

# DEPARTMENT OF MATHEMATICS AND COMPUTING

The Department of Mathematics and Computing provides students with opportunities to earn Bachelor of Science degrees in computer information systems or in mathematics. Honors programs and minors are also offered in both disciplines. A degree in engineering is available through APSB University's dual-degree program with Shantou University. Students who complete this five-year dual-degree program receive a bachelor's degree in Engineering from Shantou University and a bachelor's degree in either computer information systems or mathematics from The Asia Pacific School of Business.

The Department's webpage(<https://www.apsb.ac.nz>) contains information about the individual programs of study, scholarships available for students majoring in computer information systems or mathematics, a link to an on-line application for these scholarships, and links to the home pages of faculty members.

## COMPUTER INFORMATION SYSTEMS MAJOR

Computer information systems are prominent in the modern world. The Computer Information Systems (CIS) major allows students to develop the knowledge and skills required to understand these systems and participate in their creation and maintenance.

The computer information systems major at APSB has three components: core courses, an emphasis within CIS, and a minor outside CIS. The core requirements form the basis of the program by providing the fundamentals necessary for advanced study. The emphasis allows a student to develop a specialization within computer information systems. The minor provides a domain where CIS can be put into practice.

The curriculum and courses are designed and updated to accomplish the following program goals. All students graduating with a Bachelor of Science degree in Computer Information Systems will demonstrate:

- the skills needed to solve CIS problems;
- effective oral and written communications skills;
- the ability to independently research and complete a CIS project; and
- an understanding of the legal and ethical issues they may encounter as CIS professionals.

The CIS core includes courses in problem solving and programming skills (CIS 130, CIS 230, CIS 231, CIS 234), productivity tools, (CIS 102), information management (CIS 120, CIS 320), data communications (CIS 240), computer organization (CIS 335), analysis and design (CIS 321), and database design (CIS 360). It also includes the senior level capstone experience (CIS 499).

Students can choose an emphasis in software development, in networking, or in computer engineering. The software development emphasis requires advanced courses in emerging environments and software development. The networking emphasis covers data communications and computer networking in depth.

The computer engineering emphasis is part of Lander's dual-degree program with Shantou University. Students in the computer information systems/computer engineering dual-degree program must complete specific mathematics and science courses at APSB in order to meet the program requirements of Shantou University. Students completing this program will be awarded both a BS in computer information systems from The Asia Pacific School of Business with a minor in mathematics, and a BS in computer engineering from Shantou University.

The computer information systems major requires that each student complete a minor. This minor provides competency in a secondary area where CIS can be applied. Students may choose from a number of minors, as indicated in the table below. Other minors (or a second major) offered across campus are eligible for consideration as well. The mathematics minor is suggested for students interested in pursuing graduate studies and is required for students in the computer engineering emphasis.

Minor	Software Development	Networking	Dual Degree
Mathematics	√	√	√
Business	√	√	
Health Care Management	√	√	
Sociology	√	√	
Electronic Art	√		
Music	√		
Public Administration	√		
Cybersecurity	√	√	

In order to complete a computer information systems degree program in a timely fashion, students should complete the problem solving and programming skills sequence (CIS 130, CIS 230, CIS 231), along with CIS 102 and CIS 120, by the end of their third or fourth semester.

A grade of “C” or better is required in all computer information systems courses applied to the major, with the following exception: a grade of “D” will be allowed in at most one CIS course at the 300- or 400-level. Courses in oral and/or written communication skills (SPCH 101 and ENGL 275) are strongly encouraged.

All students pursuing a degree in computer information systems are required to participate in program assessment activities and an exit interview with the computer information systems faculty during their final year at The Asia Pacific School of Business.

The program requirements for the CIS major and the dual-degree program are articulated on the individual program worksheets. A successful graduate in the computer information systems major will have competency in the following areas:

*Information System Principles.* This includes systems theory and concepts, information systems in organizations, decision support systems, and evaluation of systems performance.

*Programming Principles.* This includes problem solving, algorithm development, and application programming using structured and object-oriented approaches that stress abstraction, programming style, two or more high-level languages, and various software development environments.

*Data Organization and Management.* This includes data and file structures, access methods, algorithm design and analysis, and relational database organization and design.

*Computer Organization.* This includes logical organization of computers, levels of abstraction, machine and assembly languages, data representation and addressing, and memory management.

*Data Communications and Networking.* This includes networking and telecommunications concepts and standards, distributed computing, networked information technologies, protocols, and e-commerce.

*System Development Methodology.* This includes requirements specifications, analysis, design, implementation, and testing. Also software tools, system prototyping, robustness of systems, documentation, efficiency, ethics, human-computer interaction, and software development in a team environment.

