Operations Analytics (OPAN)

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Operations Analytics Website (https://operations-analytics.uark.edu/)

Degree Conferred:
M.S.O.A. in Operations Analytics (OPAN)

Program Description: The Department of Industrial Engineering offers a graduate program leading to the Master of Science in Operations Analytics (M.S.) for engineering, science, and other non-engineering graduates. The Master of Science in Operations Analytics is an intensive program that will guide students through the theory and practice of the quantitative modeling of enterprise operations via descriptive, predictive, and prescriptive analytics. Students will develop knowledge of the principles and practices of analytics modeling methods, such as optimization, statistical modeling, machine learning, simulation, and computing methods, as they apply to the strategic, operational, and tactical control of operations.

Requirements for M.S. in Operations Analytics

Prerequisites to the M.S.O.A. Degree Program:

1. There are no prerequisites for students with an undergraduate degree from an ABET-accredited industrial engineering program.
2. For students with a degree other than an ABET-accredited industrial engineering degree, a number of prerequisite courses may be required. Students are expected to have completed mathematics courses through differential and integral calculus of several variables and vector calculus and linear algebra. Students are expected to have completed a calculus-based probability and statistics course. In addition, students are expected to have completed a computer programming course. Specific University of Arkansas courses that meet these prerequisites are available on-line through the INEG departmental web-pages.

Requirements for the Master of Science in Operations Analytics

In addition to the requirements of the Graduate School and the College of Engineering, the following program requirements must be satisfied by candidates for the M.S.O.A. degree.

1. Candidates for the degree are required to complete 30 semester hours of course work.
2. All candidates must successfully complete a master's oral examination that is conducted by the candidate's faculty committee.

Accelerated Master of Science in Operations Analytics

High-achieving current undergraduate students seeking a BS degree at the University of Arkansas who choose to pursue graduate studies in Operations Analytics may participate in the accelerated M.S.O.A. program. Provided that 6 credit hours of 5000-level courses listed as required or electives for the M.S.O.A. degree can be applied towards the student's current undergraduate program, students may also count those 6 hours towards their M.S.O.A. degree. In addition, students may take another 6 credit hours of graduate degree credit as undergraduate students in order to apply them to their M.S.O.A. degree. These additional 6 hours of courses may not have been used towards the B.S. undergraduate degree and must meet M.S.O.A. degree requirements. The total of 12 credit hours of graduate courses taken as an undergraduate student must be taken during the final 12 month period of their undergraduate degree.

Once fully admitted to the M.S.O.A. program, students request that up to 12 hours of 5000-level or above courses taken in the final 12-month period of their undergraduate degree count toward their graduate degree, if these courses were taken on the University of Arkansas, Fayetteville campus. Students then take an additional 18 credit hours of approved OPAN graduate-level courses in order to meet the M.S.O.A. degree requirements.

Undergraduate students interested in the accelerated M.S.O.A. degree should apply to the program prior to starting the second-to-last semester of their undergraduate program. To be eligible students must have a 3.5 cumulative GPA or higher and submit the normal application materials required by the graduate school for the M.S.O.A. degree program.

Required Courses

OPAN 50003	Introduction to Operations Analytics	3
OPAN 50103	Applied Predictive Analytics	3
OPAN 50203	Applied Prescriptive Analytics	3
OPAN 59003	Operations Analytics Capstone	3
or OPAN 59103	Operations Analytics Industrial Practicum	
Electives		**18**

Students must select course electives from both of the following course topic areas for a total of 18 credit hours.

Operations Analytics (choose 4 or 5 courses)	
INEG 51603	Introduction to Modern Statistical Techniques for Industrial Applications
INEG 53103	Engineering Applications of Probability Theory
INEG 53203	Engineering Applications of Stochastic Processes
INEG 54403	Decision Models
INEG 58303	Introduction to Database Concepts for Industrial Engineers
INEG 56803	Nonlinear Programming
INEG 56903	Heuristic Optimization
OPAN 57103	Simulation Analytics
Engineering and Operations Management (choose 1 or 2 courses)	
EMGT 50303	Introduction to Engineering Management
EMGT 50503	Tradeoff Analytics for Engineering Management
EMGT 56003	Systems Thinking and Systems Engineering
OMGT 50103	Supply Chain Management for Operations Managers
OMGT 53703	Quality Management
OMGT 57803	Project Management for Operations Managers
OMGT 59803	Advanced Project Management

INEG 52603	Engineering Statistics
INEG 53303	Design of Industrial Experiments
INEG 54203	Advanced Engineering Economy
INEG 56203	Analysis of Inventory Systems
INEG 58003	Simulation

Total Hours **30**

Courses

OPAN 50003. Introduction to Operations Analytics. 3 Hours.
An introduction to operations analytics providing an understanding of the role of analytics within operational settings. Builds basic skill instruction in descriptive analytics and the communication of analytics. An overview of introductory techniques within the field of analytics and their application. (Typically offered: Fall, Spring and Summer)

OPAN 50103. Applied Predictive Analytics. 3 Hours.
This course focuses on the fundamental theory, methodologies, algorithms and software tools for predictive analytics. The main goal is to equip the students with the basic knowledge and skills to solve common predictive analytics problems arising from various applications. Methodologies covered in this course include linear and non-linear regression, additive models, ensemble trees, model assessment and selection, Artificial Neural Network. Students will learn how to implement the methods using popular statistical computing and analytics tools. Working knowledge of multi-variate calculus based probability and statistical inference is expected. Prerequisite: OPAN 50003. (Typically offered: Fall, Spring and Summer)

OPAN 50203. Applied Prescriptive Analytics. 3 Hours.
Methods, algorithms, and techniques for optimization models used in analytics applications. Coverage includes model formulation, solution methods and the use of optimization software. Prerequisite: OPAN 50003. (Typically offered: Fall, Spring and Summer)

OPAN 57103. Simulation Analytics. 3 Hours.
An overview of Monte Carlo computer simulation methods and their application within analytics. Generation of random variates from univariate and multi-variate distributions. Probability model representation and fitting methods. Computing methods for simulating and estimating random processes. Bootstrapping procedures. Statistical reasoning and decision making under uncertainty. Working knowledge of calculus-based probability and statistics and computer programming is expected. (Typically offered: Fall and Summer)

OPAN 59003. Operations Analytics Capstone. 3 Hours.
Comprehensive analytics project. Conduct background research, data collection, and preliminary analysis; define objectives, performance measures, and deliverables; apply analytics methods, develop recommended solutions, and document solution and benefits. Course should be taken in the term prior to meeting degree requirements. Students cannot receive credit for both OPAN 59003 and OPAN 59103. Prerequisite: Instructor consent. (Typically offered: Fall, Spring and Summer)

OPAN 59103. Operations Analytics Industrial Practicum. 3 Hours.
Student must apply to enroll in this course. Students must be employed within an analytics organization in industry. Prior approval to use an organization's analytics project as the basis of the student's course project must be obtained. A project report documenting the application of analytics performed by the student within the organization is required. An evaluation by the student's supervisor on the technical aspects of the student's work will be required in addition to an evaluation by the course instructor. The student's supervisor must be an analytics professional. Course should be taken in the term prior to meeting degree requirements. Students cannot receive credit for both OPAN 59003 and OPAN 59103. Prerequisite: Instructor consent. (Typically offered: Fall, Spring and Summer)