate computer package to obtain the solution. Because of their importance, significant time is devoted to formulating linear programming models using a variety of examples. You will see how to obtain and interpret a solution from a computer package in EXCEL and how to use the associated output to answer "What-happens-if" questions that arise after solving the problem. You will also get an introduction to formulating and solving other optimization problems in the areas of integer programming, networks, combinatorial optimization, and nonlinear programming. The art of formulating problems, understanding what is involved in solving them, and obtaining and interpreting the solution from a computer package are shown. A comparison with linear programming problems is provided as a way of understanding the advantages and disadvantages of these other models and their solution procedures. Prereq: For Master of Supply Chain Management students only.

## **SCMG 420. Experiential Learning with Six Sigma Green Belt. 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 OPMT 420 and SCMG 420. Prereq: SCMG/MSOR 406 and SCMG/MSOR 433 and enrolled in Master of Supply Chain Management program.

**SCMG 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: 5S & 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 OPMT 422 and SCMG 422. Prereq: SCMG 406.

**SCMG 432A. Spreadsheet and Business Process Simulation - I. 1.5 Unit.**

Computer simulation is a process of designing and creating a computer model (video game) 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. Another reason for the recent popularity of simulation is the availability of specialized software with animation capabilities. This course is designed to give students basic ideas of simulation methodology with the aid of popular 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 main focus of the course is on building simulation models using state of the art software (@RISK and ARENA). The grading is based on weekly homework and final exam. Offered as OPRE 332A, OPRE 432A, and SCMG 432A. Prereq: SCMG 433.

**SCMG 432B. Spreadsheet and Business Process Simulation - II. 1.5 Unit.**

Computer simulation is a process of designing and creating a computer model (video game) 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. Another reason for the recent popularity of simulation is the availability of specialized software with animation capabilities. This course is designed to give students basic ideas of simulation methodology with the aid of popular 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. This course builds on 332A/432A (where the main emphasis was to build simulation model using @RISK and ARENA) and focuses on statistical ideas and tools needed in building, analyzing and experimenting with these models. Offered as OPRE 332B, OPRE 432B, and SCMG 432B. Prereq: SCMG 433 and Prereq or Coreq: SCMG 432A.

**SCMG 433. Statistical Data Analytics for Supply Chain. 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 OPRE 433 and SCMG 433. Prereq: For Master of Supply Chain Management students only.

**SCMG 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 OPMT 350, OPMT 450 and SCMG 450. Prereq or Coreq: SCMG 433

**SCMG 460. Supply Chain Strategy. 1.5 Unit.**

Have you ever wondered what it takes to manage a successful supply chain? It all comes down to the right strategy. Supply Chain Management Strategy is the indispensable direction for managing a successful supply chain. This course reviews how organizational strategies can inform operations and supply chain strategies. Several cases in various industries are discussed to illustrate how businesses employ various supply chain business models to achieve higher efficiencies, better, quality, faster service, and subsequently promote business objectives. Offered as OPMT 460 and SCMG 460. Prereq: For Master of Supply Chain Management students only.

**SCMG 461. Professional Development in Supply Chain. 0 Unit.**

The course will cover topics such as: overview of SCM, networking best practices, social media, applying for jobs, professional communications, behavioral interviewing, career planning, etc. Guest lecturers from industry leaders will be featured throughout. Prereq: Enrolled in the Master of Supply Chain Management program.

**SCMG 462. Artificial Intelligence Fundamentals for Supply Chain Management. 1.5 Unit.**

Artificial Intelligence (AI) is transforming how companies manage their supply chains, enabling more accurate predictions, smarter decisions, increased efficiency, and competitive advantage. This course provides a comprehensive introduction to AI and Machine Learning (ML), emphasizing practical applications within Supply Chain Management (SCM). Starting with fundamental AI concepts, students explore supervised and unsupervised learning methods, including decision trees, ensemble learning, clustering, and dimensionality reduction, through practical SCM use cases. Building upon this foundation, the course covers advanced deep learning methods, including multi-layer perceptrons (MLPs), convolutional neural networks (CNNs) for computer vision, and recurrent neural networks (RNNs) and transformers for natural language processing (NLP), relevant to inventory management, predictive maintenance, quality control, and supplier analysis. The course also addresses critical topics in AI ethics, model interpretability, fairness, and bias mitigation, promoting responsible AI implementation. Through lectures and practical examples, students will develop skills to implement and critically assess AI-driven solutions to enhance supply chain prediction, decision-making, and performance. Coding exercises will be done in Python. Prereq: SCMG 433 and SCMG 492 and enrolled in the Master of Supply Chain Management program.