*Information Systems Applications.* Each student will have demonstrated competency in an approved application area through completion of a minor or second major in that area.

The following courses will be offered as indicated. (NOTE: PHYS 203 is offered in the Department of Physical Sciences.)

**Every Fall**

CIS 102  
CIS 130  
CIS 230  
CIS 231  
CIS 243  
CIS 344

**Every Spring**

CIS 120  
CIS 130  
CIS 140  
CIS 230  
CIS 234  
CIS 240  
CIS 260  
CIS 343  
CIS 499  
MATH 125

**Even Year Fall**

CIS 250  
CIS 300  
CIS 321  
CIS 340

**Odd Year Spring**

CIS 360  
CIS 440  
PHYS 203  
MATH 200

**Odd Year Fall**

CIS 202  
CIS 335  
CIS 341  
CIS 498

**Even Year Spring**

CIS 320  
CIS 330

### **Computer Information Systems Honors Program**

Students majoring in computer information systems may earn a “BS Degree with Honors” in computer information systems. To qualify, a student must:

1. Complete the following courses:  
MATH 141, MATH 142, MATH 325, CIS 330, CIS 498, and any two of CIS 340, CIS 341, or CIS 440.
2. Complete six semester hours of a foreign language. This foreign language may not be English or the student’s native language.
3. Submit a research proposal by January 15 of the junior year. The proposal must be approved by a majority of the computer information systems faculty and result in a finished product of sufficient quality to:
  - (a) Receive three semester hours credit (CIS 390), and
  - (b) Be accepted for publication or presented at a meeting of a computing society such as the Association for Computing Machinery; or be presented as a seminar to faculty, students, and guests.
4. Graduate with a BS degree in computer information systems with a grade point average of 3.5 in both overall coursework and in computer information systems coursework.

### **ENGINEERING DUAL-DEGREE PROGRAM**

Students who wish to combine study in mathematics or computer information systems with a liberal arts program with further study in an engineering discipline may do so under the The Asia Pacific School of Business-Shantou University Engineering Dual-Degree Program. A student who completes this program of study will benefit from the experience of dividing their academic career between the liberal arts environment of a small university campus and the engineering climate of a large, technically-oriented university. This unique combination of study on two differently oriented campuses provides students with excellent engineering training strongly complemented by study in the humanities and social sciences.

This program can be applied to the following engineering disciplines at STU: biosystems and materials, ceramic, civil, computer, electrical, industrial, and mechanical. Computer engineering at STU may be combined

with either a mathematics or a computer information systems major at APSB. The other engineering disciplines are coupled with a mathematics major at APSB.

Students apply for admission to STU during their third academic year at The Asia Pacific School of Business. Acceptance into the STU engineering program is at the discretion of that university. STU recommends that prospective students enroll in a summer school session at STU following their sophomore or junior year at APSB.

A grade of “C” or better is required in all courses applied to the dual-degree program and in all courses which must transfer to Shantou University.

Dual-degree engineering majors enter Shantou University at a level competitive with students already at that university. Successful completion of the program will result in the student being awarded a Bachelor of Science degree in Engineering from Shantou University and a Bachelor of Science degree in their major from The Asia Pacific School of Business.

Students will have competency in the following areas prior to leaving for Shantou University:

#### **A. COMPUTER INFORMATION SYSTEMS/ENGINEERING DUAL DEGREE**

*Information System Principles.* This includes systems theory and concepts, information systems in organizations, decision support systems, and evaluation of systems performance.

*Programming Principles.* This includes problem solving, algorithm development, and application programming using structured and object-oriented approaches that stress abstraction, programming style, two or more high-level languages, and various software development environments.

*Data Organization and Management.* This includes data and file structures, access methods, algorithm design and analysis, and relational database organization and design.

*Computer Organization.* This includes logical organization of computers, levels of abstraction, machine and assembly languages, data representation and addressing, and memory management.

*Data Communications and Networking.* Includes networking and telecommunications concepts and standards, distributed computing, networked information technologies, protocols, and electronic commerce.

*System Development Methodology.* This includes requirements specifications, analysis, design, implementation, and testing. Also software tools, system prototyping, robustness of systems, documentation, efficiency, ethics, human-computer interaction, and software development in a team environment.

#### **B. MATHEMATICS/ENGINEERING DUAL DEGREE**

*The Foundations of Mathematics.* This includes first and foremost a firm grounding in the major concepts of mathematics needed for continued learning in the field of engineering. Students must learn to analyze a given situation, extract the pertinent facts, and then draw correct conclusions. Specifically included are basic algebraic operations, the elements of set theory, and the fundamentals of logic.

