Business Analytics Courses (BAIS)

BAIS Courses

This is a list of courses with the subject code BAIS. For more information, see Business Analytics (Tippie College of Business) in the catalog.

BAIS:1300 First-Year Seminar   **1 s.h.**
Small discussion class taught by a faculty member; topics chosen by instructor; may include outside activities (e.g., films, lectures, performances, readings, visits to research facilities).

BAIS:1500 Business Computing Essentials   **2 s.h.**
Basic proficiency with common business application software (word processing, spreadsheet, presentation software, database); simulation training to achieve requisite skills; additional support available via optional textbook or ebook; online, modular, self-taught course.

BAIS:2800 Foundations of Business Analytics   **3 s.h.**
Introduction to business decision-making using data; students transform data into insight using visualization and statistics; introduction to Excel as a tool for business analytics. Prerequisites: (STAT:1030 or STAT:2010 or STAT:3100 or STAT:3101 or STAT:3120 or STAT:3510 with a minimum grade of B or STAT:4100 or BIOS:4120 or PSQF:4143 with a minimum grade of B) and (MATH:1350 or MATH:1380 or MATH:1460 or MATH:1550 or MATH:1850 or MATH:1860) and (BAIS:1500 or CS:1020 or CS:1110 or CS:1210 or CS:2110 or ENGR:1300 or ENGR:2730).

BAIS:3000 Operations Management   **2-3 s.h.**
Strategic, tactical, operational issues that arise in management of production and service operations; product and process design, facilities planning, quality management, materials management, operations planning and scheduling, emerging technologies in production and service management. Prerequisites: STAT:2010 or STAT:3120 or STAT:3101 or STAT:2020 with a minimum grade of B or STAT:3510 with a minimum grade of B or BIOS:4120 or STAT:3100 or PSQF:4143 with a minimum grade of B or STAT:1030 or STAT:4100.

BAIS:3005 Information Systems   **2 s.h.**
Application of computing principles to solving business problems; information technology in modern organizations; focus on sound data analysis to support decision-making; tools used for problem solving (i.e., databases, Python); role of information systems in organizations; components of information technology; internet and network economy; basic data analysis and visualization; emerging technologies. Prerequisites: BAIS:1500 or CS:1020.

BAIS:3020 Computational Thinking   **3 s.h.**
Introduction to algorithmic problem-solving logic with Python; use of data structures and programming constructs to manipulate data and solve business problems. Prerequisites: BAIS:3005 or CS:2110.

BAIS:3025 Business Process Automation   **3 s.h.**
Explore the essential skills of mapping and measuring business processes and uncovering opportunities for improvement. Through practical exercises and case studies, gain proficiency in process mining, utilizing data to analyze and optimize business processes. Learn the fundamentals of robotic process automation, discovering how automation technologies can streamline and enhance organizational efficiency. Students gain a comprehensive understanding of process analysis and automation, enabling them to drive innovation and operational excellence in diverse business environments. Prerequisites: BAIS:3005 or CS:2110.

BAIS:3050 Business Analytics and Information Systems Professional Preparation   **1 s.h.**
Information on career opportunities in the fields of business analytics and information systems (BAIS); introduction to the many career avenues available to a BAIS major and how to position oneself for success in those careers.

BAIS:3070 Business Analytics and Information Systems Topics   **arr.**
Special topics in business analytics and information systems.

BAIS:3100 Accounting Systems and Analytics   **3 s.h.**
Application of computer technology and internal controls to accounting and transaction processing systems; auditing of information systems; information systems infrastructure and trends; problem solving with Python and databases; accounting cycle operations. Prerequisites: ACCT:2200 and ACCT:2100 and (BAIS:3005 or CS:2110). Same as ACCT:3600.

BAIS:3140 Information Visualization   **3 s.h.**
Instruments for reasoning about quantitative information; analyzing and communicating statistical information; main typologies of data graphics (data-maps, time-series, space-time narrative, relational diagrams, graphs and methods for dimensionality reduction); language for discussing data visualizations combined with knowledge of human perception of visual objects; how to visualize information effectively by using statistical methods, knowledge of human perception, and basics of data graphics. Prerequisites: BAIS:2800 and BAIS:3005.

