

**Master of Science in Business Analytics**  
**DEGREE REQUIREMENTS**  
**Prior Revision: 11/8/2018 (Approved by the Graduate Council on May 14, 2019)**  
**Current Revision Date: 12/11/2023**  
**Graduate Council Approval: 2/9/2024**

**1) Admissions requirements**

Applicants are expected to enter the program with an undergraduate degree in quantitative majors such as engineering, mathematics, statistics, econometrics, and other majors. No restrictions exist on any of the majors, but applicants are expected to possess aptitude and appetite for quantitatively oriented coursework and careers. Early applications are accepted before Jan 15<sup>th</sup> of the current academic year for enrollment in the next academic year's Fall Quarter entering class. Late applications are accepted up to June 30<sup>th</sup>.

Applicants interested in the Plan I option are encouraged to communicate with potential thesis advisors before admission to the program. It is helpful for prospective students to contact faculty in the MSBA program in order to introduce themselves and inquire about the faculty's willingness to serve as their thesis advisor. This process of communicating with potential thesis advisors may begin in the Fall, prior to the relevant applications deadline. Applicants could take the initiative to inquire about future research directions, exchange research ideas with potential thesis advisors, and make every effort to identify viable possibilities. While formal acceptance into a research group cannot occur prior to admission, contacts should be sufficiently developed such that at least tentative identification of a research advisor can be made as soon after the time of admission as possible.

To be admitted, students must meet the following requirements:

- A completed Office of Graduate Studies application.
- An undergraduate degree from an accredited institution.
- A minimum undergraduate grade point average of 3.0
- Satisfactory performance on the GMAT (550 minimum) or GRE (300 minimum) exam
- Satisfactory performance on the Test of English as a Foreign Language (TOEFL above the university minimum of 80, IELTS or PTE) exam for applicants whose primary language is not English or whose graduation is from a university at which the language of instruction was not English.
- A written statement of purpose and essays
- Two letters of recommendations

In addition to the above requirements, a written exam and/or an interview (in person or video/audio call) may be required. Exceptions to certain admissions requirements (e.g., GMAT or GRE testing requirement) may be requested based on criteria such as GPA, relevant work experience, or related graduate coursework.

**a) Prerequisites**

In addition to the admission requirements stated above, applicants are expected to have

passed the *equivalent* of the following UC Davis courses:

### **Computing and software engineering**

- ECS 40: Software Development and Object-Oriented Programming  
Elements of program design, style, documentation, efficiency. Methods for debugging and verification. Operating system tools. Principles and use of object-oriented programming in C++. Basic data structures and their use.
- ECS 60: Data Structures and Programming  
Design and analysis of data structures for a variety of applications. Trees, heaps, searching, sorting, hashing, graphs. Extensive programming.

### **Mathematics**

- MAT 21A: Calculus I. Functions, limits, continuity. Slope and derivative. Differentiation of algebraic and transcendental functions. Applications to motion, natural growth, graphing, extrema of a function. Differentials. L'Hopital's rule.
- MAT 21B: Calculus II. Definition of definite integral, fundamental theorem of calculus, techniques of integration. Application to area, volume, arc length, average of a function, improper integral, surface of revolution.
- MAT 21C: Calculus III. Sequences, series, tests for convergence, Taylor expansions. Vector algebra, vector calculus, scalar and vector fields. Partial derivatives, total differentials. Applications to maximum and minimum problems in two or more variables.
- MAT 22A: Linear Algebra. Matrices, determinants, eigenvalues, eigenvectors, diagonalization, factorization.

### **Statistics and probability**

- STA 130A or 130 B or 131A or 131B: Mathematical Statistics  
Basic probability, densities and distributions, Chebyshev's inequality, some special distributions, sampling distributions, central limit theorem and law of large numbers, point estimation, interval estimation, confidence intervals, general linear model, least squares estimates, Gauss-Markov theorem, multiple regression. Computations to access, transform, explore, analyze data and produce results. Concepts and vocabulary of statistical/scientific computing.
- ECS 132: Probability and Statistical Modeling for Computer Science  
Univariate and multivariate distributions. Estimation and model building. Markov/Hidden Markov models. Applications to data mining, networks, security, software engineering.

- b) **Deficiencies:** Course work deficiencies should be made up by taking equivalent courses or equivalent online certification courses by the end of the first quarter by earning a letter grade of “B” or better.

