# Department of Mathematics

# Program of Mathematics and Applied Mathematics for International Students (2020)

## I. Introduction

Established in 2012, Southern University of Science and Technology is a young university aiming to become a top research university in the world. In recent years, the university has attracted many outstanding researchers. The Department of Mathematics currently has 44 full-time faculty members.Our faculty members' research covers a broad range of areas including Mathematics (dynamical systems, algebra and combinatorics, algebraic number theory, PDEs, mathematical physics and differential geometry, etc.), Computational and Applied Mathematics (applied mathematics, numerical analysis, computational fluid dynamics, scientific computing, inverse problems, data science, etc.), Probability and Statistics, and Financial Mathematics.

There are many jobs and opportunities for further academic development for undergraduate students in mathematics and applied mathematics. Government agencies, banks, insurance companies, securities investment companies, software developers, market survey and analysis companies, e-commerce companies and many high-tech companies all have job opportunities for undergraduate students in mathematics and applied mathematics. Students who wish to pursue graduate studies in mathematics and applied mathematics can also find many opportunities either in China or overseas.

## II. Objectives and Learning Outcomes

The objective of the undergraduate programs in mathematics and applied mathematics is to produce outstanding students with a solid foundation in mathematics, a broad knowledge base in related areas such scientific computing and other areas of science, and excellent ability of critical thinking and working independently. The department provides a wide verity of courses that will meet the needs of students interested in pure mathematics and applied mathematics. The ultimate training objective of the undergraduate programs is to enable students to excel in their future career choices, whether they choose to work in government or industries, or to become mathematical scientists.

## III. Study Length and Graduation Requirements

Study length: 4 years

Degree conferred: Bachelor of Science

The minimum credit requirement for graduation: 129 credits (not including English courses);

| Category | Module | Minimum Credit Requirement |
|---|---|---|
| General Education (GE) Required Courses (48 creidts) | Science | 28 |
| | Physical Education | 4 |
| | Chinese Languages & Culture | 16 |
| General Education (GE) Elective Courses (13 creidts) | Humanities | 4 |
| | Social Sciences | 4 |
| | Arts | 2 |
| | Science | 3 |
| Major Course (68 creidts) | Major Foundational Courses | 12 |
| | Major Core Courses | 13 |
| | Major Elective Courses | 33 |
| | Research Projects, Internship and Undergraduate Thesis / Projects | 10 |
| Total (not including English courses) | | 129 |

## IV. Discipline

Mathematics and Applied Mathematics

## V. Main Courses

Foundational core courses: Calculus I A, Calculus II A, Mathematical Analysis, Linear Algebra A&Advanced Linear Algebra,Ordinary Differential Equations A, Complex Analysis, Real Analysis ,Probability and Statistics, Abstract Algebra, Elementary Number Theory, Numerical Analysis, Mathematical Modeling, Partial Differential Equations, , Functional Analysis and etc.

## VI. Practice-Based Courses

Undergraduate Thesis/Project, Research Projects and Internship, etc

## VII. Pre-requisites for Major Declaration

| Major Declaration Time | Course Code | Course Name | Prerequisite |
|---|---|---|---|
| Declare major at the end of Second Year | MA101B | Calculus I A | |
| | MA102B | Calculus II A | MA101B |
| | MA107A | Linear Algebra A | |
| | MA109 | Advanced Linear Algebra | MA107A |
| | MA213-16 | Mathematical Analysis | MA102B |
| | MA212 | Probability and Statistics | MA102B |
| | PHY103B | General Physics B (I) | |
| | PHY105B | General Physics B (II) | PHY103B |

