



A Course of Study for

## COMPUTER SCIENCE

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The field of computer science leads to a variety of careers that all require core computer science skills. These skills include theory Courses such as Computer Hardware, Data Structures, and Networks, as well as programming in different computer languages. Thereafter, within the field, areas of specialty lead into careers including software development, project management, system analysis, and maintenance among other areas. With the Internet being an integral part of everyday life, Web page authoring and Web application development have been other areas of high demand in the job market.

For additional career possibilities, visit the Career Services Center on the main campus to utilize computerized career information systems and other valuable career resources.

### PROGRAMS OFFERED

- Transfer Preparation

### DEGREES AND CERTIFICATES

#### Associate Degrees

- Cloud Computing
- Computer Programming
- Computer Science
- Database Applications Developer
- Web Developer

#### Certificates of Achievement

- Applied Artificial Intelligence
- Blockchain Developer
- Cloud Computing
- Computer Programming
- Computer Science
- Data Analyst
- Data Science
- Database Applications Developer
- Information Systems Management
- Mobile Apps Development – Android
- Mobile Apps Development – iPhone
- System Administrator (*formerly Networking*)
- Web Developer

#### Department Certificates

- Artificial Intelligence
- Cloud Computing
- Cybersecurity
- Entry Level Programmer
- Microsoft Azure

## ASSOCIATE DEGREE REQUIREMENTS

An Associate degree is granted upon successful completion of a program of study with a minimum grade point average (GPA) of 2.0 (C) in degree applicable coursework and a minimum of **60 degree applicable semester units**, including:

- Completion of the academic path with a grade of C or higher in each course, or with a P if the course was taken on a Pass/No Pass basis, and the P is equal to a C or higher (Title 5 §55063);
- Completion of at least 50% of academic path units at Santa Monica College; Department Chairs have the discretion to waive the 50% minimum units required at SMC to meet the major or area of emphasis.
- Completion of one of the following general education patterns: SMC GE, CSU GE, or Cal-GETC;
- Completion of the SMC Global Citizenship graduation requirement.

## CERTIFICATE OF ACHIEVEMENT REQUIREMENTS

A Certificate of Achievement is granted upon successful completion of a program of study with a minimum overall grade point average (GPA) of 2.0 (C) and a **designated minimum number of units**, including:

- At least 50% of the units required for the Certificate of Achievement must be completed at Santa Monica College. Department Chairs have the discretion to waive the 50% minimum units required at SMC to meet the major or area of emphasis (Exception: For Cal-GETC/CSU GE Certificates, 50% of the units required for Certificates of Achievement must be completed at any combination of California Community Colleges).
- Students must receive a grade of C or higher in each course to successfully complete a Certificate of Achievement. (Exception: For CSU GE Certificates of Achievement, a minimum grade of D- (0.7 on a 4.0 scale) is required for each course, except for Area A and B4, which may be completed with a C or higher. The minimum overall grade point average (GPA) on the CSU GE pattern must be a C (2.0 on a 4.0 scale).
- Students must complete each course of the academic or career path with a grade of C or higher, or with a Pass/No Pass basis, and the P is equal to a C or higher (Title 5 §55063).

## DEPARTMENT CERTIFICATE REQUIREMENTS

A Department Certificate is granted upon successful completion of a program of study with a **designated minimum number of units**, including:

- Completion of the academic or career path with a grade of C or higher in each course, or with a P if the course was taken on a Pass/No Pass basis, and the P is equal to a C or higher (Title 5 §55063);
- Completion of at least 50% of academic or career path at Santa Monica College. Department Chairs have the discretion to waive the 50% minimum units required at SMC to meet the major or area of emphasis.

*Note: Department Certificates are not noted on student transcripts. Students must submit a petition to the relevant academic department to be awarded a Department Certificate.*

## CATALOG RIGHTS

Catalog rights – which go into effect when a student starts at a California Community College or California State University - determine the general education pattern the student will follow at SMC, regardless of future changes to requirements.

