Department of Management Science and Statistics

Mission Statement

The mission of the Department of Management Science and Statistics is to offer both undergraduate and graduate educational programs that are of high quality and meet the changing needs of the global community; to provide a supportive learning environment for students; to foster the success of our students in their professional careers; and to create an academic environment that stresses excellence in teaching, intellectual contributions, and service. The Department contributes to the missions of the College and the University through research and education in the quantitative sciences. Theory and analysis are applied to a variety of interdisciplinary problems to discover new approaches for meeting the challenges of decision making in a global arena of expanding technology and information.

Department Information

The disciplines of Management Science and Statistics are integral to modern decision-making processes. These interdisciplinary fields emphasize the use of quantitative methods and computers for analyzing, understanding, visualizing, and interpreting data. Management Science seeks to provide a rational basis for decision analysis across a broad spectrum of business functions such as production/operations, marketing, finance, human resources, project management, logistics, and supply chain management. Statistical methods provide analytical tools for research in high-technology and biomedical industries, insurance, and government agencies. Both disciplines offer the opportunity to pursue advanced graduate studies. The Department of Management Science and Statistics offers a Bachelor of Business Administration degree in Management Science, a Bachelor of Business Administration degree in Actuarial Science, and a Bachelor of Science degree in Statistics. The department also offers minors in Actuarial Science, Adaptive Decision Models for Business, Statistics, and Management Science, which are open to all majors in the University. In addition, certificates are offered in Business Analytics, and Operations and Supply Chain Management.

Department Honors

The Department of Management Science and Statistics offers the opportunity for certain of its outstanding students to achieve the designation of Honors in Major and provides the opportunity for advanced study under close faculty supervision.

Selection for Honors designation is based on the student’s academic performance and recommendation by the Department Undergraduate Program Committee (UPC) in consultation with the faculty of the student’s major discipline. To be eligible for the designation, students must have a minimum overall grade point average of 3.0 at UTSA and a minimum grade point average of 3.5 in their major at UTSA. To graduate with the honors designation, these minimum grade point averages must be maintained. Students interested in this program should contact the Department of Management Science and Statistics office for additional information. Department honors can be attained independent of, or in addition to, University Honors. In order to have departmental honors noted on the transcript, students must submit a letter of request for departmental honors to the Department Chair by Census Date of their last semester.

- B.B.A. degree in Actuarial Science (p. 1)
- B.B.A. degree in Management Science (p. 3)
- B.S. degree in Statistics (p. 5)

Bachelor of Business Administration Degree in Actuarial Science

Actuarial Science is a discipline that uses mathematics and statistical models to assess and manage risk and to solve emerging financial and social problems. Graduates’ unique blend of analytical and business skills are especially valuable in the insurance and financial services industry. They apply their skills to calculations in life, health, social, and casualty insurance, annuities and pensions. Traditionally, they have been involved in developing probability tables for natural disasters, unemployment, etc. There is an increasing need for trained actuaries in the insurance industry. The Bachelor of Business Administration (B.B.A.) in Actuarial Science provides students the opportunity to acquire the quantitative and business skills to prepare them for a career as an actuary. The minimum number of semester credit hours for the B.B.A. degree in Actuarial Science is 120, at least 39 of which must be at the upper-division level.

All candidates seeking this degree must fulfill the Core Curriculum requirements, the Common Body of Knowledge (CBK) requirements, and the degree requirements, which are listed below.

Core Curriculum Requirements (42 semester credit hours)

Students seeking the B.B.A. degree in Actuarial Science must fulfill University Core Curriculum requirements. The two courses listed below satisfy both degree requirements and Core Curriculum requirements; however, if these courses are taken to satisfy both requirements, then students may need to take additional courses in order to meet the minimum number of semester credit hours required for the degree.

MAT 1214 should be used to satisfy the core requirement in Mathematics.

ECO 2023 should be used to satisfy the core requirement in Social and Behavioral Sciences.

All degrees in the College of Business require 120 hours. If students elect to take a course that satisfies both a Core and COB requirement, students may need to take an additional course to meet the 120 hours.