BAIS:3150 Emerging Technology Driving Business Innovation   **3 s.h.**
Emerging technologies (i.e., blockchain, Web 3.0, virtual reality, artificial intelligence, etc.) are at the forefront of driving business innovation; students learn from businesses actively using them and identify potential use cases for the technology.

BAIS:3200 Database Management   **3 s.h.**
Design, implementation, and use of relational database systems; emphasis on conceptual, logical, and physical data modeling; hands-on skill development with Structured Query Language (SQL). Prerequisites: BAIS:3005 or CS:1210 or CS:2110 or CS:2230 or CS:3330 or ENGR:2730.

BAIS:3250 Data Wrangling   **3 s.h.**
Use of R programming to collect, process, and manipulate data; application of methods for descriptive and visual analytics to derive insights that can aid business decision-making. Prerequisites: (BAIS:2800 or STAT:2020 with a minimum grade of B or STAT:4101 or ECON:4800) and BAIS:3020 and BAIS:3200.

BAIS:3300 Digital Product Management   **3 s.h.**
Utilization of Agile project management to manage digital projects; many companies want employees who have experience managing technical projects; students experience each role on a project team as they prioritize backlogs, gather requirements, and deliver features that add value for their customer. Prerequisites: BAIS:3020 and BAIS:3200.

BAIS:3400 Cloud Computing   **3 s.h.**
Introduction to cloud providers (i.e., Amazon Web Services, Microsoft Azure) and the underlying technology to provide reliable, secure transmission of data between client and cloud provider; hands-on experience configuring compute, storage, database, application, and networking services to provide cost-effective solutions to solve businesses' everyday problems. Prerequisites: BAIS:3005 or CS:2110 or CS:1210.

BAIS:3500 Data Mining   **3 s.h.**
Introduction to predictive analytics methods motivated by problems in operations, marketing, finance, and health care; data mining techniques including classification, regression, and clustering. Prerequisites: (BAIS:2800 or STAT:2020 with a minimum grade of B or STAT:4101 or ECON:4800) and BAIS:3020 and BAIS:3200.

BAIS:3600 Data Engineering   3 s.h.
Students Identify metrics to measure business initiatives, and identify and manipulate data artifacts necessary to track and measure success of those metrics; topics include ingesting streaming and batch data, creating data pipelines, warehousing appropriate data, and using software to create dashboards to visualize data. Prerequisites: BAIS:3020 and BAIS:3200.

BAIS:3800 Optimization and Simulation Modeling   3 s.h.
Students utilize data and apply logic to construct optimization models to guide business decisions in operations, finance, accounting, marketing, economics, and human resources; leverage data to model uncertainty and construct Monte Carlo simulation models to quantify risk and assess different strategies. Prerequisites: BAIS:2800 or STAT:4101 or ECON:4800 or STAT:2020 with a minimum grade of B.

BAIS:4050 Directed Readings   arr.

BAIS:4150 Business Analytics and Information Systems Capstone   3 s.h.
Relevant analytics project experience which facilitates a real professional engagement utilizing Tippie College Business analytics curriculum and delivering value to project sponsors; outcomes include client presentation, steps to recreate analysis, and project report. Prerequisites: BAIS:3250 and BAIS:3500 and ACCT:2200 and BUS:3000.

BAIS:4220 Advanced Database Management and Big Data   3 s.h.
Advanced database management topics; basics of semi-structured data and web services; how to retrieve real-world big data sets from web services; use of SQL and PL/SQL to analyze data in relational databases; big data related topics such as Hadoop and Hive. Prerequisites: BAIS:3200.

BAIS:4280 Cybersecurity   3 s.h.
High-level view of computer security and fostering a cybersecurity mindset which is in demand across all industries; frequent change of perspective from employee to CEO, casual home user, and hacker; broad range of topics; actionable items to make daily digital interactions more secure. Prerequisites: BAIS:3005 or CS:1210 or CS:2110 or CS:2230 or CS:3330 or ENGR:2730. Same as ACCT:4280.

