

# SOFTWARE DEVELOPMENT, ASSOCIATE IN APPLIED SCIENCE



College(s): DA, HW, KK, MX, OH, TR, WR

Program Code: 0440

In an increasingly digital world, software development is key to the technology we use in our daily lives. There is now a growing need for software developers to create new mobile applications and software services in a variety of businesses and fields. City Colleges' Software Development program teaches students several in-demand programming languages, including Python, C++, Java and JavaScript. Through the courses, students will learn the whole life cycle of software and be ready to meet employer demands.

The degree program focuses on developing expertise in at least one programming language, obtaining hands-on experience in the analysis, design, implementation, and maintenance of software applications using those languages. Students also build skills in either back end website programming or mobile application development, and gain work-based experience through an internship or field project. Graduates of the AAS in Software Development will be prepared to enter the workforce as entry-level programmers.

## Program Requirements

Code	Title	Hours
<b>General Education Coursework</b>		
ENGLISH 101	Composition	3
Fine Arts & Humanities Course <sup>1</sup>		3
Select one of the following:		3
Physical Sciences & Life Sciences		
ECON 201	Principles Of Economics I	
ECON 202	Principles Of Economics II	
Select two Mathematics Courses:		8

MATH 118	General Education Math (or higher)
MATH 125	Introductory Statistics
MATH 140	College Algebra (or higher) <sup>2</sup>
MATH 146	Discrete Mathematics <sup>2</sup>

## Required Program Core

BUSINES 111	Introduction To Business	3
or BUSINES 21: Data Visualization and Presentation for Business		
CIS 101	Computer Science 101	3
CIS 103	Fundamentals of Programming	3
CIS 114	Mobile Application Development	3
or CIS 281 Web Development III/Server Side Programming		
CIS 142	C++ Object Oriented Programming I	3
CIS 144	Java Object Oriented Programming I	3
CIS 181	Web Development I/Basic Web Technologies	3
CIS 182	Web Development II/Client Side Scripting	3
CIS 242	C++ Object Oriented Programming II	3
or CIS 244 Java Object Oriented Programming II		
CIS 245	Principles of Software Development	3
NET TEC 101	Client-Server Database I	3

## Required Work-Based Learning Courses

CIS 260	Computer Information Systems Field Project	3
or CIS 265 Computer Information Systems Internship		

## Program Electives

Select a minimum of 9 credit hours of program electives (p. 1)	9
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<b>Total Hours</b>	<b>62</b>
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<sup>1</sup> At least one general education course must meet the State of Illinois' Human Diversity requirement.

<sup>2</sup> Two Mathematics are required for AAS: MATH 118 General Education Math, or higher. (Acceptable); MATH 140 College Algebra or higher.

(Recommend, Pre-requisite for MATH 146 Discrete Mathematics); MATH 125 Introductory Statistics. (Recommend for Software Engineer, Testing, Security, Data, ML, AI); MATH 146 Discrete Mathematics. (Pre-requisite MATH 140 College Algebra – Recommended for Software Engineer)

## Program Electives

Code	Title	Hours
BUSINES 111	Introduction To Business	3
BUSINES 213	Data Visualization and Presentation for Business	3
BUSINES 259	Introduction to Project Management	3
CIS 113	Human-Computer Interaction	3
CIS 116	Operating System I	3
CIS 242	C++ Object Oriented Programming II	3
CIS 244	Java Object Oriented Programming II	3
CIS 250	Systems Analysis and Design	3
CIS 281	Web Development III/Server Side Programming	3
CIS 282	Web Development IV/Web Database Integration	3
COMPSFI 102	Information Security Essentials	3
COMPSFI 202	Cybercrime and Incident Response	3
COMPSFI 213	Ethical Hacking	3
COMPSFI 215	Information Security Domain	3
ECON 201	Principles Of Economics I	3
ECON 202	Principles Of Economics II	3
NET TEC 121	Internetworking I	3
NET TEC 122	Internetworking II	3
NET TEC 240	Operating Systems/Server I	3

## Pathway

This is an **example course sequence** for students interested in pursuing Software Development. This does not represent a contract or guarantee course availability. If this pathway is followed as outlined, students will earn a Basic Certificate (BC), an Advanced Certificate (AC), and an Associate in Applied Science (AAS) Degree in Software Development.

