# Department of Statistics and Data Science

# Program of Statistics for International Students (2024)

## I. Introduction

Established in April 2019, the Department of Statistics and Data Science aims to build up a world-class educational training and research center. The department is committed to cultivating top-notch talents with solid scientific knowledge, active thoughts, innovative awareness, and global vision. Until June 2022, the department has 15 full-time (2 of them will join soon) and 5 jointly appointed faculty members, including 4 Chair Professors, 4 Professors, 5 Associate Professors, 7 Tenure-track Assistant Professors and 1 Visiting Assistant Professor. All faculty members have extensive overseas study or work experiences. One member is an invited speaker at the International Congress of Mathematics, and IMS Medallion Lecturer. Two members are the winners of the prestigious State Natural Science Award (2nd class). At present, the department has two undergraduate programs, namely the Program of Statistics and the Program of Data Science and Big Data Technology, as well as two graduate programs (M.Phil. and Ph.D.), which cover a broad array of research areas including Biostatistics, Clinical Trial Design, High Dimensional Data Analysis, Random Matrix, Time Series Analysis, Bayesian Statistics, Financial Statistics, Limit Theory in Probability and Statistics, Data Science and Big Data Technology. Statistics is applied extensively in various disciplines, from natural sciences (like physics, chemistry, biomedicine, etc.) to social sciences and humanities, as well as business and government decision-making. The undergraduate program of Statistics focuses on applying probability theory to establish statistical models based on the collected data, conduct quantitative analysis, and make inferences and predictions to serve as the reference for decision-making.

Academic subject areas: Bachelor of Science in Statistics

Program code: 071201

## II. Objectives and Learning Outcomes

### 1. Objectives

The objective for international undergraduates majoring in statistics is to cultivate professional talents who are interested in statistical research or data analysis. International undergraduates in this major will have a solid theoretical foundation in mathematics and statistics, proficient computer programming skills, and be good at statistical modeling and analysis of real data. Moreover, they will be able to conduct further research related to statistics or engage in data analysis, data mining, statistical investigate, statistical information management in enterprises and government departments. In the era of big data, statistics faces a wealth of opportunities and challenges. Graduates of statistics major will have a strong theoretical background in statistics and a broad range of knowledge to seize the opportunities and meet the challenges.

**2. Learning Outcomes**

2.1 Students should have a solid mathematical foundation, master the basic knowledge and theories of statistics, and understand the basics of natural science, social science, engineering technologies related to biomedical statistics, social economic statistics, industrial statistics, etc.

2.2 Students should be able to proficiently read statistical literature in English, master the principal methods of literature search, information retrieval, and data query with modern information technology.

2.3 Students should be equipped with the essential skills of applying statistical knowledge and principles to analyze and solve practical problems. These skills include but are not limited to experience in using computer (including commonly used tools, programming languages, and statistical software) and writing simple programs; design questionnaires, conduct survey, collect and process survey data; good communication skills and teamwork spirit.

## III. Study Length, Degree and Graduation Requirements

1. Study Length: Four years.

2. Degree Conferred: Students who complete and meet the degree requirements of the undergraduate program will be awarded a bachelor's degree in science.