BAIS:4540 Statistical Learning   3 s.h.
Introduction to supervised and unsupervised statistical learning, with a focus on regression, classification, and clustering; methods will be applied to real data using appropriate software; supervised learning topics include linear and nonlinear (e.g., logistic) regression, linear discriminant analysis, cross-validation, bootstrapping, model selection, and regularization methods (e.g., ridge and lasso); generalized additive and spline models, tree-based methods, random forests and boosting, and support-vector machines; unsupervised learning topics include principal components and clustering. Requirements: an introductory statistics course and a regression course. Recommendations: prior exposure to programming and/or software, such as R, SAS, and Matlab. Same as DATA:4540, IGPI:4540, STAT:4540.

BAIS:4999 Honors Thesis in Business Analytics   arr.
Independent student project directed by faculty or staff advisor; culminates in thesis that conforms to University of Iowa Honors Program guidelines; may include empirical research, library research, applied projects.

BAIS:6040 Data Programming in Python   3 s.h.
Introduction to principles and practices of handling, cleaning, processing, and visualizing data using the Python programming language; basic data programming skills that can be applied to software development in any high-level programming language; data types, control structures, functions and modules, and other useful libraries for data manipulation and machine learning applications in Python.

BAIS:6050 Data Management and Visual Analytics   3 s.h.
Understanding how data is stored in databases and learning the tools used to access the data is key to creating data sets used to answer many business questions; how to manage and access data in relational databases using Structured Query Language (SQL); basic principles of visual analytics using Tableau; techniques for presenting data retrieved from databases.

BAIS:6060 Data Analysis with R   3 s.h.
Students practice the steps of handling, cleaning, processing, visualizing, and drawing conclusions from data using R programming language; introduction to additional programming techniques and topics in machine learning; real-world group project; prior programming experience not required.

BAIS:6070 Data Science   3 s.h.
Underlying concepts and practical computational skills of data-mining tools including penalty-based variable selection (LASSO), logistic regression, regression and classification trees, clustering methods, principal components and partial least squares; analysis of text and network data; theory behind most useful data mining tools and how to use these tools in real-world situations; software for analysis, exploration, and simplification of large high-dimensional data sets. Prerequisites: MBA:8150 or BAIS:9100.

BAIS:6100 Text Analytics   3 s.h.
Concepts and techniques of text mining; practice of using statistical tools to automatically extract meaning and patterns from collections of text documents; topics include document representation, text classification and clustering, sentiment analysis and topic modeling. Prerequisites: BAIS:6040. Corequisites: BAIS:6070. Recommendations: prior or concurrent enrollment in data science course for part-time MS in business analytics program students is encouraged.

BAIS:6105 Social Analytics   3 s.h.
Exploration of collection, management, and analysis of social data (interactions among actors); actors as individuals, organizations, or other collectives; sources for social data including social media, websites, annual reports, press releases, articles, and other traditional media. Prerequisites: BAIS:6040.

BAIS:6110 Big Data Management and Analytics   3 s.h.
Introduction to advanced techniques for managing and analyzing big data using R programming language; non-relational data models, such as semi-structured (XML) and unstructured (key-value) data; state-of-the-art big data tools for non-relational data management, such as NoSQL databases and distributed databases (Hadoop); query languages such as Hive); design and implementation of data analysis methods on these platforms; students use introduced tools to implement analysis tasks on big data sets through exercises and course projects. Prerequisites: BAIS:6050 and BAIS:6040.

BAIS:6120 Analytics Experience   3 s.h.
Students work in groups to complete semester-long projects pertaining to business analytics; all project stages are addressed including problem definition, data cleaning, analysis, and final presentation; appropriate tools from required courses used throughout. Prerequisites: BAIS:9100 and BAIS:6050 and BAIS:9110 and BAIS:6040 and BAIS:6070. Requirements: all CER courses and at least one master's course.