A student may satisfy the requirements of a degree or certificate by completing the general education and academic or career path requirements in effect at any time of the student's **continuous** enrollment. Continuous enrollment means attendance in at least one semester (fall or spring) in each academic year.

**TRANSFER PREPARATION**

Many colleges/universities offer baccalaureate degrees in this field. Students planning to transfer to a four-year college or university should complete the lower-division major requirements and the general education pattern for the specific transfer institution. SMC has articulation agreements with the many UC and CSU campuses, as well as several private and out-of-state institutions.

Exact major requirements for UC and CSU campuses can be found online at [assist.org](https://assist.org).

A listing of private, nonprofit California colleges and universities can be found online at [aiccu.edu](https://aiccu.edu). For articulation agreements between SMC and some of these institutions see [smc.edu/articulation](https://smc.edu/articulation).

The **University of California system has a transfer pathway** for any UC campus that offers Computer Science. For more information, visit [pathwaysguide.universityofcalifornia.edu](https://pathwaysguide.universityofcalifornia.edu)

**CLOUD COMPUTING, ASSOCIATE DEGREE OR CERTIFICATE OF ACHIEVEMENT**

This certificate provides students with the industry skills to understand, build and maintain applications for the cloud. These skills include the technical principles of the hardware and software requirements to run systems in the cloud including storage, database management, and software systems, while maintaining secure access.

**Program Learning Outcomes:** Upon completion of the program, students will demonstrate a high level of competency in the different operational levels of cloud computing, such as storage and software as a service, while applying security standards to their operation.

**AREA OF EMPHASIS: (27 UNITS)****Required Courses: (15 units)**

CS 41	Linux Workstation Administration	3
<i>or</i>		
CS 43	Windows Network Administration	3
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CS 70	Network Fundamentals and Architecture	3
CS 79A	Introduction to Cloud Computing	3
CS 81	Javascript Programming	3
CS 87A	Python Programming	3

**Select 1 Track: (9 units)****AWS TRACK:**

CS 79B	Database Essentials in Amazon Web Services	3
<i>and</i>		
CS 79C	Compute Engines in Amazon Web Services	3
<i>and</i>		
CS 79D	Security in Amazon Web Services	3

*or***AZURE TRACK:**

CS 33	C # Programming	3
<i>and</i>		
CS 79Y	Microsoft Azure Database Essentials	3
<i>and</i>		
CS 79Z	Microsoft Azure Essentials	3

**Elective Courses: Select 1 course from the following:**

CS 55	Java Programming	3
<i>or</i>		
CS 79E	Best Practices in Amazon Web Services	3
<i>or</i>		
CS 79F	Machine Learning on AWS	3
<i>or</i>		
CS 82	ASP.NET Programming in C#	3
<i>or</i>		
CS 83R	Server-Side Ruby Web Programming	3

**COMPUTER PROGRAMMING, ASSOCIATE DEGREE OR CERTIFICATE OF ACHIEVEMENT**

A computer programmer is a professional who is skilled in writing medium to large-scale computer applications. This requires the knowledge and practice of a multitude of areas in Computer Science. This certificate focuses on learning and using advanced programming techniques to build software applications. In addition, it covers core computer science concepts such as Operating Systems and Database Theory.

**Program Learning Outcomes:** Upon completion of the program, students will design, code, test, and debug computer programs. They will understand and use the Internet and World Wide Web, application software, the components of the system unit, input, output, storage, operating systems and utility programs, communications and networks, database management, information systems development, and project management. Students will also explain the social implications of technological development, and understand the capabilities of current day computers and the possibilities for the future.

