

# DECISION SCIENCES (DNSC)

## Explanation of Course Numbers

- Courses in the 1000s are primarily introductory undergraduate courses
- Those in the 2000s to 4000s are upper-division undergraduate courses that can also be taken for graduate credit with permission and additional work
- Those in the 6000s and 8000s are for master's, doctoral, and professional-level students
- The 6000s are open to advanced undergraduate students with approval of the instructor and the dean or advising office

### **DNSC 3401. Introduction to Business Analytics. 3 Credits.**

Fundamentals of business analytics: what information it provides, how and when that information is used, and how it affects decision making. Working with uncertainty; understanding the dynamic nature of decision making; using data, regardless of its size; and making decisions with incomplete data. The simulation of real-life scenarios to support optimal decision making. Prerequisites: APSC 3115 or STAT 1051 or STAT 1053 or STAT 1111.

### **DNSC 3402. Data Mining. 3 Credits.**

The practice of exploring and discovering actionable business intelligence from large amounts of data; concepts, methods, and tools; supervised and unsupervised data mining techniques for discovering relationships in large data sets and building predictive models; regression models, decision trees, neural networks, clustering, and association analysis. Prerequisites: APSC 3115 or STAT 1051 or STAT 1053 or STAT 1111; Math 1231 or Math 1252.

### **DNSC 4403. Decision Models. 3 Credits.**

Design and development of decision models using spreadsheet software with decision support add-ins; interpreting decision model outputs; commonly used classes of models; decision analysis spanning business disciplines. Restricted to juniors and seniors.

### **DNSC 4404. Essentials of Project Management. 3 Credits.**

Theoretical foundations of and practical insights into project management; the role of project management in contemporary business and government organizations; the link between projects and strategy. Project design and development.

### **DNSC 4900. Special Topics. 0-3 Credits.**

### **DNSC 6201. Introduction to Business Analytics. 1.5 Credit.**

An introduction to business analytic concepts, methods, and tools with concrete examples from industry applications; Big Data and the opportunities it has created for businesses to store, organize, and analyze vast amounts of information. Completion of a basic course in statistics prior to enrollment is recommended.

### **DNSC 6202. Statistics for Managers. 3 Credits.**

Mathematical and statistical concepts employed in the solution of managerial problems. Applications of functions, elements of calculus, and linear algebra. Introduction to probability, frequency distributions, statistical inference, and regression and correlation.

### **DNSC 6203. Statistics for Analytics I. 1.5 Credit.**

The foundations of statistical methodologies used in business analytics; statistical inference and probability models; methods of estimation, hypothesis testing, contingency table analysis, analysis of regression models and logit and probit analysis. Restricted to students in the MS in business analytics and graduate certificate in business analytics programs or with departmental permission.

### **DNSC 6206. Stochastic Fndn: Prob Models. 1.5 Credit.**

### **DNSC 6207. Applied Probability Models. 1.5 Credit.**

### **DNSC 6208. Computational Optimization. 3 Credits.**

### **DNSC 6209. Forecasting for Analytics. 1.5 Credit.**

### **DNSC 6210. Decision and Risk Analytics. 1.5 Credit.**

Concepts, methods, and practical tools to analyze managerial decisions involving risk and uncertainty. Decision tree modeling, the strategic value of information, real options valuation, measurement and incorporation of risk preferences, and Monte Carlo simulation. The roles and limitations of judgment and sensitivity and robustness analysis as means to deal with the ambiguities inevitably present in real situations.

### **DNSC 6211. Programming for Analytics. 3 Credits.**

Accessing, preparation, handling, and processing data that differ in variety, volume, and velocity. The ability to handle and process data is a core capability in the context of any analytics position in the industry. Development of a theoretical grounding in emerging paradigms like schema-less data. The programming environments that will be typically employed include Python and R.

### **DNSC 6212. Optimization Methods and Applications. 3 Credits.**

Linear, network, integer, and nonlinear models and their fundamental underlying analytic concepts and solution methods. Emphasis on development of an intuitive understanding of solution methods and their underpinning theoretical paradigms for effective use of optimization models. Model formulation, solutions, and interpretation of results.

### **DNSC 6213. Statistics for Analytics II. 1.5 Credit.**

Statistical methodologies for business analytics in real world scenarios; introduction of high-level analytical techniques such as hierarchical linear modeling and mixed-effects modeling. Restricted to students in the MS in business analytics and graduate certificate in business analytics programs or with departmental permission. Prerequisites: DNSC 6203.

**DNSC 6214. Pricing and Revenue Management. 1.5 Credit.**

Methodologies for addressing pricing issues; tactical optimization of pricing and capacity allocation decisions; quantitative models of consumer behavior and constrained optimization.

**DNSC 6215. Social Network Analytics. 1.5 Credit.**

Concepts, methods, and applications of network science; Analyzing real networks and related phenomena such as disease propagation, organizational analysis, social power, and fraud detection. Exposure to Python and R scripts prior to enrollment is recommended.

