Economics and Business

Degrees Offered:

- Bachelor of Science in Economics
- Bachelor of Science in Business Engineering and Management Science

Program Description

The economy is becoming increasingly global and dependent on advanced technology. In such a world, private companies and public organizations need leaders and managers who understand economics and business, as well as science and technology.

Programs in the Department of Economics and Business are designed to bridge the gap that often exists between economists and managers, on the one hand, and engineers and scientists, on the other. All Mines undergraduate students are introduced to economic principles in a required course, and many pursue additional course work in minor programs or elective courses. The courses introduce undergraduate students to economic and business principles so that they will understand the economic and business environments, both national and global, in which they will work and live.

In keeping with the mission of the Colorado School of Mines, the Department of Economics and Business offers a Bachelor of Science in Economics. Most economics degrees at other universities are awarded as a Bachelor of Arts, with a strong liberal arts component. Our economics degree is grounded in mathematics, engineering and the sciences. We graduate technologically literate economists with quantitative economics and business skills that give them a competitive advantage in today's economy.

Economics majors have a range of career options following their undergraduate studies. Some pursue graduate degrees in economics, business, or law. Others begin careers as managers, economic advisors, and financial officers in business or government, often in organizations that deal with engineering, applied science, and advanced technology.

The Department of Economics and Business also offers a Bachelors of Science in Business Engineering and Technology Management (BEMS). This degree develops graduates with applied quantitative skills that they can apply to data-driven business decisions. The BEMS degree lies at the intersection of technical skills and business training and enables students to develop leadership skills and passion that are needed in today's rapidly changing, technology-focused business world.

Bachelor of Science in Economics

In addition to contributing toward achieving the educational objectives described in the CSM Graduate Profile and the ABET Accreditation Criteria, the educational objectives of the undergraduate program in economics and business are:

1. To provide students with a strong foundation in economic theory and analytical techniques, taking advantage of the mathematical and quantitative abilities of CSM undergraduate students; and
2. To prepare students for the work force, especially in organizations in CSM's areas of traditional strength (engineering, applied science, mathematics and computer science), and for graduate school, especially in economics, business, and law.

Curriculum

All economics majors take forty percent of their courses in math, science, and engineering, including the same core required of all CSM undergraduates. Students take another forty percent of their courses in economics and business. The remaining twenty percent of the course work can come from any field. Many students complete minor programs in a technical field, such as computer science, engineering, geology or environmental science. A number of students pursue double degrees.

To complete the economics major, students must take 45 hours of 300 and 400 level economics and business courses. Of these, 18 hours must be at the 400 level. At least 30 of the required 45 hours must be taken in residence in the home department. For students participating in an approved foreign study program, up to 19 hours of the 30 hours in residence requirement may be taken abroad.

Degree Requirements in Economics

Freshman

Fall		**lec**	**lab**	**sem.hrs**
MATH111	CALCULUS FOR SCIENTISTS AND ENGINEERS I			4.0
CHGN121	PRINCIPLES OF CHEMISTRY I			4.0
CSCI128	COMPUTER SCIENCE FOR STEM			3.0
EDNS151	CORNERSTONE - DESIGN I			3.0
CSM101	FRESHMAN SUCCESS SEMINAR			1.0
				15.0
Spring		**lec**	**lab**	**sem.hrs**
PHGN100	PHYSICS I - MECHANICS			4.0
MATH112	CALCULUS FOR SCIENTISTS AND ENGINEERS II			4.0
EBGN201	PRINCIPLES OF ECONOMICS			3.0
HASS100	NATURE AND HUMAN VALUES			3.0
CSM202	INTRODUCTION TO STUDENT WELL-BEING AT MINES			1.0
				15.0

Sophomore

Fall		**lec**	**lab**	**sem.hrs**
MATH201	INTRODUCTION TO STATISTICS			3.0
MATH213	CALCULUS FOR SCIENTISTS AND ENGINEERS III			4.0
HASS200	GLOBAL STUDIES			3.0
CSCI303	INTRODUCTION TO DATA SCIENCE			3.0
FREE	Free Elective			3.0
				16.0
Spring		**lec**	**lab**	**sem.hrs**
EBGN301	INTERMEDIATE MICROECONOMICS			3.0

EBGN280	INTRODUCTION TO BUSINESS ANALYTICS			3.0
EBGN	EBGN Elective I*			3.0
ELECTIVE	CULTURE AND SOCIETY (CAS) Mid-Level Restricted Elective			3.0
FREE	Free Elective			3.0
				15.0
Junior				
Fall		**lec**	**lab**	**sem.hrs**
EBGN302	INTERMEDIATE MACROECONOMICS			3.0
EBGN321	ENGINEERING ECONOMICS			3.0
EBGN381	PREDICTIVE BUSINESS ANALYTICS or EBGN Elective VIII*			3.0
EBGN	EBGN Elective II*			3.0
FREE	Free Elective			3.0
				15.0
Spring		**lec**	**lab**	**sem.hrs**
EBGN303	ECONOMETRICS			3.0
EBGN382	PRESCRIPTIVE BUSINESS ANALYTICS or EBGN Elective VIII*			3.0
EBGN	EBGN Elective III*			3.0
EBGN	EBGN Elective IV*			3.0
FREE	Free Elective			3.0
				15.0
Senior				
Fall		**lec**	**lab**	**sem.hrs**
EBGN	EBGN Elective V*			3.0
EBGN	EBGN Elective VI*			3.0
EBGN403	FIELD SESSION			2.0
ELECTIVE	CULTURE AND SOCIETY (CAS) Mid-Level Restricted Elective			3.0
FREE	Free Elective			3.0
S&W	SUCCESS AND WELLNESS			1.0
				15.0
Spring		**lec**	**lab**	**sem.hrs**
EBGN	EBGN Elective VII*			3.0
EBGN403	FIELD SESSION			2.0
ELECTIVE	CULTURE AND SOCIETY (CAS) 400-Level Restricted Elective			3.0
FREE	Free Elective			3.0
FREE	Free Elective			3.0
				14.0