**AREA OF EMPHASIS: (27 UNITS)****(Effective Fall 2023)****Required Core Courses: (15 units)**

CS 3	Introduction to Computer Systems	3
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CS 40	Operating Systems	3
<i>or</i>		
CS 80	Internet Programming	3
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CS 50	C Programming	3
CS 60	Database Concepts and Applications	3
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MATH 4	College Algebra for STEM Majors	4
<i>or</i>		
<b>1 Course from the following:</b>		
MATH 2, 3, 7, 8, 10, 11, 13, 15, 21, 26, 28, 29, 41, 54 PHILOS 9		
<b>Required Concentration Courses: Select 2 of the following groups: (12 units)</b>		
<b>GROUP 1:</b>		
CS 15	Visual Basic Programming	3
CS 19	Advanced Visual Basic Programming	3
<b>GROUP 2:</b>		
CS 81	JavaScript and Dynamic HTML	3
<i>and</i>		
<b>1 Course from the following:</b>		
CS 82	ASP.NET Programming in C#	3
CS 83	Server-Side Java Web Programming	3
CS 83R	Server-Side Ruby Web Programming	3
CS 84	Programming with XML	3
CS 85	PHP Programming	3
<b>GROUP 3:</b>		
CS 65	Oracle Programming	3
CS 66	Advanced Oracle	3
<b>GROUP 4:</b>		
CS 52	C++ Programming	3
<i>and</i>		
<b>1 Course from the following:</b>		
CS 20A	Data Structures with C++	3
CS 51	Visual C++ Programming	3
<b>GROUP 5:</b>		
CS 55	Java Programming	3
<i>and</i>		
<b>1 Course from the following:</b>		
CS 20B	Data Structures with Java	3
CS 56	Advanced Java Programming	3

## COMPUTER SCIENCE, ASSOCIATE DEGREE OR CERTIFICATE OF ACHIEVEMENT

Computer Science covers a broad spectrum of Courses ranging from core computer science to a variety of branch fields of computer science. This major provides the student with the basic skills required of core computer science. Courses include programming in low-level and essential languages, Database Theory, Operating Systems Fundamentals, Computer Hardware and Data Structures. Students finishing this major are well equipped to work in the field of computer science as well as transfer to a four-year degree program in this area.

**Program Learning Outcomes:** Develop software in a variety of programming and scripting languages, have experience creating and manipulating fundamental data structures, work with a variety of networking technologies, manage software projects and analyze digital systems.

Develop the quantitative and computational reasoning skills needed to develop software applications.

### AREA OF EMPHASIS: (23 UNITS)

#### Required Core Courses: (17 units)

CS 3	Introduction to Computer Systems	3
CS 17	Assembly Language Programming	3
CS 42	Digital Logic	3
CS 50	C Programming	3
MATH 7	Calculus 1	5

#### Required Concentration Courses: Select 1 of the following groups: (6 units)

##### GROUP 1:

CS 20A	Data Structures with C++	3
CS 52	C++ Programming	3

##### GROUP 2:

CS 20B	Data Structures with Java	3
CS 55	Java Programming	3

## DATABASE APPLICATIONS DEVELOPER, ASSOCIATE DEGREE OR CERTIFICATE OF ACHIEVEMENT

This program develops the skills needed to design and build a database architecture as well as interact with modern database management systems locally, remotely or in the cloud. This program will provide an understanding on how to consistently design databases in an organized structure for storing and retrieving data. With increasing concerns over security, a database developer must also be able to write secure code that runs with minimum risk of attacks.

**Program Learning Outcomes:** Upon completion of this program, students will demonstrate the ability to design, develop and populate databases locally, remotely and in the cloud. Upon completion of this program, students will demonstrate the ability to properly organize and structure information for storing and retrieving different kinds of data at industry scale.