**DNSC 6216. Business Analytics Skills Workshops. 0-1.5 Credits.**

A series of workshops covering project management techniques for analytics projects, team dynamics skills, communicating quantitative information, and ethics, security, and privacy policies in analytics.

**DNSC 6217. Business Analytics Practicum. 1.5 Credit.**

Working in small teams, students apply their analytics skills to projects sponsored by public or private institutions. Each team is advised by a faculty member, and the practicum sponsor designates a mentor to provide guidance to the team for the duration of the project. Prerequisite: MSBA degree candidacy.

**DNSC 6219. Time Series Forecasting for Analytics. 3 Credits.**

Predictive analysis and blackbox models for time series and econometric forecasting; identifying hidden patterns and structures in the univariate and multivariate time series data and exploiting these for forecasting; use of SAS to apply different forecasting models and methodologies to real life time-series data. Restricted to students in the master of science in business analytics degree program; program approval may be substituted.

**DNSC 6225. Business Process Simulation. 1.5 Credit.**

Introduction to the compromises and limitations involved in business process design; basic tools used to analyze and improve processes; simulation models using a powerful discrete-event simulation tool. Restricted to students in the master of science in business analytics degree program; program approval may be substituted. Prerequisites: DNSC 6202.

**DNSC 6230. Mgt of Technology Innovation. 3 Credits.****DNSC 6234. Procurement and Contracting. 3 Credits.**

Principles and concepts essential to effecting large procurement programs. Planning, sourcing, and contractual design for diverse acquisitions. Emphasis on federal government policy with comparison of buying at other governmental levels and the private sector.

**DNSC 6235. Communication Strategies in Project Management. 3 Credits.**

Communication leadership and management practices that facilitate successful project management; strategies and practices related to communication, change management, and performance reporting.

**DNSC 6236. Project Quality Management. 3 Credits.**

Current theories and practices regarding quality management as applied to manufacturing and the service industry, the application to project systems, and the application to individual projects. Prerequisite: None.

**DNSC 6237. International Project Management. 1.5 Credit.**

Augments the basics of project management with theory, practice, and methodology related to global project environment; practical investigation of the cultural environment in the context of managing global projects.

**DNSC 6238. Project Management and Organizational Context. 1.5 Credit.**

Organizational influences on project management practices; definition and classification of organizations; organizational culture; organizational strategy; project management practices that take place during initiation, planning, execution, monitoring and controlling, and closing processes.

**DNSC 6239. Project Governance. 1.5 Credit.**

An overview of project governance; models, practices and case studies.

**DNSC 6247. Organization, Management, and Leadership. 3 Credits.**

Fundamentals of human resource management for project managers. Tools and techniques for success in managing and leading people in a project environment.

**DNSC 6250. Project Management Finance. 3 Credits.****DNSC 6251. Optimization Models for Decision Making. 1.5 Credit.**

Optimization techniques, including linear programming, sensitivity analysis, networks, integer programming and multiple objective optimization, and nonlinear and evolutionary programming. Prerequisites: DNSC 6202 (equivalent to MBAD 6221 and MBAD 6222 or MBAD 6224).

**DNSC 6252. Risk Analysis for Decision Making. 1.5 Credit.**

Probabilistic modeling techniques with spreadsheet implementation. Special focus is placed on the concept of risk and methods for analyzing it. Topics include: risk attitudes, risk measures, decision trees, simulation models, game theory, real options approach, and risk communication.

**DNSC 6254. Risk Management. 1.5 Credit.**

Basic principles of risk management practices. Developing a risk management plan, including identifying, analyzing, mitigating, and monitoring projects risks. Prerequisites: DNSC 6202 or MBAD 6224 or MBAD 6221, MBAD 6222.

**DNSC 6257. Cost Estimation and Control. 1.5 Credit.**

Methods of developing project estimates during the planning stages and updating the estimates throughout the life of the project; monitoring, reporting, controlling, and managing project cost; relationships between project cost and other parameters, including scope, time, quality, reliability and procurement risk. Prerequisites: DNSC 6202 or MBAD 6221, MBAD 6222 or MBAD 6224.

**DNSC 6258. Executive Decision Making. 1.5 Credit.**

**DNSC 6259. Project Portfolio Management. 1.5 Credit.**

Management of an organization's portfolio of projects for the overall success of the enterprise; alignment of projects with an organization's strategy and goals and consistency with values and culture. Prerequisites: DNSC 6202 or MBAD 6221, MBAD 6222 or MBAD 6224.

**DNSC 6261. Introduction to Project and Program Management. 3 Credits.**

Practical examination of how projects can be managed from start to finish, including specific emphasis on planning and controlling to avoid common pitfalls. Identifying needs, defining requirements, project costing, scheduling, resource allocation, and project politics.

**DNSC 6262. Directed Computational Project Management. 3 Credits.**

Practical examination of project management concepts by quantitative application using various software tools. Research in real cost data to support project calculations. Prerequisite: DNSC 6254, DNSC 6257, DNSC 6261, DNSC 6267.