BAIS:6130 Applied Optimization   **3 s.h.**
Use of optimization (also called prescriptive analytics or mathematical programming) to make tactical and strategic decisions; advanced optimization skills including data collection and preparation, logical modeling, and solution interpretation and implementation within a software environment; applications in the various functional areas of business are discussed throughout. Prerequisites: (BAIS:9100 or MBA:8150) and BAIS:6040.

BAIS:6140 Information Visualization   **3 s.h.**
Exposure to problems and challenges of effectively interpreting and communicating the pervasive data that surround us; students cover the area of information visualization, grounded in theoretical foundations of visual perception, cognition, information design, human-computer interaction, and analysis of quantitative, unstructured, and relational data; lecture/seminar format with discussion of assigned readings, critiquing visualization examples, hands-on experience with a commercial information visualization application, and exploration of select open-source information visualization tools and toolkits.

BAIS:6150 Financial Analytics   **3 s.h.**
Businesses as well as investors are affected by fluctuating treasury bond rates, equity prices, and foreign exchange rates, and the risk must be measured; students focus on gaining knowledge of the classic financial models and statistical and risk metrics and scaling them up with analytics techniques (sorting with thresholds, portfolio optimization, decision trees, and database programming) to find the best investments based on historical data sets; beginning with descriptive analytics and pushing into predictive and prescriptive analytics, students build a software simulation laboratory using R. Prerequisites: (BAIS:9100 or MBA:8150) and BAIS:6040.

BAIS:6160 Big Data Analytics   **3 s.h.**
Principles of data mining and machine learning in the context of big data; basic data mining principles and methods (pattern discovery, clustering and ordering); analysis of different types of data (sets and sequences); machine learning topics including supervised and unsupervised learning, tuning model complexity, dimensionality reduction, nonparametric methods, comparing and combining algorithms, and applications of these methods; development of analytical techniques to cope with challenging and real big data problems; introduction to graphics processing unit (GPU) computing tools. Prerequisites: (BAIS:9100 or MBA:8150) and BAIS:6060.

BAIS:6170 Directed Readings - Graduate Business Analytics   arr.
Project and/or research with a faculty member as part of the graduate business analytics program. Requirements: enrollment in graduate business analytics program.

BAIS:6180 Healthcare Analytics   **3 s.h.**
Clinical data management is essential for evaluating evidence-based practice/performance-improvement projects; a high quality data management plan provides key stakeholders with information necessary to make decisions; plan components include identified processes and outcomes linked to variables and data sources, adequate statistical power, data cleaning and manipulation techniques, statistical methods, and meaningful presentation of variables that address stakeholder concerns and questions; students gain knowledge and skills necessary to develop and execute a data management plan within a final project. Prerequisites: (BAIS:9100 or MBA:8150) and BAIS:6050.

BAIS:6190 Forecasting   **3 s.h.**
Forecasting plays a central role in business decision-making, and accurate forecasts are needed when making decisions about investments, resource allocations, schedules, and inventory levels; quantitative forecasting tools; extrapolation of time series data (e.g., daily, weekly, monthly sales); exponential smoothing methods: time series extrapolations from autoregressive and autoregressive integrated moving average (ARIMA) Box-Jenkins models; regression models that predict a variable of interest from its own history as well as any other available information (e.g., sales promotions, price reductions); methods for assessing performance of forecasting methods. Prerequisites: MBA:8150 or BAIS:9100.

BAIS:6210 Data Leadership and Management   **3 s.h.**
Core chief information officer (CIO) basics; focus on how to keep technology, systems, and procedures supporting business goal outcomes including management of information technology (IT)) teams, systems selection, vendor negotiation, change, information risk, data integrity, ethics, information system (IS) policies, strategies, cloud computing, and budget.

BAIS:6220 Business Analytics Certification Workshop   0-3 s.h.
Preparation for one or more industry certifications in the field of business analytics; certification varies based on timing of course and current trends in business analytics; several options include certifications related to programming languages (e.g., Python, R, SQL), analytics tools (e.g., Tableau, PowerBI), or general professional skills certifications (e.g., Associate Certified Analytics Professional, Certified Associate in Project Management).