### AREA OF EMPHASIS: (21 UNITS)

**(Effective Fall 2023)**

#### Required Courses: (12 units)

CS 3	Introduction to Computer Systems	3
CS 9A	Technology Project Management I ( <i>same as CIS 9A</i> )	3
CS 60	Database Concepts and Applications	3
CS 79A	Introduction to Cloud Computing	3
<b>Select 1 Course from the following: (3 units)</b>		
CS 61	Microsoft SQL Server Database	3
<b><u>or</u></b>		
CS 65	Oracle Programming	3
<b><u>or</u></b>		
CS 79B	Database Essentials in Amazon Web Services	3
<b><u>or</u></b>		
CS 79Y	Microsoft Azure Database Essentials	3
<b>Select 1 Track from the following: (6 units)</b>		
CS 55	Java Programming	3
<b><u>and</u></b>		
CS 56	Advanced Java Programming	3
<b><u>or</u></b>		
CS 87A	Python Programming	3
<b><u>and</u></b>		
CS 87B	Advanced Python Programming	3

**WEB DEVELOPER (FORMERLY WEB PROGRAMMER), ASSOCIATE DEGREE OR CERTIFICATE OF ACHIEVEMENT**

This program helps students develop skills to design interactive and responsive websites and apps. Web developers need to be knowledgeable on a variety of technologies such as HTML, CSS, JavaScript, programming languages, Web Frameworks, cloud hosting, networking, database management, and cybersecurity. They are chiefly responsible for code implementation and maintenance of web applications at both the front-end and back-end. Web developers are instrumental in the success of an organization's online presence.

**Program Learning Outcomes:** Upon completion of this program, students will design and develop full stack web apps as well as provide the code to make websites interactive or allows users to interact with back-end applications and databases.

**AREA OF EMPHASIS: (27 UNITS)****(Effective Fall 2023)****Required Courses: (18 units)**

CS 60	Database Concepts and Applications	3
CS 70	Network Fundamentals and Architecture	3
CS 79A	Introduction to Cloud Computing	3
CS 80	Internet Programming	3
CS 81	Javascript Programming	3
CS 87A	Python Programming	3
<b>Select 1 Course from the following: (3 units)</b>		
CS 82	ASPEN.NET Programming in C#	3
<b>or</b>		
CS 83	Server-Side Java Web Programming	3
<b>or</b>		
CS 83R	Server-Side Ruby Web Programming	3
<b>or</b>		
CS 85	PHP Programming	3
<b>Select 1 Course from the following: (3 units)</b>		
CS 73A	Fundamentals of Computer Security	3
<b>or</b>		
CS 73B	Computer Forensics Fundamentals	3
<b>or</b>		
CS 73C	Cybersecurity and Ethical Hacking	3
<b>or</b>		
CS 73L	Cybersecurity Literacy	3
<b>or</b>		
CS 79D	Security in Amazon We Services	3
<b>Select 1 Course from the following: (3 units)</b>		
CIS 67	WordPress	3
<b>or</b>		
CS 77A	Salesforce Administration Essentials	3
<b>or</b>		
CS 77B	Salesforce Developer Essentials	3
<b>or</b>		
CS 79B	Database Essentials in Amazon Web Services	3
<b>or</b>		
CS 79C	Compute Engines in Amazon Web Services	3
<b>or</b>		
CS 79E	Best Practices in Amazon Web Services	3
<b>or</b>		
CS 79Y	Microsoft Azure Database Essentials	3
<b>or</b>		
CS 79Z	Microsoft Azure Essentials	3

## APPLIED ARTIFICIAL INTELLIGENCE, CERTIFICATE OF ACHIEVEMENT

As the impact of artificial intelligence expands to many different fields, foundational skills and familiarity with artificial intelligence systems are skillsets that are in increasing demand in various industry sectors today. The Certificate of Completion in Applied Artificial Intelligence is suited for students in any field interested in learning about the applications of artificial intelligence and the ethical considerations when adopting artificial intelligence technologies, generative artificial intelligence and chatbots. This certificate provides the foundational knowledge and practical skills to pursue careers in artificial intelligence development, data science, or prompt engineering.

### Program Learning Outcomes:

Upon completion of this program, students will critically analyze applications of artificial intelligence and its impact on decision-making and identify other societal impacts.

Upon completion of the program, students will use common artificial intelligence tools and libraries to solve different business problems.

