# Information Systems & Analytics

*Professors:* Narendra Agrawal (Benjamin and Mae Swig Professor), Gangshu Cai (Department Co-Chair), Manoochehr Ghiassi, Steven Nahmias, S. Andrew Starbird, Andy A. Tsay

*Emeritus Professor*: Stephen A. Smith

*Associate Professors:* Ram Bala, Tao Li , Haibing Lu (Department Co-Chair), David K. Zimbra, Sami Najafi-Asadolahi

*Assistant Professors:* Michele Samorani, Mohammad Amin Morid, Sunghun Chung, Yaqiong Wang, Xiaoyan Liu

*Lecturers:* Graeme Warren, Homi Fatemi, Sumana Sur, Rick Schaffzin

Undergraduate study in the Department of Information Systems and Analytics (ISA) explores the use of computer information systems and analytical decision-making methods in organizations. Essential to the conduct of business, these skills equip the department’s majors and minors to design, implement, and evaluate systems central to an organization’s success.

In addition to the major in management information systems (MIS), the department offers an MIS minor for nonbusiness and non-MIS majors, the interdepartmental major of accounting and information systems (AIS), and the minor in business analytics for business students.

The department’s majors and minors may pursue a variety of careers after graduation, including management consulting, systems administration, technical sales and marketing, operations management, and roles as business analysts in public, private, service, and nonprofit sectors. Past graduates have also gone on to various master’s degree or doctoral programs, as well as law school.

## Requirements for the Majors

In addition to fulfilling undergraduate Core Curriculum and Leavey School of Business requirements for the bachelor of science in commerce degree, students majoring in management information systems or in accounting and information systems must complete the following departmental requirements:

**Major in management information systems (MIS)**

* OMIS 30
* OMIS 105, 106, and 107
* Three courses from OMIS 111, 113, 114, 116, 117, 118, 120, 135, 137, 150

**Major in accounting and information systems (AIS)**

* ACTG 20, 130, 131, 132, 135, 136, and 138
* OMIS 30
* OMIS 105, 106, and 150 (or ACTG 155); students must register for ACTG 155 to take the CPA exam
* One course from OMIS 107, 111, 113, 114, 120, 135, 137

Accounting and information systems majors may use either OMIS 30 or 31 to satisfy the information systems requirement in the Leavey School of Business curriculum. OMIS 150 is cross-listed with ACTG 155. Accounting and information systems majors may enroll in OMIS 150 or ACTG 155.

## Requirements for the Management Information Systems Minor

Non-business majors and non-MIS majors in the Leavey School of Business may pursue the MIS minor, enabling them to apply a deeper understanding of technology to their major.

The MIS minor has the following requirements:

* OMIS 30
* OMIS 105
* Three courses from OMIS 106, 107, 111, 113, 114, 116, 117, 118, 120, 135, 137, 150

Nonbusiness students minoring in MIS must also complete the following requirements:

* One course in mathematics from MATH 11 or 30
* One course in statistics and data analysis from OMIS 40, MATH 8, MATH 122, PSYC 40, COMM 110
* Three courses in business from BUSN 70, MGMT 160, MGMT 161, MKTG 181, FNCE 121, OMIS 108 or OMIS 108E

## Requirements for the Business Analytics Minor

The Business Analytics minor currently is only open to business students. The minor has the following requirements:

* OMIS 30, 105, 109, 114, and 115
* One elective from OMIS 113, OMIS 118, ACTG 134, ACTG 155, ECON 173, ECON 174, FNCE 146, FNCE 148, and MKTG 182

Note: A course cannot be double-dipped in multiple programs. For example, if OMIS 113 is taken as an elective for BA minor, it cannot count towards MIS major.

## Lower-Division Courses

### 15. Introduction to Spreadsheets

Using spreadsheets to analyze business data and present the findings in tables, charts, and graphs. Topics covered will include spreadsheet formulas, functions, pivot tables, and pivot charts. Students will also learn how to retrieve data from sources such as text files, relational databases, and servers. Students may not take both OMIS 15 and 17 for credit. Students must have less than 87.5 units completed. (2 units)

### 30. Introduction to Programming

Fundamental methodologies and approaches to computer programming, with emphasis on problem solving, top-down program design, and thinking like a programmer. Students will learn basic structures of computer programming; analyze real business problems from a computer programmer perspective; and program, test, and debug well-structured programs. Focuses on essential aspects of writing software that include good design, modularity, efficiency, documentation, clarity, portability, and style. Students will obtain hands-on programming skills through several programming assignments. This course is the basis for business application development in database design and systems programming courses. Students who receive credit for CSCI 10 (formerly MATH 10), COEN 6, COEN 11, or OMIS 31 may not take this course for credit. (4 units)