## VIII. Requirements for GE Required Courses

### (I) Science Module

| Course Code | Course Name | Credit | Lab Credits | Hours/week | Term | Language Instruction | Prerequisite | Dept |
|---|---|---|---|---|---|---|---|---|
| MA101B | Calculus I A | 4 | | 4 | Spr/ Fall | B | | MATH |
| MA102B | Calculus II A | 4 | | 4 | Spr/ Fall | B | MA101B | MATH |
| MA107A | Linear Algebra A | 4 | | 4 | Spr/ Fall | B | | MATH |
| PHY103B | General Physics B (I) | 4 | | 4 | Spr/ Fall | B | | PHY |
| PHY105B | General Physics B (II) | 4 | | 4 | Spr/ Fall | B | PHY103B | PHY |
| BIO102B | Introduction to Life Science | 3 | | 3 | Fall/ Spr | B | | BIO |
| CS102B | Introduction to Computer Programming B | 3 | 1 | 4 | Spr/ Fall | B | | CSE |
| PHY104B | Experiments of Fundamental Physics | 2 | 2 | 4 | Spr/ Fall | B | PHY103B | PHY |
| Total | | **28** | **3** | **31** | | | | |

### (II) Physical Education

| Course Code | Course Name | Credits | Hours/week | Terms | Instruction language | Prerequisite | Dept. |
|---|---|---|---|---|---|---|---|
| GE131 | Physical Education I | 1 | 2 | Fall | C | NA | PE Center |
| GE132 | Physical Education II | 1 | 2 | Spr | C | NA | |
| GE231 | Physical Education III | 1 | 2 | Fall | C | NA | |
| GE232 | Physical Education IV | 1 | 2 | Spr | C | NA | |
| GE331 | Physical Education V | 0 | / | Fall | C | NA | |
| GE332 | Physical Education Ⅵ | 0 | / | Spr | C | NA | |
| GE431 | Physical Education Ⅶ | 0 | / | Fall | C | NA | |
| GE432 | Physical Education Ⅷ | 0 | / | Spr | C | NA | |
| **Total** | | 4 | 8 | | | | |

Note: All physical education courses are general required courses. For Semester 1-4, each course(GE131.GE132,GE231,GE232) counted as 1 credit ; for semester 5-8,（GE331.GE332,GE431,GE432）are extracurriculum courses without no credits, details can be referred to Physical Education Curriculum Program of Sustech.

**(III) Chinese Languages & Culture**

| Course Code | Course Name | Credit | Hours/week | Term | Language Instruction | Prerequisite | Dept |
|---|---|---|---|---|---|---|---|
| CLE008 | Elementary Chinese I | 2 | 4 | 1/Fall | B | NA | CLE |
| CLE009 | Elementary Chinese II | 2 | 4 | 1/Spr | B | CLE008 | |
| CLE027 | Intermediate Chinese I | 2 | 4 | 2/Fall | B | CLE009 | |
| CLE028 | Intermediate Chinese II | 2 | 4 | 2/Spr | B | CLE027 | |
| CLE031 | Advanced Chinese I | 2 | 4 | 3/Fall | B | CLE028 | |
| CLE032 | Advanced Chinese II | 2 | 4 | 3/Spr | B | CLE031 | |
| CLE033 | Chinese Culture | 2 | 2 | Spr/Fall | B/E | NA | CLE/ HUM/ SSC |
| CLE034 | Chinese History | 2 | 2 | Spr/Fall | B/E | NA | |
| Total | | 16 | 28 | | | | |

**(IV) English Language**

Students will undertake the English Placement Test and be placed into three levels according to the result of the test and their performance in the National College Entrance Exam. Students at different levels are required to take the courses with a different credit value in total.

Level A: 6 credits; SUSTech English III, and English for Academic Purposes

Level B: 10 credits; SUSTech English II, SUSTech English III, and English for Academic Purposes

Level C: 14 credits; SUSTech English I, SUSTech English II, SUSTech English III, and English for Academic Purposes.

| Course Code | Course Name | Credit | Hours/week | Instruction Language | Prerequisite | Dept |
|---|---|---|---|---|---|---|
| CLE021 | SUSTech English I | 4 | 4 | E | NA | CLE |
| CLE022 | SUSTech English II | 4 | 4 | E | CLE021 | |
| CLE023 | SUSTech English III | 4 | 4 | E | CLE022 | |
| CLE030 | English for Academic Purposes | 2 | 2 | E | CLE023 | |

## IX Requirements for GE Elective Courses

(I) Students are required to complete 4 credits for the Humanities Module and Social Sciences Module respectively, and 2 credits for the Music and Art Module. (Information about the available courses and the instruction language will be announced before the course selection session)

(II) Students are required to complete 3 credits for Science Module.