Upon completion of this program, students will understand and evaluate various ethical considerations in artificial intelligence development and identify potential biases within popular existing systems as well as those they create themselves.

### AREA OF EMPHASIS: (15 UNITS)

**(Effective Fall 2026)**

### Required Courses:

BUS 1	Introduction to Business	3
CS 3	Introduction to Computer Systems	3
CS 4	Copiloting with Artificial Intelligence Tools	3
CS 82A	Introduction to Data Science	3
CS 82B	Principles of Data Science	3
CS 82D	Generative Artificial Intelligence Fundamentals	3
CS 87A	Python Programming	3

**BLOCKCHAIN DEVELOPER, CERTIFICATE OF ACHIEVEMENT**

In this certificate, students study the world of blockchain technology and the promise it holds. Blockchain has always been synonymous with cryptocurrency, but its applications go far beyond financial transactions. Companies in every industry are finding value in understanding how to apply blockchain-based solutions to solve problems. Students will learn how cryptocurrencies, like Bitcoin, make use of the blockchain to facilitate peer-to-peer digital transactions. Students will identify the problems blockchain technologies aim to solve as well as learn its underlying ability to facilitate a marketplace without traditional intermediaries, promoting widespread, transformational change. Students will design and code decentralized blockchain applications.

**Program Learning Outcomes:** Upon completion of the program, students will demonstrate the ability to create and deploy blockchain technology to support different industries.

**AREA OF EMPHASIS: (15 UNITS)****Required Courses:**

CS 20A	Data Structure with C++	3
<b><u>or</u></b>		
CS 20B	Data Structures with Java	3
<b><u>or</u></b>		
CS 81	Javascript Programming	3
<b><u>or</u></b>		
CS 87B	Advanced Python Programming	3
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CS 73A	Fundamentals of Computer Security	3
CS 76A	Cryptocurrency and Cryptoassets	3
CS 76B	Fundamentals of Blockchain	3
CS 79A	Introduction to Cloud Computing	3

**DATA ANALYST, CERTIFICATE OF ACHIEVEMENT**

Data science is an applied field that uses scientific methods, processes, algorithms and systems to extract knowledge and insights from both structured and unstructured data sources. Data Analysts incorporate data mining, machine learning and big data to make predictions and identify actions that organizations can take to be more effective. Data Analysts are responsible for breaking down big data into usable information and creating software and algorithms that help companies and organizations determine optimal operations. This certificate will prepare students for jobs in this field by providing students with skills in different technologies and techniques that are used for data science and machine learning. Students may also choose to transfer to four-year universities with established undergraduate programs in Data Science.

**Program Learning Outcomes:** Upon completion of the program, students will be able to analyze data and employ different software tools to make certain predictions and optimize organizational operations.

**AREA OF EMPHASIS: (12 UNITS)****Required Courses: (9 units)**

CIS 30T	Tableau Desktop Essentials	3
CS 82A	Introduction to Data Science	3
CS 82B	Principles of Data Science	3
<b>Select 1 course from the following ( 3 units)</b>		
CS 82C	R Programming	3
<b><u>or</u></b>		
CS 87A	Python Programming	3

## DATA SCIENCE, CERTIFICATE OF ACHIEVEMENT

Data science is an applied field that uses scientific methods, processes, algorithms and systems to extract knowledge and insights from both structured and unstructured data sources. Data science incorporates data mining, machine learning and big data to make predictions and identify actions that organizations can take to be more effective. Data scientists are responsible for breaking down big data into usable information and creating software and algorithms that help companies and organizations determine optimal operations. This certificate will prepare students for jobs in this field by providing students with skills in different technologies and techniques that are used for data science and machine learning. Students may also choose to transfer to four-year universities with established undergraduate programs in Data Science.

**Program Learning Outcomes:** Upon completion of the program, students will be able to analyze data and employ different software tools to make certain predictions and optimize organizational operations.

