

Mac computers and CentOS Linux are provided to students for iPhone development and other learning needs. The embedded systems labs cover Embedded Linux, Raspberry Pi, and the Android System.

• Learning Resources and Laboratories

Designated learning laboratories are open for students to conduct after-class hands-on practice as well as to take laboratory courses. Practice focuses on the following:

- Big data, data mining, and machine learning
- Data Engineering/Data Science
- Artificial Intelligence
- The Internet of Things (IoT)
- Mobile Apps design
- Computer networking, systems administration, and network security
- Database administration and database design
- VLSI/SOC design
- Embedded systems design

Other applications: Students also use the computer laboratory facility to do homework and projects in areas such as machine learning, artificial intelligence, blockchain, object-oriented design and programming, Linux system programming, Java/C++/Python programming, MATLAB, website design, e-business programming, software testing, digital media and graphics, and business auditing.

• The University Library and Digital Campus

The SFBU administration strives to provide an up-to-date digital campus facility to the students and faculty to increase their learning/teaching effectiveness. The university library not only maintains traditional service functions but also **provides commercially available digital libraries** easily accessible online by students, faculty, and staff.

The MySFBU portal is the gateway for students and faculty to access SFBU's unique online environment. Faculty members use the portal to manage their courses, and students use the portal to submit online request to administrative staff as well as to access learning resources, personal records, career information, and library information and resources. The MySFBU portal is maintained by the SFBU IT Department.

◆ Library Services

Besides learning in class, students are encouraged to pursue independent research using resources provided by the San Francisco Bay University Library. SFBU's physical collections comprise of books and periodicals. The online resources include databases from ProQuest, a leading provider of academic content to researchers and libraries around the world. ABI/INFORM GLOBAL is the most comprehensive business database on the market, providing access to thousands of scholarly journals and trade publications. The university also provides access to thousands of digital copies of business, computer science, engineering, and technical books to faculty and students through subscription to ABI/INFORM GLOBAL and O'Reilly for Higher Education.

To encourage and help students stay current in their chosen fields, SFBU Library maintains print subscriptions of core periodicals in business and engineering.

San Francisco Bay University Library aims to continuously adapt and increase its resources in response to the educational and research needs and interests of SFBU students and faculty. The SFBU Library welcomes suggestions from faculty and students on new acquisitions.

Information Literacy

The SFBU Library is committed to teaching students information literacy skills, which will enable them to develop their abilities to assess their information needs, find the needed information efficiently, evaluate information critically, and use it ethically. These information literacy skills will prepare our students for life-long learning.

Library users can find help by using Ask-a-Librarian on the library website.

To access the library catalog, library patrons have two options:

- 1) Using the computer in the library lobby whose home page is the catalog
- 2) Access the catalog from the library's website

To access the library's electronic collection, library users have three options:

- 1) Using the computer in the library lobby
- 2) Access the e-library via the link on the student/faculty portal:
 - a. Go to: <https://my.sfbu.edu/>
 - b. Click e-Services tab, top right
 - c. Select eLibrary > ProQuest or O'Reilly
- 3) 24/7 access from anywhere is provided via EZProxy:
 - a. Go to: <https://elib.sfbu.edu/login>
 - b. Enter your on-campus computer login information
 - c. Click on "ProQuest Digital Library" or "O'Reilly for Higher Education"

◆ MySFBU portal for Faculty and Students

Faculty members use the Canvas LMS and MySFBU faculty portal as tools to help them manage their courses online, including maintaining their students' academic and attendance records, posting and updating course syllabi, assignments, instructions, and handout materials. Teaching Assistants access the system to post homework-related information and useful learning materials for individual courses. Faculty members and teaching assistants can also send messages to their students through these electronic facilities.

Each current student is assigned accounts to access the MySFBU and LMS student portals. The systems are designed such that student users can access all general information but only their own personal data and academic records. Using the systems, students can obtain their course-related information, update their personal contact data, and check their own study plan, financial records, and attendance records.

■ Audio/Video/Photographic Recording

Students wishing to take photographs or make any type of video and/or audio recordings of lectures presented by SFBU faculty members and/or visiting lecturers must obtain the written consent of those faculty members or lecturers.

ACADEMIC PROGRAMS

SFBU's undergraduate and graduate programs are designed to prepare students for the practice of electrical engineering, embedded systems engineering, computer science, and business administration at a professional level. In particular, the degree curricula are designed to keep pace with the development of Silicon Valley's major industries, including electronics, computer engineering, information technology, enterprise management, and global business development.

As Silicon Valley is a dynamic and fast changing high-technology hub where the only constant is fierce competition among the employers, the employers in the Valley are more demanding on workers' qualifications. Therefore, job seekers in the Valley are required to be well prepared in their background training and have the understanding that continued education is a general requirement in the workplace.

SFBU's program committees in various disciplines hold regular meetings to ensure that the curriculum design and facility support in hardware and software can meet the industry standards. Furthermore, faculty members who teach major and related courses must have had previous or current industry experience and are equipped with up-to-date knowledge and skills in their teaching subjects.

Degree programs are offered by two schools: The School of Engineering and the School of Business. Each School offers degree programs at two levels: bachelors and master's levels. In addition, the School of Business offers an academic Graduate Certificate in Business Management. The following are program information divided by School and, within each School, by degree level.

SCHOOL OF ENGINEERING

The School of Engineering offers degree programs in two disciplinary areas: Computer Science and Electrical Engineering. The Chief Academic Officer, School Dean, program advisory committees, as well as the faculty members of the School of Engineering are responsible for the School's academic affairs. The program advisory committees are comprised of industry professionals, potential employers, and community leaders who advice, review, and provide recommendations on the undergraduate and graduate programs. Practical applications are emphasized throughout the students' learning process although theoretical background is taught in each course subject as fundamentals.

■ Purpose

Degree programs offered by the School of Engineering are designed for students who intend to become professional engineers in the high-technology electronics or computer industry, as well as for those who desire a modern, general education based on the problems and the promises of a technological society. The environment in which students are educated is as important in shaping their future as their classroom experiences. The School of Engineering offers a friendly atmosphere and a variety of academic programs that have made SFBU engineering graduates highly valued in high-tech firms and Bay Area communities.

■ Faculty

All SFBU engineering faculty members possess the following qualities: advanced degrees earned in engineering and science disciplines, high-tech work experience, and enthusiasm in teaching and helping the students. Engineering is not a homogeneous discipline; it requires many special talents. Some faculty members in the School are goal-oriented designers, concerned with teaching students how to solve problems - how to synthesize relevant information and ideas and apply them in a creative, feasible design. Other engineering faculty members function more typically as method-oriented scientists, using the techniques of their disciplines in their teaching and research to investigate various natural and artificial phenomena.

