Proposal for an Undergraduate Major in Business Analytics

1. **Name of the academic program and the department or unit that will administer the program.**

   Name: Business Analytics Undergraduate Major
   Administration: The Business Analytics major will be administered by the School of Business, which is one department.

2. **A thorough justification, including the motivation for the creation of the program in terms of student interest and professional or academic importance.**

   Business Analytics (BA) describes the process of using quantitative methods and techniques to extract value from data to improve business decision-making and enhance business performance. More data and more types of data than ever are now available to businesses, resulting in several types of business analytics techniques requiring in-depth learning: those that describe the past or current situation of a business (descriptive analytics); those that seek to understand reasons for past or current business performance (diagnostic analytics); those that predict figures and results (predictive analytics); and those that recommend specific solutions for business to enhance growth (prescriptive analytics). The ubiquity of data and the increasing need by for-profit and not-for-profit organizations for analysts is also why business analytics is a fast-growing field. In 2020, LinkedIn listed business analysis as one of the skills companies need most, and the Bureau of Labor Statistics projects business analytics jobs to grow by up to 25% through 2031—a rate much faster than the average for all occupations (which is 8%). Such high demand and job growth translate into high salaries: business analysts with a bachelor’s degree in California earn an average of $93,431 as a base salary per year, according to data from Indeed.com, which in February 2024 also showed 228 Business Analyst jobs available within 35 miles of Riverside. Business Analytics is also an important part of Supply Chain Management, positioning our graduates well for employment in the Inland Empire.

   To help meet the demand for Business Analysts, many business schools have started offering a Business Analytics major or concentration. An examination of our aspirant business schools (i.e., those within 50 ranks above UCR’s School of Business on the UT Dallas list of business schools) showed that of those who have Business Analytics programs, 64% offer a Business Analytics major, while 36% offer a concentration in Business Analytics as part of a general Business Administration major. In addition, several business schools in the local area (Chapman University; California State University, San Bernadino) offer a Business Analytics major, as does California State University, Northridge.

   The School of Business will seek a STEM certification for the BS in Business Analytics, increasing the attractiveness of the major to potential students. STEM certified programs are essential for producing professionals for fields that help increase economic growth and global competitiveness, and the Bureau of Labor Statistics has classified STEM careers as having the greatest growth potential and highest paying jobs for the 21st century. STEM certification will also help recruit more international students to UCR and the School of Business, since students graduating from a STEM-designated degree program are eligible to work for three years in the US and gain valuable workplace experience.
3. **Relationship of the new program to existing programs.**

The School of Business currently offers a Business Analytics concentration as one of its seven concentrations in the BS in Business Administration (BSAD) major. The objective of the BSAD major with a concentration in Business Analytics is to provide students with a strong knowledge base across all of the fundamental disciplines in business. As such, the curriculum for the Business Analytics concentration is strongly focused on breadth rather than depth, and shares all courses with the other concentrations in the BSAD major (Accounting and Auditing; Finance; Information Systems; Management; Marketing; Operations and Supply Chain Management) except for six courses uniquely required for the Business Analytics concentration. Given the large overlap in courses among the different BSAD concentrations, the Business Analytics concentration will remain attractive not only for students who seek breadth in their business education, but also for students seeking to have a double-concentration, which would only require them to take 4 additional courses and their two Business electives in the second concentration area. The Business Analytics major will be far more quantitatively oriented than the Business Analytics concentration, and its breadth requirement courses will follow the School of Business curriculum. Given its strong technical and quantitative focus, the BS in Business Analytics major will also seek STEM certification, which the BSAD Business Analytics concentration does not have.

Furthermore, UCR offers an intercollegiate Data Science undergraduate major, which is housed in the Department of Computer Science and Engineering (BCOE) and in the Department of Statistics (CNAS). Each of the two colleges offers the degree, with students choosing from which college they wish to have their degree awarded. In contrast to the proposed curriculum for the BS in Business Analytics, the curriculum for the BS in Data Science is heavily focused on courses from statistics and computer science, with data science – in contrast to business analytics – widely relying on coding. As part of the Data Science major requirements, students complete 37 units of lower-division coursework, 60 units of upper-division coursework, and just 8 units of major breadth requirements that includes three sequences of courses offered by the School of Business (BUS 103 & BUS 115; BUS 103 & BUS 119; BUS 105 & BUS 129). Given the lack of focus on business applications of the BS in Data Science major, the BS in Business Analytics major is not expected to have a significant impact on enrollment in the Decision Science major. Indeed, even though the Data Science major is only in its second year, just 8 out of 301 students enrolled in the major have taken a course in one of the three business course sequences as of Spring 2023.

If students discovered that they do not have the quantitative training to succeed in the BS in Business Analytics major, they would be advised to switch to the BSAD major either with a Business Analytics concentration, with an Operations and Supply Chain Management concentration, or with a Finance concentration after their second year in the program. They might also switch to the Bachelor of Arts in Economics / Administrative Studies major in the College of Humanities, Arts, and Social Sciences.
4. **The proposed curriculum.** Great care should be given in this area, correct rubrics should be listed for courses, all cross listings should be listed, unit total considerations should be taken into account and totals should be verified by program staff, faculty, and appropriate Executive Committee personnel. A copy of the proposed program change should be provided for inclusion in the Catalog.