### AREA OF EMPHASIS: (24 UNITS)

**(Effective Fall 2023)**

#### Required Courses: (21 units)

CIS 30T	Tableau Desktop Essentials	3
CS 79A	Introduction to Cloud Computing	3
CS 82A	Introduction to Data Science	3
CS 82B	Principles of Data Science	3
CS 82C	R Programming	3
CS 87A	Python Programming	3
CS 87B	Advanced Python Programming	3

#### Elective Courses: Select 1 course: (3 units)

CS 79F	Machine Learning on AWS	3
<b><i>or</i></b>		
CS 79X	Data Science on Azure	3

**INFORMATION SYSTEMS MANAGEMENT, CERTIFICATE OF ACHIEVEMENT**

This program aims to provide Computer Science students with the knowledge needed to develop Information Systems in a real-world setting. Students learn how to develop medium to large scale applications while applying the skills needed to plan and budget resources in development projects from conceptual design to deployment.

**Program Learning Outcomes:** Upon completion of this program, students will understand the real-world complexity of Information Systems in industry today. Students will learn how to plan and budget resources for the successful implementation of Information Systems.

**AREA OF EMPHASIS: (13 UNITS)****Required Courses: (10 units)**

CIS 9A	Technology Project Management I	3
<i>or</i>		
CS 9A	Technology Project Management I ( <i>same as CS 9A</i> )	3
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CIS 9B	Technology Project Management II	3
<i>or</i>		
CS 9B	Technology Project Management II ( <i>same as CS 9B</i> )	
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CS 15	Visual Basic Programming	3
CS 88A	Independent Studies in Computer Science	3
<b>Select 1 Course from the following: (3 units)</b>		
CS 19	Advanced Visual Basic Programming	3
CS 32	Database Programming in Visual Basic.NET	3
CS 37	Web Programming in VB .NET	3

**MOBILE APPS DEVELOPMENT – ANDROID, CERTIFICATE OF ACHIEVEMENT**

The program in Mobile Apps Development provides students with the knowledge and skills necessary to work in the emerging mobile career field. Students learn how to design and write apps for the Android platform. In addition to programming Courses, the program includes Courses teaching the fundamentals of mobile app and icon design.

**Program Learning Outcomes:** Upon completion of this program, students will design, and use the Eclipse environment to develop, test and debug, apps that run on the Android platform for mobile phones and tablets. In addition, students will use the Android Framework to develop apps for mobile devices that incorporate audio, pictures, animation, maps, networking and the Internet.

**AREA OF EMPHASIS: (15 UNITS)****Required Courses: (12 units)**

CS 55	Java Programming	3
CS 56	Advanced Java Programming	3
CS 86	Android Development	3
GR DES 25	Mobile Design 1 ( <i>formerly GR DES 75</i> )	3
<b>Select 1 Course from the following: (3 units)</b>		
CIS 60A	Photoshop I	3
CS 60	Database Concepts and Applications	3
CS 84	Programming with XML	3

## MOBILE APPS DEVELOPMENT – IPHONE, CERTIFICATE OF ACHIEVEMENT

The program in Mobile Apps Development provides students with the knowledge and skills necessary to work in the emerging mobile career field. Students learn how to design and write apps for either the iPhone/iPad/iPod platform. In addition to programming Courses, the program includes Courses teaching the fundamentals of mobile app and icon design.

**Program Learning Outcomes:** Upon completion of the program, students will design, develop, test, and debug iOS apps using XCode environment for iPhone, iPad, and iPod. In addition, students will develop iOS apps using Cocoa Framework that incorporate the Address Book, Audio, Video, Networking, and the Internet.