■ Objectives

The course offerings and hands-on experiences offered to the engineering students aim to achieve the following objectives:

- ❑ To provide each student a goal-oriented education by tailoring each student's study plan based on the student's background and interests.
- ❑ To provide in-depth professional training with state-of-the-art learning resources to the student.
- ❑ To provide relevant laboratory experience throughout each program as an integral part of the education.
- ❑ To provide undergraduate students well-rounded and balanced undergraduate studies.
- ❑ To nurture a learning environment which leads to professional values recognizing high quality and integrity in a true engineer.
- ❑ To provide graduate students an opportunity to pursue advanced training and professional development to practice their profession with increased competence.

■ Undergraduate Programs

The School of Engineering offers one undergraduate degree program:

Bachelor of Science in Computer Science (BSCS)

● Credential Requirements

The undergraduate program accepts qualified high school graduates and college transfer students.

- **Freshmen Applicants:** Undergraduate applicants who have not completed at least **30** semester units of college credit are considered **freshmen**.

● Application Requirements

To apply for admission into a bachelor's degree program, the applicant is required to submit the following to the SFBU Admissions Office:

1. Application Form (online)
 2. Nonrefundable application fee
 3. Copy of passport or a government issued I.D.
 4. Official transcripts from ALL previously attended institutions; freshman applicant is required to submit his/her official high school transcript and document certifying high school completion. Applicant must have been in good academic standing at the last institution attended.
 - a high school/college CGPA of 2.5 or above is recommended. Lower CGPAs may require an interview with the Academic team. A GPA below 2.0 does not qualify for admission.
 5. Foreign Credential Evaluation: Foreign transcripts must be evaluated by a member of National Association of Credential Evaluation Services (NACES), Association of International Credential Evaluators (AICE), or American Association of Collegiate Registrars and Admissions Officers (AACRAO)'s International Education Services
 6. An English proficiency document is required for non-native English speakers: an official transcript with English course records or TOEFL/IELTS/iTEP/PTE Academic/Cambridge B2 First score report or equivalent will suffice. See English Proficiency Requirement below for detailed information on the English entrance requirement.
- **F-1 International Students:** In addition to the above general application requirements, an international applicant is required to submit the following additional documents:
 1. A financial support document: provide a recent financial support document indicating a minimum amount of \$40,000 available to pursue study in the first academic year at SFBU.

- a current bank letter and bank statement; or
- a loan letter from a lending institution; or
- Copies of fixed deposits.

An affidavit of support or sponsor letter is required if the funds are not in the applicant's name.

2. A transfer student (from a U.S. institution) is required to submit a photocopy of his/her
 - previous I-20 form,
 - visa, and
 - I-94 (U.S Department of Homeland Security issued arrival/departure form).

GED: SFBU recognizes the General Educational Development (GED) tests and accepts the GED graduates.

- GED score of 456 or above is recommended. Lower scores may require an interview with the Academic team

Applicants interested in applying for scholarships need to provide additional documentation. Please refer to the section on Scholarships in this catalog and on the website.

• **Credential Evaluation Requirement**

Applicants who have earned their high school or college credentials at a foreign institution must provide a course-by-course credential evaluation analysis. This credential evaluation must be completed by a member of National Association of Credential Evaluation Services (NACES), Association of International Credential Evaluators (AICE), or American Association of Collegiate Registrars and Admissions Officers (AACRAO)'s International Education Services. This credential evaluation must be in the original sealed envelope, if it is a hard copy; an electronic copy may be sent directly from the evaluation agency to SFBU.

Note: International schools/colleges accredited by U.S. regional accrediting bodies are exempt from this requirement.

• **English Proficiency Requirement**

Non-native English speakers are considered meeting the entrance English proficiency requirement if they meet any of the following requirements:

- An official IELTS (Academic), TOEFL (iBT), TOEFL Essentials, iTEP Academic, PTE Academic or Cambridge B2 First test score report. Minimum Score:
 - IELTS (Academic) 5.5 band
 - TOEFL (iBT) 59
 - TOEFL Essentials 6.5 band
 - iTEP Academic 3.7
 - PTE Academic and PTE Academic Online 50
 - Cambridge B2 First 168
- Successful completion of IEP Upper Intermediate Level B with a grade of B or better in all four courses
- An English assessment report from a few U.S. English language institutions recognized by major universities in the U.S.
- A degree earned or a college-level English credit course passed at an institution located in the U.S., U.K., Ireland, Australia, New Zealand, or Canada
- A degree earned at an institution in which the language of instruction is strictly English (as determined solely by SFBU)

• **Entrance Assessment Test**

The entrance assessment test, SAT/ACT, is optional for freshmen students. Applicants may submit SAT/ACT or other national level exam scores to strengthen their application.

SFBU's Institution Code for reporting

- SAT scores: 4335
- ACT scores: 1750

• **General Background Requirements for Pursuing Bachelor's Degrees**

Remedial courses are not offered at SFBU except for English as a Second Language classes. Applicants to all programs are required to have completed pre-calculus subjects in algebra, trigonometry, and geometry prior to admission into any program.

• **Transfer of Credit from Other Institutions**

Course credit earned at other institutions of higher education may be transferable. Credit transfer is made by the admission evaluators while conducting the admission evaluation or by formal transfer agreement between institutions. The transfer of credit is done at the program-of-study level, topic area level, the major and major selectable levels and on a case-by-case basis. The following statements apply to all transfer credits:

- The SFBU Admissions Office must receive all official transcripts prior to the student's joining a degree program. Without preapproval, transcripts received after the student joins SFBU cannot be used in transferring credits, except for records from the term immediately preceding the student's starting trimester at SFBU. Up to 75 units of courses that have been reviewed and currently approved as part of a formal SFBU articulation/transfer agreement are guaranteed to transfer.
- The student was officially enrolled in the course.
- Courses eligible for transfer by prearranged transfer / articulation agreement shall follow the details contained in the agreement. Courses eligible for one-to-one matching course transfer will be evaluated based on the comparability in content, quality and rigor with SFBU's courses. Required courses require a closer comparability match. Courses eligible for topic area transfer may be mapped to the program's relevant topic area unit requirements without the need for one-to-one course matching and may have their units used in lieu of required units with the approval of the Registrar and School Dean. The transfer evaluation will include, but is not limited to, course descriptions, course syllabi, and/or general public information. Students may be asked to provide course catalogs or syllabi if needed. Up to 75 trimester units of courses that have been reviewed and currently approved as part of a formal SFBU articulation/transfer agreement are guaranteed to transfer.
- When evaluating any foreign transcript, the admission evaluators may accept or transfer credit based on their knowledge of the course contents in comparison with similar courses offered in the U.S.
- Without prior approval courses for transfer to SFBU may not be completed concurrently at another institution while a student is matriculated in an SFBU degree program.
- College English courses taken at an institution where English is not an official language cannot be transferred for general education credit.
- The credits under consideration for transfer must be earned at (1) institutions approved by the Bureau for Private Postsecondary Education, (2) public or private institutions of higher learning accredited by an accrediting association recognized by the U. S. Department of Education, or (3) foreign institutions of higher learning. Credits earned at a foreign institution degree must be evaluated by a member of National Association of Credential Evaluation Services (NACES), Association of International Credential Evaluators (AICE), or American Association of Collegiate Registrars and Admissions Officers (AACRAO)'s International Education Services.
- Professional Development Units (PDUs) offered by professional/industry organizations cannot be transferred to SFBU for academic credit.

- Continuing Education Units (CEUs) offered on a non-academic basis by other academic institutions cannot be transferred to SFBU for academic credit.
- The total credits transferred from other institutions to meet the student's undergraduate program requirements are limited to 75 trimester units. Students must take at least 45 units at SFBU.
- Credits transferred at the time of admission evaluation will reduce program length. Credit transferred from any outside institution has no effect on the calculation of the student's GPA or CGPA.
- Credits transferred from any outside institution are excluded from the maximum attempted units for the program.
- Credits are transferred by the following conversion:

a. Definition of a Trimester Unit:

One trimester credit hour equals, at a minimum, 15 contact classroom hours of lecture, 30 contact hours of laboratory, or 45 contact hours of practicum.

b. Conversion Factor:

1 quarter unit = **0.66** trimester unit

- **Grades Required for Transfer Credit**

In the bachelor's degree programs, applicable courses completed with an equivalency of a letter grade of "C" or better are transferable. Courses completed with Pass/No Pass are not transferable unless the transcript states that the general grading policy is not based on letter grades. This policy must be in writing from the institution (transcript key or a letter of verification).

- **Other Types of Undergraduate Transfer Credit**

The following other types of credit may be transferable:

a. AP/IB course credit earned which is considered to be equivalent to college credit.

b. Credit by Examination - CLEP

SFBU grants credit to those students who pass examinations in English, natural sciences, humanities, and social science subjects offered by the College Level Examination Program (CLEP). Only General Education credits will be granted. Students should consult with the Admissions Office for information on acceptable CLEP scores and units. **The CLEP Institution Code for SFBU is 7569.**

c. Transfer of Credit from Defense Activity for Nontraditional Education Support (DANTES) and Military Services

Credits will be allowed for DANTES Subject Standardized Tests and professional military education evaluated by the American Council on Education (ACE). The maximum transferable credits follow the same policies as specified above. SFBU's evaluation of an application is made prior to the student's admission to a program unless otherwise approved by the authorizing VA office. **The DANTES Institution Code for SFBU is 9670.**

- ❑ **Proficiency Exams:** A student may be required to demonstrate proficiency in a subject taken more than ten years prior to application with SFBU by successful completion of a proficiency examination.

- ❑ **Experiential Learning**

SFBU does not award credit for prior experiential learning.

- **Tuition**

Tuition is charged per unit. Tuition for courses taken to fulfill the undergraduate degree requirement is \$330.00 per unit.

- **Tuition per Unit for Courses Audited**

For courses audited (without earning credit), the tuition is half the regular unit rate. Not all courses can be taken with “audit” status.

- **Estimated Total Charges for On-time Completion of Entire Educational Program**

- Tuition: \$39,600
- Fees: \$4,000
- Graduation Petition Fee: \$300
- Textbooks & Software Costs: \$6000
- Health Insurance Premium: \$4,950

- **BSCS: \$54,850**

Please note that this estimate includes tuition, fees, textbooks costs, and health insurance premium, which is subject to change. All students are required to pay current rates for tuition and fees each trimester. Additional fees may apply, depending on the services requested (see Tuition and Fee section). The cost of textbooks is estimated to be approximately \$150 per course. The actual cost of textbooks can vary significantly from course to course.

- **Graduation Requirements**

Each program requires coursework in the following areas:

- (1) General education,
- (2) Major study, and
- (3) Electives.

An overall G.P.A. of 2.0 or better and a D grade or higher on all courses towards the degree are required. The student must be in good standing with the University and have an approved petition to graduate on file.

1. General Education Requirements

All undergraduate students in the engineering programs must complete at least 40 trimester units in general education (GE). GE courses cover subjects in the following areas: (a) English language communication and critical thinking, (b) mathematics and natural sciences, (c) arts and humanities, and (d) social sciences.

Examples of courses that fall under each area of general education are as follows:

- Area A: English Language Communication and Critical Thinking: Expository Writing, Critical Thinking, Public Speaking, Small Group Communication, Intercultural Communication, American Literature.
- Area B: Mathematics and Natural Sciences: Calculus, Linear Algebra, Probability & Statistics, Physical Sciences, Physics.
- Area C: Arts and Humanities: Introduction to Philosophy, Art/Music Appreciation, Principle of Ethics.
- Area D: Social Sciences: American Experience, American/California History, Emotional Intelligence, Introduction to Psychology, Multiculturalism, Public Administration, Sociology.

General Education Student Learning Outcomes

SFBU has determined that the first five institutional learning outcomes will also serve as general education outcomes, with one modification: The general education outcome for critical thinking has been modified to include an introductory phrase, “Using various disciplinary perspectives, explore and analyze issues, ideas,

artifacts, and/or events to formalize an opinion or conclusion.” This inclusion allows for a clear mapping between general education courses in natural sciences, social sciences, communications, and humanities.

All undergraduate students are expected to demonstrate the following general education student learning outcomes:

Written Communication - Write sustained, coherent arguments or explanations.

Oral Communication - Utilize effective oral communication strategies.

Quantitative Reasoning - Utilize mathematical concepts and methods to analyze, and explain issues in quantitative terms.

Information Literacy - Identify, locate, evaluate, and effectively and responsibly use and share information in support of academic, personal, and professional needs.