Core Curriculum Component Area Requirements (http://catalog.utsa.edu/undergraduate/bachelorsdegreeeregulations/degreerequirements/corecurriculumcomponentarearequirements)

| First Year Experience Requirement | 3 |
| Communication | 6 |
| Mathematics | 3 |
| Life and Physical Sciences | 6 |
| Language, Philosophy and Culture | 3 |
| Creative Arts | 3 |
| American History | 6 |
| Government-Political Science | 6 |
| Social and Behavioral Sciences | 3 |
Component Area Option  3
Total Credit Hours  42

Common Body of Knowledge (CBK)
All students seeking a B.B.A. degree in the College of Business must complete the following Common Body of Knowledge (CBK) courses in addition to the Core Curriculum.

ACC 2013  Principles of Accounting I  3
ACC 2033  Principles of Accounting II  3
COM 1053  Business and Professional Speech  3
or COM 1063  Digital Business Communication
ECO 2013  Introductory Macroeconomics  3
ECO 2023  Introductory Microeconomics (satisfies Social and Behavioral Sciences Core Curriculum requirement)  3
FIN 3013  Principles of Business Finance  3
GBA 2013  Legal, Social and Ethical Issues in Business  3
IS 1403  Business Information Systems Fluency  3
IS 3003  Principles of Information Systems for Management  3
MAT 1033  Algebra with Calculus for Business (satisfies Mathematics Core Curriculum requirement, Actuarial Science majors must take MAT 1214 in lieu of MAT 1033)  3
MGT 3003  Business Communication and Professional Development  3
MGT 3013  Introduction to Organization Theory, Behavior, and Management  3
MGT 4893  Management Strategy (taken in semester of graduation)  3
MKT 3013  Principles of Marketing  3
MS 1023  Business Statistics with Computer Applications I (Actuarial Science majors must take STA 3003 in lieu of MS 1023)  3
MS 3043  Business Statistics with Computer Applications II (Actuarial Science majors must take STA 3513 in lieu of MS 3043)  3
MS 3053  Management Science and Operations Technology  3

Note: Students must have earned at least 31 hours to enroll in any 3000 and 4000 level courses listed above.

In addition to the Core Curriculum requirements and requirements from the College of Business Common Body of Knowledge (CBK), all candidates for the degree must complete the following degree requirements.

Degree Requirements

A. Major Requirements  20
MAT 1224  Calculus II
MAT 2214  Calculus III
STA 3523  Mathematical Statistics
STA 4133  Introduction to Programming and Data Management in SAS
STA 4713  Applied Regression Analysis
STA 4753  Time-Series Analysis

B. Support Work in Major  12
Select four courses from the following:
FIN 4523  Introduction to Risk Management
FIN 4813  Property-Liability Insurance Finance
FIN 4823  Life and Health Insurance Finance
MS 3073  Business Analytics
STA 4233  Statistical Applications Using SAS Software
STA 4643  Introduction to Stochastic Processes
STA 4933  Internship in Statistics
STA 4963  Actuarial Science Examination Preparation

Total Credit Hours  32

Course Sequence Guide for B.B.A. Degree in Actuarial Science
This course sequence guide is designed to assist students in completing their UTSA undergraduate business degree requirements. This is a term-by-term sample course guide. Students must satisfy other requirements in their catalog and meet with their academic advisor for an individualized degree plan. Progress within this guide depends upon such factors as course availability, individual student academic preparation, student time management, work obligations, and individual financial considerations. Students may choose to take courses during Summer terms to reduce course loads during long semesters.

Recommended Four-Year Academic Plan

First Year
Fall
AIS 1203  Academic Inquiry and Scholarship (core)  3
IS 1403  Business Information Systems Fluency (CBK)  3
MAT 1214  Calculus I (core and CBK)  1  4
WRC 1013  Freshman Composition I (Q) (core)  3
American History (core)  3
Spring
COM 1053 or 1063  Business and Professional Speech (CBK)  3
ECO 2023  Introductory Microeconomics (core and CBK)  3
MAT 1224  Calculus II (major)  4
STA 3003  Applied Statistics (CBK)  3
WRC 1023  Freshman Composition II (Q) (core)  3