### AREA OF EMPHASIS: (12 UNITS)

#### Required Courses: (9 units)

CS 53A	iOS Development with Swift	3
CS 53B	iOS Mobile App Development	3
GR DES 25	Mobile Design 1 ( <i>formerly GR DES 75</i> )	3
<b>Select 1 Course from the following: (3 units)</b>		
CIS 60A	Photoshop I	3
CS 60	Database Concepts and Applications	3
CS 84	Programming with XML	3

## SYSTEM ADMINISTRATOR (NETWORKING), CERTIFICATE OF ACHIEVEMENT

The IT world is integrated by networks of connected devices, each secured and properly configured. Success in IT disciplines like database, website, or e-commerce development demands a supporting grasp of the network environment. Major technologies are the networks themselves, their fit within the operating platforms they connect to, specific network applications, and measures to achieve networks security. System administrators and other qualified IT specialists must understand the various protocols, programs' interfaces, how networks are presented and managed on Unix and Windows platforms, specific server programs and their clients, and what the inherent risks are.

**Program Learning Outcomes:** Design and implement computer and information networks, such as local area networks (LAN), wide area networks (WAN), intranets, extranets, and other data communications networks. Perform network modeling, analysis, and planning; design network security measures; research and recommend network and data communications hardware and software.

### AREA OF EMPHASIS: (14-15 UNITS)

#### Required Courses: (9 units)

CS 9A	Technology Project Management I ( <i>same as CIS 9A</i> )	3
CS 70	Network Fundamentals and Architecture	3
CS 84A	Google IT Support Fundamentals I	3
<b>Select 1 Courses from the following: (3 units)</b>		
CS 41	Linux Workstation Administration	3
<i>or</i>		
CS 43	Windows Network Administration	3
<i>or</i>		
CS 84B	Google IT Support Fundamentals II	3
<b>Select 1 Courses from the following: (2-3 units)</b>		
CS 75	Network Protocols and Analysis	2
<i>or</i>		
CS 78	Secure Server Installation and Administration 3	3
<i>or</i>		
CS 84C	Google IT Support Fundamentals III	3

**ARTIFICIAL INTELLIGENCE, DEPARTMENT CERTIFICATE**

As the impact of artificial intelligence expands to many different fields, foundational skills and familiarity with artificial intelligence systems are skillsets that are in increasing demand in various industry sectors today. The Department Certificate in Artificial Intelligence is suited for students in any field interested in learning about the applications of artificial intelligence and the ethical considerations when adopting artificial intelligence technologies and generative artificial intelligence.

**Program Learning Outcomes:**

Upon completion of the program, students will gain an understanding of both the theoretical and practical aspects of artificial intelligence and its applications.

Upon completion of the program, students will apply artificial intelligence tools in various professional settings to enhance productivity.

Upon completion of the program, students will evaluate ethical considerations in artificial intelligence development and identify potential biases within popular existing systems.

**AREA OF EMPHASIS: (12 UNITS)****(Effective Fall 2026)****Required Courses: (12 units)**

BUS 1	Introduction to Business	3
CS 3	Introduction to Computer Systems	3
CS 4	Copiloting with Artificial Intelligence Tools	3
CS 87A	Python Programming	3

**CLOUD COMPUTING, DEPARTMENT CERTIFICATE**

This program provides the industry standard skills to understand and develop applications for the cloud. Students learn a range of topics that cover the technical principals of the hardware and software requirements to run systems in the cloud including storage, database management, and software systems, while maintaining secure access.

**Program Learning Outcomes:**

Ability to host a database and run queries using an interface from a commercial provider.

Ability to run a file-server service using a provider of their choice.

**AREA OF EMPHASIS: (15 UNITS)****Required Courses: (12 units)**

CS 79A	Introduction to Cloud Computing	3
CS 79B	Database Essentials in Amazon Web Services	3
CS 79C	Compute Engines in Amazon Web Services	3
CS 79D	Security in Amazon Web Services	3

**Select 1 Course from the following: (3 units)**

CS 55	Java Programming	3
CS 82	ASP.NET Programming in C#	3
CS 83R	Server-Side Ruby Web Programming	3
CS 87A	Python Programming	3

## CYBERSECURITY, DEPARTMENT CERTIFICATE

This certificate will prepare students for an entry-level position in the field of information security. They will gain an understanding of technological needs, threats, and weaknesses in cybersecurity. Through this certificate, students will learn the tools needed to manage computer systems as well as gain insight into the legal, and social aspects of the cyber universe.