Critical Thinking - Utilizing various disciplinary perspectives, explore and analyze issues, ideas, artifacts, and / or events to formalize an opinion or conclusion.

2. Major Study Requirements

The BSCS program is designed to include a series of major study coursework. The courses provide the student the foundation and training in computer & database technologies, programming languages, network engineering, data science, structured programming, algorithms, and engineering mathematics and science areas.

Professional Development: The Career Development, Professional & Technical Writing, and Senior Capstone Project courses prepare the engineering students for their professional careers.

3. Electives

Electives are built in each program to promote breadth as well as depth in the study program. The student must complete a sufficient number of elective courses to meet the graduation requirements.

Course numbers: Courses numbered in the 100s and 200s are lower-division courses; courses numbered in the 300s and 400s are upper-division courses.

The following is the description of the undergraduate engineering program.

- **Bachelor of Science in Computer Science (BSCS)**

Program Objectives: The Bachelor of Science in Computer Science curriculum is designed to provide in-depth professional training in a range of current computer science subjects, including artificial intelligence, cybersecurity, data science, structured programming, object-oriented analysis and program design, computer organization principles and operating systems, database principles and applications, and principles of computer networks. It is designed to equip the student with both a theoretical background and hands-on experience.

The curriculum provides training in software engineering and prepares the students for employment in computer software related areas, such as computer software design and development, and computer software applications in computer networks and Internet systems. After completing the undergraduate degree, a student is also prepared to enter an advanced degree program in a computer science related field if he/she desires.

Program Learning Outcomes: Students graduating with a BSCS degree are expected to demonstrate the following program learning outcomes –

Written & Oral Communication - Communicate proficiently on topics that are related to computer science and computer systems with a range of audiences.

Quantitative Reasoning & Problem Solving - Utilize general knowledge in areas such as data management, algorithms, networking, or quantitative analysis to solve computing problems.

Information Literacy - Search, locate, and utilize information pertaining to current computing practices, technology used in the industry, and software tools to fulfill specified requirements.

Inquiry, Analysis, & Critical Thinking - Demonstrate rational thinking over the selection and application of suitable computing solutions appropriate to the discipline.

Specialized Knowledge & Foundations/Integrative Learning - Apply computer science principles and skills acquired in the degree program to work on programming assignments and projects.

Graduation Requirements: A minimum of **120 units** are required for graduation. They include the following:

- 1) **40 units of general education courses** including (a) 12 units in English language communication and critical thinking, (b) 16 units in mathematics and natural sciences, (c) 6 units in arts and humanities, , and 6 units in social sciences,
- 2) **65 units of major courses**, and
- 3) **15 units of electives**.

BSCS Curriculum

(Total **120 units**)

1. General Education (minimum 40 units)

The purpose of general education is to give breadth to the student's education. With a general background in English language communication and critical thinking, mathematics and natural sciences, arts and humanities, and the social sciences, the student will be prepared for his/her roles both in society and at work. Students who have not completed the general education requirements upon entering a degree program at SFBU are required to observe the following curriculum to meet the general education requirements.

Area A: English Language Communication and Critical Thinking (12 units) Units

(ENGL101, ENGL115, AND ENGL425 are required courses. Other listed courses are suggested subjects.)

ENGL101	Expository Writing	(3)
ENGL102	Critical Thinking	(3)
ENGL115	Public Speaking	(3)
ENGL220	Small Group Communication	(3)
ENGL320	Intercultural Communication	(3)
ENGL425	Modern American Literature	(3)

Area B: Mathematics and Natural Sciences (16 units)

(MATH201, MATH202, MATH203, MATH208, PHYS201, and PHYS201L are required courses. Other listed courses are suggested subjects.)

MATH201	Calculus – I	(3)
MATH202	Calculus – II	(3)
MATH203	Linear Algebra	(3)
MATH208	Probability and Statistics	(3)
PHYS101	Introduction to Physical Sciences	(3)
PHYS201	Physics – I	(3)
PHYS201L	Physics Lab – I	(1)

PHYS202	Physics – II	(3)
PHYS202L	Physics Lab – II	(1)

Area C: Arts and Humanities (6 units)

(The students can select any 6 units from the following suggested subjects.)

HU210	Introduction to Philosophy	(3)
HU230	Art Appreciation	(3)
HU240	Music Appreciation	(3)
HU280	Principles of Ethics	(3)
HU420	Critical Analysis of Film	(3)
HU450	Information Literacy for Academics, Life, and the Workplace	(3)

Area D: Social Sciences (6 units)

(The students can select any 6 units from the following suggested subjects.)

SOC201	California History	(3)
PSY210	Introduction to Psychology	(3)
SOC215	Introduction to Sociology	(3)
SOC235	Multiculturalism in the United States	(3)
SOC250	Public Administration	(3)
SOC260	Civilization and Urbanization	(3)
SOC275	The American Experience	(3)
HIST340	Modern American History	(3)
HIST400	Early American History	(3)
SOC450	Emotional Intelligence	(3)

2. Major Requirements (minimum 65 units)

[Computer & database technologies, programming languages, data science, structured programming, algorithms, artificial intelligence, network engineering, professional/career development, and capstone project courses to prepare for professional career]

Core Courses (50 units)		<u>Units</u>
CS200	Discrete Logic	(3)
CS230	Linux and Shell Scripting	(3)
CS230L	Linux and Shell Scripting Lab	(1)
CS250	Introduction to Programming	(3)
CS250L	Introduction to Programming Lab	(1)
CE305	Computer Organization	(3)
CS350	Data Structures	(3)
CS350L	Data Structures Lab	(1)
CS360	Programming in C and C++	(3)
CS360L	Programming in C and C++ Lab	(1)
CS380	Operating Systems	(3)
BUS450	Professional and Technical Writing	(3)
P450	Career Development	(1)
CS455	Algorithms & Structured Programming	(3)
CS457	Data Modeling and Implementation Techniques	(3)
CS457L	Database Technologies Lab	(1)
CS480	Java and Internet Applications	(3)
CS480L	Java Programming Lab	(1)
CS483	Fundamentals of Artificial Intelligence	(3)
CS483L	Artificial Intelligence & Machine Learning Lab	(1)
CS487	Object-oriented Design and Implementations	(3)
CS494	Senior Capstone Project – I	(3)

Specialization Courses - Complete Five Courses from Below: (15 units)

CE450	Fundamentals of Embedded Engineering	(3)
CS453	Compiler Design	(3)
CS470	Network Engineering and Management	(3)
CS477	Ethical Hacking and Penetration Testing	(3)
CS478	Blockchain Technology and Applications	(3)
CS481	Introduction to Data Science	(3)
CS485	JavaScript and Internet Programming	(3)

3. Electives (minimum 15 units)

The student may select courses in any discipline to fulfill this requirement to promote breadth as well as depth in their study program. Course prerequisite requirements must be met. When applicable, the student may take curricular practicum courses and engage in practical training to work on company projects that are directly related to the student's course of study.