Second Year
Fall
ACC 2013  Principles of Accounting I (CBK)  3
ECO 2013  Introductory Macroeconomics (CBK)  3
MAT 2214  Calculus II (major)  4
STA 3513  Probability and Statistics (CBK)  3
Language, Philosophy & Culture (core)  3
Evaluated for Admission to the College of Business
Spring
ACC 2033  Principles of Accounting II (CBK)  3
FIN 3013  Principles of Business Finance (CBK)  3
STA 3523  Mathematical Statistics (major)  3
The diverse courses offered provide students with an opportunity to specialize in professional fields such as operations and logistics. Thus, students have the option of emphasizing operations and logistics or using their breadth of marketable skills and abilities to solve problems in a variety of organizations and functional areas. The degree is designed to prepare students for careers in manufacturing, materials management, service operations, procurement, third party logistics, transportation processes, and management consulting. Since management science majors study a wide variety of topics dealing with daily activities and problems faced by managers in today’s ever-changing world, many career tracks are available to them. The minimum number of semester credit hours required for the Bachelor of Business Administration (B.B.A.) in Management Science is 120, at least 39 of which must be at the upper-division level.

All candidates seeking this degree must fulfill the Core Curriculum requirements, the Common Body of Knowledge (CBK) requirements, and the degree requirements, which are listed below.

Core Curriculum Requirements (42 semester credit hours)

Students seeking the B.B.A. degree in Management Science must fulfill University Core Curriculum requirements in the same manner as other students. The two courses listed below satisfy both degree requirements and Core Curriculum requirements; however, if these courses are taken to satisfy both requirements, then students may need to take additional courses in order to meet the minimum number of semester credit hours required for this degree.

MAT 1033 should be used to satisfy the core requirement in Mathematics.

ECO 2023 should be used to satisfy the core requirement in Social and Behavioral Sciences.

All degrees in the College of Business require 120 hours. If students elect to take a course that satisfies both a Core and COB requirement, students may need to take an additional course to meet the 120 hours.

Core Curriculum Component Area Requirements (http://catalog.utsa.edu/undergraduate/bachelorsdegeregulations/ degreerequirements/corecurriculumcomponentarearequirements)

| First Year Experience Requirement | 3 |
| Communication                    | 6 |
| Mathematics                      | 3 |
| Life and Physical Sciences       | 6 |
| Language, Philosophy and Culture | 3 |
| Creative Arts                    | 3 |
| American History                 | 6 |
| Government-Political Science     | 6 |
| Social and Behavioral Sciences   | 3 |
| Component Area Option            | 3 |

Total Credit Hours 42

Bachelor of Business Administration Degree in Management Science

Solving problems and making decisions are integral parts of every organization’s daily operations. The discipline of Management Science focuses on the development and application of scientific and mathematical modeling to aid organizations in making these decisions. Students will have the opportunity to develop and apply analytical models and to acquire essential computer skills necessary in the increasingly technical business environments. Many organizations hire management science majors for managerial positions because of their computing skills and problem-solving abilities. These skills are essential in business environments that are seeking increased efficiency and productivity. The focus of this degree is on applications and appropriate software with a view toward how a manager can effectively apply quantitative models to improve the decision-making process.

| American History (core) | 3 |
| Life & Physical Sciences (core) | 3 |

Third Year

**Fall**
- MGT 3003 Business Communication and Professional Development (CBK) 3
- MS 3053 Management Science and Operations Technology (CBK) 3
- STA 4133 Introduction to Programming and Data Management in SAS (major) 3
- STA 4713 Applied Regression Analysis (major) 3
- Government-Political Science (core) 3

**Spring**
- IS 3003 Principles of Information Systems for Management (CBK) 3
- MGT 3013 Introduction to Organization Theory, Behavior, and Management (CBK) 3
- MKT 3013 Principles of Marketing (CBK) 3
- STA 4753 Time-Series Analysis (major) 3
- Upper-division FIN or STA Directed Elective (major) 3

Fourth Year

**Fall**
- GBA 2013 Legal, Social and Ethical Issues in Business (CBK) 3
- Upper-division FIN or STA Directed Elective (major) 3
- Component Area Option (core) 3
- Government-Political Science (core) 3

**Spring**
- MGT 4893 Management Strategy (CBK) 3
- Upper-division FIN or STA Directed Elective (major) 3
- Creative Arts (core) 3
- Life & Physical Sciences (core) 3

Total Credit Hours: 120.0

1. College of Business students should take MAT 1214 and ECO 2023 to satisfy both Core Curriculum and CBK requirements.

Common Body of Knowledge (CBK)

All students seeking a B.B.A. degree in the College of Business must complete the following Common Body of Knowledge (CBK) courses in addition to the Core Curriculum.
Degree Requirements

**Gateway Course**

Students pursuing the B.B.A. degree in Management Science must successfully complete the following Gateway Course with a grade of “C-” or better in no more than two attempts. A student who is unable to successfully complete this course within two attempts, including dropping the course with a grade of “W” or taking an equivalent course at another institution, will be required to change his or her major.