**Program Learning Outcomes:** Upon completion of the program, students will be able to analyze potential cyber threats to an organization network, and recommend and apply the proper tools to defend against those attacks.

### AREA OF EMPHASIS: (12 UNITS)

#### Required Core Courses: (12 units)

CS 70	Network Fundamentals and Architecture	3
CS 73A	Fundamentals of Computer Security	3
CS 73B	Computer Forensics Fundamentals	3
CS 73C	Cybersecurity and Ethical Hacking	3

**ENTRY LEVEL PROGRAMMER, DEPARTMENT CERTIFICATE**

This certificate provides students with the knowledge and practice needed to develop small-scale applications. The certificate also provides students with the building blocks to pursue further studies in computer science and/or start an entry-level position in the software development industry.

**Program Learning Outcomes:** Upon completion of this program, students will design, code, test and debug computer programs. They will understand and use application software and the various components involved in system development. Students will also learn the social implications of technological development and understand the capabilities of current day computers and the possibilities for the future.

**AREA OF EMPHASIS: (12 UNITS)****Required Course: (3 units)**

CS 3	Introduction to Computer Systems	3
<b>Complete any 3 Courses from the following: (9 units)</b>		
CS 15	Visual Basic Programming	3
CS 17	Assembly Language Programming	3
CS 18	Advanced Assembly Language Programming	3
CS 19	Advanced Visual Basic Programming	3
CS 20A	Data Structures with C++	3
CS 20B	Data Structures with Java	3
CS 30	MATLAB Programming	3
CS 32	Database Programming in Visual Basic.Net	3
CS 33	C # Programming	3
CS 34A	Game Programming 1	3
CS 37	Web Programming in VB .Net	3
CS 50	C Programming	3
CS 51	Visual C++ Programming	3
CS 52	C++ Programming	3
CS 53A	iOS Development with Swift	3
CS 53B	iOS Mobile App Development	3
CS 55	Java Programming	3
CS 56	Advanced Java Programming	3
CS 80	Internet Programming	3
CS 81	Javascript Programming	3
CS 82	ASP.NET Programming in C#	3
CS 83	Server-Side Java Web Programming	3
CS 83R	Server-Side Ruby Web Programming	3
CS 85	PHP Programming	3
CS 86	Android Development	3
CS 87A	Python Programming	3

## MICROSOFT AZURE, DEPARTMENT CERTIFICATE

This program provides the industry standard skills to understand and develop applications for the cloud using the Microsoft Azure platform. Students learn a range of topics that cover the technical principles of the hardware and software requirements to run systems in the cloud including storage, database management, and software systems, while maintaining secure access.

**Program Learning Outcomes:** Upon completion of this program, students will design and develop full stack web apps, as well as provide the code to make websites interactive or allow users to interact with back-end applications and databases. Students will be able to host a database and run queries using an interface from a commercial provider. Students will be able to run a file-server service using a provider of their choice.

### AREA OF EMPHASIS: (9 UNITS)

#### Required Courses: (6 units)

CS 79A	Introduction to Cloud Computing	3
CS 79Z	Microsoft Azure Essentials	3
<b>Select 1 Course from the following: (3 units)</b>		
CS 33	C # Programming	3
<i>or</i>		
CS 79Y	Microsoft Azure Database Essentials	3
<i>or</i>		
CS 82	ASP.NET Programming in C#	3
<i>or</i>		
CS 83R	Server-Side Ruby Web Programming	3
<i>or</i>		
CS 87A	Python Programming	3

## ROBOTICS AND ARTIFICIAL INTELLIGENCE, DEPARTMENT CERTIFICATE (13 UNITS)

This program is temporarily suspended. Many of the required classes are not being offered at this time. If you are interested in this certificate program, please contact the Computer Science department at (310) 434-4295.