BAIS:6230 People Analytics   **3 s.h.**
Developing, interpreting, and making decisions related to knowledge of human behavior, performance characteristics, and tendencies for organizational success and competitive advantage; data driven frameworks, strategies, and methods for job assignment, scheduling, skill acquisition, staffing, and cross training.

BAIS:6280 Cybersecurity   **3 s.h.**
High-level view of computer security and fostering a cybersecurity mindset which is in demand across all industries; frequent change of perspective from employee to CEO, casual home user, and hacker; broad range of topics; actionable items to make daily digital interactions more secure.

BAIS:6300 Dynamic Programming   **3 s.h.**
Fundamentals of discrete sequential dynamic programming with special focus on situations in which outcomes are uncertain; formulation and analysis of deterministic and stochastic dynamic programs under several objective criteria; emphasis on rapidly expanding field of approximate dynamic programming; applications including inventory control, vehicle routing, and resource allocation.

BAIS:6400 Cloud Computing   **3 s.h.**
Introduction to cloud providers (i.e., Amazon Web Services, Microsoft Azure) and underlying technology to provide reliable, secure transmission of data between client and cloud provider; hands-on experience configuring compute, storage, database, application, and networking services to provide cost-effective solutions to solve businesses' everyday problems.

BAIS:6420 Advanced Database Management and Big Data   3 s.h.
Advanced database management topics; basics of semi-structured data and web services; how to retrieve real-world big data sets from web services; use of SQL and PL/SQL to analyze data in relational databases; big data related topics (e.g., Hadoop, Hive). Same as IGPI:6420.

BAIS:6480 Knowledge Discovery   **3 s.h.**
Knowledge discovery process including data reduction, cleansing, and transformation; advanced modeling techniques from classification, prediction, clustering, and association; evaluation and integration. Same as IGPI:6480.

BAIS:6500 Social Network Analytics: Models and Algorithms   **3 s.h.**
Preparation for future research in computational network analysis; introduction to methodology for analyzing various types of complex networks including social networks, information networks, and business networks; basic concepts of networks, models for network structures and dynamics, computational algorithms for analyzing networks; hands-on experience with analyzing real-world networks using third-party software or programming APIs.

BAIS:6600 Linear Programming   **3 s.h.**
Mathematical programming models; linear and integer programming, transportation models, large-scale linear programming, network flow models, convex separable programming. Requirements: calculus and linear algebra. Same as IGPI:6600, ISE:6600.

BAIS:6700 Discrete Optimization   **3 s.h.**
Introduction to modeling and solving discrete optimization problems; integer programming, network flows, dynamic programming. Prerequisites: BAIS:6600. Same as IGPI:6700.

BAIS:6900 Heuristic Search   **3 s.h.**
Design of heuristic search algorithms to find good (near-optimal) solutions to difficult (NP-hard) optimization problems that occur in many disciplines; basic heuristic concepts (local search, greedy search, problem decomposition) which serve as fundamental constructs for metaheuristics, including simulated annealing, genetic algorithms, tabu search, variable neighborhood search; introduction to various optimization problems and survey of various heuristic approaches; underlying theoretical structure of several heuristic methods; how to implement a heuristic algorithm.

BAIS:6999 Graduation Registration Requirement   **1 s.h.**
Requirements: professional business analytics MS degree candidate in final semester and all mandatory courses completed.

BAIS:7000 Business Analytics Topics   **3 s.h.**
Same as IGPI:7000.

BAIS:7500 Statistical Machine Learning   **3 s.h.**
Regularization methods for sparse models, computational algorithms for large scale problems, statistical inference in high-dimensional models, reproducing kernel Hilbert space, supervised learning, nonparametric density and conditional density estimation, neural networks and deep learning, optimal transport and generative learning, dimension reduction and representation learning. Prerequisites: STAT:5100 or STAT:5200. Same as STAT:7500.

BAIS:7900 Special Topics in Business Analytics   **arr.**

BAIS:7925 Machine Learning and Causal Inference   **3 s.h.**
Exploration of methods and research at intersections of machine learning and causal inference; examination of intersections related to regression and classification, regularization, treatment effects, counterfactuals, text analytics, dimensionality reduction, and causal trees.