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MAT 1033  Algebra with Calculus for Business (satisfies Mathematics Core Curriculum requirement, Actuarial Science majors must take MAT 1214 in lieu of MAT 1033)
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In addition to the Core Curriculum requirements and requirements from the College of Business Common Body of Knowledge (CBK), all candidates for the degree must complete the following degree requirements.

**Degree Requirements**

**A. Major Requirements**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS 3403</td>
<td>Logistics Management</td>
<td>3</td>
</tr>
<tr>
<td>MS 4333</td>
<td>Project Management</td>
<td>3</td>
</tr>
<tr>
<td>MS 4343</td>
<td>Production/Operations Management</td>
<td>3</td>
</tr>
<tr>
<td>MS 4913</td>
<td>Internship in Management Science</td>
<td>3</td>
</tr>
<tr>
<td>MS 4933</td>
<td>Actuarial Science Internship</td>
<td>3</td>
</tr>
<tr>
<td>MS 4953</td>
<td>Special Studies in Management Science</td>
<td>3</td>
</tr>
</tbody>
</table>

**B. Support Work in Major**

Select five courses from the following:

- FIN 4523  Introduction to Risk Management
- FIN 4873  Computer Modeling of Financial Applications

**C. Additional Support Work**

Option 1: Complete a Business Competency (9 semester credit hours in a competency)

Option 2: Complete 9 semester credit hours of upper-division business electives or free electives

**Total Credit Hours**

33

Note: Students must have earned at least 31 hours to enroll in any 3000 and 4000 level courses listed above.

To substitute another course for one of the above electives, a student should submit a petition to their academic advisor and receive approval from the chair of the Management Science and Statistics department or department designee before registering for the course.

**Course Sequence Guide for B.B.A. Degree in Management Science**

This course sequence guide is designed to assist students in completing their UTSA undergraduate business degree requirements. This is a term-by-term sample course guide. Students must satisfy other requirements in their catalog and meet with their academic advisor for an individualized degree plan. Progress within this guide depends upon such factors as course availability, individual student academic preparation, student time management, work obligations, and individual financial considerations. Students may choose to take courses during Summer terms to reduce course loads during long semesters.

For options in designing and selecting career tracks and/or certificates, contact the chair of the Management Science and Statistics department or department designee.

**Recommended Four-Year Academic Plan**

**First Year**

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>AIS 1203</td>
<td>Academic Inquiry and Scholarship (core)</td>
<td>3</td>
</tr>
</tbody>
</table>

1. To substitute another course for one of the above electives, a student should submit a petition to their academic advisor and receive approval from the chair of the Management Science and Statistics department or department designee before registering for the course.
Bachelor of Science Degree in Statistics

Statistics is a science that deals with principles and procedures for obtaining and processing information in order to make decisions in the face of uncertainty. In particular, it deals with collection, organization, analysis, and interpretation of numerical information to answer questions in almost every aspect of modern-day life. Statistical methods are used to address complex questions common in business, government, and science. Employers such as research divisions in pharmaceutical companies, clinical research units at medical centers, quality control or reliability departments in manufacturing companies, corporate planning and financial analysis units, and government agencies require persons with advanced quantitative skills.

The Bachelor of Science (B.S.) degree in Statistics provides students with access to such skills preparing them for careers as statistical analysts or for further graduate academic training. The minimum number of semester credit hours required for the Bachelor of Science degree in Statistics is 120, at least 39 of which must be at the upper-division level.

Core Curriculum Requirements (42 semester credit hours)

Students seeking the B.S. degree in Statistics must fulfill University Core Curriculum requirements. The courses listed below satisfy both degree requirements and Core Curriculum requirements; however, if these courses are taken to satisfy both requirements, then students may need to take additional courses in order to meet the minimum number of semester credit hours required for this degree.