| Course Code | Course Name | Credit | Lab Credits | Hours/week | Term | Language Instruction | Prerequisite | Dept |
|---|---|---|---|---|---|---|---|---|
| CH101B | General Chemistry B | 3 | | 3 | Spr/ Fall | E | | CHEM |
| CS205 | C/C++ Program Design | 3 | 1 | 4 | Spr | E | | CSE |
| Total | | 6 | 1 | 7 | | | | |

## X. Major Course Arrangement

**Table 1: Major Required Course (Foundational and Core Courses)**

| Course Category | Course Code | Course Name | Credit | Lab Credits | Hours/week | Term | Advised term to take the course | Instruction language | Prerequisite | Dept. |
|---|---|---|---|---|---|---|---|---|---|---|
| Major Foundational Courses | MA109 | Advanced Linear Algebra | 4 | | 4 | Spr | 1/Spr | E | MA107A | MATH |
| | MA213-16 | Mathematical Analysis | 5 | | 4 | Fall/ Spr | 2/Fall | E | MA102B | MATH |
| | MA212 | Probability and Statistics | 3 | | 3 | Fall | 2/Fall | E | MA102B | MATH |
| | Total | | 12 | | 11 | | | | | |
| Major Core Courses | MA202 | Complex Analysis | 3 | | 3 | Spr | 2/Spr | E | MA213-16 | MATH |
| | MA201a | Ordinary Differential Equations A | 4 | | 3 | Spr | 2/Spr | E | MA213-16 & MA109 | MATH |
| | MA301 | Real Analysis | 3 | | 3 | Fall | 3/Fall | E | MA213-16 | MATH |
| | MA303 | Partial Differential Equations | 3 | | 3 | Fall | 3/Fall | E | MA201a | MATH |
| | Total | | 13 | | 12 | | | | | |
| Major Practice-Based Courses | MA490 | Undergraduate Thesis/Project | 8 | 8 | 4 | Fall/ Spr | 4/Spr | | | MATH |
| | MA480 | Research Projects* | 2 | 2 | 2 | Fall/ Spr/ Smr | Any semester after the first school year | | | MATH |
| | MA470 | Internship* | | 2 | 16 | Smr | Any summer after the first school year | | | MATH |
| | Total | | 10 | 12 | 22 | | | | | |