**2) M.S. Degree, Masters Plan I (Thesis) and Plan II (Comprehensive Examination)**

- a. **MSBA Plan I.** This plan requires 50 units of advisor-approved, courses and a thesis. Students choosing the thesis option should have a 3.3 grade-point average and should pass all courses with a “B-” or higher at the end of Winter Quarter. Students, in consultation with the Graduate Advisor, must choose a thesis advisor and committee by Week 3 of Spring Quarter of Year 1. The student should submit the thesis plan to the thesis committee by Week 6 of Spring Quarter of Year 1. The thesis plan should be approved and finalized by Week 10 of the Spring Quarter of Year 1.

This Plan requires more units than the UC Davis minimum, which are: 30 units of graduate and upper-division courses (the 100 and 200 series only), at least 12 of which must be graduate work in the major field.

- b. **MSBA Plan II.** This plan requires 44 units of advisor-approved, graduate and upper division courses with a **written** comprehensive examination.

This Plan requires more units than the UC Davis minimum, which are: 36 units of graduate and upper-division courses, of which at least 18 units must be graduate courses in the major field. No more than 9 units of research (299 or equivalent) may be used to satisfy the 18-unit requirement.

**3) Course Requirements**

- a) **Core Courses (total 40 units):** The MSBA curriculum is lock-step, and all courses, except courses noted as electives, are required. Total number of core units is 40 as shown in the table which are required. Four units are chosen by the students as elective units:

Quarter	Courses	Description	Plan I Units	Plan II Units
<b>Year 1</b>				
Summer II	BAX400	Foundations of Analytics	4	4
Summer II	BAX440	Practicum Initiation	2	2
<i>Total Units in Summer II</i>			<b>6</b>	
Fall	BAX 401	Information, Insight and Impact	4	4
Fall	BAX 421	Data Management	2	2
Fall	BAX 441	Statistical Exploration and Reasoning	4	4
Fall	BAX 461	Practicum Elaboration-I	2	2
<i>Total Units in Fall</i>			<b>12</b>	

Winter	BAX 422	Data Design and Representation	2	2
Winter	BAX 442	Advanced Statistics & Forecasting	4	4
Winter	BAX 452	Machine Learning & Artificial Intelligence	4	4
Winter	BAX 462	Practicum Elaboration-II	2	2
<i>Total Units in Winter</i>			<b>12</b>	
Spring	BAX 423	Big Data	4	4
Spring	BAX 443	Analytic Decision Making	4	4
Spring	BAX 493*	People Analytics*	2	2
Spring	BAX 453*	Application Domains*	2	2
Spring	BAX 424*	Analytics for Logistics & Supply Chain Management*	2	2
<i>*Elective Courses (Students take any 2 of the courses for a total of 4 units)</i>				
<i>Total Units in Spring</i>			<b>12</b>	
<b>Year 2</b>				
Summer I	Practicum Implementation		2	2
Summer	Thesis Preparation and Completion		3	
Fall	Thesis Preparation and Completion		3	
Total			<b>50</b>	<b>44</b>

**b) Electives (Plan I: 10 units; Plan II: 4 units).**

**a. Plan I (4 units of elective courses and 6 units of research electives)**

- i. Students currently choose between BAX424, BAX 453 and BAX 493 as elective courses. Additional advisor-approved courses may be added in subsequent years to meet changing trends in industry. Note that a minimum course load is 12 units each academic quarter, and that per UC regulations students typically do not ordinarily enroll in more than 12 units of graduate-level courses (200) or more than 16 units of combined undergraduate and graduate level (100, 200, 300) courses per quarter
- ii. Thesis Report – A thesis plan is required. In addition, the thesis serves as the capstone requirement. Research for the Master's thesis will be carried out under the supervision of a faculty member of the program and must represent an original contribution to knowledge in the field. The thesis research must be conducted while the student is enrolled in the program. The thesis report is submitted to the Thesis Committee at least one month before the student plans to make requested revisions. All committee members must approve the thesis. The thesis must be filed in a quarter in which the student is registered or on filing fee.

