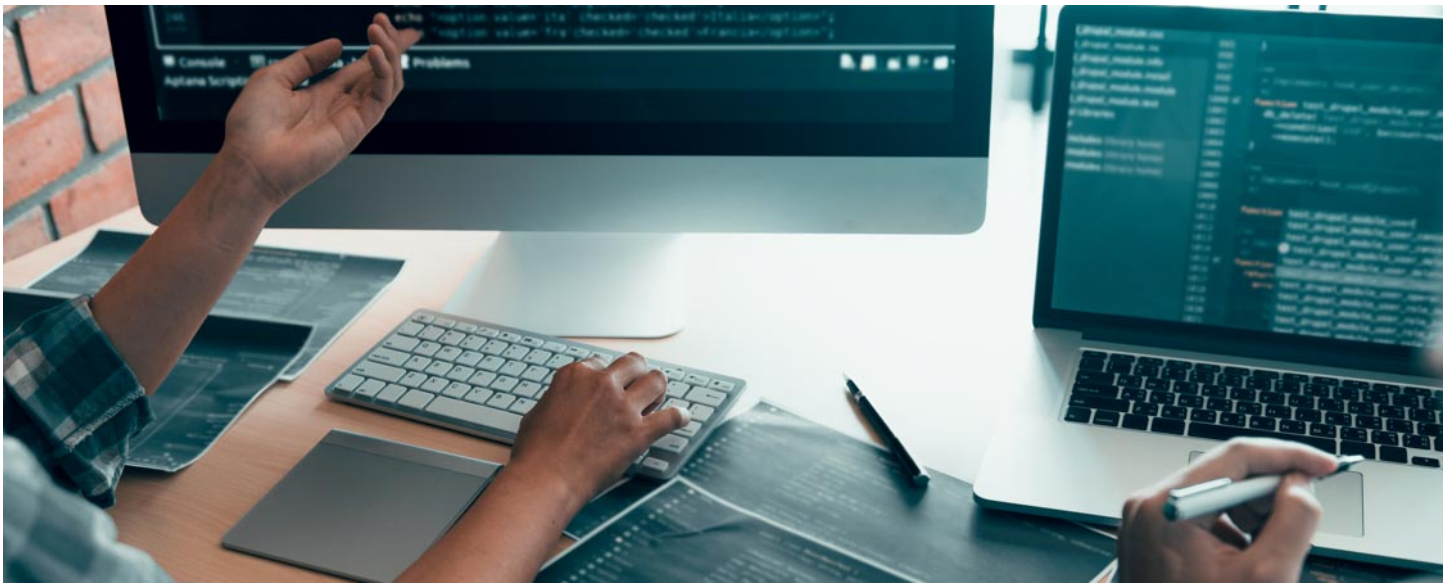
# SOFTWARE DEVELOPMENT, ASSOCIATE IN APPLIED SCIENCE



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 |
|---|---|---|
| **General Education Coursework** | | |
| ENGLISH 101 | Composition | 3 |
| Fine Arts & Humanities Course [1] | | 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) [2] | |
| MATH 146 | Discrete Mathematics [2] | |
| **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 |
| **Total Hours** | | **62** |

[1] At least one general education course must meet the State of Illinois' Human Diversity requirement.

[2] 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 1 | | Hours |
|---|---|---|
| CIS 101 | Computer Science 101 [1] | 3 |
| CIS 103 | Fundamentals of Programming | 3 |
| CIS 181 | Web Development I/Basic Web Technologies | 3 |
| MATH 118<br>or MATH 140 | General Education Math [2,4]<br>or College Algebra | 4 |
| ENGLISH 101 | Composition [4] | 3 |
| | **Hours** | **16** |
| **Semester 2** | | |
| CIS 142<br>or CIS 144 | C++ Object Oriented Programming I<br>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) [3,4] | | 3 |
| | **Hours** | **15** |
| **Semester 3** | | |
| CIS 114<br>or CIS 281 | Mobile Application Development<br>or Web Development III/Server Side Programming | 3 |
| CIS 142<br>or CIS 144 | C++ Object Oriented Programming I<br>or Java Object Oriented Programming I | 3 |
| CIS 242<br>or CIS 244 | C++ Object Oriented Programming II<br>or Java Object Oriented Programming II | 3 |
| Select one of the following: [2,4] | | 4 |
| MATH 125 | Introductory Statistics | |
| MATH 140 | College Algebra | |
| MATH 146 | Discrete Mathematics | |
| Program Elective (p. 2) | | 3 |
| | **Hours** | **16** |
| **Semester 4** | | |
| BUSINES 111<br>or BUSINES 213 | Introduction To Business<br>or Data Visualization and Presentation for Business | 3 |
| CIS 260<br>or CIS 265 | Computer Information Systems Field Project<br>or Computer Information Systems Internship | 3 |
| Select one of the following: [4] | | 3 |
| Physical Sciences & Life Sciences | | |
| ECON 201 | Principles Of Economics I | |
| ECON 202 | Principles Of Economics II | |
| Program Elective (p. 2) | | 3 |
| Program Elective (p. 2) | | 3 |
| | **Hours** | **15** |
| | **Total Hours** | **62** |

1 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.

2 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

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

4 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 10th Percentile** | $53,206 |
| **Median 50th Percentile** | $86,676 |
| **Senior-Level 90th Percentile** | $180,557 |

### Hourly Wages

| | |
|---|---|
| **Entry-Level 10th Percentile** | $26 |
| **Median 50th Percentile** | $42 |
| **Senior-Level 90th Percentile** | $87 |

## Annual Job Openings

48 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 10th Percentile** | $61,434 |
| **Median 50th Percentile** | $99,746 |
| **Senior-Level 90th Percentile** | $140,442 |

### Hourly Wages

| | |
|---|---|
| **Entry-Level 10th Percentile** | $30 |
| **Median 50th Percentile** | $48 |
| **Senior-Level 90th Percentile** | $68 |

## Annual Job Openings

220 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 10th Percentile** | $77,550 |
| **Median 50th Percentile** | $132,852 |
| **Senior-Level 90th Percentile** | $181,453 |

### Hourly Wages

| | |
|---|---|
| **Entry-Level 10th Percentile** | $37 |
| **Median 50th Percentile** | $64 |
| **Senior-Level 90th Percentile** | $87 |

## Annual Job Openings

1384 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