Suggested Course Study Flow for On-time Degree Completion

The key objectives for the first few trimesters are to complete prerequisite courses and earn credits for lower-division general education & major requirement courses. The table below shows suggested course sequence for a full-time student who plans to complete the program (120 units) in 10 trimesters. Course selections for a trimester may vary based on course availability and whether the prerequisites have been completed.

The duration to complete the degree may be shortened to 9 trimesters by taking extra course loads during the course of study. Please consult with an Academic Advisor for rules pertaining to extra course loads and to map out an alternative study plan.

Trimester	Course	Title	Units	Prerequisite
First	CS200	Discrete Logic	3	Pre-Calculus
	ENGL101	Expository Writing	3	
	MATH201	Calculus – I	3	Pre-Calculus
	MATH208	Probability and Statistics	3	Pre-Calculus
		Total Units	12	
Second	CS250	Introduction to Programming	3	
	CS250L	Introduction to Programming Lab	1	
	ENGLxxx	English (Lower-Division)	3	
	HUxxx	Humanities (Lower-Division)	3	
	MATH202	Calculus – II	3	MATH201
		Total Units	13	
Third	CS230	Linux and Shell Scripting	3	
	CS230L	Linux and Shell Scripting Lab	1	
	ENGL115	Public Speaking	3	
	PHYS201	Physics – I	3	MATH201
	PHYS201L	Physics Lab – I	1	MATH201
		Social Sciences (Lower-Division)	3	
		Total Units	14	
Fourth	CE305	Computer Organization	3	
	CS350	Data Structures	3	CS250
	CS350L	Data Structures Lab	1	CS250L
	HUxxx	Humanities (Lower-Division)	3	
	MATH203	Linear Algebra	3	MATH201
		Total Units	13	

Fifth	CS360	Programming in C and C++	3	CS250
	CS360L	Programming in C and C++ Lab	1	CS250L
	CS380	Operating Systems	3	CS250
	ENGL425	Modern American Literature	3	ENGL101
		Elective Course	3	
		Total Units	13	
Sixth	BUS450	Professional and Technical Writing	3	ENGL101
	CS455	Algorithms & Structured Programming	3	CS350
	CS457	Data Modeling and Implementation Techniques	3	CS250
	CS457L	Database Technologies Lab	1	CS250L
		Elective Course	3	
		Total Units	13	
Seventh	CS480	Java and Internet Applications	3	CS250
	CS480L	Java Programming Lab	1	CS250L
	CS487	Object-Oriented Design and Implementations	3	CS250
	CS4xx	Specialization Course for Major	3	CSxxx
		Elective Course	3	
		Total Units	13	
Eighth	CS483	Fundamentals of Artificial Intelligence	3	CS250
	CS483L	Artificial Intel. & Machine Learning Lab	1	CS250L
	CS4xx	Specialization Course for Major	3	CSxxx
	CS4xx	Specialization Course for Major	3	CSxxx
		Elective Course	3	
		Total Units	13	
Ninth	CS4xx	Specialization Course for Major	3	CSxxx
	CS4xx	Specialization Course for Major	3	CSxxx
		Social Sciences (Upper-Division)	3	
		Elective Course	3	
		Total Units	12	
Tenth	CS494	Senior Capstone Project – I	3	Senior Year
	P450	Career Development	1	
		Total Units	4	

• **Course Descriptions**
Bachelor Degree Programs, School of Engineering

For undergraduate programs, lower division courses are numbered in the 100s and 200s, and upper division courses are numbered in the 300s and 400s.

Course No.	Description	Course No.	Description
100-199	Freshman level courses	200-299	Sophomore level courses
300-399	Junior level courses	400-499	Senior level courses
450-499	Senior level specialized skills courses taken for undergraduate level credit		

Courses are listed by subject: Business, Computer Engineering, Computer Science, Curricular Practicum, English, Humanities, Mathematics, Physics and Physical Sciences, Professional Development, and Social Science.

Each course description is followed by its prerequisite/co-requisite information expressed in course numbers.

Each **1-unit lab** course requires at least 2 contact hours of lab work each week. Each 1 unit of a practicum course requires at least 45 contact hours of practical experience related to the student's program curriculum.

Business

BUS450 Professional and Technical Writing (3 units)

This course presents students with practical instructions about communicating in different kinds of academic and workplace environments, as well as professional/technical communities. Students will learn how to organize and produce common professional writing work, such as technical reports, white papers, proposals, and theses. The course also covers different forms of effective writing, writing styles, approaches, formats, and citation of referenced materials.

Prerequisite: **ENGL101**

Computer Systems Engineering

CE305 Computer Organization (3 units)

This course is designed to provide a fundamental understanding of the issues and challenges involved in designing and implementing modern computer systems. The primary goal is to help students become more skilled in their understanding of computer systems, including how the hardware and software interact with each other. This course will also provide an understanding of where computers came from and where they are going, as well as understanding their strengths and weaknesses, such as why compiled code will always execute faster than JAVA code. Subjects will include: RISC vs. CISC CPU design approach, instruction sets, pipelining, instruction scheduling (branch prediction, speculative and out-of-order execution, etc.), cache, and storage hierarchy design. Additional key focuses will be on modern I/O architectures such as PCI, PCI-X, SATA, SCSI, USB, etc., and their importance on performance and compatibility.

CE450 Fundamentals of Embedded Engineering (3 units)

This is the first in a series of embedded systems courses designed for students who are interested in learning real-time embedded systems and practicing real-time programming of embedded systems. Topics include hardware issues including platform, microprocessors commonly used in these systems and how a microprocessor works in such systems, concept of memory, registers, I/O; interrupt generation and handling in an embedded system; the concept of real-time programming, multi-task, concurrency, mutual exclusion; overview of real-time kernel/OS, drivers; system initialization and startup, and debug issues. Hands-on exercises are required.

Prerequisite: **CS250**

CE450L Embedded Engineering Lab (1 unit)

This is a drill course designed to be taken with the course CE450 Fundamentals of Embedded Engineering. The students gain hands-on experience with embedded systems programming and design. They are also guided to work on projects involving controller systems.