**b. Plan II**

- i. Students currently choose between BAX424, BAX 453 and BAX 493. Additional advisor-approved courses may be added in subsequent years to meet changing trends in the industry. Note that a minimum course load is 12 units each academic quarter, and per UC regulations students typically do not ordinarily enroll in more than 12 units of graduate-level courses (200) or more than 16 units of combined undergraduate and graduate level (100, 200, 300) courses per quarter.
- c) **Research:** Students in Plan I enroll in 6 units of research electives towards the completion of their Thesis requirement. The units are divided as 3 units in the Summer and Fall quarters of their second year. Students in Plan II do not enroll in these courses.
- d) **English Language Requirement:** Students who have not obtained a previous degree at an approved English-medium institution or demonstrated English-language proficiency through an appropriate exam (e.g. TOEFL) are required to complete appropriate English-language courses, as described in the policy *Graduate Student Course Requirements – English as Second Language (GC2018-02)*. Courses taken in satisfaction of this requirement do not count towards the units required for graduation.
- e) **Summary:** Total 44 units of courses are required for both Plan I and Plan II. Plan I requires an additional 6-units for the Thesis. All courses are graduate courses.

4) **Special requirements:** *N/A.*

#### 5) **Advising Structure and Mentoring**

The GPC Chair, the Executive Director of the MSBA program, along with the additional advisors nominated by the Chair and appointed by the Dean of Graduate Studies, and the Graduate School of Management serve as resource for information on academic requirements, policies and procedures, and registration information.

Thesis advisors are expected to

- i. Set clear and reasonable expectations for their students.
- ii. Respond promptly to communications from students.
- iii. Review expectations and progress on a regular basis.
- iv. Provide timely feedback on student’s preparation of publications, conference presentations, exhibitions, performances, or comparable communication with the academic community.
- v. Establish in advance a mutual understanding on criteria for co-authorship of collaborative work consistent with Graduate Council policy, if applicable.
- vi. Hold meetings of student’s dissertation committees as required by the graduate program.
- vii. Provide clear guidelines for starting and finishing dissertation or thesis work
- viii. Meet individually with each of their students to review degree progress, goals and other topics on a quarterly basis.

Support activities will begin via the Admitted Students Intranet prior to the students starting the program and are continued on a regular schedule throughout the program. GSM provides academic advising and assistance to students in the Graduate Student Services area. Incoming students get a comprehensive orientation to academic requirements and policies, appropriate course enrollment, monitoring of academic performance, and guidance on course selection. Students with disabilities will receive appropriate assistance and accommodation. Students experiencing academic or personal difficulty are provided guidance and referrals to other services at GSM or elsewhere on campus.

The resources available for out of class assistance with course material and assignments include discussion groups run by faculty and teaching assistants and access to faculty and teaching assistants by e-mail or in person and at the offices.

Mentoring and Advising Guidelines can be found at the GSM website:  
<http://gsm.ucdavis.edu/students>.

## 6) Committees

- a) **Admission Committee.** Once the completed application, all supporting material, and the application fee have been received, the application will be submitted to the Admissions Committee. The three voting faculty members of the Graduate Program Committee (GPC described in 3(d) below) automatically serve as the Admission Committee, with the chair of the GPC acting as chair. The committee reviews all complete files and makes recommendations for admission, which are then sent to the Dean of Graduate Studies for final approval of admission. Notification concerning admissions will be sent by Graduate Studies. Early applications are accepted before Jan 15<sup>th</sup> of the current academic year for enrollment in the next academic year's Fall Quarter entering class. Late applications are accepted up to June 30<sup>th</sup>.
- b) **Graduate Program Committee (GPC).** GPC shall provide the oversight of the admissions, membership, student academic standing, and education policy and curriculum issues of the MSBA program. See Appendix C for Bylaws.

The Graduate Program Committee has three voting members, two of which are elected by and from the Graduate Program membership with the third being the MSBA Program Chair. The Chair of the GPC will be the MSBA Program Chair (or their Chair-Delegate). In addition to these three voting members, there will be non-voting ex-officio members consisting of one student representative, the Executive Director of the MSBA program, the Chair of the GSM Education Policy committee, and the Chair of the GSM Committee on Courses.

The Graduate Program Chair, upon recommendation of the program's graduate students, will appoint a student representative to the GPC. The chair of the GPC must excuse the student representative from meetings during discussion about other students, personnel actions or disciplinary issues relating to faculty or staff, during rankings of existing students for funding, and for disciplinary issues related to students. The student representative will serve a maximum of one year on the GPC. Students are non-voting

members, however, their representation of student perspectives will be taken into account by other GPC members.