MAT 1214 should be used to satisfy the core requirement in Mathematics. ECO 2023 should be used to satisfy the core requirement in Social and Behavioral Sciences.

All degrees in the College of Business require 120 hours. If students elect to take a course that satisfies both a Core and COB requirement, students may need to take an additional course to meet the 120 hours.
Core Curriculum Component Area Requirements (http://catalog.utsa.edu/undergraduate/bachelorsdegeregulations/degreerequirements/corecurriculumcomponentarearequirements)

First Year Experience Requirement 3
Communication 6
Mathematics 3
Life and Physical Sciences 6
Language, Philosophy and Culture 3
Creative Arts 3
American History 6
Government-Political Science 6
Social and Behavioral Sciences 3
Component Area Option 3
Total Credit Hours 42

Degree Requirements

A. Required courses in the computational and mathematical sciences 15
MAT 1214 Calculus I
MAT 1224 Calculus II
MAT 2214 Calculus III
MAT 2233 Linear Algebra

B. Courses required for the major 39
1. Required Statistics courses:
STA 3003 Applied Statistics
STA 3013 Multivariate Analysis for the Life and Social Sciences
STA 3313 Experiments and Sampling
STA 3513 Probability and Statistics
STA 4133 Introduction to Programming and Data Management in SAS
STA 4233 Statistical Applications Using SAS Software
STA 4713 Applied Regression Analysis
STA 4723 Introduction to the Design of Experiments
2. Select four of the following:
MS 3073 Business Analytics
MS 4363 Quality Management and Control
STA 3813 Discrete Data Analysis
STA 4143 Data Mining
STA 4643 Introduction to Stochastic Processes
STA 4753 Time-Series Analysis
STA 4903 Applied Survival Analysis
STA 4933 Internship in Statistics

C. Electives in disciplines where statistics is actively applied and practiced 18
1. Specialization in Actuarial Science:
ACC 2013 Principles of Accounting I
ECO 2013 Introductory Macroeconomics
ECO 2023 Introductory Microeconomics
FIN 3013 Principles of Business Finance
FIN 3023 Intermediate Corporate Finance
or FIN 4873 Computer Modeling of Financial Applications

STA 4963 Actuarial Science Examination Preparation

2. Specialization in Biology:
BIO 2313 Genetics
BIO 3283 Principles of Ecology
BIO 3323 Evolution
BIO 3333 Plants and Society
BIO 3433 Neurobiology
BIO 4033 Conservation Biology

3. Specialization in Business:
ECO 3123 Introduction to Econometrics and Business Forecasting
MKT 3083 Marketing Research
MS 3063 Decision Support Systems
MS 4313 Six Sigma and Lean Operations
MS 4343 Production/Operations Management
MS 4363 Quality Management and Control

4. Specialization in Education:
BBL 3403 Cultural and Linguistic Equity for Schooling
EDP 3203 Learning and Development in the Secondary School Adolescent
EDU 2103 Social Foundations for Education in a Diverse U.S. Society
ESL 3023 Second Language Teaching and Learning in EC-6
IDS 2013 Introduction to Learning and Teaching in a Culturally Diverse Society
SPE 3603 Introduction to Special Education

5. Specialization in Mathematics:
MAT 2233 Linear Algebra
MAT 3213 Foundations of Analysis
MAT 3223 Complex Variables
MAT 3613 Differential Equations I
MAT 3633 Numerical Analysis
MAT 4213 Real Analysis I

6. Specialization in Psychology:
PSY 1013 Introduction to Psychology
PSY 2503 Developmental Psychology
PSY 3403 Experimental Psychology
PSY 3413 Experimental Projects and Laboratory
Two additional psychology courses at the 3000 or 4000 level

7. Specialization in Social Sciences:
SOC 1013 Introduction to Sociology
SOC 3223 Population Dynamics and Demographic Techniques
SOC 3323 Introduction to Social Research
SOC 3373 Qualitative Research Methods
SOC 3393 Quantitative Research Methods
One additional sociology course at the 3000 or 4000 level

D. Lower-division or upper-division business or non-business electives 6
Select 6 semester credit hours of lower-division or upper-division business or non-business electives.