**Breadth requirements (56 units plus English Composition):**
The program involves completion of School of Business breadth requirements: Humanities (12 units), Social Sciences (8 units), Ethnicity (4 units), Natural Sciences and Mathematics (20 units), an additional 12 units from Humanities, Social Sciences, or Natural Sciences and Mathematics, plus English composition. We expect these requirements to provide students with a broad, liberal education of an R1 university.

**Business Analytics major preparation requirements (5 courses, 20 units):**
The program involves completion of ECON 003, STAT 008 or STAT 010 or ECON 101, and MATH 009A plus MATH 009B plus MATH 009C.

**Lower-division Business Analytics major requirements (5 courses, 18 units):**
The program involves completion of BUS 010, BUS 020, BUS 098, CS 009A, CS 009B.

**Core courses Business Analytics major requirements (12 courses, 48 units):**
The program involves completion of BUS 100W, BUS 101, BUS 102, BUS 103, BUS 104, BUS 105, BUS 106, BUS 107, BUS 109, STAT 160A, STAT 160B, STAT 160C. Completion of the breadth, major preparation, and lower-division major requirements satisfies all pre-requisites for the Business Analytics core courses major requirements.

**Upper-division Business Analytics major requirements (11 courses, 42 units):**
The program involves completion of BUS 110, BUS 115, BUS 119, BUS 123, BUS 124A, BUS 124B, BUS 125, BUS 129, BUS 130, BUS 173, BUS 198i. Completion of the breadth, major preparation, lower-division, and core courses major requirements satisfies all pre-requisites for the Business Analytics upper-division major requirements.

The required courses are included in Appendix A. Course descriptions are included in Appendix B. Catalog copy is included in Appendix C.
5. A list of faculty who will be involved in the program, including those teaching, advising, and administering.

Below is the current list of faculty members of the School of Business who would teach in the program:

**Professors:**
- Subramanian Balachander (marketing area coordinator)
- Peter Chung (finance area coordinator)
- Mohsen El Hafsi (supply chain and operations management area)
- Elodie Goodman (supply chain and operations management area coordinator)
- Thomas Kramer (marketing area)
- Barry Mishra (accounting and IS area coordinator)

**Associate Professors:**
- Alexander Barinov (finance area)
- Hai Che (marketing area)
- Long Gao (supply chain and operations management area)
- Boris Maciejovsky (management area coordinator)
- Marlo Raveendran (management area)
- Danko Turcic (supply chain and operations management area)

**Assistant Professors:**
- Mike Dong (finance area)
- Kyle Ingram (management area)
- Sanjoy Moulik (information systems area)
- Adem Orsdemir, Business (supply chain and operations management area)
- Rich Yueh (information systems area)

**Professors of Practice:**
- Sean Jasso (marketing area)
- Raj Singh (management area)

**Lecturers:**
- John Acker (management area)
- Suri Gurumurthi (supply chain and operations management area)
- MD Moniruzzaman (information systems area)
6. For interdisciplinary programs, the degree of participation and the role of each department must be explicitly described. The chairs of all participating departments must provide written approval for the creation of the program and indicate their commitment to provide necessary resources including faculty release.

The program is not an interdepartmental one, although it is interdisciplinary. The degree is offered through the School of Business, which teaches the majority of the courses in the program. Written approvals from the dean and the department chair of the School of Business, as well as the chairs of the Statistics, Economics, Mathematics, and Computer Science departments in which the Business Analytics students will take courses, are included in Appendix D.

7. Projected enrollment in the program

Because of the highly quantitative nature of the program, we expect enrollment to be relatively low. The projected enrollment at the start of the program is about 10 students per year, reaching about 20 starting in its second year, for a total eventual enrollment of about 100 students across all class levels.

8. Name of degree, if applicable, and the anticipated number of degrees to be granted when the program reaches steady state.

BS in Business Analytics, 25 degrees awarded per year

9. Potential impact of the new program on existing programs. If the proposed program includes required courses from a department other than the administering department, the proposal must include a statement from the department indicating that it has been consulted and that it will provide access to the required courses.

The new major uses existing courses that are offered by the School of Business, Statistics, Mathematics, and Economics. Given that these courses are also used by many other departments to satisfy college and major requirements, and given the expected low enrollment in the program, we do not expect the new major in Business Analytics to impact their offerings.
10. A full listing of resources required for start-up and for operations. In cases where no additional resources will be needed, this must be explicitly stated. This listing may include: personnel (faculty FTE or temporary positions, Teaching Assistants or Readers, administrative staff, technical support); support services including computer facilities and library resources; space requirements. A plan indicating how the resources will be obtained would also be helpful to the committee in reviewing the proposal. A letter of support from the College Dean and/or Executive Vice Chancellor-Provost indicating endorsement as well as a promise of support for the proposal also would be extremely helpful.

- Faculty FTE: the program will use existing faculty given that the new major will only add a few dozen students to existing courses.
- Teaching Assistants: no additional TAs are required.
- Administrative Staff: the program will be administered by existing staff in the School of Business. One academic advisor will be recruited to specialize in the Business Analytics major and the Business Analytics concentration.
- Computer facilities and library resources: no new facilities required
- Space requirements: no new space requirements.

11. Both internal and external letters of support should be provided with the proposal. Internal letters of support are often from UCR department chairs and faculty of related programs. The external letters should be from other UC campuses or other peer institutions. Letters from off-campus help to establish the quality of the program and its fit within the context of related programs at other universities. Upon consultation with the CEP the demand for external letters may be waived.