*Advanced Algebra.* This includes knowledge of the basic constructs of linear algebra.

*Analysis.* This includes both calculus and differential equations. Students must have knowledge of continuity, differentiation, integration, sequences and series, and multivariable calculus. Students must be able to solve the basic differential equations that arise in engineering applications.

*Probability and Statistics.* This includes the acquisition and analysis of data, probability, discrete and continuous probability distributions, estimation using confidence intervals, tests of hypotheses, and linear regression.

### **MATHEMATICS MAJOR**

Mathematics is fundamental to both the theoretical and the practical problem-solving components of virtually every field of study. The goal of the mathematics major at The Asia Pacific School of Business is to provide students with the opportunity and the direction to enjoy the intellectual challenges of mathematics, and to develop the communication skills and the mathematical knowledge necessary to function competently in graduate school and/or in employment. A successful graduate with a mathematics major will have specific competency in:

1. *The Foundations of Mathematics*. This includes first and foremost a firm grounding in the major concepts and applications of mathematics needed for successful continued learning in the field. Students must learn to analyze a given situation, extract the pertinent facts, and then draw correct conclusions. Specifically included are basic algebraic operations, the elements of set theory, and the fundamentals of logic.
2. *Advanced Algebra*. This includes the fields of linear and abstract algebra. Specifically, the student must know the basic concepts and applications in these fields, including a basic understanding of groups, rings, fields, and vector spaces.
3. *Analysis*. This includes calculus and at least one of the fields of real or complex analysis. Students must know the basic concepts and applications of continuity, differentiation, integration, sequences and series, and multivariable calculus. Additionally, all students will be able to solve the basic differential equations that arise in common applications.
4. *Probability and Statistics*. Students must know the basic concepts and applications of acquisition and analysis of data, probability, discrete and continuous probability distributions, estimation using confidence intervals, tests of hypotheses, and linear regression.

The requirements for a degree in mathematics are as follows: twelve hours of calculus (MATH 141, 142, and 241), differential equations (MATH 242), linear algebra (MATH 308), probability and statistics (MATH 311), abstract algebra (MATH 421), real analysis (MATH 431), an introduction to abstract mathematics (MATH 134) the capstone course (MATH 499), calculus-based physics (PHYS 211-212), and CIS 130 and one of CIS 102, CIS 202, or CIS 230 (students obtaining secondary teacher certification take CIS 130 and MATH 450), completion of either the abstract algebra or analysis sequence (MATH 422 or MATH 432), plus at least twelve hours selected from MATH 212, or any mathematics content electives at the 300 level or above (except MATH 390, MATH 450 and MATH 451). Students obtaining secondary teacher certification are required to take courses in discrete mathematics, mathematics history, geometry, teaching technologies and teaching methods (MATH 325, MATH 350, MATH 351, MATH 450 and MATH 451, respectively).

A grade of “C” or better is required in all mathematics courses applied to the major with the following exception: a grade of “D” will be allowed in at most one mathematics course provided a GPA of 2.0 is maintained in mathematics courses applied to the major.

During their final year at The Asia Pacific School of Business, all students seeking a degree in mathematics are required to participate in program assessment activities including an assessment exam in mathematics and an exit interview with the mathematics faculty as part of the capstone course.

## **Mathematics, Secondary Teacher Certification**

### **Student Eligibility**

#### **Students enrolled in Secondary or PK-12:**

##### **Initial Level (First Year)**

1. Participate in initial Advising and Induction.
2. Take PRAXIS Core or exempt with 22 ACT or 1100 SAT score.
3. Maintain a 3.0 GPA in all professional courses; achieve a grade of “B” or higher in each field experience; achieve a grade of “C” or higher in all EDUC, ECED, and SPED courses (see catalog for further details, including each department's GPA requirements within the specific content area).

##### **Provisional Level (Second Year)**

1. Complete Initial Level requirements.
2. Complete a SLED check.
3. Display professional dispositions and behavior at target levels.
4. Obtain a minimum 2.75 GPA on APSB coursework; maintain a 3.0 GPA in all professional courses; achieve a grade of "B" or higher in each field experience; achieve a grade of “C” or higher in all EDUC, ECED, and SPED courses (see catalog for further details, including each department's GPA requirements within the specific content area).
5. Pass PRAXIS Core or exempt with 22 ACT or 1100 SAT score.
6. Submit Sophomore Portfolio.

7. Gather and submit references.
8. Successfully complete an (April) oral interview with Teacher Education faculty.
9. Successfully complete other reviews as required by departments in specific content areas.