Total Credit Hours 78
Nine (9) semester credit hours must be upper division. The department has given pre-approval to the following plans of study for specializations in actuarial science, biology, business, education, mathematics, psychology, and social sciences. Other specialization plans and the relevant courses may be submitted for approval to the designated statistics faculty member.

Course Sequence Guide for B.S. Degree in Statistics

This course sequence guide is designed to assist students in completing their UTSA undergraduate business degree requirements. This is a term-by-term sample course guide. Students must satisfy other requirements in their catalog and meet with their academic advisor for an individualized degree plan. Progress within this guide depends upon such factors as course availability, individual student academic preparation, student time management, work obligations, and individual financial considerations. Students may choose to take courses during Summer terms to reduce course loads during long semesters.

Recommended Four-Year Academic Plan

First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIS 1203 Academic Inquiry and Scholarship (core)</td>
<td>3</td>
</tr>
<tr>
<td>MAT 1214 Calculus I (core and major)</td>
<td>4</td>
</tr>
<tr>
<td>WRC 1013 Freshman Composition I (Q) (core)</td>
<td>3</td>
</tr>
<tr>
<td>American History (core)</td>
<td>3</td>
</tr>
<tr>
<td>Life &amp; Physical Sciences (core)</td>
<td>3</td>
</tr>
</tbody>
</table>

Spring

| MAT 1224 Calculus II (major) | 4            |
| STA 3003 Applied Statistics (major) | 3            |
| WRC 1023 Freshman Composition II (Q) (core) | 3            |
| American History (core) | 3            |
| Life & Physical Sciences (core) | 3            |

Second Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 2214 Calculus III (major)</td>
<td>4</td>
</tr>
<tr>
<td>STA 3313 Experiments and Sampling (major)</td>
<td>3</td>
</tr>
<tr>
<td>STA 3513 Probability and Statistics (major)</td>
<td>3</td>
</tr>
<tr>
<td>Creative Arts (core)</td>
<td>3</td>
</tr>
<tr>
<td>Government-Political Science (core)</td>
<td>3</td>
</tr>
</tbody>
</table>

Spring

| MAT 2233 Linear Algebra (major) | 3            |
| STA 3013 Multivariate Analysis for the Life and Social Sciences (major) | 3            |
| STA 3523 Mathematical Statistics (major) | 3            |
| Government-Political Science (core) | 3            |
| Social and Behavioral Sciences (core) | 3            |

Third Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>STA 4133 Introduction to Programming and Data Management in SAS</td>
<td>3</td>
</tr>
<tr>
<td>Course option in major</td>
<td>3</td>
</tr>
<tr>
<td>Course option in specialization track (support work)</td>
<td>3</td>
</tr>
<tr>
<td>Course option in specialization track (support work)</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>STA 4233 Statistical Applications Using SAS Software (major)</td>
<td>3</td>
</tr>
<tr>
<td>Course option in major</td>
<td>3</td>
</tr>
<tr>
<td>Course option in specialization track (support work)</td>
<td>3</td>
</tr>
<tr>
<td>Course option in specialization track (support work)</td>
<td>3</td>
</tr>
<tr>
<td>Component Area Option (core)</td>
<td>3</td>
</tr>
</tbody>
</table>

Fourth Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>STA 4713 Applied Regression Analysis (major)</td>
<td>3</td>
</tr>
<tr>
<td>Course option in major</td>
<td>3</td>
</tr>
<tr>
<td>Course option in specialization track (support work)</td>
<td>3</td>
</tr>
<tr>
<td>Business or non-business elective (support work)</td>
<td>3</td>
</tr>
<tr>
<td>Free elective</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>STA 4723 Introduction to the Design of Experiments (major)</td>
<td>3</td>
</tr>
<tr>
<td>Course option in major</td>
<td>3</td>
</tr>
<tr>
<td>Course option in specialization track (support work)</td>
<td>3</td>
</tr>
<tr>
<td>Business or non-business elective (support work)</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credit Hours: 120.0

1 Students must take Math Placement Test to register for MAT 1214. Beginning math course will be determined by Math Placement Test scores.