3. The Minimum Credit Requirement for Graduation: 146 credits. The specific requirements are as follows.

<table>
<tr><th colspan="2">Module</th><th>Category</th><th>Minimum Credit Requirement</th></tr>
<tr><td rowspan="14">General Education Courses</td><td>Chinese Language and Culture Module</td><td>Chinese Language and Culture</td><td>16</td></tr>
<tr><td rowspan="2">Arts and Physical Education Module</td><td>Physical Education</td><td>4</td></tr>
<tr><td>Arts</td><td>2</td></tr>
<tr><td rowspan="3">Competence Development Module</td><td>Computer Programming</td><td>3</td></tr>
<tr><td>Writing</td><td>2</td></tr>
<tr><td>Foreign Languages</td><td>14</td></tr>
<tr><td rowspan="3">Humanities and Social Sciences Module</td><td>Humanities</td><td rowspan="2">6</td></tr>
<tr><td>Social Sciences</td></tr>
<tr><td>Chinese Studies</td><td>2</td></tr>
<tr><td rowspan="4">Mathematics and Natural Sciences Module</td><td>Mathematics</td><td>12/14</td></tr>
<tr><td>Physics</td><td>10</td></tr>
<tr><td>Chemistry</td><td>3</td></tr>
<tr><td>Geoscience + Life Science</td><td>3</td></tr>
<tr><td>GE to Majors Bridging Module</td><td>Introduction to Majors</td><td>2</td></tr>
<tr><td rowspan="4">Major Courses</td><td rowspan="3">Major Required Courses</td><td>Major Foundational Courses</td><td>11</td></tr>
<tr><td>Major Core Courses</td><td>18</td></tr>
<tr><td>Practice-based Learning (Undergraduate Thesis, Internships, Research projects, etc.)</td><td>14</td></tr>
<tr><td>Major Elective Courses</td><td>Major Elective Courses</td><td>24/22</td></tr>
<tr><td colspan="3">Total</td><td>146</td></tr>
<tr><td colspan="4">Note: please see the General Education Requirement for more details on Chinese Language and Culture Module, Arts and Physical Education Module, Competence Development Module（Foreign Languages & Writing）, Humanities and Social Sciences Module, and GE to Majors Bridging Module.</td></tr>
</table>

## IV. Course Requirements for the Mathematics and Natural Sciences Module and Computer Programming

| Course Category | Course Code | Course Name | Credits | Terms | Prerequisite | Department |
|---|---|---|---|---|---|---|
| Mathematics | MA101a / MA117 | Mathematical Analysis I / Calculus I | 5/4 | 1 Fall | None | Mathematics |
| | MA102a / MA127 | Mathematical Analysis II / Calculus II | 5/4 | 1 Spring | MA101a/ MA117 | Mathematics |
| | MA107 / MA113 | Advanced Linear Algebra I / Linear Algebra | 4 | 1 Fall / 1 Fall-Spring | None | Mathematics |
| Physics | PHY101/ PHY105 | General Physics I / College Physics I | 5/4 | 1 Fall | None | Physics |
| | PHY102/ PHY106 | General Physics II/ College Physics II | 5/4 | 1 Spring | PHY101/ PHY105 | Physics |
| | PHY104B | Experiments of Fundamental Physics | 2 | 1-2 Spring & Fall | None | Physics |
| Chemistry | CH103/ CH105 | General Chemistry/ Chemistry: The Central Science | 4/3 | 1-2 Spring & Fall | None | Chemistry |
| Geoscience + Life Science | BIO103/ BIO102B/ EOE100 | Principles of Biology/ Introduction to Life Science/ Introduction to Earth Sciences | 3 | 1-2 Spring & Fall | None | Biology/ ESS, OCE, ESE |
| Computer Programming | CS109/ CS110/ CS111/ CS112 | Introduction to Computer Programming/ Introduction to Java Programming/ Introduction to C Programming/ Introduction to Python Programming | 3 | 1-2 Spring & Fall | None | Computer Science and Engineering |