Letters of support are included in Appendix E.

12. Approvals from program faculty, College faculty (if the new proposal affects a college regulation), and the appropriate Executive Committee should be obtained before forwarding the new program to the attention of the Senate Analyst for CEP.

Approved by the Executive Committee of the School of Business: October 10, 2023

Approved by the faculty of the School of Business: October 20, 2023

All proposals for new programs should be submitted to the Senate Chair no later than March 1 of the academic year prior to the fall quarter in which the proposed program is anticipated to go into effect. This schedule should provide sufficient time for Senate review of the proposal to meet the deadline for final consideration of approval at the May Division Meeting.
Appendix A: Requirements for the new BS in Business Analytics degree

**Accounting (4 units)**
BUS 020 – Financial Accounting and Reporting

**General Business (6 units)**
BUS 010 – Introduction to Business
BUS 098 – Personal Branding and Professional Development

**Core Business (36 units)**
BUS 100W – Management Writing and Communications
*Requires ENGL 001B with a grade of C or better; BUS 020; ECON 003; STAT 008; ENGL 007 may be taken concurrently*

BUS 101 – Information Technology Management
*Requires BUS 020; ECON 003; STAT 008; or equivalent*

BUS 102 – Ethics and Law in Business and Society
*Requires BUS 020; ECON 003; STAT 008; or equivalent*

BUS 103 – Marketing and Distribution Management
*Requires BUS 020; ECON 003; STAT 008; or equivalent*

BUS 104 – Decision Analysis and Management Science
*Requires STAT 008 or STAT 010; or equivalent*

BUS 105 – Production and Operations Management
*Requires STAT 008 or STAT 010; or equivalent*

BUS 106 – Introduction to Financial Management
*Requires BUS 020; ECON 003 or ECON 003H; STAT 008 or ECON 101; or equivalent*

BUS 107 – Organizational Behavior
*Requires BUS 020; ECON 003; STAT 008; or equivalent*

BUS 109 – Competitive and Strategic Analysis
*Requires BUS 100W; BUS 103; BUS 108; BUS 106 or ECON 134 or BUS 133*
**Major Requirements Business (42 units)**

BUS 110 – Introduction to Data Mining and Visual Analytics  
*Requires BUS 101*

BUS 115 – Marketing Research  
*Requires BUS 103*

BUS 119 – Data-driven Marketing  
*Requires BUS 103*

BUS 123 – Spreadsheet Modeling for Decision-Making  
*Requires BUS 104 or STAT 104*

BUS 124A – Business Analytics  
*Requires STAT 008*

BUS 124B – Advanced Business Analytics  
*Requires BUS 124A with a grade of C- or better; STAT 008 or STAT 010*

BUS 125 – Simulation for Business  
*Requires BUS 104 or STAT 104*

BUS 129 – Supply Chain Management  
*Requires BUS 105*

BUS 130 – Supply Chain Modeling  
*Requires BUS 104 or STAT 104 or BUS 105*

BUS 173 – Introduction to Databases for Management  
*Requires BUS 101; or equivalent*

BUS 198i – Individual Internship in Business Administration  
*Requires upper-division standing*

**Statistics (16 units)**

STAT 008 or STAT 010 or ECON 101  

STAT 160A Probability Theory  
*Requires MATH 009C*

STAT 160B Probability Theory  
*Requires STAT 160A*

STAT 160C Probability Theory  
*Requires STAT 160A and STAT 160B*
Math (12 units)
MATH 009A First-Year Calculus
   Requires MATH 005A with a grade of C- or better or MATH 006B
MATH 009B First-Year Calculus
   Requires MATH 009A
MATH 009C First-Year Calculus
   Requires MATH 009B

Computing (8 units)
CS 009A – Data-oriented Introduction to Computing
   Requires MATH 009B but can be taken concurrently
CS 009B – Data Oriented Introduction to Computing
   Requires CS 009A

Economics (4 units)
ECON 003 – Introduction to Microeconomics
Appendix B. Course Descriptions

BUS 010 Introduction to Business 4 Lecture, 3 hours, discussion, 1 hour. Prerequisite(s): none. Provides an overview of the field of business administration. Explores business goals and strategies, functional areas of business and their integration in policy and decision making, social responsibility, computers in business, and business trends and challenges including the international dimension.

BUS 020 Financial Accounting and Reporting 4 Lecture, 3 hours, discussion, 1 hour. Prerequisite(s): none. A study of the concepts and techniques for measurement and communication of financial information. Includes interpretation of financial statements.

BUS 098 Personal Branding and Professional Development 2 Lecture, 2 hours. Prerequisite(s): none. Readies students for successful internships and develops critical career management skills through greater understanding of students’ abilities and preferences, and of available job search resources. Topics include career-enhancing techniques such as self-assessment, career research, resume writing, networking, interviewing, and professionalism.

BUS 100W Management Writing and Communication 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): ENGL 001B with a grade of C or better; BUS 020; ECON 003; STAT 008; ENGL 007, may be taken concurrently; for concurrent enrollment in ENGL 007, review the course titles or topics in the current online Schedule of Classes to find the corresponding ENGL 007 writing workshop; or consent of instructor. Focuses on writing and communication methods in business environment. Topics include written and oral presentations, interpersonal skills, teamwork in multicultural setting, and effective use of communication technologies. Fulfills the third-quarter writing requirement for students who earn a grade of “C” or better for courses that the Academic Senate designates, and that the student’s college permits, as alternatives to English 001C.