**SCMG 463. Case Studies in Artificial Intelligence - Supply Chain Applications. 1.5 Unit.**

This course will take an in-depth look at important SCM Digitization business cases to build a broad awareness. Topics related to digitization will be: planning, procurement, distribution, manufacturing and services. Prereq: SCMG 492 and enrolled in the Master of Supply Chain Management program.

**SCMG 470. Supply Chain Risk Management. 1.5 Unit.**

A Supply Chain comprises firms, organizations, and individuals, linked through material, information, and financial flows, and whose activities enable products and services to be created and reach the consumers. Risk Management is the process of identifying risks, forecasting their impact, devising, mitigation strategies, and applying those strategies in anticipation or in response to adverse events. Supply Chain Risk Management (SCRM) is a set of solutions for identifying, measuring, preparing for, and mitigating adverse events in supply chains. As the widespread use of outsourcing is stretching supply chains further geographically and turning supply networks into intricate, global, and fragile webs, supply disruptions happen more frequently than ever and lead to substantial financial losses. A 2015 National Institute of Standards and Technology study concluded that "the likelihood that a manufacturing organization will not experience a supply chain disruption in a twenty-four month period is a mere 2%." According to research, firms that experienced supply glitches have suffered tremendous erosion in the shareholders' value (the abnormal return on stock of these companies was negative 40%). Disruptions are only one example of supply risks. From commodity price fluctuations to product adulteration, from cyber security to patent violations, from regulatory compliance to supplier bankruptcies, supply chains are rife with risks and opportunities if you know how to recognize and take advantage of them. In this course, you will learn the best industry practices and be exposed to the most current academic insights on SCRM. You will know the process for SCRM, a variety of well-known and emerging supply risks, and the unique challenges of managing each one. You will also learn advantages and disadvantages of different risk mitigation tools. You will take away a number of useful analysis tools that you can immediately apply at your job. You will know the terminology of the field, the definitions, and the "state of the art" techniques. By the end of the course, you will be able to evaluate companies' performance with respect to supply risk management, and you will be able to create, contribute to, and run a supply-risk management program at your company. Offered as OPMT 470 and SCMG 470. Coreq: SCMG 406. Prereq or Coreq: MBAC 507 and SCMG 476A or OPMT 476A or Requisites Not Met permission.

**SCMG 475. Global Supply Chain Logistics. 3 Units.**

The course will attempt to achieve two objectives: (1) to develop your skills in solving specific types of logistics/supply chain problems, and (2) to improve your capabilities in dealing with unstructured problems of the type encountered by intermediate and top managers. Skill development is accomplished through lectures, case studies, homework, and examinations. These skills are valuable for addressing specific problems where the given technology is useful in treating them. On the other hand, broader analytical skills are enhanced using case studies and class discussion, which allow problem solving to be placed in a larger context. Defining a framework for analysis, applying concepts and principles, and commenting on the analysis of others help to achieve the second objective. Of course, these objectives interplay throughout the course of study. Offered as OPMT 475 and SCMG 475. Prereq: SCMG/MSOR 406 and SCMG/MSOR 433 and enrolled in Master of Supply Chain Management program.

**SCMG 476A. Strategic Sourcing in Supply Chain. 1.5 Unit.**

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 OPMT 476A and SCMG 476A. Prereq: For Master of Supply Chain Management students only.

**SCMG 477A. Business Forecasting. 1.5 Unit.**

This course introduces nonmathematical managers to the major quantitative models designed for sound demand and system forecasting in today's complex and increasingly uncertain supply chains. Topics will also include reliability of historical data sets to forecast future patterns. The course will also cover non-quantitative tools to forecast demand for new products, services and technologies when historical data are not readily available. Emphasis is placed on a general understanding of theory, mechanics, application potential, available software packages, and templates. Offered as OPMT 377A, OPMT 477A and SCMG 477A. Prereq: SCMG 411A and SCMG 433 and enrolled in Master of Supply Chain Management program.

**SCMG 477B. Enterprise Resource Planning in the Supply Chain. 1.5 Unit.**

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. 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 OPMT 377B, OPMT 477B, and SCMG 477B. Prereq: Enrolled in Master of Supply Chain Management program. Prereq or Coreq: SCMG 477A.