## V. Prerequisites for Major Declaration

| Major Declaration Time | Course Code | Course Name | Prerequisite |
|---|---|---|---|
| Declare Major at the End of the First Academic Year | MA101a/ MA117 | Mathematical Analysis I/ Calculus I | None |
| | MA102a/ MA127 | Mathematical Analysis II/ Calculus II | MA101a |
| | MA107 / MA113 | Advanced Linear Algebra I / Linear Algebra | None |
| | PHY101 / PHY105 | General Physics I / College Physics I | None |
| | PHY102 / PHY106 | General Physics II / College Physics II | PHY101 / PHY105 |
| | CS109/ CS110/ CS111/ CS112 | Introduction to Computer Programming/ Introduction to Java Programming/ Introduction to C Programming/ Introduction to Python Programming | None |
| Declare Major at the End of the Second Academic Year | MA101a / MA117 | Mathematical Analysis I / Calculus I | None |
| | MA102a / MA127 | Mathematical Analysis II / Calculus II | MA101a / MA117 |
| | MA107 / MA113 | Advanced Linear Algebra I / Linear Algebra | None |
| | PHY101 / PHY105 | General Physics I / College Physics I | None |
| | PHY102 / PHY106 | General Physics II / College Physics II | PHY101 / PHY105 |
| | PHY104B | Experiments of Fundamental Physics | None |
| | CH103 / CH105 | General Chemistry / Chemistry: The Central Science | None |
| | BIO103/ BIO102B/ EOE100 | Principles of Biology/ Introduction to Life Science/ Introduction to Earth Sciences | None |
| | CS109/ CS110/ CS111/ CS112/ | Introduction to Computer Programming/ Introduction to Java Programming/ Introduction to C Programming/ Introduction to Python Programming | None |

Note:

1. If the number of students entering a major at the end of the first academic year in the department is greater than or equal to the total number of the teaching-research faculty (PI)*2*60%, all majors in the department may implement the prerequisites for major declaration at the end of the second academic year.
2. If the number of students entering a major at the end of the first academic year in the department is less than the total number of the teaching-research faculty (PI)*2*60%, all majors in the department do not implement the prerequisites for major declaration at the end of the second academic year.
3. Suppose the number of students applying for a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), then the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance).
4. For departments that do not implement prerequisites for major declaration at end of the second academic year, if the cumulative number of students applying for a major at the end of the second academic year and the number of students who have entered a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance).

## VI. Major Course Arrangement

### Table 1: Major Required Courses

**Program of Statistics**

| Course Category | Course Code | Course Name | Credits | Practice-based Learning Credits | Terms | Prerequisite | Dept. |
|---|---|---|---|---|---|---|---|
| Major Foundational Courses | STA203 | Foundation of Probability Theory | 3 | 0 | 2 Fall | MA102a / MA127 & MA113 | Statistics and Data Science |
| | MA203a / MA231 / MA213-16 | Mathematical Analysis III / Mathematical Analysis III (H) / Mathematical Analysis | 5 | 0 | 2 Fall | MA102a / MA127 | Mathematics |
| | MA204 | Mathematical Statistics | 3 | 0 | 2 Spring | MA215 / STA203 / MA212 | Statistics and Data Science |
| | **Total** | | 11 | 0 | | | |
| Major Core Courses | STA201 | Operational Research and Optimization | 3 | 0 | 2 Spring | MA107 / MA113 | Statistics and Data Science |
| | MA329 | Statistical Linear Models | 3 | 0 | 3 Fall | MA204 / MA212 | Statistics and Data Science |
| | MA309 | Time Series Analysis | 3 | 0 | 3 Fall | MA204 / MA212 | Statistics and Data Science |
| | MA308 | Statistical Computation and Software | 3 | 0 | 3 Fall | MA204 / MA212 | Statistics and Data Science |
| | MA304 | Multivariate Statistical Analysis | 3 | 0 | 3 Spring | MA204 / MA212 | Statistics and Data Science |
| | STA306 | Bayesian Statistics | 3 | 0 | 3 Spring | MA329 | Statistics and Data Science |
| | **Total** | | 18 | 0 | | | |
| Practice-based Courses | STA490 | Undergraduate Thesis/Project | 12 | 12 | 4 Fall & Spring | | Statistics and Data Science |
| | STA480 | Research Projects | 2 | 2 | Any semester after the first cademic yea | | Statistics and Data Science |
| | STA470 | Internship | 2 | 2 | Any summer after the first cademic yea | | Statistics and Data Science |
| | **Total** | | 14 | 14 | | | |
| **Total** | | | 43 | 14 | | | |

Note:
Students are required to choose Research Projects (including all kinds of scientific research activities, scientific and technological innovation projects, wining prizes in competitions above the provincial level, publishing papers, engaging in advanced studies both at home and abroad as well as attending a certain number of seminars or public lectures, and related credits are identified by the Department) and one course in Internship to carry out practice.