BUS 101 Information Technology Management 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): CS 008; BUS 020; ECON 003; STAT 008; or equivalent; or consent of instructor. Topics include computer hardware and software, business data processing, databases, telecommunications, systems analysis and design, cost-benefit analysis, and systems applications in business. Includes database and spreadsheet projects.

BUS 102 – Ethics and Law in Business and Society 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BUS 020; ECON 003; STAT 008; or equivalent; or consent of instructor. Analyzes the legal, ethical, political, and social aspects of the business environment. Topics include ethics and social responsibility, government regulation, corporate governance, and global management issues.

BUS 103 Marketing and Distribution Management 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BUS 020; ECON 003 or ECON 003H, STAT 008; or consent of instructor. An introduction to the role of marketing in society emphasizing concepts, marketing methods, and institutions.
BUS 104 Decision Analysis and Management Science 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): CS 008; STAT 008 or STAT 010; or equivalents; or consent of instructor. A survey of deterministic and probabilistic models for decision making. Topics include linear programming and extensions, networks, dynamic programming, decision trees, queuing models, and simulation. Explores the application of these models in decision making. Cross-listed with STAT 104.

BUS 105 Production and Operations Management 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 008 or STAT 010; or equivalent. Addresses the issues of design and control of production systems in manufacturing and service organizations. Covers product and process selection, capacity planning, location and layout design, project and job scheduling, inventory control, material planning, and quality control.

BUS 106 Introduction to Financial Management 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BUS 020; ECON 003 or ECON 003H; STAT 008 or ECON 101; or equivalent; or consent of instructor. An introduction to financial management and financial institutions. Includes time value of money, stock and bond valuation, risk and return, portfolio theory, capital budgeting, capital structure, dividend policy, and financial databases. Cross-listed with ECON 134. Credit is awarded for one of the following BUS 106, ECON 134, or BUS 133.

BUS 107 Organizational Behavior 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BUS 020; ECON 003; STAT 008; or equivalent; or consent of instructor. Studies organizations from the behavioral science perspective. Topics include motivation, leadership, communication, groups, organization structure and culture, and control in complex organizations.

BUS 109 Competitive and Strategic Analysis 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): BUS 100W; BUS 103; BUS 108; BUS 106 or ECON 134 or BUS 133; restricted to major(s) Business Administration. Provides an understanding of strategic decision-making processes in organizations, the interrelationships among functional areas, and how decision making is affected by internal and external environments.

BUS 110 Introduction to Data Mining and Visual Analytics 2 Lecture, 2 hours; laboratory, 1 hour; extra reading, 2 hours; written work, 3 hours. Prerequisite(s): BUS 101. Covers the processes, methodologies and practices used to transform data into useful information to support business decision-making. Offers an opportunity to gain insights and hands-on-experience with basic functionality of industry standard data mining and visualization software tools such Tableau, JMP and IBM’s Watson Analytic.

BUS 115 Marketing Research 4 Lecture, 3 hours; research, 3 hours. Prerequisite(s): BUS 103. Covers types and sources of marketing information, the marketing research process, and techniques of data collection and analysis, including consumer and customer surveys and test marketing. Examines both quantitative and qualitative research with analysis of the values and limitations of data. Emphasis is placed on evaluation and interpretation of results.
BUS 119 Data-driven Marketing 4 Lecture, 3 hours; individual study, 2 hours; extra reading, 1 hour. Prerequisite(s): BUS 103; or consent of instructor. Examines marketing cases and develops data analytical skills for managerial decision making. Utilizes statistical software to manage, display, and analyze marketing information including consumer survey, relationship management, scanner, and socioeconomic data. Topics include attitude measurement, market segmentation and targeting, competition analysis, market performance analysis, and store location choice.

BUS 123 Spreadsheet Modeling for Decision-Making 4 Lecture, 3 hours; written work, 3 hours. Prerequisite(s): BUS 104 or STAT 104. Introduces the fundamental techniques of using data to make informed management decisions in the presence of uncertainty. Utilizes advanced Microsoft Excel functionality.

BUS 124A Business Analytics 4 Lecture, 3 hours; term paper, 1 hour; written work, 2 hours. Prerequisite(s): STAT 008. Provides fundamental concepts and tools needed to understand the emerging role of business analytics in organizations. Applies basic business analytics tools in a spreadsheet environment. Introduces market-leading techniques that help identify and manage key data from business processes. Provides the essential tools required for data mining and business process re-engineering.

BUS 124B Advanced Business Analytics 4 Lecture, 3 hours; written work, 3 hours. Prerequisite(s): BUS 124A with a grade of C- or better; STAT 008 or STAT 010; CS 008. Teaches statistical methods for descriptive, predictive, and prescriptive analysis. Provides opportunities to apply these acquired skills in various business applications in operations, finance, and marketing. Utilizes tools such as R Programming for data analysis and Tableau for data visualization.