Total Semester Hrs: 120.0

* At least 3 EBGN elective courses must be at the 400-level or above. At least 2 of the 400-level or above elective courses must be from the following list of courses: EBGN409, EBGN430, EBGN434, EBGN435, EBGN437, EBGN441, EBGN443, EBGN470.

Major GPA

During the 2016-2017 Academic Year, the Undergraduate Council considered the policy concerning required major GPAs and which courses are included in each degree's GPA. While the GPA policy has not been officially updated, in order to provide transparency, council members agreed that publishing the courses included in each degree's GPA is beneficial to students.

The following list details the courses that are included in the GPA for this degree:

- EBGN100 through EBGN599 inclusive

Bachelor of Science in BUSINESS ENGINEERING AND MANAGEMENT SCIENCE

In addition to contributing toward achieving the educational objectives described in the CSM Graduate Profile, the Department of Economics and Business has established the following program educational objectives for the BS in Business Engineering and Management Science:

Upon completion of the Business Engineering and Management Science degree, students will be able to:

1. Identify, access, validate, and visualize relevant data to inform business decisions.
2. Demonstrate proficiency with deterministic and stochastic analytical tools.
3. Demonstrate mastery of basic business principles.
4. Build models and apply quantitative tools to inform decisions about business strategy and operations.
5. Communicate effectively in a professional context in a variety of formats.
6. Identify and propose solutions to ethical issues in business decision-making.
7. Demonstrate expertise in their track areas of choice.

Curriculum

The BS in Business Engineering and Management Science develops graduates with applied quantitative skills that Mines is known for including data science, data analytics, and operations research. This degree lies at the intersection of technical skills and business training and enables students to develop leadership skills and passion that are needed in today's rapidly changing, technology-focused business world.

The Business Engineering and Management Science degree provides comprehensive training in two core areas: Data Analytics and Business Principles. The Data Analytics core includes courses in data science, data visualization, predictive modeling and optimization modeling. The Business Principles core includes accounting, finance, marketing, communications, and management. In addition to these core courses, students specialize in tracks that allow them to deepen their knowledge of specific application areas. Students choose two 4-course tracks from a selection of Business Analytics, Financial Economics, Artificial Intelligence and Machine Learning, Advanced Manufacturing, and Technology Management.

Degree Requirements in Business Engineering and Management Science

Freshman

Fall		lec	lab	sem.hrs
CSCI128	COMPUTER SCIENCE FOR STEM			3.0
MATH111	CALCULUS FOR SCIENTISTS AND ENGINEERS I			4.0
CHGN121	PRINCIPLES OF CHEMISTRY I			4.0
HASS100	NATURE AND HUMAN VALUES			3.0
CSM101	FRESHMAN SUCCESS SEMINAR			1.0
				15.0
Spring		**lec**	**lab**	**sem.hrs**
PHGN100	PHYSICS I - MECHANICS			4.0
MATH112	CALCULUS FOR SCIENTISTS AND ENGINEERS II			4.0
EDNS151	CORNERSTONE - DESIGN I			3.0
EBGN201	PRINCIPLES OF ECONOMICS Effective Fall 2023 EBGN 201 in lieu of free elective			3.0
CSM202	INTRODUCTION TO STUDENT WELL-BEING AT MINES			1.0
				15.0

Sophomore

Fall		lec	lab	sem.hrs
MATH213	CALCULUS FOR SCIENTISTS AND ENGINEERS III			4.0
MATH201	INTRODUCTION TO STATISTICS			3.0
HASS200	GLOBAL STUDIES			3.0
EBGN305	FINANCIAL ACCOUNTING			3.0
EBGN307	BUSINESS COMMUNICATIONS			3.0
				16.0
Spring		**lec**	**lab**	**sem.hrs**
ELECTIVE	CAS Mid-Level Restricted Elective			3.0
CSCI303	INTRODUCTION TO DATA SCIENCE			3.0
EBGN280	INTRODUCTION TO BUSINESS ANALYTICS			3.0
EBGN345	PRINCIPLES OF CORPORATE FINANCE			3.0
FREE	Free Elective			3.0
S&W	SUCCESS AND WELLNESS			1.0
				16.0