### 34. Science, Information Technology, Business, and Society

Examines the complex relationship among science, information technology, business, and society. Investigates major breakthroughs in information technology, how they were influenced by business needs, and how they affect business and society. Explores social and cultural values in business science and technology, and economic challenges posed by rapid business information technology. Also examines the workings of major components of information technology used in business today. (4 units)

### 40. Statistics and Data Analysis I

First course in a two-course sequence. Students learn to summarize and describe sets of data using numerical and graphical methods; to quantitatively express the probability of events and utilize probability rules; to employ probability distributions to describe the probabilities associated with discrete and continuous random variables, and to compute means and variances; to evaluate sample data collection plans for quantitative and qualitative data; and to construct interval estimates for the population mean. Students analyze real-world data using spreadsheet software. Prerequisites: MATH 11 or 30, and OMIS 15 or 17. (4 units)

### 41. Statistics and Data Analysis II

Second course in a two-course sequence. Students learn to construct confidence intervals and test hypotheses about means, proportions, and variances for one and two populations; to formulate and test hypotheses about multinomial data; to construct both simple and multiple regression models, evaluate model quality and predict the value of dependent variables using regression. Students analyze real-world data using spreadsheet software. Prerequisites: OMIS 15 or 17, and OMIS 40. (4 units)

### 43. Data Wrangling and Visualization

Cross-listed with ECON 43. Prerequisites: MATH 30 and OMIS 40 (2 units)

## Upper-Division Courses

### 105. Database Management Systems

This course presents issues related to databases and database management systems (DBMS). Students will acquire technical and managerial skills in planning, analysis, design, implementation, and maintenance of databases. Hands-on training in relational database design, normalization, SQL, and database implementation will be provided. Use of DBMS software is required. Emphasis is placed on the issues of managing a database environment. Prerequisite: OMIS 30. (5 units)

### 106. Systems Analysis and Design

This course presents methodologies and approaches to the analysis and design of computer-based information systems for business applications. Topics include the systems development lifecycle, development methodologies, requirements determination, use case analysis, process modeling, systems architecture, program, and interface design, systems implementation, and organizational transition. Application of the studied methodologies and techniques to a systems analysis and design project is required. Prerequisite: OMIS 30. (5 units)

### 107. Systems Programming

Discussion of the fundamental concepts of systems programming. Major focus on the overall structure and capabilities of modern operating systems (LINUX/UNIX, Windows, etc.) and how to use operating system facilities to manipulate files and processes. Also covers shells and scripting programming concepts for performing system-level programming assignments on dedicated computer systems. Development of several software assignments utilizing systems programming concepts is required. Prerequisite: OMIS 30. (5 units)

### 108. Operations Management

Survey of analysis and design methods for business systems that produce and deliver goods and services. Topics chosen from the following: process analysis, sales forecasting, production planning and scheduling, inventory management, material requirements planning, quality control, lean manufacturing, and supply chain management. Prerequisite: OMIS 41 or ECON 41 and 42. This section is equivalent to OMIS 108E. (5 units)

### 108E. Sustainable Operations Management

This version of OMIS 108 emphasizes applications to sustainable business practices. Prerequisite: OMIS 41 or ECON 41 and 42. This section is equivalent to OMIS 108. (5 units)

### 108S. Operations Management

Enrollment in this version of OMIS 108 is restricted to students in the Leavey Scholars Program. Prerequisite: OMIS 41 or ECON 41 and 42. (5 units)

### 109. Prescriptive Analytics

Mathematical methods for solving decision problems encountered in business situations. Emphasis on problem formulation and application of spreadsheet-based algorithms for solution. Linear models and linear programming. Sensitivity analysis. Network models. Integer and nonlinear programming. Decision analysis and value of information. Dynamic analysis and the principle of optimality. Prerequisite: OMIS 41 or ECON 41 and 42. (5 units)

### 111. Computer Communications Systems

Designed to provide the information systems professional with a basic literacy in communication technologies driving the digital economy. Basics of data and telecommunications, LANs, WANs, broadband, analog and digital communications, Internet architecture and concepts, wireless including cellular and WLANs, and market and regulatory issues are covered. Emphasis on being able to assess the business impact of networking technologies. Prerequisite: OMIS 30. (5 units)

### 113. Data Warehousing and Business Intelligence

This course examines a broad collection of software tools and analytical applications that allow enterprises to analyze data maintained in data warehouses and operational databases for business intelligence. Topics include data storage and data integration architecture, enterprise analytics, and business intelligence tools and presentations. Students will acquire hands-on experience in building business intelligence applications. Prerequisites: OMIS 30, and OMIS 105. (5 units)

### 114. Data Science with Python

The objective of this course is to teach the analytical mindset and programming skills relevant to data science. Students will learn the principal tools for data science in Python, including the Jupyter (IPython) Notebook, Pandas, Seaborn, and Scikit-learn. Students will learn skills that cover the various phases of exploratory data analysis: importing data, cleaning and transforming data, algorithmic thinking, grouping and aggregation, visualization, time series, statistical modeling/prediction and communication of results. The course will utilize data from a wide range of sources and will culminate with a final project and presentation. Prerequisite: OMIS 30. (5 units)