BUS 125 Simulation for Business 4 Lecture, 3 hours; extra reading, 1.5 hours; outside projects, 1.5 hours. Prerequisite(s): BUS 104 or STAT 104; or equivalents. Introduces simulation as a tool for analyzing complex systems. Analyzes and discusses the theory and practice of modeling through simulation. Topics include modeling uncertainty and collecting input data, Monte Carlo simulation techniques, model verification and validation, and sensitivity analysis. Examines applications in finance, marketing, operations, and supply chain management.

BUS 129 Supply Chain Management 4 Lecture, 3 hours; assigned problems, 3 hours. Prerequisite(s): BUS 105. Focuses on management of the distribution of goods and services from plants, ports, and vendors to customers. Key topics include transportation, inventories, warehousing, materials handling, order processing, packaging, pricing, customer service standards, and warehouse and retail location.

BUS 130 Supply Chain Modeling 4 Lecture, 3 hours; homework problems and preparation for presentations, 3 hours. Prerequisite(s): BUS 104/STAT 104 or BUS 105. Covers the modeling and analysis of decision problems in supply chain management. Includes logistics network design, integration of supply chain operations, and supply and sourcing decisions. Utilizes the electronic spreadsheet as the principal device for building models, as well as addresses the concepts of effective spreadsheet design and use.
BUS 173 Introduction to Databases For Management 4 Lecture, 3 hours; extra reading, 2 hours; projects, 1 hour. Prerequisite(s): BUS 101 or equivalent. Covers physical and conceptual aspects of database management systems, including familiarity with the variety of database systems based on different data models. Examines the role of database systems in management information systems (MIS) and issues in database design for effective support of MIS. Requires the use of a database package.

BUS 198I Individual Internship in Business Administration 1 to 12 Seminar, 1 hour; internship, 3 to 36 hours; term paper, 1 to 11 hours. Prerequisite(s): upper-division standing in Business Administration; consent of instructor. Active participation in the work of a business concern or a public or quasi-public agency combining academic instruction and supervised field experience. A maximum of 4 quarter units may be counted toward the degree requirements for Business Administration. Course is repeatable to a maximum of 16 units.

CS 009A Data Oriented Introduction to Computing I 4 Lecture, 3 hours; laboratory, 2 hours; individual study, 1 hour. Prerequisite(s): MATH 004, may be taken concurrently or MATH 005A, may be taken concurrently or MATH 006A, may be taken concurrently or MATH 006B, may be taken concurrently or MATH 007A, may be taken concurrently or MATH 009A, may be taken concurrently or MATH 09HA, may be taken concurrently. Covers computational thinking, problem-solving, and data analysis through application-based data manipulation tasks from science, engineering, business, and the humanities. Includes variables, expressions, branches, loops, functions, parameters, lists, strings, file I/O, and exception handling. Also covers software design, testing, and debugging. Credit is awarded for one of the following CS 009A, CS 009M, or CS 010A.

CS 009B Data Oriented Introduction to Computing II 4 Lecture, 3 hours; laboratory, 2 hours; individual study, 1 hour. Prerequisite(s): CS 009A; or equivalent. Covers advanced programming concepts and algorithms through application-based data manipulation tasks from science, engineering, business, and the humanities. Emphasizes good programming principles in the design and development of substantial programs using the Python language. Topics include abstract data types, objects and classes, recursion, and basic software engineering principles. Credit is awarded for one of the following CS 009B or CS 010B.

ECON 003 Introduction to Microeconomics 5 Lecture, 3 hours; discussion, 1 hour; written work, 3 hours. Prerequisite(s): none. An introduction to the study of the economic system from the micro, or individual decision-maker’s, perspective. Includes the study of opportunity cost, markets, consumption, production and competition. Credit is only awarded for one of ECON 003 or ECON 003H.

ECON 101 Statistics For Economics 5 Lecture, 3 hours; discussion, 1 hour; laboratory, 1 hour; individual study, 2 hours. Prerequisite(s): MATH 007A or MATH 009A or MATH 09HA or MATH 022; or equivalent. An introduction to the basic statistical methods for economics. Topics include economic data analysis, index numbers, univariate and bivariate probability distributions, correlation and regression, sampling distributions, properties of estimators, and hypothesis testing.
MATH 009A First-Year Calculus 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 005 with a grade of “C-” or better or MATH 006B with a grade of “C-” or better or equivalent. Introduction to the differential calculus of functions of one variable. Credit is awarded for only one of MATH 008B, MATH 009A, or MATH 09HA.

MATH 009B First-Year Calculus 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 008B with a grade of “C-” or better or MATH 009A with a grade of “C-” or better or MATH 09HA with a grade of “C-” or better. Introduction to the integral calculus of functions of one variable. Credit is awarded for only one of MATH 009B or MATH 09HB.

MATH 009C First-Year Calculus 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 009B with a grade of “C-” or better or MATH 09HA with a grade of “C-” or better. Further topics from integral calculus, improper integrals, infinite series, Taylor’s series, and Taylor’s theorem. Credit is awarded for only one of MATH 009C or MATH 09HC.

STAT 008 Statistics For Business 5 Lecture, 3 hours; discussion, 1 hour; laboratory, 3 hours. Prerequisite(s): CS 008 or CS 009A or CS 010A; MATH 004 or MATH 005A or MATH 006B or MATH 007A or MATH 009A or MATH 09HA or MATH 022; or equivalent. An introduction to statistics using business applications. Topics include descriptive statistics; probability; discrete and continuous distributions; Bayes’ theorem; random variables; estimation and confidence intervals; hypothesis testing; and simple linear regression. Credit is awarded for one of the following STAT 008 or STAT 010.