Junior

Fall		lec	lab	sem.hrs
EBGN308	PRINCIPLES OF MARKETING			3.0
EBGN381	PREDICTIVE BUSINESS ANALYTICS			3.0
EBGN321	ENGINEERING ECONOMICS			3.0
TRACK 1 TECHNICAL ELECTIVE #1				3.0
TRACK 2 TECHNICAL ELECTIVE #1				3.0
				15.0
Spring		**lec**	**lab**	**sem.hrs**
EBGN303	ECONOMETRICS			3.0
EBGN382	PRESCRIPTIVE BUSINESS ANALYTICS			3.0
EBGN453	PROJECT MANAGEMENT			3.0
TRACK 1 TECHNICAL ELECTIVE #2				3.0
TRACK 2 TECHNICAL ELECTIVE #2				3.0
				15.0

Senior

Fall		lec	lab	sem.hrs
EBGN490	BUSINESS ANALYTICS CAPSTONE			3.0
TRACK1 TECHNICAL ELECTIVE #3				3.0
TRACK 2 TECHNICAL ELECTIVE #3				3.0
ELECTIVE	CAS Mid-Level Restricted Elective			3.0
FREE	Free Elective			3.0
				15.0
Spring		**lec**	**lab**	**sem.hrs**
EBGN485	BUSINESS STRATEGY			3.0
TRACK 1 TECHNICAL ELECTIVE #4				3.0
TRACK 2 TECHNICAL ELECTIVE #4				3.0
ELECTIVE	CAS 400-Level Restricted Elective			3.0
FREE	Free Elective			3.0
				15.0

Total Semester Hrs: 122.0

The Mines guidelines for Minor/ASI can be found in the Undergraduate Information section of the Mines Catalog.

Minor Program in Economics

The minor in Economics requires that students complete 6 courses from the Division of Economics and Business, for a total of 18.0 credits. Minors are required to take Principles of Economics (EBGN201) and either Intermediate Microeconomics (EBGN301) or Intermediate Macroeconomics (EBGN302). Students must complete 4 additional EBGN courses. Up to 9 of the 18 hours required for the Economics minor may be used for other degree requirements including Culture and Society (CAS) electives. At least 9.0 of the hours required for the Economics minor must not be used for any part of the degree other than Free Electives.

Program Requirements:

EBGN201	PRINCIPLES OF ECONOMICS	3.0
EBGN301	INTERMEDIATE MICROECONOMICS	3.0
or EBGN302	INTERMEDIATE MACROECONOMICS	
EBGN	Economics Electives	12.0
Total Semester Hrs		**18.0**

Minor in Business and Entrepreneurship

The Minor in Business and Entrepreneurship provides the opportunity for students to gain skills and knowledge in business and entrepreneurship. The minor requires that students complete 6 business courses for a total of 18.0 credits. Requirements as follows:

Required		
EBGN201	PRINCIPLES OF ECONOMICS	3.0
EBGN321	ENGINEERING ECONOMICS	3.0
Select 4 of the following:		
EBGN230	INTRODUCTION TO BUSINESS	3.0
EBGN304	PERSONAL FINANCE	3.0
EBGN305	FINANCIAL ACCOUNTING	3.0
EBGN345	PRINCIPLES OF CORPORATE FINANCE	3.0
EBGN346	INTRODUCTION TO INVESTMENTS	3.0
EBGN360	INTRODUCTION TO ENTREPRENEURSHIP	3.0
EBGN425	BUSINESS ANALYTICS	3.0
EBGN453	PROJECT MANAGEMENT	3.0
EBGN460	BUSINESS MODEL DEVELOPMENT	3.0
EBGN485	BUSINESS STRATEGY	3.0

At least 9.0 of the credits required for the Business and Entrepreneurship minor must not be used for any part of the degree other than Free Electives.

Area of Special Interest in Economics

The area of special interest in Economics requires that students complete Principles of Economics (EBGN201) and 3 other EBGN courses for a total of 12 credits. Except for Principles of Economics (EBGN201), EBGN courses taken to complete the ASI in Economics must not be used for any part of the degree other than Free Electives.

EBGN201	PRINCIPLES OF ECONOMICS	3.0
EBGNXXX	Economics Electives	9.0
Total Semester Hrs		**12.0**

Area of Special Interest in Entrepreneurship

The objective of the Area of Special Interest in Entrepreneurship is to supplement an engineering or applied science education with tools and processes to recognize and evaluate entrepreneurial opportunities. These tools include financial forecasting, business models and the interrelationships of business functions including accounting, marketing, finance, human resources and operations. The processes include developing feasibility studies and business plans.

The area of Special Interest in Entrepreneurship requires that students complete Principles of Economics (EBGN201), Introduction to Entrepreneurship (EBGN360), Business Model Development (EBGN460), and one additional business course for a total of 12 credits.

EBGN201	PRINCIPLES OF ECONOMICS	3.0
EBGN360	INTRODUCTION TO ENTREPRENEURSHIP	3.0
EBGN460	BUSINESS MODEL DEVELOPMENT	3.0
Select 1 of the following:		
EBGN304	PERSONAL FINANCE	3.0
EBGN321	ENGINEERING ECONOMICS	3.0
EBGN345	PRINCIPLES OF CORPORATE FINANCE	3.0
EBGN346	INTRODUCTION TO INVESTMENTS	3.0
EBGN425	BUSINESS ANALYTICS	3.0
EBGN485	BUSINESS STRATEGY	3.0

Courses

EBGN198. SPECIAL TOPICS IN ECONOMICS AND BUSINESS. 1-6 Semester Hr.
(I, II) Pilot course or special topics course. Topics chosen from special interests of instructor(s) and student(s). Usually the course is offered only once. Prerequisite: none. Variable credit; 1 to 6 credit hours. Repeatable for credit under different titles.