**DNSC 6263. Managing External Projects. 3 Credits.**

Fundamentals of contract management from a project manager's perspective. The outsourcing process, associated project strategies, and legal elements. Acquisition planning, vendor selection, contract formulation, and performance control.

**DNSC 6267. Planning and Scheduling. 3 Credits.**

Integrated planning, scheduling, and control systems for planning the scope of a project; optimizing time, cost, and resources; and monitoring and controlling schedules, including those for delayed projects. Prerequisites: DNSC 6202 or MBAD 6221, MBAD 6222 or MBAD 6224.

**DNSC 6269. Project Management Application. 3 Credits.**

Students will be expected to demonstrate integration of the knowledge accumulated in their study plan and apply integrated knowledge and experience to best practices, a project case history, and a handbook. Prerequisites: M.S.P.M. candidacy or permission of instructor/advisor.

**DNSC 6274. Statistical Modeling and Analysis. 3 Credits.**

The process of specifying, analyzing, and testing models of human and systemic behavior. Formalization of models; statistical test comparison and selection; computer implementation of univariate, bivariate, and multivariate tests. General linear model: linear regression, analysis of variance, and analysis of covariance. Prerequisite: MBAD 6221 and MBAD 6222 .

**DNSC 6275. Advanced Statistical Modeling and Analysis. 3 Credits.**

Advanced topics associated with the general linear model. Testing for and remediation of assumption violations. Detection of outliers, influential observations, and multicollinearity. Alternative design strategies in the analysis of variance; latent growth analysis; hierarchical linear modeling; testing for interactions and parallelism. Prerequisite: DNSC 6274 or permission of instructor.

**DNSC 6276. Exploratory and Multivariate Data Analysis. 3 Credits.**

Methods for exploratory and multivariate data analysis. Application and comparison of advanced multivariate analytical procedures. Multivariate and discriminant analysis, LISREL analysis, and canonical correlation. Prerequisite: DNSC 6274 or permission of instructor.

**DNSC 6277. Applied Forecasting and Time-Series Analysis for Managers. 3 Credits.**

Introduction to various forecasting techniques, including time-series regression models, cyclical trends, exponential smoothing methods, seasonal and nonseasonal ARIMA processes, and the Box-Jenkins approach. Application of forecasting methods in economics, finance, and marketing. Prerequisite: MBAD 6222 or permission of instructor.

**DNSC 6279. Data Mining. 3 Credits.**

How organizations make better use of the increasing amounts of data they collect and how they convert data into information that is useful for managerial decision making. Examination of several data mining and data analysis methods and tools for exploring and analyzing data sets. State-of-the-art software tools for developing novel applications.

**DNSC 6290. Special Topics. 0-3 Credits.**

Experimental offering; new course topics and teaching methods. May be repeated once for credit.

**DNSC 6298. Directed Readings and Research. 0-3 Credits.**

**DNSC 6300. Thesis Seminar. 3 Credits.**

**DNSC 6401. Sustainable Supply Chains. 1.5 Credit.**

Introduction to integrating environmental management and sustainability concepts into the operations and supply chain management fields.

**DNSC 6403. Visualization for Analytics. 1.5 Credit.**

Use of data visualization software technology in the context of exploratory and reporting capabilities; SAS Visual Analytics/ Statistics and other methodologies; various graphical approaches to preparing and visualizing data. Prerequisites: DNSC 6201 and DNSC 6203.

**DNSC 6404. Sports Analytics. 1.5 Credit.**

Analyzing and leveraging information throughout a sports organization; strategies for gaining competitive advantage on the field of play; player analysis; and business operations.

**DNSC 8328. Special Topics in Decision Making. 3 Credits.**

Special topics and advanced applications, such as catastrophe theory, Markovian decision processes, and Bayesian statistics. May be repeated once for credit.

**DNSC 8385. Special Topics in Research Methods. 3 Credits.**

Research problems and issues related to student dissertations form topics for readings, group discussions, and assigned papers.

**DNSC 8392. Computational Optimization. 3 Credits.**

The description, design, and programming of efficient computational methods for large-scale optimization problems; introduction to software, optimization solvers, and programming languages used by professionals to code and model industry-size optimization problems.

**DNSC 8393. Applied Stochastic Models for Business. 3 Credits.**

In-depth coverage of stochastic models and their applications in business and industry; applications to marketing, call center modeling, finance, queuing systems, and operations.

**DNSC 8394. Stochastic Programming. 3 Credits.**

The intersection of probability theory and statistics with mathematical programming for modeling optimization problems that involve uncertainty. Basic knowledge of linear programming, elementary analysis and probability. Emphasis on algorithmic methods to solve stochastic programming instances.

**DNSC 8397. Advanced Special Topics. 1-3 Credits.**

Current research and scholarly issues in management science.

**DNSC 8998. Advanced Readings and Research. 1-12 Credits.**

May be repeated for credit. Restricted to doctoral candidates preparing for the general examination.

**DNSC 8999. Dissertation Research. 1-12 Credits.**

May be repeated for credit. Restricted to doctoral candidates.