STAT 010 Introduction to Statistics 5 Lecture, 3 hours; discussion, 1 hour; laboratory, 3 hours. Prerequisite(s): MATH 005A or MATH 006B or MATH 007A or MATH 009A or MATH 09HA. A general introduction to descriptive and inferential statistics. Topics include histograms; descriptive statistics; probability; normal and binomial distributions; sampling distributions; hypothesis testing; and confidence intervals. Credit is awarded for one of the following STAT 010 or STAT 008.

STAT 160A Elements of Probability and Statistical Theory 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 009C or MATH 09HC (may be taken concurrently). Topics include statistical regularity, probability spaces, fundamental theorems in discrete probability, Bayes’ theorem, random variables, densities and distribution functions, and continuous distributions.

STAT 160B Elements of Probability and Statistical Theory 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 160A with a grade of “C-” or better. Topics include transformations of random variables and central limit theorem, distributions of sample statistics, statistical inference, and estimation.

STAT 160C Elements of Probability and Statistical Theory 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 160B with a grade of “C-” or better. Topics include hypothesis testing, chi-square tests, and nonparametric methods.
Appendix C. Catalog Copy for the BS in Business Analytics major

Business Analytics
Subject Abbreviation: BSBA
School of Business

Major
Business Analytics describes the process of using quantitative methods and techniques to extract value from data to improve business decision-making and enhance business performance. Students receive their degree from the School of Business after completing coursework focused on developing quantitative skills necessary for in-depth data analysis.

University Requirements
See Undergraduate Students section.

College Requirements
Students must fulfill all breadth requirements of the School of Business or the Intersegmental General Education Transfer Curriculum or the California General Education Transfer Curriculum prior to transferring to the UC.

Major Requirements
The following are requirements leading to the B.S. degree in Business Analytics. At least 50 percent of business course requirements must be completed at UCR.

Business Analytics Major
Lower division requirements (10 courses, [at least 38 units])
Major prerequisites (non-BUS courses may be used to satisfy breadth requirements for the School of Business):

BUS 010
BUS 020
BUS 098
CS 009A
CS 009B
ECON 003
STAT 008 or STAT 010 OR ECON 101
MATH 009A
MATH 009B
MATH 009C

The major requirements for the B.S. in Business Analytics are as follows:
Upper-division major requirements (23 courses [at least 90 units])

BUS 100W, BUS 101, BUS 102, BUS 103, BUS 104, BUS 105, BUS 106, BUS 107, BUS 109, BUS 110, BUS 115, BUS 119, BUS 123, BUS 124A, BUS 124B, BUS 125, BUS 129, BUS 130, BUS 173, BUS 198i, STAT 160A, STAT 160B, STAT 160C.
Appendix D. Written Approvals

This section contains approval letters from the following department chairs:

1. Yunzeng Wang, Dean, School of Business
2. Margaret (Meg) Campbell, Department Chair, School of Business
3. Christian Shelton, Department Chair, Computer Science
4. Marcelle Chauvet, Department Chair, Economics
5. Fred Wilhelm, Department Chair, Math
6. Yehua Li, Department Chair, Statistics
December 22, 2023

To Whom It May Concern:

I am writing to endorse the proposed Business Analytics Undergraduate Major. This is a well thought-through program to serve the industry needs and a niche market that offers opportunities to professionals with specialized educational training in Business Analytics. In addition, the program creates great opportunities for the School of Business to collaborate with rest of the campus.

Like the faculty, I enthusiastically support the program, and the School is committed to support the program by offering the courses required by the proposal.

Sincerely

Yunzeng Wang
Dean
December 29, 2023

To Whom it May Concern,

As the Chair of the School of Business, I write to approve the proposed undergraduate major in business analytics. It is incumbent upon a high-quality university to consider the changing knowledge in society and adjust curriculum to best serve current students and their likely futures. The world is now awash in data and careful use of data can improve decision-making in organizations (and governments). The ability to think critically about what data is important and how to use it to make data-driven decisions that are informed by appropriate analysis will be valuable learning that will be useful in many different career paths.

The School of Business consists of one department with five areas of specialization: finance, marketing, operations, accounting and management. The proposed major will draw upon faculty and courses across these areas. As such, the majority of resources and courses are currently in place within the School of Business. Given the quantitative nature of the major, current estimates are for fairly low enrollment (from 10 to 20 students per year). This suggests that the number of existing courses will be sufficient to include these students. If, however, additional sections of courses are necessary to ensure that business analytics students are able to complete their courses in a timely manner, the department is prepared to support the program with such additions. (The major also includes some courses in Economics, Statistics and Computer Science; as described in the proposal the low expected enrollment is such that these courses are not expected to be significantly impacted either).

The BS in Business Analytics can provide timely and important knowledge to enrolled students while also highlighting the need for quantitative studies and skills within business more generally. This can enhance UCR’s reputation as an R1, AAU university—particularly if the School of Business succeeds in attaining STEM certification for the major—and our commitment to economic growth and competitiveness for the Inland Empire and California. This major will help our students to develop the knowledge foundation to understand and appropriately use data that is critical to progress across industries and thus I strongly support it.