*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**

| Course Code | Course Name | Credit | Lab Credits | Hours/week | Term | Advised term to take the course | Instruction language | Prerequisite | Dept. |
|---|---|---|---|---|---|---|---|---|---|
| CS203B | Data Structures and Algorithm Analysis B | 3 | 1 | 4 | Fall | 2/Fall | E | CS205 | CSE |
| CS205 | C/C++ Program Design | 3 | 1 | 4 | Spr | 1/Spr | | | CSE |
| MA209-16 | Elementary Number Theory | 3 | | 3 | Fall | 2/Fall | E | MA109 | MATH |
| MA110 | MATLAB Programming and Application | 3 | 1 | 4 | Spr | 2/Spr | E | | MATH |
| CS201 | Discrete Mathematics | 3 | | 3 | Spr | 2/Spr | C&E | MA107A& MA102B | CSE |
| MA206 | Mathematical Modeling | 3 | | 3 | Spr | 2/Spr | C&E | MA201a/ MA201b | MATH |
| MA214 | Abstract Algebra | 3 | | 3 | Spr | 2/Spr | E | MA109 | MATH |
| MA208 | Applied Stochastic Processes | 3 | | 3 | Spr | 2/Spr | E | MA213-16 & (MA215/MA212) & MA109 | MATH |
| MAS221 | The Basic Principle of Statistical Learning | 2 | | 8 | Smr | 2/Smr | C&E | MA215 / MA212 | MATH |
| MA207 | Mathematical Experiments | 3 | 1 | 4 | Fall | 3/Fall | C&E | MA213-16 | MATH |
| MA210 | Operations Research | 3 | | 3 | Spr | 2/Spr | E | MA203a/MA231 /MA213-16 | MATH |
| MA216 | Computational Finance | 3 | | 3 | Fall | 3/Fall | E | (MA215/MA212) & MA109 | MATH |
| MA323 | Topology | 3 | | 3 | Fall | 3/Fall | E | MA214 | MATH |
| MA321 | Representations of groups | 3 | | 3 | Fall | 3/Fall | E | MA214 | MATH |
| MA320 | Mathematics Writing in English | 3 | | 3 | Fall | 3/Fall | E | | MATH |
| MA329 | Statistical Linear Models | 3 | | 3 | Fall | 3/Fall | E | MA204/ MA212 | STAT |
| MA302 | Functional Analysis | 3 | | 3 | Spr | 3/Spr | E | MA301& MA202& MA109 | MATH |
| MA314 | Sample Surveys | 3 | | 3 | Spr | 3/Spr | E | MA204/ MA212 | STAT |
| MA327 | Differential Geometry | 3 | | 3 | Spr | 3/Spr | E | MA201a/ M201b | MATH |
| MA333 | Introduction to Big Data Science | 3 | | 3 | Spr | 3/Spr | E | MA215/MA212 | MATH |
| MA401 | Dynamical Systems | 3 | | 3 | Fall | 4/Fall | E | MA201a/ MA201b | MATH |
| MAT8006 | Scientific Computing | 3 | | 3 | Fall | 4/Fall | E | MA201a | MATH |
| MAT7001 | Algebra (Graduate) | 3 | | 3 | Fall | 4/Fall | E | MA214 | MATH |
| MAT7002 | Measure Theory and Integration (PG) | 3 | | 3 | Fall | 4/Fall | E | MA301 | MATH |
| MAT7012 | Algebraic Graph Theory | 3 | | 3 | Spr | 4/Spr | B | MA214 | MATH |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAT8010 | Combinatorics | 3 | | 3 | Spr | 4/Spr | E | MA214 | MATH |
| **Total** | | 77 | 4 | 87 | | | | | |
| Notes:<br>1. Students are required to complete 33 credits for the Major Elective Courses. | | | | | | | | | |

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

| Course Code | Course Name | Credit | Lab Credits | Hours/week | Term | Advised term to take the course | Instruction language | Prerequisite | Dept. |
|---|---|---|---|---|---|---|---|---|---|
| MA470 | Internship* | 2 | 2 | 16 | Fall & Spr | 4/Spr | | | MATH |
| MA480 | Research Projects* | 2 | 2 | 2 | Fall/Spr/Smr | Any semester after the first school year | | | MATH |
| MA490 | Undergraduate Thesis/Project | 8 | 8 | 4 | Smr | Any summer after the first school year | | | MATH |
| MA207 | Mathematical Experiments | 3 | 1 | 4 | Fall | 2/Fall | E | MA213-16 | MATH |
| MA110 | MATLAB Programming and Application | 3 | 1 | 4 | Spr | 2/Spr | E | | MATH |
| CS205 | C/C++ Program Design | 3 | 1 | 4 | Spr | 1/Spr | E | | CSE |
| CS203B | Data Structures and Algorithm Analysis B | 3 | 1 | 4 | Fall | 2/Fall | E | CS205 | CSE |
| CS102B | Introduction to Computer Programming B | 3 | 1 | 4 | Fall/Spr | 1/Spr & Fall | E | | |
| PHY104B | Experiments of Fundamental Physics | 2 | 2 | 4 | Spr/ Fall | B | PHY 103B | PHY | |
| **Total** | | 29 | 19 | 46 | | | | | |

**Table 4: Overview of Course Hours and Credits**

| Course Category | Total Course Hours | Total Credits | Credit Requirements | Percentage of the Total* |
|---|---|---|---|---|
| General Education (GE) Required Courses (not including English courses) | 768 | 48 | 48 | 35.56% |
| General Education (GE) Elective Courses | | | 13 | 9.63% |
| Major Foundational Courses | 176 | 12 | 12 | 8.89% |
| Major Core Courses | 144 | 13 | 13 | 9.63% |
| Major Elective Courses | 1232 | 77 | 33 | 24.44% |
| Research Projects, Internship and Undergraduate Thesis/Projects | | | 10 | 7.41% |
| Total (not including English courses) | | | 129 | |

**Curriculum Structure of Mathematics and Applied Mathematics**