Prerequisite: CS250L

Computer Science

CS200 Discrete Logic (3 units)

This course is designed to introduce students to discrete logic concepts related to computer science and a broad spectrum of applications. Topics include logic set theory, Boolean matrix algebra, relations, structures, combinatorics, computational methods, elements of logic design, graphs theory and its applications to computer science and telecommunications, and design and analysis of efficient algorithms.

Prerequisite: Pre-calculus subjects.

CS230 Linux & Shell Scripting (3 units)

This course is designed to familiarize the students with the Linux environment. Topics include concepts of the Linux operating system, Shell commands, Visual editor, file manipulation and securities, Linux utility commands, Shell features and Shell environment, online manual, controlling user processes and managing jobs, introduction of Regular Expression and its usage with grep, sed, and awk power utilities, basic Shell programming techniques, large file management, and the user programming environment customization. Students are also introduced to Linux shells (bash, Bourne, and Korn), shell programming, basic Linux file system, and resource management. The students will be able to write shell scripts to accomplish routine tasks for software development and testing. Hands-on exercises are required.

CS230L Linux & Shell Scripting Lab (1 unit)

This course is designed to be taken with the course CS230 Linux & Shell Scripting. The students gain hands-on experience with Unix/Linux commands, vi editor, Linux utility, Shell scripting/programming, security issues, and managing long files and customization of user environment.

CS250 Introduction to Programming (3 units)

This course is an introduction to computer science using Python programming language. Major topics covered include defining and analyzing problems, developing algorithms, implementation, debugging, and documentation of programs, coverage of basic algorithms, programming concepts and data types. Students will write computer programs that include control structures, iteration, methods and argument passing, and classes.

CS250L Introduction to Programming Lab (1 unit)

This course is designed to be taken with the course CS250 Introduction to Programming. It is aimed at students new to the language and who may, or may not, have experience with other programming languages. Students will learn (a) how Python works and its place in the world of programming languages, (b) to work with and manipulate strings, (c) to perform math operations, (d) to work with Python sequences, (e) to collect user input and output results, (f) flow control processing, (g) to write to, and read from, files, (h) to write functions, and (i) to handle exceptions.

CS350 Data Structures (3 units)

This course is designed to teach efficient use of data structures and algorithms to solve problems. Students study the logical relationship between data structures associated with a problem and the physical representation. Topics include introduction to algorithms and data organization, arrays, stacks, queues, trees, graphs, sorting, hashing, and heap structures. Hands-on exercises are required.

Corequisite: CS250

CS350L Data Structures Lab (1 unit)

This course is designed to be taken with the course CS350 Data Structures. C language - a structured programming language - is further investigated. Topics include pointer structure, structure and union, stack, queue, linked list, sort, binary tree, and heaps.

Corequisite: CS250L

CS360 Programming in C and C++ (3 units)

This course is designed to develop the students' abilities to design, code, and document application programs using C and C++ programming languages. Emphasis is on establishment of design objectives, criteria and specifications, processes of synthesis, analysis, construction, testing, and evaluation of open-ended problems. Topics include an introduction to procedural C programming and general object-oriented programming as implemented in C++, data

types, expression, statements, functions, program scope, run-time memory allocation, function overloading, template functions, class mechanism, derivation, inheritance, and migration from C to C++. Labs may accompany lectures in partial class meetings during the trimester. Hands-on exercises are required.

Prerequisite: **CS250**

CS360L Programming in C and C++ Lab (1 unit)

This course is designed to be taken with the course CS360 Programming in C and C++ to practice and develop the programming skills in both C and C++.

Prerequisite: **CS250L**

CS380 Operating Systems (3 units)

This course covers the fundamental concepts and implementation techniques of modern operating systems. Topics include processes, threads, concurrency, memory management, file systems, I/O systems, security, and OS virtualization. Popular operating systems will be selected for case studies including Linux/UNIX, Windows, Android, and VMWare hypervisors. Hands-on exercises and projects are required.

Prerequisite: **CS250**

CS453 Compiler Design (3 units)

This course is designed to give students a fundamental knowledge of compilers and interpreters for modern computer languages. Topics include a study of modern computer languages, regular expressions, lexical analysis, parsing techniques, context-free grammars, and syntax-directed translation. Hands-on exercises and trimester projects are required.

Prerequisite: **CS350**

CS455 Algorithms & Structured Programming (3 units)

This course introduces students to the design, analysis, and implementation of algorithms to solve engineering problems using an object-oriented programming language. It covers the common algorithms, algorithmic complexity, and data structures used to solve these problems. The course concentrates on the design of algorithms and the analysis of their efficiency.

Prerequisite: **CS350**

CS457 Data Modeling and Implementation Techniques (3 units)

This is the first of a series designed to teach relational database concepts, design, and applications. Topics include database architecture, relational model, structured query language (SQL), data manipulation language (DML), data definition language (DDL), database design, ER modeling, database normalization, denormalization, and physical database design. Popular database systems, such as Oracle and Microsoft SQL server, are used for hands-on exercises and projects.

Corequisite: **CS250**

CS457L Database Technologies Lab (1 unit)

This is a drill course designed to be taken with the course CS457 Data Modeling and Implementation Techniques. The students gain hands-on experience in database applications using popular database systems including Oracle database and Microsoft SQL server. They are also guided in working on database design projects.

Corequisite: **CS250L**

CS470 Network Engineering and Management (3 units)

This course is designed to introduce network communications. Topics include network layered models (OSI, TCP/IP), architecture, principles, service models and protocols; data communication basics, switching, routing, security, network management, and wireless and mobile networks. Modern Internet technologies and implementations are presented in case studies. Hands-on exercises are required.

Prerequisite: **CS250**

CS477 Ethical Hacking and Penetration Testing (3 units)

An ethical hacker is usually employed by an organization which trusts him or her to attempt to penetrate networks and/or computer systems, using the same methods as a hacker, for the purpose of finding and fixing computer security vulnerabilities. This course goes in-depth into the computer hacking techniques. The students leave with the ability to quantitatively assess and measure threats to information assets; and discover where the organization is most vulnerable to hacking. This allows system administrators to deploy proactive countermeasures and stay ahead of information security developments and exploited vulnerabilities.

Prerequisite: **CS250**

CS478 Blockchain Technology and Applications (3 units)

This course explores the fundamentals and applications of blockchain technology; the transparent, secure, immutable and distributed database used currently as the underlying technology for Cryptocurrency. Types of blockchain will be introduced and studied with real-life cases. This course will introduce students to the workings and applications of this potentially disruptive technology and its potential impact, on all aspects of business world and society with practical cases and research assignments.