### 115. Predictive Analytics

This course aims to teach conceptual foundations of predictive analytics and practical data analytics skills in order to perform out-of-sample predictions on real-world data. The course (1) introduces multiple data structures (e.g., time series, cross-sectional) that are frequently used in several different business contexts, (2) demonstrates predictive model construction techniques on different data structures, and (3) focuses on improving out-of-sample predictive performance. Topics include time series analysis and forecasting, regression models, classification and prediction models, text mining and analytics, and social network analysis. Prerequisite: OMIS 114. (5 units)

### 116. Applied Machine Learning

This course examines applications of machine learning using Apache Spark and Python. Topics include supervised and unsupervised machine learning algorithms such as regression, decision trees, support vector machines, clustering, and dimensionality reduction. Students will develop and run Spark jobs using Python and have hands-on experience on cases such as developing predictive models, generating recommendations with Collaborative Filtering, analyzing unstructured data with text mining, etc. Prerequisite: OMIS 30 and OMIS 114 (5 units)

### 117. Software Development Project

Integration of system and programming concepts to develop a comprehensive software system. Also presents an overview of software development methodology. Prerequisite: OMIS 30. (5 units)

### 118. Social Media Analytics

User generated content on social media platforms has increased dramatically. This includes rich data about various user communities, their interests, interactions and requirements. To understand, analyze and extract knowledge from social media data, this course employs a multidisciplinary approach that combines graph analysis, natural language processing, and machine learning. This approach is applied on real world data of social media platforms like Twitter, Facebook and Yelp for different applications such as sentiment analysis, topic modeling and user interaction mining. Students will have hands-on experience by developing all applications in Python throughout the course. Prerequisite: OMIS 114 and 116. (5 units)

### 120. Web Programming

The course will focus on the design and development of Web-based applications using a number of currently popular tools and strategies, and also explore the use of databases as data repositories for Web applications. Core technologies including HTML, CSS, JavaScript, PHP, MySQL, and AJAX will be emphasized. Prerequisites: OMIS 30, and 105. (5 units)

### 135. Enterprise Resource Planning Systems

Enterprise Resource Planning (ERP) systems are the foundation of modern business processes. Study of business process integration, ERP technology, and ERP implementation. Students will have the opportunity to work with ERP software from SAP. Includes a team project and case studies. Prerequisite: OMIS 105 or COEN 178. (5 units)

### 137. Object-Oriented Programming

Introduction to object-oriented design methodology. Discussion of different programming paradigms, concepts of data abstraction, inheritance, and encapsulation. Topics include an overview of Java programming language, classes and objects, data abstraction, inheritance, I/O packages, exceptions, threads, and GUI. Development of several programming assignments using Java is required. Prerequisite: OMIS 30. (5 units)

### 145. Competitive Quality

Slogans like “Quality is Job 1”; “When it absolutely, positively has to be there overnight”; and “The Dependability People” leave little doubt as to the importance of quality in commercial competition. This course explores how quality contributes to competitiveness. The course starts by defining quality and introducing methods for measuring quality. The course investigates variation in quality and its effect on firm performance, and studies methods for monitoring and controlling quality including quality control charts and sampling inspection. Finally, in light of new developments in operations theory and in technology for tracking and monitoring products, the course also tackles strategic supply chain issues associated with quality. Case studies and field trips are used to bolster student understanding. Prerequisites: ECON 1 and OMIS 108/108E/108S. (5 units)

### 150. Financial Information Systems

Course focuses on computer-based financial information systems that allow finance and accounting professionals to acquire and manage a company’s financial system. Topics include the business functions of a financial information system, the technical aspects of the system, and the management issues of implementing such a system. Students will acquire hands-on experience using ERP systems. Students who receive credit for ACTG 155 may not take this course for credit. Also listed as ACTG 155. Prerequisites: OMIS 30, and OMIS 105. (5 units)

### 198. Internship

Opportunity for selected upper-division students to work in local businesses or government units. Requires a faculty advisor and should be fairly well structured. Note: A student cannot use a collection of internship courses to satisfy the upper-division course requirement for any of the OMIS department’s major or minor programs. Prerequisites: Upper-division standing and approval of the undergraduate committee one week prior to registration. Written proposal must be approved by instructor and chair one week prior to registration. (1 unit)

### 199. Directed Reading/Directed Research

Independent projects undertaken by upper-division students with a faculty advisor. Note: A student cannot use a collection of directed reading/directed research courses to satisfy the upper-division course requirement for any of the OMIS department’s major or minor programs. Prerequisites: Upper-division standing and approval of the undergraduate committee one week prior to registration. Written proposal must be approved by instructor and chair one week prior to registration. (1–5 units)