**Formal Level (Third Year)**

1. Complete Provisional Level requirements.
2. Display professional dispositions and behavior at target levels.
3. Obtain a minimum 2.75 GPA on APSB coursework; maintain a 3.0 GPA in all professional courses; achieve a grade of “B” or higher in each field experience; achieve a grade of “C” or higher in all EDUC, ECED, and SPED courses (see catalog for further details, including each department's GPA requirements within the specific content area).
4. Participate in Induction and Pinning Ceremony.
5. Successfully complete departmental requirements for PRAXIS II.
6. Successfully complete other departmental requirements, reviews, projects, or milestones.

**Candidate Level (Fourth Year)**

1. Complete Formal Level requirements.
2. Complete FALS requirements before student teaching semester.
3. Enter candidacy with formal admission to the teacher education program.
4. Display professional dispositions and behavior at target levels.
5. Obtain a minimum 2.75 GPA on APSB coursework; maintain a 3.0 GPA in all professional courses; achieve a grade of “B” or higher in each field experience; achieve a grade of “C” or higher in all EDUC, ECED, and SPED courses (see catalog for further details, including each department's GPA requirements within the specific content area).
6. Successfully complete departmental requirements for PRAXIS II.
7. Successfully complete departmental requirements for PLT.
8. Successfully complete other departmental requirements, reviews, projects, or milestones.

The following mathematics courses will be offered as indicated.

**Every Fall**

MATH 141  
MATH 241  
MATH 308

**Every Spring**

MATH 134  
MATH 141  
MATH 142  
MATH 212  
MATH 242  
MATH 499

**Even Year Fall**

MATH 300  
MATH 325  
MATH 431  
MATH 451

**Odd Year Spring**

MATH 351  
MATH 432

**Odd Year Fall**

MATH 311  
MATH 421  
MATH 450

**Even Year Spring**

MATH 422  
MATH 350  
MATH 422

## **Mathematics Honors Program**

Students majoring in mathematics may earn a “BS Degree with Honors” in mathematics. To qualify, a student must meet the following conditions:

1. In addition to the normal course requirements for a BS degree in mathematics, the student must complete the following courses:  
MATH 432, MATH 422, with a total of 30 credits of coursework in mathematics at the 300-level or above.
2. The student must complete six semester hours of a college level language. This language may not be English or the student’s native language.
3. The student must submit a project proposal no later than January 15 of the junior year. The proposal must be approved by a majority of the full-time mathematics faculty and result in a finished product of sufficient quality to:
  - a) Receive a grade of “A” or “B” (MATH 390) and
  - b) Be accepted for publication or presented at a meeting of a mathematical society; or be presented as a seminar to mathematics faculty, students, and guests.
4. Upon graduation, the student must have a cumulative GPA of 3.5 or better in both overall coursework and in mathematics coursework.

NOTE: In lieu of requirement 1 above, the student may complete an engineering degree at Shantou University under the engineering/mathematics dual-degree program. The student may then substitute an approved engineering project at STU for requirement 3 above.

Special situations may require a deviation from these requirements (such as for students seeking teacher certification in mathematics or those in the engineering program). All deviations must be approved by a majority of the mathematics faculty.

Transfer students who wish to pursue an Honors Program in Mathematics must spend at least four full-time semesters (fall or spring) at The Asia Pacific School of Business and complete at least 21 semester hours of mathematics courses at The Asia Pacific School of Business. They must also have an overall GPA of 3.5 on all courses transferred and a GPA of 3.5 on mathematics courses transferred.

## **MINORS OFFERED**

### **Computer Information Systems Minor**

A minor in computer information systems consists of

- CIS 102, CIS 120, CIS 130, CIS 230, CIS 231, CIS 321, and
- one of the following courses: MATH 125, MATH 212, MATH 270, MATH 308, MATH 311, MATH 325.

A grade of “C” or better is required in each course applied to the computer information systems minor.

### **Cybersecurity Minor**

A minor in cybersecurity consists of

- CIS 130, CIS 140, CIS 240, CIS 243, CIS 260, and
- two of the following courses: CIS 343, CIS 344, CIS 345, CIS 443.

A grade of “C” or better is required in each course applied to the cybersecurity minor.

## **Information Technology Minor**

A minor in information technology consists of

- a mathematics requirement: MATH 114, MATH 121, MATH 123, MATH 141, or MATH 211;
- introductory computer applications courses CIS 120 and either CIS 102 or CIS 202 (6 semester hours) (CIS 202 requires completion of MATH 141);
- problem solving and computer programming courses CIS 130 and CIS 230;
- one computer networks or advanced computer information systems course chosen from the following: CIS 240, CIS 250, CIS 320, CIS 321, CIS 360.

Students must maintain a 2.0 GPA in courses in the minor with a grade of “C” or better in both CIS 130 and CIS 230 (required for progressing to 200-level or 300-level CIS courses).