**Table 2: Major Elective Courses**

**Program of Statistics**

| Course Code | Course Name | Credits | Practice-based Learning Credits | Terms | Prerequisite | Department |
|---|---|---|---|---|---|---|
| MA109 / MA111 / MA121 | Advanced Linear Algebra / Advanced Linear Algebra II / Advanced Linear Algebra II (H) | 4 | 0 | 1 Spring | MA113 | Mathematics |
| CS203B | Data Structures and Algorithm Analysis B | 3 | 1 | 2 Fall | CS205 | Computer Science and Engineering |
| MA201a / MA230 | Ordinary Differential Equations A / Ordinary Differential Equations A (H) | 4 | 0 | 2 Spring | (MA203a / MA213-16) & (MA109 / MA111 / MA121) | Mathematics |
| MA206 | Mathematical Modeling | 3 | 0 | 2 Spring | MA201a / MA230 / MA201b | Mathematics |
| MA208 | Applied Stochastic Processes | 3 | 0 | 3-4 Spring | MA203a/ MA213-16 & MA215/ MA212 & (MA109/MA111/ MA121) | Mathematics |
| MA214 / MA219 | Abstract Algebra / Abstract Algebra (H) | 3 | 0 | 2 Spring | MA109 / MA111/ MA121 | Mathematics |
| MA202 / MA232 | Complex Analysis / Complex Analysis (H) | 3 | 0 | 2 Spring | MA203a / MA213-16 | Mathematics |
| MA322 | Life Insurance Actuarial Science | 3 | 0 | 2 Spring | MA215 / MA212 | Mathematics |
| MAS221 | The Basic Principle of Statistical Learning | 2 | 0 | 2 Summer | MA215 / MA212 | Mathematics |
| MA228 | Nonlife Actuarial Models | 3 | 0 | 3 Fall | MA215 / MA212 | Mathematics |
| MA303 | Partial Differential Equations | 3 | 0 | 3 Fall | MA201a / MA201b | Mathematics |
| MA301 | Real Analysis | 3 | 0 | 3 Fall | MA203a / MA213-16 | Mathematics |
| MA305 | Numerical Analysis | 3 | 0 | 3 Fall | MA203a / MA213-16 | Mathematics |
| STA322 | Sample Surveys and Experimental Design | 3 | 0 | 3-4 Spring | MA204 / MA212 | Statistics and Data Science |
| MA333 | Introduction to Big Data Science | 3 | 0 | 3 Spring | MA215 / MA212 | Mathematics |
| MA417 | Nonparametric Statistics | 3 | 0 | 3 Spring | MA212 / MA204 | Statistics and Data Science |
| MAT7101 | Generalized Linear Models | 3 | 0 | 3 Spring | MA329 | Statistics and Data Science |
| MA325 | Numerical Solution of Partial Differential Equations | 3 | 0 | 3 Spring | MA303 | Mathematics |
| CS405 | Machine Learning | 3 | 1 | 4 Fall | MA107A & MA212 | Computer Science and Engineering |
| MAT7035 | Computational Statistics | 3 | 0 | 3 Fall | MA204 | Statistics and Data Science |
| MA405 | Survival Analysis | 3 | 0 | 4 Fall | MA329 | Statistics and Data Science |

| | | | | | | |
|---|---|---|---|---|---|---|
| MA409 | Statistical Data Analysis with SAS | 3 | 0 | 3 Spring | MA329 | Statistics and Data Science |
| MAT7102 | Topics in Probability and Statistics | 3 | 0 | 3 Spring | MA204 | Statistics and Data Science |
| STA404 | Network Science and Computing | 3 | 0 | 3 Spring | MA204 | Statistics and Data Science |
| STA217 | Introduction to Data Science | 3 | 0 | 2 Fall | MA102a / MA102B | Statistics and Data Science |
| STA435 | Statistical Writing and Communication in English | 3 | 0 | 3-4 Spring | | Statistics and Data Science |
| STA204 | Discrete Mathematics with Applications | 3 | 0 | 2 Fall | MA102B\MA127\ MA102a, MA107A\MA113 | Statistics and Data Science |
| STA327 | Generalized Linear Models | 3 | | 3 Fall | MA329 | Statistics and Data Science |
| STA320 | Statistical Learning | 3 | | 3/ Spring | MA329 | Statistics and Data Science |
| Total | | 85 | 2 | | | |