CS480 Java and Internet Applications (3 units)

This course introduces students to the Java language, programming with object-oriented construct, GUI design and graphics programming, and core Java libraries. Students will learn Java language basics such as syntax and classes, inheritance, interfaces, reflection, graphics programming, event handling, user-interface components with Swing, Java applets, exception handling, stream, and files. Hands-on exercises are required.

Prerequisite: **CS250 or CS360**

CS480L Java Programming Lab (1 unit)

This is a drill course designed to be taken with the course CS480 Java and Internet Applications. The students gain Java programming skills through hands-on exercises in this weekly lab course. Weekly hands-on exercises normally correspond with the lecture material offered in each week.

Prerequisite: **CS250L or CS360L**

CS481 Introduction to Data Science (3 units)

Data science is an interdisciplinary field that combines mathematics, statistics, programming languages, and specific domain knowledge. The course describes (1) the process of gaining knowledge and insights from data in both a structured and an unstructured way, (2) scientific methods, processes, algorithms, and systems that can be employed to analyze, design, develop, and implement solutions to challenging novel and existing data science problems.

Prerequisite: **MATH208**

CS483 Fundamentals of Artificial Intelligence (3 units)

This course covers artificial intelligence applications in problem solving, reasoning, planning, natural language understanding, computer vision, autonomous car navigation, machine learning, business intelligence, robot design, and so on. In order to solve artificial intelligence problems, the major algorithms include machine learning, search, Markov decision processes, constraint satisfaction, graphical models, and logic. The main goal of the course is to equip students with the tools in Python library to tackle a variety of AI problems in the industries.

Prerequisite: **CS250**

CS483L Artificial Intelligence & Machine Learning Lab (1 unit)

Students will learn python programming in Google colab platform with numpy, pandas, matplotlib, scikit-learn, seaborn, tensorflow models and Keras API to implement algorithms covered in the lecture from different raw dataset sources. And they will have the chance to build system for several hand-on design projects. In two hours lab session, student will be getting familiar with algorithm functions in above libraries to implement different data processes in machine learning, search, Markov decision processes, constraint satisfaction, graphical models, logic, and optimize design system by plotting data process curves and error analysis in the model.

Prerequisite: **CS250L**

CS485 JavaScript and Internet Programming (3 units)

This course is designed to provide students with advanced programming knowledge and skills for application development on the Internet. Students study both client-side and server-side scripting including HTML, JavaScript, and CSS to develop interactive and responsive web sites. Other topics covered include jQuery, Bootstrap, Node.js Express Framework, RESTful API, MongoDB (NoSQL) and various JavaScript frameworks such as Angular and React. Hands-on exercises are required.

Prerequisite: **CS250**

CS487 Object-Oriented Design and Implementations (3 units)

This course is designed to use an object-oriented programming language to achieve the goal of teaching the students the design methodology for algorithm development. The objective is to develop the students' programming ability with proper logical and object-oriented thinking processes, as well as basic design patterns. The course covers two main topics: (1) Problem specification and analysis - understand the problem, analyze it, and translate the human thinking into a computer program; (2) Object-oriented design and analysis - understand data abstraction, encapsulation, aggregation, and inheritance. These concepts are the foundation for object-oriented programming languages such as Python, Java, C++, and C#. Hands-on practices using Python are required.

Corequisite: **CS250**

CS494 Senior Capstone Project – I (3 units)

The senior capstone project course is designed to develop the creativity of every graduating senior in Computer Science through the exercise of the design effort and implementation skills on a self-selected project. The design approach must employ the modern design techniques and methodologies in the related fields that were acquired during the course of program study. Completion of the project entails (1) proper research on relevant topics, (2) formulation of a design problem statement, (3) design specifications, (4) consideration of alternative solutions, (5) development plan, (6) actual implementation, and (7) submission of a final report. The student must discuss with and follow the guidelines provided by the instructor through the period of research, implementation, testing, report writing, and related procedures.

Prerequisite: **Must be in the senior year of the program.**

CS495 Senior Capstone Project – II (3 units)

This is the second part of the senior capstone project series. The student may choose to continue to work on the project developed during the CS494 Senior Capstone Project - I course. The goal is to allow students to enhance or expand their projects to gain more experience in product development, as well as apply additional knowledge/skills acquired during the course of program study or through individual research. Upon completion of the project, the student is required to conduct an open-forum presentation of the project and submit a professional report.

Prerequisite: **CS494**

Curricular Practicum**CPT401 Curricular Practicum (1 unit)**

Curricular practicum, or curricular practical training, is a supervised practical experience that is the application of previously studied theory. The curricular practicum must provide students a valuable learning experience and must significantly increase their knowledge in their program of study. It is defined as alternative work/study, internship, cooperative education, or any other type of required internship or practicum that is offered by sponsoring employers through cooperative agreements with the school and the course is an integral part of an established curriculum. At least three hours of work in a practical setting has the credit equivalency of one hour of classroom lecture (1 unit). To be eligible to take this course, the student must have completed at least two trimesters of coursework required in his/her degree program, obtained a written agreement that outlines the arrangement between the institution and the practicum site (including specific learning objectives, course requirements, and evaluation criteria), and received approval by a designated advisor. F-1 International students must follow additional rules required by the U.S. Immigration and Customs Enforcement. The student must use SFBU's online tool to submit his/her application for taking this course before meeting with a designated advisor for an assessment of eligibility. Information and instructions concerning this course are provided in the application form. This is a part-time practicum course taken by the undergraduate student to work no more than twenty hours each week during the approved practicum period. Failure in this course will prevent the student from taking any curricular practicum course afterwards.

Prerequisite: Refer to the instructions on the application and agreement documents.

CPT402 Curricular Practicum (2 units)

Curricular practicum, or curricular practical training, is a supervised practical experience that is the application of previously studied theory. The curricular practicum must provide students a valuable learning experience and must significantly increase their knowledge in their program of study. It is defined as alternative work/study, internship, cooperative education, or any other type of required internship or practicum that is offered by sponsoring employers through cooperative agreements with the school and the course is an integral part of an established curriculum. At least three hours of work in a practical setting has the credit equivalency of one hour of classroom lecture (1 unit). To be eligible to take this course, the student must have completed at least two trimesters of coursework required in his/her degree program, obtained a written agreement that outlines the arrangement between the institution and the practicum site (including specific learning objectives, course requirements, and evaluation criteria), and received approval by a designated advisor. F-1 International students must follow additional rules required by the U.S. Immigration and Customs Enforcement. The student must use SFBU's online tool to submit his/her application for taking this course before meeting with a designated advisor for an assessment of eligibility. Information and instructions concerning this course are provided in the application form. This is a full-time practicum course taken by the undergraduate student to work more than twenty hours but not to exceed forty hours each week during the approved practicum period. Failure in this course will prevent the student from taking any curricular practicum course afterwards.