## Semester-by-Semester Program Plan for Full-Time Students

All plans can be modified to fit the needs of part-time students by adding more semesters.

Semester	Code	Title	Hours	
Semester 1	CIS 101	Computer Science 101 <sup>1</sup>	3	
	CIS 103	Fundamentals of Programming	3	
	CIS 181	Web Development I/Basic Web Technologies	3	
	MATH 118 or MATH 140	General Education Math <sup>2,4</sup> or College Algebra	4	
	ENGLISH 101	Composition <sup>4</sup>	3	
<b>Hours</b>			<b>16</b>	
Semester 2	CIS 142 or CIS 144	C++ Object Oriented Programming I or Java Object Oriented Programming I	3	
	CIS 182	Web Development II/Client Side Scripting	3	
	CIS 245	Principles of Software Development	3	
	NET TEC 101	Client-Server Database I	3	
	Fine Arts & Humanities course (HD) <sup>3,4</sup>		3	
	<b>Hours</b>			<b>15</b>

Semester	Code	Title	Hours
Semester 3	CIS 114 or CIS 281	Mobile Application Development or Web Development III/Server Side Programming	3
	CIS 142 or CIS 144	C++ Object Oriented Programming I or Java Object Oriented Programming I	3
	CIS 242 or CIS 244	C++ Object Oriented Programming II or Java Object Oriented Programming II	3
	Select one of the following: <sup>2,4</sup>		4
	MATH 125	Introductory Statistics	
MATH 140	College Algebra		
MATH 146	Discrete Mathematics		
Program Elective (p. 2)			3
<b>Hours</b>			<b>16</b>
Semester 4	BUSINES 111 or BUSINES 213	Introduction To Business or Data Visualization and Presentation for Business	3
	CIS 260 or CIS 265	Computer Information Systems Field Project or Computer Information Systems Internship	3
	Select one of the following: <sup>4</sup>		3
	Physical Sciences & Life Sciences		
	ECON 201	Principles Of Economics I	
	ECON 202	Principles Of Economics II	
	Program Elective (p. 2)		
Program Elective (p. 2)			3
<b>Hours</b>			<b>15</b>
<b>Total Hours</b>			<b>62</b>

<sup>1</sup> For students who may have taken CIS 101 already, please select CIS 142 or CIS 144 in the first semester, so that you can take CIS 244 or CIS 242 in the later semesters.

<sup>2</sup> Two Mathematics are required for AAS:

- MATH 118 General Education Math, (or higher) is acceptable;
- MATH 140 College Algebra (or higher) is recommended (Pre-requisite for MATH 146);
- MATH 125 Introductory Statistics is recommend for Software Engineering, Testing, Security, Data, ML, AI;
- MATH 146 Discrete Mathematics (Pre- requisite MATH 140) is recommended for Software Engineering

<sup>3</sup> At least one general education course must meet the State of Illinois' Human Diversity requirement.

<sup>4</sup> General education course

## Program Electives

Code	Title	Hours
BUSINES 111	Introduction To Business	3
BUSINES 213	Data Visualization and Presentation for Business	3
BUSINES 259	Introduction to Project Management	3
CIS 113	Human-Computer Interaction	3
CIS 116	Operating System I	3
CIS 242	C++ Object Oriented Programming II	3
CIS 244	Java Object Oriented Programming II	3
CIS 250	Systems Analysis and Design	3
CIS 281	Web Development III/Server Side Programming	3
CIS 282	Web Development IV/Web Database Integration	3
COMPSFI 102	Information Security Essentials	3
COMPSFI 202	Cybercrime and Incident Response	3
COMPSFI 213	Ethical Hacking	3

COMPSFI 215	Information Security Domain	3
ECON 201	Principles Of Economics I	3
ECON 202	Principles Of Economics II	3
NET TEC 121	Internetworking I	3
NET TEC 122	Internetworking II	3
NET TEC 240	Operating Systems/Server I	3

Choose your courses with your College Advisor.

## Careers

### Computer Programmers

#### Job Description

Create, modify, and test the code and scripts that allow computer applications to run. Work from specifications drawn up by software and web developers or other individuals. May develop and write computer programs to store, locate, and retrieve specific documents, data, and information.