**SCMG 478. Operational Excellence. 3 Units.**

This course focuses on the essence, principles, and practices of total quality management (TQM) and Operational Excellence. Students learn management issues of identifying, analyzing, and implementing improvement projects in organizations. Topics are mostly non-quantitative with a focus on challenging aspects of quality management that students need to know beyond green belt certification such as learning to see processes better, defining quality ethically, analyzing side effects of change, and leading Kaizen, benchmarking, and brainstorming sessions. The course involves a rigorous real-world project of continuous improvement. Students will also have an opportunity to visit a local plant to get hands on experience with a real Kaizen event. Several guest talks are also scheduled to invite Black Belt professionals to discuss their experiences with quality management in Supply Chain. Offered as OPMT 478 and SCMG 478. Prereq: For Master of Supply Chain Management students only and (SCMG 420 or OPMT 420 or IIME 440).

**SCMG 480. Blockchain Technology in Supply Chain Management. 1.5 Unit.**

This course is intended to provide students with a solid foundation in blockchain basics and recent innovations and how this emerging technology can disrupt supply chains by addressing problems related to inefficiency, opacity, and fraud. We will cover fundamentals of blockchain technology such as distributed ledger, public key cryptography, the Bitcoin protocol, and proof-of-work consensus mechanism, as well as the Ethereum blockchain, proof-of-stake, smart contracts, oracles, layer 2 scaling solutions, and Solidity for implementing smart contracts. Furthermore, the course explores how blockchain technology can aid supply chain systems in lowering costs, ensuring product quality, enhancing speed, minimizing risks, promoting flexibility, and facilitating sustainable practices. The course also discusses various applications of blockchain technology in supply chain management, including its use in the food and beverage industry, healthcare and pharmaceutical industry, and supply chain finance. Lastly, the course highlights how combining blockchain technology with other cutting-edge technologies, such as artificial intelligence (AI), can amplify its value to supply chains. Offered as OPMT 480 and SCMG 480. Prereq or Coreq: SCMG 406 or MBAC 408 or MBAC 507 or HSMC 412 or IIME 432 or Requisites Not Met permission.

**SCMG 481. Artificial Intelligence for Business Management. 1.5 Unit.**

In an era marked by rapid technological advancements and an abundance of data, the role of Artificial Intelligence (AI) in transforming business practices has become pivotal. This course aims to demystify AI and elucidate its rapidly growing influence in the business world. We will cover the fundamentals of AI, its practical applications in various business sectors, and the strategic integration of AI in business processes. Throughout this course, students will delve into the core technologies underpinning AI, including deep learning, computer vision, natural language processing, and generative AI, and explore how these technologies are revolutionizing marketing, finance, accounting, operations, supply chain management, and customer relations. The course also provides a high-level overview of how AI is employed in decision-making and improving business operations. Furthermore, the course addresses the crucial aspects of ethics, legal compliance, and societal impacts of AI implementation in business. By exploring case studies and real-world applications, students will gain a nuanced understanding of the opportunities and challenges presented by AI in the business context. This course requires no coding background and is tailored for management and business students. Familiarity with basic statistical methods (e.g., linear regression) is needed. Offered as OPMT 481 and SCMG 481. Prereq: MBAC 511 or MBAP 403 or SCMG 433 or BUAI 433.

**SCMG 491. Revenue Management. 3 Units.**

This course will focus on the theories and applications of data techniques to analyze demand models, and use optimization techniques to inform strategic decision making upon pricing and revenue management problems. The key ingredients of the class include the use of sophisticated data and optimization tools towards: - Mastering static and dynamic demand models - Understanding consumer choice behaviors - Understanding and formulating firm policies based on price response - Creating optimization toolkits for organizational decision making - Understanding and formulating competitive response The course is "tools agnostic" - you are welcome to use any of the available software packages (like MS Excel, Stata, SPSS) and programming languages (like R, Python or Matlab). Offered as OPMT 491 and SCMG 491. Prereq: (SCMG 433 or BUAI 433 or MBAC 511 or MBAP 403 or OPRE 207) and (SCMG 406 or BUAI 406B or MBAP 408 or OPRE 301 or MBAC 507).

**SCMG 492. Foundations of Python Programming. 1.5 Unit.**

Python is an object-oriented programming language that can interact with the world wide web as well as Excel and other programming languages like VBA. As such, Python has gained popularity and is becoming an industry standard in many areas, including supply chain management. In addition to assignment, if/then, and for/while statements, in this course you will learn about object-oriented programming and how to implement those ideas with appropriate data structures. You will also learn how to use libraries that others have created, such as Numpy for numerical calculations (like working with vectors, matrices, and solving systems of linear equations). In addition to individual homeworks, you will solve an assigned project in groups and make a final presentation to the class with PowerPoint. Being able to communicate your model and results is part of learning to work effectively with others in an organization, which is a goal of the supply chain program. All of this is designed to enable you to build and solve models that help organizations make good decisions. Offered as BUAI 492 and SCMG 492. Prereq: For Master of Supply Chain Management students only.