- c) **Course Guidance or Advising Committee.** MSBA program is “lock-step” with all admitted students taking the same courses with an identical study plan. The three voting faculty members of the Graduate Program Committee (GPC described in 3(b)) automatically serve as the Advising Committee, with the chair of the GPC acting as chair. The members of the Advising Committee will advise the admitted students of the study plan. The chair will submit the “Plan of Study” to the Office of the Graduate Studies every year.
- d) **Thesis Committee (Plan I).** The student, in Spring Quarter or at advancement to candidacy (if earlier), will declare the Thesis Committee. The student in consultation with the Graduate Advisor, will choose a Thesis Advisor. The thesis advisor serves as Chair of the thesis committee and must be a member of the MSBA Program. Senate Faculty and Lecturers (continuing) who hold appointments at the Graduate School of Management may serve as co-chairs or members of the Thesis Committee. Senate Faculty who are not members of the Graduate School of Management Graduate Group may also serve on the Thesis Committee. The Graduate Advisor, in consultation with the student and the Thesis Advisor, will nominate the other members of the Thesis Committee. These nominations are submitted to the Office of Graduate Studies for formal appointment in accordance with Graduate Council policy. The responsibility of this committee is to assist in the guidance of the student and to read and approve the thesis. The thesis must be prepared in accordance with Graduate Studies guidelines.
- e) **Comprehensive Examination Committee.** The Comprehensive Examination Committee consists of three voting faculty members of the Graduate Program Committee, with the chair of GPC acting as chair. The chair of GPC is appointed by the Dean of the Graduate School of Management. GPC Chair serves as the Graduate Advisor with signature authority on Graduate Studies’ forms.

## 7) **Advancement to Candidacy**

Every student must file an official application for Candidacy for the Degree of Master of Business Analytics after completing one-half of their course requirements and at least one quarter before completing all degree requirements; this is typically the spring quarter. The Candidacy for the Degree of Master form can be found online at: <https://grad.ucdavis.edu/forms>. A completed form includes a list of courses the student will take to complete degree requirements. If changes must be made to the student’s course plan after s/he has advanced to candidacy, the Graduate Advisor must recommend these changes to Graduate Studies. Students must have their Graduate Advisor and committee Chair sign the candidacy form before it can be submitted to Graduate Studies. If the candidacy is approved, the Office of Graduate Studies will send a copy to: the appropriate Graduate Program Coordinator, the Thesis Committee Chair (if applicable) and the student. If the Office of Graduate Studies determines that a student is not eligible for advancement, the program and the student will receive written notification of the reasons for the application’s deferral. Some reasons for deferring an application include: grade point average below 3.0, outstanding “I” grades in required courses, or insufficient units.

## 8) **Comprehensive Examination and/or Thesis Requirements**

### a) **Thesis Requirements (Plan I):**

The M.S. thesis should be:

- i) An original scholarly technical or research contribution
- ii) A critical evaluation of state-of-art approaches in academic research or practice
- iii) Rigorous in approach, but not as comprehensive as a Ph.D. dissertation.

The topic of the thesis should be acceptable to all members of the committee when they agree to serve and a joint meeting of committee members and the student should be held at that time. For the thesis to be acceptable for the degree, all committee members must sign the title page. Instructions on preparation of the thesis and a schedule of dates for filing the thesis in final form are available from Graduate Studies.

To monitor progress and assess student contributions, the candidate and the thesis advisor, should meet at least once every month to (a) discuss progress and any changes in the thesis objectives and (b) assess individual student's learning and contributions tied to specific outcomes. The format of the thesis covers a description of the business problem, its translation into an analytical framework, definition of decision variables and other related variables, description of data collection, explanation of estimation and optimization methods used, documentation of results and its implication to management practice. The length of the thesis can vary based on specifics of the project between 30 to 50 double-spaced pages (about 7500-12500 words, if single spaced the number of pages will adjust accordingly). Thesis committee members have a responsibility to review the thesis within four weeks (one month) after being provided a copy. Should the committee determine that the thesis is unacceptable, a recommendation to disqualify the student will be made to the Dean of Graduate Studies.