EBGN199. INDEPENDENT STUDY. 0.5-6 Semester Hr.
(I, II) Individual research or special problem projects supervised by a faculty member, also, when a student and instructor agree on a subject matter, content, and credit hours. Prerequisite: ?Independent Study? form must be completed and submitted to the Registrar. Variable credit; 1 to 6 credit hours. Repeatable for credit.

EBGN201. PRINCIPLES OF ECONOMICS. 3.0 Semester Hrs.
(I,II,S) Introduction to microeconomics and macroeconomics. This course focuses on applying the economic way of thinking and basic tools of economic analysis. Economic effects of public policies. Analysis of markets for goods, services and resources. Tools of cost-benefit analysis. Measures of overall economic activity. Determinants of economic growth. Monetary and fiscal policy. Prerequisites: None. 3 hours lecture; 3 semester hours.

EBGN230. INTRODUCTION TO BUSINESS. 3.0 Semester Hrs.
An introduction to everything business. In this class, you will explore why businesses are formed, what gives them a competitive advantage in the market, and how businesses report information to the public. You will also learn best practices for individual behavior and success when operating in a business environment, including what makes for a good business presentation, leading and communicating with teams, and project decision analysis. Being business smart is the foundation of every career path moving forward.

EBGN280. INTRODUCTION TO BUSINESS ANALYTICS. 3.0 Semester Hrs.
Business analytics implements a data-driven approach to the business world, leveraging statistics and data modeling to generate new business insights. In this introductory course, students will learn how to manage, visualize, and analyze data for business decision making. Students will use a variety of statistical methods, visualization tools, and data cleaning techniques to generate business insights from large data sets. Prerequisite: MATH201. Co-requisite: CSCI303.

EBGN298. SPECIAL TOPICS IN ECONOMICS AND BUSINESS. 1-6 Semester Hr.
(I, II) Pilot course or special topics course. Topics chosen from special interests of instructor(s) and student(s). Usually the course is offered only once. Prerequisite: none. Variable credit; 1 to 6 credit hours. Repeatable for credit under different titles.

EBGN299. INDEPENDENT STUDY. 1-6 Semester Hr.
(I, II) Individual research or special problem projects supervised by a faculty member, also, when a student and instructor agree on a subject matter, content, and credit hours. Prerequisite: ?Independent Study? form must be completed and submitted to the Registrar. Variable credit; 1 to 6 credit hours. Repeatable for credit.

EBGN301. INTERMEDIATE MICROECONOMICS. 3.0 Semester Hrs.
Equivalent with EBGN411,
This course introduces the theoretical and analytical foundations of microeconomics and applies these models to the decisions and interactions of consumers, producers and governments. Develops and applies models of consumer choice and production with a focus on general equilibrium results for competitive markets. Examines the effects of market power and market failures on prices, allocation of resources and social welfare. Prerequisite: EBGN201 and MATH213.

EBGN302. INTERMEDIATE MACROECONOMICS. 3.0 Semester Hrs.
Equivalent with EBGN412,
Intermediate macroeconomics provides a foundation for analyzing both short-run and long-run economic performance across countries and over time. The course discusses macroeconomic data analysis (including national income and balance of payments accounting), economic fluctuations and the potentially stabilizing roles of monetary, fiscal and exchange rates policies, the role of expectations and intertemporal considerations, and the determinants of long-run growth. The effects of external and internal shocks (such as oil price shocks, resource booms and busts) are analyzed. Prerequisite: EBGN201 and MATH213.

EBGN303. ECONOMETRICS. 3.0 Semester Hrs.
Equivalent with EBGN390,
Introduction to econometrics, including ordinary least-squares and single- equation models; two-stage least-squares and multiple-equation models; specification error, serial correlation, heteroskedasticity, and other problems; distributive-lag models and other extensions, hypothesis testing and forecasting applications. Prerequisite: EBGN201 and MATH201.

EBGN304. PERSONAL FINANCE. 3.0 Semester Hrs.
The management of household and personal finances. Overview of financial concepts with special emphasis on their application to issues faced by individuals and households: budget management, taxes, savings, housing and other major acquisitions, borrowing, insurance, investments, meeting retirement goals, and estate planning. Survey of principles and techniques for the management of a household's assets and liabilities. Study of financial institutions and their relationship to households, along with a discussion of financial instruments commonly held by individuals and families.

EBGN305. FINANCIAL ACCOUNTING. 3.0 Semester Hrs.
Survey and evaluation of balance sheets and income and expense statements, origin and purpose. Evaluation of depreciation, depletion, and reserve methods for tax and internal management purposes. Cash flow analysis in relation to planning and -decision making. Inventory methods and cost controls related to dynamics of production and processing. Prerequisite: EBGN201.

EBGN306. MANAGERIAL ACCOUNTING. 3.0 Semester Hrs.
Introduction to cost concepts and principles of management accounting including cost accounting. The course focuses on activities that create value for customers and owners of a company and demonstrates how to generate cost-accounting information to be used in management decision making. Prerequisite: EBGN201, EBGN305.