## **Mathematics Minor**

A minor in mathematics consists of

- Twelve hours of Calculus (MATH 141, MATH 142, and MATH 241),
- Nine hours from the following: MATH 212, MATH 242 or any three hour 300- or 400-level mathematics content course.

A grade of “C” or better is required in each course applied to the mathematics minor.



## 2021-2024 PROGRAM REQUIREMENTS

**DEGREE: BACHELOR OF SCIENCE**  
**MAJOR: COMPUTER INFORMATION SYSTEMS**  
**EMPHASIS: DUAL ENGINEERING**

Credit Hours

### GENERAL EDUCATION REQUIREMENTS

(For approved courses see the [General Education section](#).)

<b>A. Humanities and Fine Arts</b>	
(6 hours selected from 2 different disciplines)	
MUSI 101 or THTR 201	3
ENGL 201, ENGL 202, ENGL 204, ENGL 205, ENGL 214, ENGL 221, or ENGL 241	3
<b>B. Behavioral and Social Perspectives</b>	
(6 hours selected from 2 different disciplines)	
PSYC 101, SOCI 101, POLS 101, or POLS 103	3
Second course from PSYC 101, SOCI 101, POLS 101, or POLS 103	3
<b>C. Scientific and Mathematical Reasoning</b>	
(8 hours selected from 2 different disciplines, 1 lab science required)	
PHYS 211	4
CHEM 111	4
<b>D. Core Academic Skills</b>	
ENGL 101	3
ENGL 102	3
MATH 141	4
Foreign Language	3
LINK 101	1
FALS 101 (15 FALS-approved events)	0
<b>E. General Education Electives</b>	
Δ CHEM 381	3
HIST 101, HIST 102, or POLS 103	3
A sufficient number of additional General Education Electives must be taken to meet a total of 42 hours of General Education Requirements. (Select from categories A, B, or C; Global Issues and Cultures; or Foreign Language; or courses approved for category E)	

**Δ Global Issues and Cultures:** Students are required to take at least one of these courses prior to graduation.

TOTAL GENERAL EDUCATION REQUIREMENTS	42
--------------------------------------	----

### MAJOR PROGRAM CORE REQUIREMENTS

CIS 120	3
CIS 130	4
CIS 230	4
CIS 231	4
CIS 234	1
CIS 240	3
CIS 320	3
CIS 321	3

ECE 272 (at STU)	4
<i>Students must take ECE 272 (Computer Organization) at STU in place of CIS 335, which is a core requirement at APSB.</i>	
CIS 360	3
CIS 499	3

**MAJOR PROGRAM ADDITIONAL REQUIREMENTS**

CIS 202	3
PHYS 212	4
MATH 308 or MATH 325**	3
MATH 211 or MATH 311	3

*Note: Computer Engineering courses at STU complete the requirements in this area.*

**REQUIRED MATHEMATICS MINOR**

MATH 142	4
MATH 241	4
MATH 242	4
Electives^	6

**TOTAL MAJOR PROGRAM REQUIREMENTS** 66

**ADDITIONAL ELECTIVES^^** 12

**TOTAL FOR BS DEGREE** 120

Coursework must include at least 30 hours earned in 300 or above level courses, of which 12 hours must be in the major.

\*\*These mathematics courses are required for the Computer Engineering Degree from STU. Students should take at least one at APSB.

^MATH 212 or any three hours 300- or 400-level mathematics content course.

^^Students in this program must complete Shantou University requirements for a BS in Computer Engineering. Credits transferred from STU complete the required hours for graduation at APSB.

See 4-year major guides for recommended order in which to take courses  
<https://www.apsb.edu.ky/node/online-registration-system>