### b) **Comprehensive Examination (Plan II)**

Fulfillment of the Comprehensive Examination is the last requirement of the M.S. Plan II. Each student is required to take a **written** comprehensive examination once all the required courses are completed. The scope of the written exam includes all the required courses from Fall, Winter and Spring Quarters. The examination will be evaluated by two reviewers, at least one of them must be a member of the GPC or MSBA program faculty with no direct vested interest in the success of the student (e.g., the student is not the reviewer's GSR or co-author on the project).

- i) *Timing.* The individual written examination will be held in the 10<sup>th</sup> month of the MSBA program. The results of the comprehensive examination will be communicated to the student within three weeks after completion of the exam.
- ii) *Outcome.* The Exam committee's unanimous vote is required to pass a student. The outcome will be communicated to the student within three weeks. If a



student does not pass the exam, the committee may recommend that the student be reexamined a second time, but only if the Graduate Advisor concurs with the committee. The second exam must take place within one quarter of the first exam. The format of the second exam is the same as that of the first exam and may include the submission of an amended version of the report. The examination may not be repeated more than once. If a student does not pass on the second attempt, the exam committee recommends the Dean of Graduate Studies that the student be disqualified from further graduate work in the MSBA program.

Once passed, the Master’s Report Form is signed by the Graduate Advisor and then forwarded to the Office of Graduate Studies in accordance with the deadlines noted in the campus General Catalog (available online at the website of the Office of the Registrar). A student must maintain a GPA of 3.0 for the M.S. degree to be awarded. A candidate must be a registered student or in Filing Fee status at the time the program submits the form, with the exception of the summer period between the end of the Spring Quarter and the beginning of Fall Quarter. The program must file the report with Graduate Studies within one week of the end of the quarter in which the student’s degree will be conferred.

**9) Normative Time to Degree**

The MSBA is a lock-step 10.5-month-long program.

**10) Typical Time Line and Sequence of Events**

The schedule of coursework is as follows:

Quarter	Courses	Description	Plan I Units	Plan II Units
<b>Year 1</b>				
Summer II	BAX400	Foundations of Analytics	4	4
Summer II	BAX440	Practicum Initiation	2	2
<i>Total Units in Summer II</i>			<b>6</b>	
Fall	BAX 401	Information, Insight and Impact	4	4
Fall	BAX 421	Data Management	2	2
Fall	BAX 441	Statistical Exploration and Reasoning	4	4
Fall	BAX 461	Practicum Elaboration-I	2	2
<i>Total Units in Fall</i>			<b>12</b>	
Winter	BAX 422	Data Design and Representation	2	2
Winter	BAX 442	Advanced Statistics & Forecasting	4	4
Winter	BAX 452	Machine Learning & Artificial Intelligence	4	4
Winter	BAX 462	Practicum Elaboration-II	2	2
<i>Total Units in Winter</i>			<b>12</b>	
Spring	BAX 423	Big Data	4	4
Spring	BAX 443	Analytic Decision Making	4	4

Spring	BAX 493*	People Analytics*	2	2
Spring	BAX 453*	Application Domains*	2	2
Spring	BAX 424*	Analytics for Logistics & Supply Chain Management*	2	2
<i>*Elective Courses (Students take any 2 of the courses for a total of 4 units)</i>				
<i>Total Units in Spring</i>			<b>12</b>	
<b>Year 2</b>				
Summer I	Practicum Implementation		2	2
Summer	Thesis Preparation and Completion		3	
Fall	Thesis Preparation and Completion		3	
Total			<b>50</b>	<b>44</b>

**11) Sources of funding**

The MSBA is a self-supporting degree program and will be funded by the students themselves. The program will be located in the GSM’s San Francisco campus. Such students are expected to be either self-funded from their own finances, current job or funded by their employers.

In addition, 5% of the program revenues will be reserved for financial aid on need or merit basis. Awards will be made at any point during the admissions cycle. Once the program is approved, private donations will be solicited to help fund additional fellowships and awards for meritorious students.

Low-cost government Stafford and Grad Plus loans are available to US Citizens and Permanent Residents. Stafford loans are available up to \$20,500 per year, and Grad Plus and private loans are available for amounts in excess of \$20,500. International students with a US co-signer, may be eligible for private loans.

**12) PELP, In Absentia and Filing Fee status.**

Information about PELP (Planned Educational Leave), In Absentia (reduced fees when researching out of state), and Filing Fee status can be found in the policies and forms on the Graduate Studies website: <https://grad.ucdavis.edu/forms>.