2 STA 3003 is prerequisite for courses listed under Part B of Degree Requirements.

• Minor in Actuarial Science (p. 7)
• Minor in Adaptive Decision Models for Business (p. 8)
• Minor in Statistics (p. 8)
• Minor in Management Science (p. 8)

Minor in Actuarial Science

The Minor in Actuarial Science is open to all majors in the University. All students pursuing the minor must complete 18 semester credit hours.

A. Required Business courses

| ECO 2013 Introductory Macroeconomics | 3 |
| ECO 2023 Introductory Microeconomics | 3 |

B. Select four of the following courses

| STA 3513 Probability and Statistics | 3 |
| STA 3523 Mathematical Statistics | 3 |
| STA 4643 Introduction to Stochastic Processes | 3 |
| STA 4713 Applied Regression Analysis | 3 |
| STA 4753 Time-Series Analysis | 3 |
| STA 4933 Internship in Statistics | 3 |

Total Credit Hours: 18

To declare a Minor in Actuarial Science, obtain advice, and seek approval of substitutions for course requirements, students must consult with their academic advisor.
Minor in Adaptive Decision Models for Business

The Minor in Adaptive Decision Models for Business is open to all majors in the University. All students pursuing the minor must complete 18 semester credit hours.

A. Course option
Select one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 3333</td>
<td>Mathematical Foundations of Computer Science</td>
</tr>
<tr>
<td>ME 3113</td>
<td>Measurements and Instrumentation</td>
</tr>
<tr>
<td>MS 3053</td>
<td>Management Science and Operations Technology</td>
</tr>
</tbody>
</table>

B. Additional courses

Select 6 semester credit hours from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC 2013</td>
<td>Principles of Accounting I</td>
</tr>
<tr>
<td>FIN 3003</td>
<td>Survey of Finance</td>
</tr>
<tr>
<td>or FIN 3013</td>
<td>Principles of Business Finance</td>
</tr>
</tbody>
</table>

C. Models

Select 6 semester credit hours from the following:

Analytical Models

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS 3063</td>
<td>Decision Support Systems</td>
</tr>
<tr>
<td>MS 3073</td>
<td>Business Analytics</td>
</tr>
<tr>
<td>MS 3313</td>
<td>Business Applications of Statistics</td>
</tr>
<tr>
<td>MS 4323</td>
<td>Simulation Applications in Business</td>
</tr>
<tr>
<td>MS 4333</td>
<td>Project Management</td>
</tr>
<tr>
<td>MS 4383</td>
<td>Applied Forecasting in Operations</td>
</tr>
</tbody>
</table>

Operational Models

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS 3403</td>
<td>Logistics Management</td>
</tr>
<tr>
<td>MS 3413</td>
<td>Purchasing and Inventory Management</td>
</tr>
<tr>
<td>MS 4313</td>
<td>Six Sigma and Lean Operations</td>
</tr>
<tr>
<td>MS 4343</td>
<td>Production/Operations Management</td>
</tr>
<tr>
<td>MS 4353</td>
<td>Service Operations Management</td>
</tr>
<tr>
<td>MS 4363</td>
<td>Quality Management and Control</td>
</tr>
<tr>
<td>MS 4543</td>
<td>Supply Chain Management</td>
</tr>
</tbody>
</table>

D. Upper-division electives

Select 3 semester credit hours from upper-division electives in disciplines where quantitative methods are actively applied and practiced. These courses should be approved by the designated management science faculty member.

Total Credit Hours

To declare a minor in Adaptive Decision Models for Business, students must consult with their academic advisor or the designated management science faculty member.

Minor in Statistics

The Minor in Statistics is open to all majors in the University. All students pursuing the minor must complete 18 semester credit hours.

A. Sequence options
Select 6 semester credit hours from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>STA 1403</td>
<td>Probability and Statistics for the Biosciences</td>
</tr>
<tr>
<td>STA 3003</td>
<td>Applied Statistics</td>
</tr>
</tbody>
</table>

B. Select four of the following courses

Select 12 semester credit hours from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS 3073</td>
<td>Business Analytics</td>
</tr>
<tr>
<td>MS 3083</td>
<td>Business Statistics with Computer Applications I</td>
</tr>
<tr>
<td>MS 3043</td>
<td>Business Statistics with Computer Applications II</td>
</tr>
</tbody>
</table>

Total Credit Hours

To declare a minor in Statistics, students must consult with their academic advisor or the designated statistics faculty member.