EBGN307. BUSINESS COMMUNICATIONS. 3.0 Semester Hrs.
Communication is one of the most vital skills in today's professional world, and effectiveness in communicating ideas, feelings, instructions, and thoughts are vital to both personal and professional success. Business Communications is designed to introduce you to skills and practices that will enable you to be an effective communicator for yourself, your business, and your clients and stakeholders. The course focuses on approaches for planning, creating, and transmitting business information within a variety of business situations found in the global marketplace. The course will focus on written, oral, and digital communication.

EBGN308. PRINCIPLES OF MARKETING. 3.0 Semester Hrs.
Principles of Marketing will introduce students to the concepts, analyses, and activities that comprise marketing management and to provide practice in assessing and solving marketing problems. Marketing involves identifying customer needs, satisfying those needs through the right products and services, assuring availability to customers through the best distribution channels, using promotional activities in ways that motivate purchases as effectively as possible, and choosing a suitable price to boost firm profitability while maintaining customer satisfaction. These decisions of product, distribution, promotion, and price, together with a rigorous analysis of the customers, competitors, and the overall business environment serve as the foundations for sound marketing management.

EBGN310. ENVIRONMENTAL AND RESOURCE ECONOMICS. 3.0 Semester Hrs.
(I) (WI) Application of microeconomic theory to topics in environmental and resource economics. Topics include analysis of pollution control, benefit/cost analysis in decision-making and the associated problems of measuring benefits and costs, non-renewable resource extraction, measures of resource scarcity, renewable resource management, environmental justice, sustainability, and the analysis of environmental regulations and resource policies. Prerequisite: EBGN201. 3 hours lecture; 3 semester hours.

EBGN315. THE ECONOMICS OF STRATEGY. 3.0 Semester Hrs.
An introduction to game theory and industrial organization (IO) principles at a practical and applied level. Topics include economies of scale and scope, the economics of the make-versus-buy decision, market structure and entry, dynamic pricing rivalry, strategic positioning, and the economics of organizational design. Prerequisite: EBGN201.

EBGN320. ECONOMICS AND TECHNOLOGY. 3.0 Semester Hrs.
(II) The theoretical, empirical and policy aspects of the economics of technology and technological change. Topics include the economics of research and development, inventions and patenting, the Internet, e-commerce, and incentives for efficient implementation of technology. Prerequisite: EBGN201. 3 hours lecture; 3 semester hours.

EBGN321. ENGINEERING ECONOMICS. 3.0 Semester Hrs.
Equivalent with CHEN421,
Time value of money concepts of present worth, future worth, annual worth, rate of return and break-even analysis applied to after-tax economic analysis of mineral, petroleum and general investments. Related topics on proper handling of (1) inflation and escalation, (2) leverage (borrowed money), (3) risk adjustment of analysis using expected value concepts, (4) mutually exclusive alternative analysis and service producing alternatives.

EBGN330. ENERGY ECONOMICS. 3.0 Semester Hrs.
Equivalent with ENGY330,
Study of economic theories of optimal resource extraction, market power, market failure, regulation, deregulation, technological change and resource scarcity. Economic tools used to analyze OPEC, energy mergers, natural gas price controls and deregulation, electric utility restructuring, energy taxes, environmental impacts of energy use, government R&D programs, and other energy topics. Prerequisite: EBGN201.

EBGN340. ENERGY AND ENVIRONMENTAL POLICY. 3.0 Semester Hrs.
This course considers the intersection of energy and environmental policy from an economic perspective. Policy issues addressed include climate change, renewable resources, externalities of energy use, transportation, and economic development and sustainability. Prerequisites: EBGN201. 3 hours lecture; 3 semester hours.

EBGN345. PRINCIPLES OF CORPORATE FINANCE. 3.0 Semester Hrs.
(II) Introduction to corporate finance, financial management, and financial markets. Time value of money and discounted cash flow valuation, risk and returns, interest rates, bond and stock valuation, capital budgeting and financing decisions. Introduction to financial engineering and financial risk management, derivatives, and hedging with derivatives. Prerequisite: EBGN201. 3 hours lecture; 3 semester hours.

EBGN346. INTRODUCTION TO INVESTMENTS. 3.0 Semester Hrs.
This course is an introduction to the principles of investment in competitive financial markets. The course will provide an overview to: 1) the structure of capital markets, 2) theories and practice of portfolio construction and management, 3) asset pricing theories used to analyze securities, 4) equity and debt securities, and 4) derivative instruments. 3 hours lecture; 3 semester hours. Prerequisite: EBGN201.

EBGN351. INTRODUCTION TO DECISION SCIENCE. 3.0 Semester Hrs.
This course focuses on how to unwind complex situations to gain clarity, model uncertainty, and enable confident decision making. Students will learn how to frame the problem correctly, ensure clarity around the objectives, develop creative alternative strategies, and qualitatively or quantitatively evaluate those alternatives. Several tools for accomplishing these goals will be introduced. Topics will include decision trees, common psychological biases and traps, scenario analysis, game theory, modeling techniques, and subject-matter-expert interviews. Students will learn to analyze and present model outputs and how to avoid common pitfalls.