Prerequisite: Refer to the instructions on the application and agreement documents.

English

(GE in English and Communication area)

ENGL100 English Structure and Composition (0 units)

This course focuses on the structural components of academic writing, starting with the parts of speech, the parts of a sentence, and the building blocks of phrases and clauses. It covers sentence types and variety, parallelism, proper word usage and punctuation, and avoiding sentence errors. This course also emphasizes unity and coherence, as well as the structure of paragraphs and standard academic essays.

ENGL101 Expository Writing (3 units)

This fundamental level college writing course is based on a systematic approach to address students' needs to acquire knowledge and skills in written communication. It explores an integrated approach to the mechanics of communication, encompassing a full range of basic concerns in informative writing, going from its processes to its forms, to the popular techniques writers have used to make their works outstanding. Students enhance their writing skills through the process of prewriting, organizing, drafting, revising, and editing of expository essays. By the end of the trimester, students should be able to use grammar and punctuation correctly and to write effective informative/explanatory essays in both academic and professional settings.

ENGL102 Critical Thinking (3 units)

This course focuses on learning to be an effective provider and consumer of ideas in our information-saturated society. Students will learn to identify the intent of the message, to judge the soundness of the argument, and to evaluate the validity of the evidence. Rigorous training will help learners go beyond feelings and personal biases to clear, impartial, and accurate problem solving and decision making that are essential to all human communication: speaking, writing, debating, and persuading.

ENGL115 Public Speaking (3 units)

This course is designed to develop effective skills in extemporaneous speaking, formal presentations, and listening. Students will learn about nonverbal communication, cultural differences in communication, and research methodology.

ENGL220 Small Group Communication (3 units)

This course is designed to accomplish the following learning goals: 1) to help the students understand theories and principles of small group decision making and problem solving, 2) to provide students with hands-on experience working in small groups, the most powerful tool in modern industry, and 3) to offer students opportunities to observe the development and operation of real-life task-oriented groups.

ENGL320 Intercultural Communication (3 units)

This course introduces theories and practices regarding intercultural relationships and communication. It helps students adapt to a rapidly diversified workforce both in Silicon Valley and in other parts of the world. From the vantage point of this course, students will see the forces that shape cultures and influence intercultural contacts. They will be enabled to build harmonious and productive relationships with individuals from all national, ethnic, and linguistic backgrounds.

ENGL425 Modern American Literature (3 units)

This course examines fiction and non-fiction writing produced by American authors in the 20th and 21st century. This course will cover the themes, styles and content of modern American authors. Genres such as Drama, Action and Science Fiction will be investigated. Students will be asked to analyze context, culture, time and structure. This course requires critical thinking on essays written about various readings.

Prerequisite: ENGL101

Humanities

(GE in Humanities area)

HU210 Introduction to Philosophy (3 units)

This course is an introduction to the great questions of philosophy, using an historical approach. The class covers Western and non-Western traditions from the pre-Socratic and Confucius to modern times.

HU230 Art Appreciation (3 units)

A crash course in western art aesthetic from ancient art to post-modernism, this course gives the student a historical western art background that makes comparisons to the East, as well as the tools to analyze paintings through their own cultural point of view.

HU240 Music Appreciation (3 units)

This course is designed for students to explore the fundamentals of music through easy listening examples from all aspects of sound: tone, color, harmony, rhythm, mood, dynamics, tempo, themes, and forms. Students will analyze music in respect to the historical and cultural context as well as to daily life.

HU280 Principles of Ethics (3 units)

This course is designed to teach students ethical principles and problems applicable to their lives. Topics include application of ethical principles, background and philosophical principles of ethics, ethical practices, and practical ethical problems and solutions.

HU420 Critical Analysis of Film (3 units)

This course examines the impact of film on society, and vice-versa. Students will review, critique and analyze several films throughout the trimester. Knowledge, insight and critical analysis will be required to demonstrate how the selected films reflect and impact cultures. This course examines content, meaning, history and culture of American and foreign films. Various genres and film movements will be viewed and discussed.

HU450 Information Literacy for Academics, Life, and the Workplace (3 units)

This course will give students a skill that they will be able to use and benefit from for the rest of their lives: the ability to read, evaluate and understand newspapers, magazines, websites, journalistic materials, business writing and journals. Students will be able to evaluate and analyze bias, propaganda, agenda, point-of-view and misinformation. Students will be able to interpret, organize and synthesize information from various sources to achieve a specific purpose with clarity and depth.

Prerequisite: ENGL101

Mathematics

MATH201 Calculus – I (3 units)

This course is the first of a series in calculus designed for students to build up the fundamental background of calculus and to learn its applications to very basic problems. Topics include functions, limits, continuous functions, derivatives and applications, antiderivatives, composite functions and chain rule, graphing techniques using derivatives, implicit differentiation, finite integrals, and fundamental theorems of calculus.

(GE – in Mathematics area)

Prerequisite: Pre-calculus subjects

MATH202 Calculus – II (3 units)

This course is the second of the calculus series designed for students to understand integration techniques and extend the differentiation notion and methods to functions of multiple variables. Topics include logarithmic and exponential functions and their derivatives, inverse trigonometric functions and derivatives, L'Hopital's rule, integration techniques and their applications, sequence, series, partial derivatives, and improper integrals.

Prerequisite: MATH201

MATH203 Linear Algebra (3 units)

Linear Algebra is one of the topics to prepare students for higher-level math courses as Differential Equations. It is also relevant to computer and business students interested in Data Science since linear problems are often the simplest models of the natural world. In this course students learn the language, concepts, and techniques, from the ground up; the course starts with geometric representation of systems by equations, and later manipulation of abstract ideas as Singular Value Decomposition.

Prerequisite: MATH201

MATH208 Probability and Statistics (3 units)

This course is designed for students to understand the concepts, theory, and applications of probability and statistics. Topics include permutation, combination, random variables, distribution, means and variance, normal distribution, random sampling, estimation, confidence interval, hypothesis testing, linear correlation and regression.

(GE – in Mathematics area)

Prerequisite: Pre-calculus subjects