Minor in Management Science

The Minor in Management Science is open to all majors in the University. All students pursuing the minor must complete 18 semester credit hours.

A. Required courses
Select 6 semester credit hours from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS 3053</td>
<td>Management Science and Operations Technology</td>
</tr>
<tr>
<td>MS 4343</td>
<td>Production/Operations Management</td>
</tr>
</tbody>
</table>

B. Select four of the following courses

Select 12 semester credit hours from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECO 3123</td>
<td>Introduction to Econometrics and Business</td>
</tr>
<tr>
<td>FIN 4523</td>
<td>Introduction to Risk Management</td>
</tr>
<tr>
<td>FIN 4873</td>
<td>Computer Modeling of Financial Applications</td>
</tr>
<tr>
<td>MKT 3083</td>
<td>Marketing Research</td>
</tr>
<tr>
<td>MS 3063</td>
<td>Decision Support Systems</td>
</tr>
<tr>
<td>MS 3073</td>
<td>Business Analytics</td>
</tr>
<tr>
<td>MS 3313</td>
<td>Business Applications of Statistics</td>
</tr>
<tr>
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</tr>
<tr>
<td>MS 3413</td>
<td>Purchasing and Inventory Management</td>
</tr>
<tr>
<td>MS 4313</td>
<td>Six Sigma and Lean Operations</td>
</tr>
</tbody>
</table>

Total Credit Hours

To declare a minor in Management Science, students must consult with their academic advisor or the designated management science faculty member.
Certificate in Business Analytics

The Business Analytics certificate is designed to prepare business students with a foundational knowledge in analytics. It certifies to employers that students awarded the certificate have completed coursework that will help them understand different forms of analytics (descriptive, predictive, and prescriptive) and the methods used in each. Moreover, this certificate program will help students learn cutting-edge techniques to sift through large volumes of data and understand how analytics can help improve decisions throughout an organization.

To earn a Business Analytics certificate, students must earn 15 semester credit hours as follows:

A. Required courses
- MS 3073 Business Analytics
- STA 4133 Introduction to Programming and Data Management in SAS
- STA 4233 Statistical Applications Using SAS Software

B. Select one of the following
- MS 3063 Decision Support Systems
- STA 4143 Data Mining

C. Select one of the following
- MS 3313 Business Applications of Statistics
- STA 3013 Multivariate Analysis for the Life and Social Sciences

To apply for the Business Analytics Certificate, students should consult with Department of Management Science and Statistics for specific information about certificate requirements and consult with their academic advisors to verify that they have met all university requirements as specified in chapter 2 (http://catalog.utsa.edu/undergraduate/certificateprograms) of this catalog. All courses used to satisfy the requirements of this undergraduate certificate program must be college-level courses taken at UTSA.

Certificate in Operations and Supply Chain Management

This certificate is designed to prepare business students with a foundational knowledge in operations and supply chain management (OSCM). It certifies to employers that students awarded the certificate have completed coursework that will help them understand a myriad of issues, challenges, problems, and decision tools that relate to the internal and external flow of materials and requisite knowledge. Production/operations management, logistics management, and procurement topics are included to resolve the myriad of complex problems facing organizations. Moreover, this certificate program will help students learn cutting-edge techniques and best practices to leverage their operations and supply chain complexities to achieve competitive advantage.

To earn an Operations and Supply Chain Management Certificate (OSCM), students must earn 15 semester credit hours as follows:

A. Required courses
- MS 3403 Logistics Management
- MS 4543 Supply Chain Management

B. Select one of the following
- MS 4343 Production/Operations Management
- MS 4353 Service Operations Management

C. Select one of the following
- MS 4313 Six Sigma and Lean Operations
- MS 4363 Quality Management and Control

D. Select one of the following
- MS 3413 Purchasing and Inventory Management
- MS 4333 Project Management
- MS 4383 Applied Forecasting in Operations

To apply for the Operations and Supply Chain Management Certificate, students should consult with Department of Management Science and Statistics for specific information about certificate requirements and consult with their academic advisors to verify that they have met all university requirements as specified in chapter 2 (http://catalog.utsa.edu/undergraduate/certificateprograms) of this catalog. All courses used to satisfy the requirements of this undergraduate certificate program must be college-level courses taken at UTSA.