EBGN360. INTRODUCTION TO ENTREPRENEURSHIP. 3.0 Semester Hrs.
This course introduces students to the entrepreneurial process, focusing on the concepts, practices, and tools of the entrepreneurial world. This will be accomplished through a combination of readings, cases, speakers, and projects designed to convey the unique environment of entrepreneurship and new ventures. The mastery of concepts covered in this course will lead to an initial evaluation of new venture ideas. In this course students will interact with entrepreneurs, participate in class discussion, and be active participants in the teaching/learning process. 3 hours lecture; 3 semester hours.

EBGN381. PREDICTIVE BUSINESS ANALYTICS. 3.0 Semester Hrs.
Predictive analytics employs mathematical modeling techniques, utilizing known data to generate predictions about unknown events. This course offers an introduction to predictive analytics. In this course, students will learn the core concepts of supervised and unsupervised learning approaches. The course also addresses performance metrics for evaluating the prediction models and introduces ensemble modeling to enhance the precision and robustness of predictive models.

EBGN382. PRESCRIPTIVE BUSINESS ANALYTICS. 3.0 Semester Hrs.
Prescriptive analytics strives to identify the best operational, tactical, and strategic decisions for organizations. In this course, students will learn the art of model building and will use linear, integer, and mixed-integer programming for a variety of business applications. Additionally, the course will provide an overview of specially structured models and model enhancement techniques. Prerequisite: EBGN280.

EBGN398. SPECIAL TOPICS IN ECONOMICS AND BUSINESS. 1-6 Semester Hr.
(I, II) Pilot course or special topics course. Topics chosen from special interests of instructor(s) and student(s). Usually the course is offered only once. Prerequisite: none. Variable credit; 1 to 6 credit hours. Repeatable for credit under different titles.

EBGN399. INDEPENDENT STUDY. 1-6 Semester Hr.
(I, II) Individual research or special problem projects supervised by a faculty member, also, when a student and instructor agree on a subject matter, content, and credit hours. Prerequisite: ?Independent Study? form must be completed and submitted to the Registrar. Variable credit; 1 to 6 credit hours. Repeatable for credit.

EBGN401. ADVANCED TOPICS IN ECONOMICS. 3.0 Semester Hrs.
(I) Application of economic theory to microeconomic and macroeconomic problems. This course will involve both theoretical and empirical modeling. Specific topics will vary by semester depending on faculty and student interest. Topics may include general equilibrium modeling, computational economics, game theory, the economics of information, intertemporal allocations, economic growth, microfoundations of macroeconomic models and policy simulation. Prerequisites: EBGN301, EBGN302 and EBGN303. 3 hours lecture; 3 semester hours.

EBGN403. ECONOMICS CAPSTONE. 1-4 Semester Hr.
Equivalent with EBGN402,
This is the capstone course for the economics major. Students will apply the tools they learned throughout the program to (1) conduct original economics research or (2) conduct an economic analysis for a client. In addition to the project, the capstone course will provide students opportunities to interact with practitioners of economics and business as well as prepare a career plan. Prerequisite: EBGN301, EBGN302, EBGN303.

EBGN409. MATHEMATICAL ECONOMICS. 3.0 Semester Hrs.
Application of mathematical tools to economic problems. Coverage of mathematics needed to read published economic literature and to do graduate study in economics. Topics from differential and integral calculus, matrix algebra, differential equations, and dynamic programming. Applications are taken from mineral, energy, and environmental issues, requiring both analytical and computer solutions using programs such as GAMS and MATHEMATICA. Prerequisite: MATH213, EBGN301, EBGN302.

EBGN425. BUSINESS ANALYTICS. 3.0 Semester Hrs.
With the increasing availability of large volumes of raw business data, the process of converting it into meaningful insights has become critical for organizations to stay competitive. Driven by massive volumes of business data, business analytics has become instrumental in unveiling such managerial practices which guide the decision making process in companies at every operational stage. This course includes various descriptive, predictive and prescriptive business analytics strategies. It provides fundamental skills using quantitative tools to organize, process, and critically interpret business data, as well as key concepts in quantitative decision making to model and solve real-world problems. Prerequisite: EBGN201, MATH112.

EBGN430. ADVANCED ENERGY ECONOMICS. 3.0 Semester Hrs.
(I) (WI) Application of economic models to understand markets for oil, gas, coal, electricity, and renewable energy resources. Models, modeling techniques and applications include market structure, energy efficiency, demand-side management, energy policy and regulation. The emphasis in the course is on the development of appropriate models and their application to current issues in energy markets. Prerequisites: EBGN301, EBGN330. 3 hours lecture; 3 semester hours.

EBGN434. PROPERTY RIGHTS AND NATURAL RESOURCES. 3.0 Semester Hrs.
When choosing how to allocate our scarce resources, institutions serve as constraints at any given time. Over time, these institutions form and evolve when it appears profitable to do so. This course focuses on the North American story of resource use and draws on economics, law, and history to understand those processes and their implications. The course will provide a framework to understand why certain institutions were adopted and how they now shape our economic decisions today. Prerequisite: EBGN201.