BAIS:7950 Directed Readings   **arr.**

BAIS:7975 Thesis in Business Analytics   **arr.**
Requirements: PhD enrollment.

BAIS:8130 Business Communication   **1-3 s.h.**
Effective communication to become a successful business professional and leader; strengthen ability to speak and write confidently, competently, and effectively regardless of venue; varied team and individual presentation coaching, applied exercises. Requirements: admission to MS in business analytics (career) program.

BAIS:9010 Contemporary Topics in Analytics   **1-3 s.h.**
Content from cutting edge topics in business analytics, operations, and project management; topics vary.

BAIS:9100 Data and Decisions   **3 s.h.**
Introduction to business analytics; utilizing Excel to apply descriptive and predictive analytical tools to solve practical business problems using real world data; dealing with uncertainty in decision-making; formal probability concepts and statistical methods for describing variability (decision trees, random variables, hypothesis testing); application of techniques (linear regression, Monte Carlo simulation, linear optimization) to model, explain, and predict for operational, tactical, and strategic decisions.

BAIS:9110 Advanced Analytics   **2-3 s.h.**
Development of data-driven, problem-solving skills for prediction of uncertain outcomes and prescription of business solutions; linear and nonlinear regression, Monte Carlo simulation, forecasting, data mining, and optimization utilizing spreadsheets and dedicated software packages. Prerequisites: MBA:8150 or BAIS:9100.

BAIS:9120 Managing the Supply Chain   **2-3 s.h.**
Design, operation, and management of a supply chain; supplier and customer partnerships, supply base management, transportation and logistics, supply chain innovation, supply chain sustainability; supply chain risk management and performance metrics. Prerequisites: MBA:8240.

BAIS:9130 Lean Process Improvement   **3 s.h.**
Design, management, and improvement of business processes which form the basis of every organization, ranging from manufacturing facilities to service providers and from for-profits to nonprofits; students learn the principles of lean thinking and continuous improvement through a series of hands-on exercises; team-based, data-driven approach on how to map a value stream, identify waste, analyze root causes, and brainstorm countermeasures for a variety of different processes. Recommendations: MBA:8240.

BAIS:9140 Agile Project Management   **3 s.h.**
Students prepare to create or participate in a successful agile work environment; learn various agile methods (e.g., scrum, lean, Kanban, XP); understand and apply tools, techniques, and approaches in an agile setting; and how to apply advanced agile topics (e.g., story mapping, advanced planning and estimating, scaling methods).

BAIS:9160 Supply Chain Analytics   **2-3 s.h.**
Supply chain analytics applications for decision-making including demand forecasting, inventory management, capacity planning, and supply chain coordination. Prerequisites: MBA:8150 or BAIS:9100.

BAIS:9210 Introduction to Modeling with VBA   **2-3 s.h.**
Introduction to programming Visual Basic for Applications in Excel; case studies in finance, marketing, operations, accounting.

BAIS:9220 Introduction to Information Systems   **3 s.h.**
Effective ways for business firms to harness the power of information technology for strategic purposes; conventional and emerging architectures of information systems; integrated perspective on structural relationships among IT components; emphasis on case studies.

BAIS:9300 Innovations in Technology   **2-3 s.h.**
Current innovations in technology; examination of virtual reality including basics, hardware and history, applications, psychology; focus on experiencing prebuilt environments to develop an understanding of how virtual reality can be used in different industries rather than on building virtual reality environments; technical background not required.

**BAIS:9400 Professional Development and Business
Acumen**   **0-3 s.h.**
Professional development and business acumen in preparation for
a postgraduate career; students explore how to grow a professional
network, examine how to build depth of knowledge and breadth
of business acumen, gain knowledge from industry professionals
on current trends and activities in business analytics, and receive
guidance and best practices on career management fundamentals as
well as specific recommendations for business analytics students;
exposure to relevant information important to student's major that does
not clearly fit into academic coursework. Requirements: admission
to MS in business analytics (career) program.