Note:

1. Students who take the series of courses "Mathematical Analysis I, II, III" will earn 22 credits as elective courses in their major. Students who take the series of courses "Advanced Mathematics (Part I), Advanced Mathematics (Part II), and Comprehensive Analysis of Mathematics" will earn 24 credits as elective courses in their major.
2. Elective courses offered by the Department of Statistics can be recognized as credits for the Statistics major, including some graduate courses open for undergraduate students. Other undergraduate or graduate courses related to statistics offered by other departments (open for undergraduate students) can be recognized as credits for the Statistics major upon approval by the Teaching Guidance Group of the Department of Statistics. Please note that the offering semester of some courses may change, so please refer to the actual semester when the corresponding course is offered by the respective department.
3. Differential Equations A (H) can be recognized as credits for the course Differential Equations A. The enrollment for (H) level courses requires a selection process, which will be organized offline by the department.

**Table 3: Overview of Practice-based Courses**

**Program of Statistics**

| Course Code | Course Name | Credits | Practice-based Learning Credits | Terms | Prerequisite | Dept. |
|---|---|---|---|---|---|---|
| STA470 | Internship | 2 | 2 | Any summer after the first academic year | | Statistics and Data Science |
| STA480 | Research Projects | 2 | 2 | Any semester after the first academic year | | Statistics and Data Science |
| STA490 | Undergraduate Thesis/Project | 12 | 12 | 4 Fall & Spring | | Statistics and Data Science |
| CS109 / CS110 / CS111 / CS112 | Introduction to Computer Programming / Introduction to Java Programming / Introduction to C Programming / Introduction to Python Programming | 3 | 1 | 1-2 Spring & Fall | | Computer Science and Engineering |
| MA110 | MATLAB Programming and Application | 3 | 1 | 2 Spring | | Mathematics |
| CS205 | C/C++ Program Design | 3 | 1 | 1 Spring | | Computer Science and Engineering |
| CS203 | Data Structures and Algorithm Analysis | 3 | 1 | 2 Fall | CS205 | Computer Science and Engineering |
| CS405 | Machine Learning | 3 | 1 | 4 Fall | MA107A & MA212 | Computer Science and Engineering |
| PHY104B | Experiments of Fundamental Physics | 2 | 2 | 1 Spring & Fall | | |
| **Total** | | 33 | 23 | | | |

## Curriculum Structure of Statistics Major

| Semester | First Year | Second Year | Third Year | Third/Fourth Year |
|---|---|---|---|---|
| Fall | Mathematical Analysis I / Calculus I | Mathematical Analysis III / Mathematical Analysis | Statistical Linear Models | Survival Analysis |
| | Advanced Linear Algebra I / Linear Algebra | Foundation of Probability Theory | Time Series Analysis | Computational Statistics |
| | | Introduction to Data Science | Statistical Computation and Software | Real Analysis |
| | | | | Advanced Statistics |
| | | | | Generalized Linear Model |
| Spring | Mathematical Analysis II / Calculus II | Mathematical Statistics | Multivariate Statistical Analysis | Undergraduate Thesis/Project |
| | Linear Algebra | Operational Research and Optimization | Bayesian Statistics | Research Projects or Internship (Any summer after the first school year) |
| | | Ordinary Differential Equations A | Statistical Data Analysis with SAS | Sample Surveys and Experimental Design |
| | | Introduction to Big Data Science | Statistical Writing and Communication in English | Nonparametric Statistics |
| | | | Statistical Learning | Selected Research Topics in Statistics |
| | | | | Network Science and Computing |
| | | | | Applied Stochastic Processes |