## 2021-2024 PROGRAM REQUIREMENTS

**DEGREE: BACHELOR OF SCIENCE**  
**MAJOR: COMPUTER INFORMATION SYSTEMS**  
**EMPHASIS: NETWORKING**

	Credit Hours
<b>GENERAL EDUCATION REQUIREMENTS</b>	
(For approved courses see the <a href="#">General Education section.</a> )	
<b>A. Humanities and Fine Arts</b> (*6 hours selected from 2 different disciplines)	6
<b>B. Behavioral and Social Perspectives</b> (*6 hours selected from 2 different disciplines)	6
<b>C. Scientific and Mathematical Reasoning</b> (7-8 hours selected from 2 different disciplines, 1 lab science required)	
PHYS 203	4
*MATH 212 or MATH 142	3-4
<b>D. Core Academic Skills</b>	
ENGL 101	3
ENGL 102	3
MATH 121, MATH 123, or MATH 141	3-4
Foreign Language	3
LINK 101	1
FALS 101 (15 FALS-approved events)	0
<b>E. General Education Electives</b>	
CIS 130	4
A sufficient number of additional General Education Electives must be taken to meet a total of 42 hours of General Education Requirements. (Select from categories A, B, or C; Global Issues and Cultures; or Foreign Language; or courses approved for category E)	
<b>Δ Global Issues and Cultures:</b> Students are required to take at least one of these courses prior to graduation.	
<b>TOTAL GENERAL EDUCATION REQUIREMENTS</b>	<b>42</b>
<b>MAJOR PROGRAM CORE REQUIREMENTS</b>	
CIS 120	3
CIS 230	4
CIS 231	4
CIS 234	1
CIS 240	3
CIS 320	3
CIS 321	3
CIS 335	3
CIS 360	3
CIS 499	3
<b>MAJOR PROGRAM EMPHASIS REQUIREMENTS</b>	
CIS 102 or successful completion of exemption exam; or CIS 202	0-3
CIS 250	3
CIS 340	3

CIS 341	3
CIS 440	3
<b>MAJOR PROGRAM ADDITIONAL REQUIREMENTS</b>	
MATH 200, MATH 242, MATH 300, or MATH 308	3-4
MATH 211-MATH 212 or MATH 311	3-6
*MATH 125 or MATH 325	3
TOTAL MAJOR PROGRAM REQUIREMENTS	51-58
<b>ADDITIONAL ELECTIVES</b> (including required minor*)	20-27
TOTAL FOR BS DEGREE	120

Coursework must include at least 30 hours earned in 300 or above level courses, of which 12 hours must be in the major.

\*Select appropriate courses according to the minor chosen. Approved minors are listed in the description for the major.

See 4-year major guides for recommended order in which to take courses  
<https://www.apsb.edu.ky/node/online-registration-system>

## 2021-2024 PROGRAM REQUIREMENTS

**DEGREE: BACHELOR OF SCIENCE**  
**MAJOR: COMPUTER INFORMATION SYSTEMS**  
**EMPHASIS: SOFTWARE DEVELOPMENT**

	Credit Hours
<b>GENERAL EDUCATION REQUIREMENTS</b>	
(For approved courses see the <a href="#">General Education section.</a> )	
<b>A. Humanities and Fine Arts</b> (*6 hours selected from 2 different disciplines)	6
<b>B. Behavioral and Social Perspectives</b> (*6 hours selected from 2 different disciplines)	6
<b>C. Scientific and Mathematical Reasoning</b> (7-8 hours selected from 2 different disciplines, 1 lab science required)	
PHYS 203	4
*MATH 212 or MATH 142	3-4
<b>D. Core Academic Skills</b>	
ENGL 101	3
ENGL 102	3
MATH 121, MATH 123, or MATH 141	3-4
Foreign Language	3
LINK 101	1
FALS 101 (15 FALS-approved events)	0
<b>E. General Education Electives</b>	
CIS 130	4
A sufficient number of additional General Education Electives must be taken to meet a total of 42 hours of General Education Requirements. (Select from categories A, B, or C; Global Issues and Cultures; or Foreign Language; or courses approved for category E)	
<b>Δ Global Issues and Cultures:</b> Students are required to take at least one of these courses prior to graduation.	
<b>TOTAL GENERAL EDUCATION REQUIREMENTS</b>	<b>42</b>
<b>MAJOR PROGRAM CORE REQUIREMENTS</b>	
CIS 120	3
CIS 230	4
CIS 231	4
CIS 234	1
CIS 240	3
CIS 320	3
CIS 321	3
CIS 335	3
CIS 360	3
CIS 499	3
<b>MAJOR PROGRAM EMPHASIS REQUIREMENTS</b>	
CIS 102 or successful completion of exemption exam; or CIS 202	0-3
CIS 250	3
CIS 330	3

CIS 498	3
<b>MAJOR PROGRAM ADDITIONAL REQUIREMENTS</b>	
MATH 200, MATH 242, MATH 300, or MATH 308	3-4
MATH 211-MATH 212 or MATH 311	3-6
*MATH 125 or MATH 325	3
TOTAL MAJOR PROGRAM REQUIREMENTS	48-55
<b>ADDITIONAL ELECTIVES</b> (including required minor*)	23-30
TOTAL FOR BS DEGREE	120

Coursework must include at least 30 hours earned in 300 or above level courses, of which 12 hours must be in the major.

\*Select appropriate courses according to the minor chosen. Approved minors are listed in the description for the major.