Sincerely,

Margaret C. Campbell
Department Chair & Associate Dean of Faculty
School of Business
Dear Professor Kramer:

I have reviewed your proposal for an undergraduate major in Business Analytics. I concur with the proposal’s Computer Science requirements of CS 009A and CS 009B. These two courses are designed to provide a foundation in Python programming, a skill helpful for analytics. Given the rest of the proposed curriculum and goals of the program, this seems entirely appropriate.

This sequence (CS 009A and CS 009B) was designed expressly for this purpose: to give non-computing majors the necessary programming skills for their major and future careers. The Computer Science & Engineering Department approves of BS students in Business Analytics who have completed the prerequisites taking these courses.

Sincerely,

Christian Shelton
Professor & Department Chair
Computer Science & Engineering
To whom it may concern,

As Chair of the Department of Economics, I write to provide my support for the proposed major in Business Analytics to be offered by the School of Business. I think this is an attractive and important addition to the majors offered on campus.

I write, in addition, to provide my approval for the inclusion of ECON 3 and ECON 101 in the proposed Business Analytics major. The Economics Department offers Introductory Microeconomics (ECON 3) every quarter for at least 550 students each. Thus, it would not be a problem to accommodate students from the proposed major in these courses. Similarly, every year the Department offers ECON 101 2-3 times each for a total of around 700 seats. Space in these courses would also not be an issue.

Please let me know if you need any additional information.

Sincerely,

Marcelle Chauvet
Professor and Chair
Department of Economics
University of California Riverside
November 7, 2023

To Whom it May Concern:

I approve of up to 30 students from the potential new BS degree in Business Analytics degree taking MATH 005A or MATH 006A 006B; MATH 009A; MATH 009B; or MATH 009C per quarter.

Sincerely yours,

Fred Wilhelm,
Professor and Chair of Mathematics
December 13, 2023

To Whom It May Concern,

As Chair of the Department of Statistics, I am writing to express my endorsement for the proposed BS in Business Analytics program within the School of Business. Envisioned as a small and selective program, it aims to offer UCR students high-quality training in business analytics to address the growing market demand for this skill set in both for-profit and non-profit organizations.

I approve including lower division STAT Intro courses STAT 08/10 and upper division STAT 160A, 160B, and 160C as major requirements in the proposed program. All courses mentioned above are required courses for Statistics and Actuarial Science majors and, hence, offered regularly. We pledge to provide additional seats for this new major in these courses.

Please let me know if you need any additional information.

Sincerely yours.

Yehua Li
Professor & Chair of Statistics,
University of California, Riverside
yehuali@ucr.edu
https://sites.google.com/a/ucr.edu/yehuali/
Appendix E. Letters of Support

This section contains letters of support from the following:

1. UCR School of Business Student Leadership Council
2. Raman Randhawa, Senior Vice Dean for Academic Programs and Professor of Data Sciences and Operation, USC Marshall School of Business
3. Alok R. Saboo, Taylor E. Little Jr. Professor of Marketing, J. Mack Robinson College of Business, Georgia State University
4. Nanda Kumar, Department Chair of Information Systems and Statistics, Zicklin School of Business, Baruch College / CUNY
December 7, 2023

To Whom It May Concern:

We, School of Business Student Business Leadership Council (SBLC), are writing this letter in support of a new undergraduate major in Business Analytics that is being proposed by the UCR School of Business. The Student Business Leadership Council is the umbrella organization for over a dozen graduate and undergraduate student organizations associated with the School of Business, established to facilitate coordination among the different business clubs and to support activities and events.

Business Analytics is an increasingly important business function, touching on most of the different areas of business, and requiring more and more employees to be able to interpret and analyze data to help with business decisions. As such, having a 4-year Bachelor of Science in Business Analytics major will be very attractive to potential applicants. It will also help raise the stature of UCR and of UCR’s School of Business.

Therefore, we request that the proposal for the BS in Business Analytics be approved. Thank you, and please let us know if you have any questions!

For the School of Business Student Business Leadership Council:

________________________________________________________________________
Timothy Chen, President

________________________________________________________________________
Nathan Gagar, Vice President

________________________________________________________________________
Trang Bui, Graduate Representative

________________________________________________________________________
Jaya Madhuri Gazula, Director of Communications

________________________________________________________________________
Nicholas Palencia, Treasurer
December 18, 2023

To Whom It May Concern:

I am writing in support of the proposed new undergraduate major in Business Analytics at UCR’s School of Business. I currently serve as the senior vice dean for academic programs at USC Marshall School of Business, where I oversee all our undergraduate, specialized masters, and MBA programs. Previously, I served as our vice dean for undergraduate programs.

At USC Marshall, we recently launched a specialization or concentration in business analytics, and have also launched this fall a 4-year degree in AI for Business. There is enormous interest in both of these areas: a concentration on analytics that students with broader business education can use to build some technical expertise, and the formal 4-year degree that provides students both with the understanding of analytics but also deeper foundational knowledge at the intersection of data science and business.

I believe UC Riverside is evaluating a formal BS degree in this topic alongside an existing concentration. Based on our experience here I expect there to be significant demand for the BS degree without impacting the concentration demand.

Overall, I believe the corporate world really needs students with analytics expertise, to assimilate the troves of data that are available today, with expertise toward decision making in responsible and ethically ways. This is perhaps the number 1 skill set for our future business leaders.