EBGN435. ECONOMICS OF WATER RESOURCES. 3.0 Semester Hrs.
This course seeks to develop the underlying economic problems of water use and how policy impacts the allocation of water in our economy. Water is a critical input for a number of sectors; from our basic sustenance to agriculture production, from industrial processes to ecological services, and from mineral extraction to energy production. Meanwhile, the supply of water is highly variable across space and through time while pollutants can further diminish the useable extent, making the policies to allocate and manage the resource central to understanding how the resource is utilized. The course will survey topics across sectors and water sources while applying economic theory and empirical/policy analysis. Prerequisite: EBGN409 or MATH213.

EBGN437. REGIONAL ECONOMICS. 3.0 Semester Hrs.
(WI) Analysis of the spatial dimension of economies and economic decisions. Interregional capital and labor mobility. Location decisions of firms and households. Agglomeration economies. Models of regional economic growth. Measuring and forecasting economic impact and regional growth. Local and regional economic development policy. Urban and regional spatial structure. Emphasis on application of tools and techniques of regional analysis. Prerequisite: EBGN201.

EBGN441. INTERNATIONAL ECONOMICS. 3.0 Semester Hrs.
Theories and determinants of international trade, including static and dynamic comparative advantage and the gains from trade. The history of arguments for and against free trade. The political economy of trade policy in both developing and developed countries. Prerequisite: EBGN301.

EBGN443. PUBLIC ECONOMICS. 3.0 Semester Hrs.
This course covers public-sector economics, including the fundamental institutions and relationships between the government and private decision makers. It covers the fundamental generalequilibrium welfare theorems and their interaction with government policy instruments that affect efficiency and distribution. Normative topics include an intensive study of the causes and consequences of, and policy prescriptions for, market failure due to public goods, or other problems associated with externalities and income distribution. Positive analysis focuses on policy formation in the context of political- economy and public choice theories. Prerequisite: EBGN201.

EBGN444. INNOV8X. 3.0 Semester Hrs.
Innovate X introduces concepts and tools to accelerate the design, validation and adoption of innovations in support of creative problem solving. Using an entrepreneurial mindset, we learn how to identify and frame problems that beneficiaries and stakeholders face. We attempt to design and test practical solutions to those problems in collaboration with those who experience the problems. We apply beneficiary discovery, pretotyping, business model design (social, economic and environmental), constrained creativity, efficient experimentation, and rapid iteration. While resolving challenges involves technical solutions, an important aspect of this course is directly engaging beneficiaries and stakeholders in social contexts to develop solutions with strong impact potential. Innov8x is grounded in collaborative creativity theory at the intersection of organizational behavior (social psychology), design principles, entrepreneurship and innovation management.

EBGN453. PROJECT MANAGEMENT. 3.0 Semester Hrs.
Project management has evolved into a business process broadly used in organizations to accomplish goals and objectives through teams. This course covers the essential principles of traditional project management consistent with professional certification requirements (the Project Management Institute's PMP certification) as well as an introduction to current agile project management methodologies. The traditional project management phases of project initiation, planning, execution, monitoring and control, and project closure are covered including related scheduling, estimating, risk assessment and other analytical tools. Students will gain experience using Microsoft Project. Organizational structure and culture issues are analyzed to understand how they can impact project management success, and the concepts of project portfolios and project programs are applied from the organizational perspective. Agile project management methodologies are introduced, including adaptive and iterative processes, scrum, lean and other Agile tools and techniques. By the end of the course, students will understand how traditional and agile project differ.

EBGN455. LINEAR PROGRAMMING. 3.0 Semester Hrs.
This course addresses the formulation of linear programming models, examines linear programs in two dimensions, covers standard form and other basics essential to understanding the Simplex method, the Simplex method itself, duality theory, complementary slackness conditions, and sensitivity analysis. As time permits, multi-objective programming, an introduction to linear integer programming, and the interior point method are introduced. Applications of linear programming models discussed in this course include, but are not limited to, the areas of manufacturing, finance, energy, mining, transportation and logistics, and the military. Prerequisite: MATH332 or MATH348 or EBGN409.

EBGN459. SUPPLY CHAIN MANAGEMENT. 3.0 Semester Hrs.
As a quantitative managerial course, the course will explore how firms can better organize their operations so that they more effectively align their supply with the demand for their products and services. Supply Chain Management (SCM) is concerned with the efficient integration of suppliers, factories, warehouses and retail-stores (or other forms of distribution channels) so that products are provided to customers in the right quantity and at the right time. Topics include managing economies of scale for functional products, managing market- mediation costs for innovative products, make-to order versus make-to-stock systems, quick response strategies, risk pooling strategies, supply-chain contracts and revenue management. Additional "special topics" will also be introduced, such as reverse logistics issues in the supply-chain or contemporary operational and financial hedging strategies. Prerequisite: None.

EBGN460. BUSINESS MODEL DEVELOPMENT. 3.0 Semester Hrs.
(II) This course leads students through the process of developing and validating a business model for an innovative product or service by a start-up or an established organization. The creation of a business model can be challenging, frustrating, fascinating and fulfilling. Building on skills learned in EBGN360, students explore ways to sustain and scale a promising new product or service in any context: commercial/for-profit, social/non-profit or government. It is an iterative process that involves uncovering beneficiary needs and leads to an in-depth understanding of how value is delivered, differentiated and captured. Students work in teams since new ventures are started by teams with complementary skills and a shared purpose. This is a demanding, hands-on course that integrates knowledge from entrepreneurship, business, economics and engineering classes. Students are expected to initiate and drive an intense beneficiary discovery process that involves reaching out to beneficiaries and engaging them outside class. Prerequisite: EBGN360. 3 hours lecture; 3 semester hours.