#### Salary Based on Experience Level

Take a look at the average hourly/annual earnings for this career in Cook County

Lightcast earnings figures are based on OES data from the BLS and include base rate, cost of living allowances, guaranteed pay, hazardous-duty pay, incentive pay (including commissions and bonuses), on-call pay, and tips.

##### Annual Wages

Entry-Level 10 <sup>th</sup> Percentile	\$48,630
Median 50 <sup>th</sup> Percentile	\$79,323
Senior-Level 90 <sup>th</sup> Percentile	\$144,882

##### Hourly Wages

Entry-Level 10 <sup>th</sup> Percentile	\$23
Median 50 <sup>th</sup> Percentile	\$38
Senior-Level 90 <sup>th</sup> Percentile	\$70

#### Annual Job Openings

75 annual openings in Cook County

#### National Education Attainment

Here, you can see the level of education that people in this career complete.

Degree Program	% of Jobs
A high school diploma or less	0.00%
A certificate	0.00%
Some college	2.52%
An Associate degree	8.99%
A Bachelor's degree	88.04%
A Master's or Professional degree	0.45%
A Doctoral degree or more	0.00%

88.49% continue their education beyond an associate degree

## Software Quality Assurance Analysts and Testers

#### Job Description

Develop and execute software tests to identify software problems and their causes. Test system modifications to prepare for implementation. Document software and application defects using a bug tracking system and report defects to software or web developers. Create and maintain databases of known defects. May participate in software design reviews to provide input on functional requirements, operational characteristics, product designs, and schedules.

#### Salary Based on Experience Level

Take a look at the average hourly/annual earnings for this career in Cook County

Lightcast earnings figures are based on OES data from the BLS and include base rate, cost of living allowances, guaranteed pay, hazardous-duty pay, incentive pay (including commissions and bonuses), on-call pay, and tips.

##### Annual Wages

Entry-Level 10 <sup>th</sup> Percentile	\$62,527
Median 50 <sup>th</sup> Percentile	\$99,166
Senior-Level 90 <sup>th</sup> Percentile	\$142,924

##### Hourly Wages

Entry-Level 10 <sup>th</sup> Percentile	\$30
Median 50 <sup>th</sup> Percentile	\$48
Senior-Level 90 <sup>th</sup> Percentile	\$69

#### Annual Job Openings

228 annual openings in Cook County

#### National Education Attainment

Here, you can see the level of education that people in this career complete.

Degree Program	% of Jobs
A high school diploma or less	2.94%
A certificate	8.82%
Some college	8.82%
An Associate degree	26.47%
A Bachelor's degree	50.00%
A Master's or Professional degree	2.94%
A Doctoral degree or more	0.00%

52.94% continue their education beyond an associate degree

## Software Developers

#### Job Description

Research, design, and develop computer and network software or specialized utility programs. Analyze user needs and develop software solutions, applying principles and techniques of computer science, engineering, and mathematical analysis. Update software or enhance

existing software capabilities. May work with computer hardware engineers to integrate hardware and software systems, and develop specifications and performance requirements. May maintain databases within an application area, working individually or coordinating database development as part of a team.

## Salary Based on Experience Level

Take a look at the average hourly/annual earnings for this career in Cook County

Lightcast earnings figures are based on OES data from the BLS and include base rate, cost of living allowances, guaranteed pay, hazardous-duty pay, incentive pay (including commissions and bonuses), on-call pay, and tips.

### Annual Wages

Entry-Level 10 <sup>th</sup> Percentile	\$78,089
Median 50 <sup>th</sup> Percentile	\$130,702
Senior-Level 90 <sup>th</sup> Percentile	\$181,191

### Hourly Wages

Entry-Level 10 <sup>th</sup> Percentile	\$38
Median 50 <sup>th</sup> Percentile	\$63
Senior-Level 90 <sup>th</sup> Percentile	\$87

## Annual Job Openings

1599 annual openings in Cook County

## National Education Attainment

Here, you can see the level of education that people in this career complete.

Degree Program	% of Jobs
A high school diploma or less	0.00%
A certificate	1.41%
Some college	0.00%
An Associate degree	3.23%
A Bachelor's degree	79.73%
A Master's or Professional degree	15.64%
A Doctoral degree or more	0.00%

95.37% continue their education beyond an associate degree