The introduction of a BS in Business Analytics degree is in line with actions taken by other universities who have recognized the industry need for employees with strong analytical and quantitative (i.e., Math, Statistics, and Computer Science) needs.

In my view, this new major should help recruit students with a strong interest in business analytics who otherwise might choose to join other business schools that offer more rigorous quantitative programs than that currently represented by the Business Analytics concentration.
In summary, I fully support the establishment of a BS in Business Analytics major at UCR.

Raman Randhawa

Senior Vice Dean for Academic Programs
Charles L. and Ramona I. Hilliard Professor
Professor of Data Sciences and Operation
USC Marshall School of Business
rrandhaw@marshall.usc.edu
28th November, 2023

To Whom It May Concern,

I am writing to express my strong support for the proposed establishment of a Business Analytics major by the School of Business at UC Riverside. I am an associate professor in the Robinson School of Business at Georgia State University, where I have had the privilege of designing and leading a similar program at the Masters level for many years. Additionally, I currently serve as the Director of the MS Marketing Program and hold the position of Marketing Professor. Furthermore, I am honored to be a part of the AMA Academic Council at the American Marketing Association. Recently, our MS-Marketing program, which I have the privilege of leading as Program Director, was ranked among the top schools in the nation. This experience has given me valuable insights into the importance and potential success of a program like the proposed Business Analytics major.

I wholeheartedly endorse UC Riverside's endeavor to introduce a Business Analytics major for several compelling reasons. Business Analytics, at its core, involves the proficient application of quantitative methods and techniques to extract actionable insights from data. This, in turn, enhances decision-making processes and augments overall business performance. In today's data-driven business environment, the discipline encompasses a wide array of analytics, including descriptive, diagnostic, predictive, and prescriptive analytics, equipping students with a comprehensive skill set.

Here are the key factors that reinforce my support for this proposal:

1. **Lucrative Career Prospects**: Graduates with a bachelor's degree in Business Analytics are in high demand and typically command substantial starting salaries, averaging around $70,000. The program aligns well with the robust job market for analytics professionals.

2. **Relevance to Supply Chain Management**: Business Analytics is intricately linked to Supply Chain Management, a significant sector in the Inland Empire region where UC Riverside is situated. Graduates of this program are well-prepared to seize employment opportunities in this thriving industry.

3. **Alignment with Market Trends**: Introducing a Business Analytics major at UC Riverside is consistent with the prevailing trends in business education. Numerous reputable business schools nationwide have already introduced similar programs or concentrations, and several local institutions, including Cal State Northridge, offer dedicated Business Analytics majors, highlighting the demand for such programs.

4. **Strategic STEM Certification**: UC Riverside's pursuit of STEM certification for the BS in Business Analytics is a strategic move that enhances the program's appeal to prospective students. This certification not only underscores the academic rigor of the program but also positions the university as an attractive destination for international
students, enriching the diversity of the student body and fostering a global learning environment.

5. **Interdisciplinary Relevance**: Business Analytics inherently fosters multidisciplinary collaboration. It equips students with the skills to bridge the gap between data analysis and strategic decision-making across various industries, making graduates versatile and adaptable professionals.

6. **Industry Partnerships**: The proposed major presents an opportunity to forge valuable partnerships with local businesses and corporations. Collaboration with industry leaders can provide students with real-world experience and enhance their career prospects.

I extend my heartfelt congratulations to UC Riverside for its forward-thinking approach in introducing this new major. I firmly believe that the Business Analytics program will equip graduates with the skills and knowledge necessary to excel in the contemporary business landscape. I eagerly anticipate the opportunity to engage with and collaborate alongside the accomplished graduates of this program in the future.

Please do not hesitate to reach out to me if you require further clarification or seek additional insights regarding this endorsement. I am at your disposal to provide any supplementary information or assistance.

Sincerely,

Dr. Alok R. Saboo
Letter of Support for the BS-BA Program at UC-Riverside

I am the Chair of the Paul H. Chook Department of Information Systems and Statistics and the Academic Program Director of the MS-BA program at the Zicklin School of Business, Baruch College, CUNY. I am writing this letter to express my strong support for the proposed establishment of a BS in Business Analytics major at UC Riverside. As the Academic Program Director of a similar program at the graduate level at my university, I firmly believe that this program would be a critical addition to the university's academic offerings.

The growth of big data, commoditized cloud computing, and artificial intelligence has increased the demand for professionals who can extract knowledge and business insights from data. A BS program in Business Analytics would equip students with the necessary skills and knowledge to meet these growing demands by leveraging the strength of business school to solve real-world business problems by leveraging data-driven decision-making.

Given the growing demand for these professionals across various industries, I expect that students graduating from business analytics programs will be well-positioned to find good job opportunities upon graduation. This is especially true for UCR given its location, which is home to many companies engaged in supply chain management.

A review of the proposal from UCR clearly demonstrates that it will meet the industry needs for data-savvy professionals by balancing theoretical knowledge with practical applications (one of the strengths of business school). It will also prepare students for diverse careers in data engineering/wrangling, business analytics, and strategic planning.

I expect the proposed major in Business Analytics at UCR to attract a strong student cohort. I believe this offering will enhance the university's reputation as a leader in contemporary and future-oriented education.

Please feel free to get in touch with me if you have any additional questions or clarifications.

Regards,

Prof. Nanda Kumar, Department Chair