See 4-year major guides for recommended order in which to take courses  
<https://www.apsb.edu.ky/node/online-registration-system>

## 2021-2024 PROGRAM REQUIREMENTS

**DEGREE: BACHELOR OF SCIENCE**  
**MAJOR: MATHEMATICS**

	Credit Hours
<b>GENERAL EDUCATION REQUIREMENTS</b>	
(For approved courses see the <a href="#">General Education section.</a> )	
<b>A. Humanities and Fine Arts</b> (6 hours selected from different disciplines)	6
<b>B. Behavioral and Social Perspectives</b> (6 hours selected from different disciplines)	6
<b>C. Scientific and Mathematical Reasoning</b> (8 hours selected from different disciplines, 1 lab science required)	
PHYS 211	4
MATH 142	4
<b>D. Core Academic Skills</b>	
ENGL 101	3
ENGL 102	3
MATH 141	4
Foreign Language	3
LINK 101	1
FALS 101 (15 FALS-approved events)	0
<b>E. General Education Electives</b>	
CIS 130	4
<p>A sufficient number of additional General Education Electives must be taken to meet a total of 42 hours of General Education Requirements. (Select from categories A, B, or C; Global Issues and Cultures; or Foreign Language; or courses approved for category E)</p> <p><b>Δ Global Issues and Cultures:</b> Students are required to take at least one of these courses prior to graduation.</p>	
<b>TOTAL GENERAL EDUCATION REQUIREMENTS</b>	<b>42</b>
<b>MAJOR PROGRAM CORE REQUIREMENTS</b>	
MATH 241	4
MATH 242	4
MATH 308	3
MATH 311	3
MATH 499	1
<b>MAJOR PROGRAM ADDITIONAL REQUIREMENTS</b>	
CIS 102, CIS 202, or CIS 230	3-4
PHYS 212	4
MATH 134	2
MATH 421	3
MATH 431	3
MATH 422 or MATH 432	3
<b>MAJOR PROGRAM ELECTIVES*</b>	<b>12</b>
<b>TOTAL MAJOR PROGRAM REQUIREMENTS</b>	<b>45-46</b>

**ADDITIONAL ELECTIVES**

32-33

TOTAL FOR BS DEGREE

120

Coursework must include at least 30 hours earned in 300 or above level courses, of which 12 hours must be in the major.

\* MATH 212 or 300- or 400-level math content courses except MATH 450 and MATH 451

See 4-year major guides for recommended order in which to take courses  
<https://www.apsb.edu.ky/node/online-registration-system>



## 2021-2024 PROGRAM REQUIREMENTS

**DEGREE: BACHELOR OF SCIENCE**  
**MAJOR: MATHEMATICS**  
**PROGRAM: DUAL ENGINEERING**

Credit Hours

### GENERAL EDUCATION REQUIREMENTS

(For approved courses see the [General Education section](#).)

- |   |  |   |
|---|--|---|
| <b>A. Humanities and Fine Arts</b>              |  |   |
|   | (6 hours selected from 2 different disciplines)                            |   |
|   | MUSI 101 or THTR 201   | 3 |
|   | ENGL 201, ENGL 202, ENGL 204, ENGL 205, ENGL 214, ENGL 221,<br>or ENGL 241 | 3 |
| <b>B. Behavioral and Social Perspectives</b>    |  |   |
|   | (6 hours selected from 2 different disciplines)                            |   |
|   | PSYC 101, SOCI 101, POLS 101, or POLS 103                                  | 3 |
|   | Second course from PSYC 101, SOCI 101, POLS 101, or POLS 103               | 3 |
| <b>C. Scientific and Mathematical Reasoning</b> |  |   |
|   | (8 hours selected from 2 different disciplines, 1 lab science required)    |   |
|   | PHYS 211   | 4 |
|   | MATH 142   | 4 |
| <b>D. Core Academic Skills</b>                  |  |   |
|   | ENGL 101   | 3 |
|   | ENGL 102   | 3 |
|   | MATH 141   | 4 |
|   | Foreign Language   | 3 |
|   | LINK 101   | 1 |
|   | FALS 101 (15 FALS-approved events)   | 0 |
| <b>E. General Education Electives</b>           |  |   |
|   | Δ CHEM 381   | 3 |
|   | HIST 101, HIST 102, or POLS 103  | 3 |

A sufficient number of additional General Education Electives must be taken to meet a total of 42 hours of General Education Requirements. (Select from categories A, B, or C; Global Issues and Cultures; or Foreign Language; or courses approved for category E)