EBGN461. STOCHASTIC MODELS IN MANAGEMENT SCIENCE. 3.0 Semester Hrs.
As a quantitative managerial course, the course is an introduction to the use of probability models for analyzing risks and economic decisions and doing performance analysis for dynamic systems. The difficulties of making decisions under uncertainty are familiar to everyone. We will learn models that help us quantitatively analyze uncertainty and how to use related software packages for managerial decision-making and to do optimization under uncertainty. Illustrative examples will be drawn from many fields including marketing, finance, production, logistics and distribution, energy and mining. The main focus of the course is to see methodologies that help to quantify the dynamic relationships of sequences of "random" events that evolve over time.

EBGN470. ENVIRONMENTAL ECONOMICS. 3.0 Semester Hrs.
(II) (WI) This course considers the role of markets as they relate to the environment. Topics discussed include environmental policy and economic incentives, market and non-market approaches to pollution regulation, property rights and the environment, the use of benefit/cost analysis in environmental policy decisions, and methods for measuring environmental and nonmarket values. Prerequisite: EBGN301. 3 hours lecture; 3 semester hours.

EBGN474. INVENTING, PATENTING AND LICENSING. 3.0 Semester Hrs.
(S) (WI) This course provides an introduction to the legal framework of inventing and patenting and addresses practical issues facing inventors. The course examines patent law, inventing and patenting in the corporate environment, patent infringement and litigation, licensing, and the economic impact of patents. Methods and resources for market evaluation, searching prior art, documentation and disclosure of invention, and preparing patent applications are presented. Prerequisite: None. 3 hours lecture; 3 semester hours.

EBGN485. BUSINESS STRATEGY. 3.0 Semester Hrs.
Business strategy is focused on formulating and implementing the major goals of the firm in relation to changing competitive environmental conditions, firm resources, and individuals' motives and values. This course is about the issues and challenges of running a firm in a competitive environment from the perspective of a senior manager. The challenge for senior managers goes well beyond applying an appropriate formula to a problem because to date there are not any universal formulas for successful companies. Rather, senior managers must be able to identify that a problem exists and then to bring resolution, despite partial information. This course requires identifying, analyzing, and solving firm problems with original thinking and execution. A key instructional objective of this course is to help you develop a rigorous approach for addressing complex business problems. Prerequisite: EBGN321 or EBGN345 or EBGN346.

EBGN490. ANALYTICS. 3.0 Semester Hrs.
The business analytics capstone course provides an opportunity for students to integrate and apply the skills and tools learned in previous business analytics courses to define, formulate, analyze, and recommend a solution for a significant, real-world business problem. Students will work as a team, and will draw on the breadth and depth of the curriculum to address an industry supplied problem.

EBGN495. ECONOMIC FORECASTING. 3.0 Semester Hrs.
An introduction to the methods employed in business and econometric forecasting. Topics include time series modeling, Box- Jenkins models, vector autoregression, cointegration, exponential smoothing and seasonal adjustments. Covers data collection methods, graphing, model building, model interpretation, and presentation of results. Topics include demand and sales forecasting, the use of anticipations data, leading indicators and scenario analysis, business cycle forecasting, GNP, stock market prices and commodity market prices. Includes discussion of links between economic forecasting and government policy. Prerequisite: EBGN301, EBGN302, EBGN303.

EBGN496. PAYNE SCHOLARS PROGRAM. 1.0 Semester Hr.
The Payne Scholars program is a one-credit, independent study course that helps students perform research, collaborate across campus, and engage with a broad network of international experts on global policy challenges. Students are taught how to write academic papers on the important issues we are facing today, and once the students finish the course, the papers they write can be published as Payne Commentaries on our website. Payne Scholars will participate in the Payne Institutes guest lecture series, discuss developing policy trends and concerns, and write on the evolving public policy landscape. As a part of School of Mines, the Payne Institute for Public Policy is dedicated to fostering the essential relationship between technical knowledge and public policy. Mines graduates often go on to become corporate leaders and are responsible for many of the innovations and changes seen across industries. In much the same way, the research done at Mines has far reaching implications for many of the social, economic, and environmental challenges faced around the world.

EBGN498. SPECIAL TOPICS IN ECONOMICS AND BUSINESS. 0.5-6 Semester Hr.
(I, II) Pilot course or special topics course. Topics chosen from special interests of instructor(s) and student(s). Usually the course is offered only once. Prerequisite: none. Variable credit; 1 to 6 credit hours. Repeatable for credit under different titles.

EBGN499. INDEPENDENT STUDY. 1-6 Semester Hr.
(I, II) Individual research or special problem projects supervised by a faculty member, also, when a student and instructor agree on a subject matter, content, and credit hours. Prerequisite: ?Independent Study? form must be completed and submitted to the Registrar. Variable credit; 1 to 6 credit hours. Repeatable for credit.

Professor

Jared Carbone

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