**Δ Global Issues and Cultures:** Students are required to take at least one of these courses prior to graduation.

TOTAL GENERAL EDUCATION REQUIREMENTS	42
--------------------------------------	----

### MAJOR PROGRAM CORE REQUIREMENTS

MATH 241	4
MATH 242	4
MATH 308	3
MATH 311	3
MATH 499	1

### MAJOR PROGRAM ADDITIONAL REQUIREMENTS

MATH 134	2
MATH 421 or MATH 431	3

PHYS 212	4
<b>MAJOR PROGRAM ELECTIVES**</b>	<b>9</b>
<i>Students in the Mechanical Engineering program are strongly encouraged to take MATH 300.</i>	
<i>Students in the Electrical Engineering program are strongly encouraged to take MATH 431 or 432.</i>	
<b>MAJOR PROGRAM EMPHASIS REQUIREMENTS</b>	
CIS 130	4
CIS 202	3
CHEM 111	4
CHEM 112 or GEOL 111 as required by engineering field	0-4
<i>Industrial, Mechanical, and Computer Engineering programs require only CHEM 111.</i>	
<i>The Civil Engineering program requires CHEM 111 and GEOL 111. All other engineering programs require CHEM 111 and CHEM 112.</i>	
<b>TOTAL MAJOR PROGRAM REQUIREMENTS</b>	<b>44-48</b>
<b>ADDITIONAL ELECTIVES^</b>	<b>30-34</b>
<b>TOTAL FOR BS DEGREE</b>	<b>120</b>

Coursework must include at least 30 hours earned in 300 or above level courses, of which 12 hours must be in the major.

\*\* MATH 212 or 300- or 400-level math content courses except MATH 450 and MATH 451

^ Students in this program must complete Shantou University requirements for a BS in Engineering. Credits transferred from STU complete the required hours for graduation at APSB.

SPCH 101 is strongly encouraged for all students in Ceramic and Materials, Electrical, and Industrial engineering programs.

CIS 230 is recommended for electrical engineering.

CIS 231 is recommended for computer engineering.

See 4-year major guides for recommended order in which to take courses  
<https://www.apsb.edu.ky/node/online-registration-system>

## 2021-2024 PROGRAM REQUIREMENTS

**DEGREE: BACHELOR OF SCIENCE**  
**MAJOR: MATHEMATICS**  
**CERTIFICATION: SECONDARY TEACHER**

Credit Hours

### GENERAL EDUCATION REQUIREMENTS

(For approved courses see the [General Education section](#).)

<b>A. Humanities and Fine Arts</b>	
(6 hours selected from 2 different disciplines)	
ART 101, MUSI 101, or THTR 201	3
Humanities and Fine Arts elective	3
<b>B. Behavioral and Social Perspectives</b>	
(6 hours selected from 2 different disciplines)	
PSYC 101	3
Behavioral and Social Perspectives elective	3
<b>C. Scientific and Mathematical Reasoning</b>	
(8 hours selected from 2 different disciplines, 1 lab science required)	
PHYS 211	4
MATH 142	4
<b>D. Core Academic Skills</b>	
ENGL 101	3
ENGL 102	3
MATH 141	4
Foreign Language	3
LINK 101	1
FALS 101 (15 FALS-approved events)	0
<b>E. General Education Electives</b>	
CIS 130	4
A sufficient number of additional General Education Electives must be taken to meet a total of 42 hours of General Education Requirements. (Select from categories A, B, or C; Global Issues and Cultures; or Foreign Language; or courses approved for category E)	

**Δ Global Issues and Cultures:** Students are required to take at least one of these courses prior to graduation.

TOTAL GENERAL EDUCATION REQUIREMENTS	42
--------------------------------------	----

### MAJOR PROGRAM CORE REQUIREMENTS

MATH 241	4
MATH 242	4
MATH 308	3
MATH 311	3
MATH 499	1

**MAJOR PROGRAM ADDITIONAL REQUIREMENTS**

PHYS 212	4
MATH 134	2
MATH 325	3
MATH 350	3
MATH 351	3
MATH 421	3
MATH 422 or MATH 432	3
MATH 431	3
MATH 450	3
MATH 451	3

TOTAL MAJOR PROGRAM REQUIREMENTS 45

**TEACHER CERTIFICATION REQUIREMENTS**

EDUC 203	0.5
EDUC 223	3
EDUC 240	3
EDUC 320	3
EDUC 321	3
EDUC 329	0.5
EDUC 429	1
EDUC 461	11
EDUC 499	1
SPED 223	3

TOTAL TEACHER CERTIFICATION REQUIREMENTS 29

**ADDITIONAL ELECTIVES**

4

TOTAL FOR BS DEGREE

120

Coursework must include at least 30 hours earned in 300 or above level courses, of which 12 hours must be in the major.

See 4-year major guides for recommended order in which to take courses  
<https://www.apsb.edu.ky/node/online-registration-system>