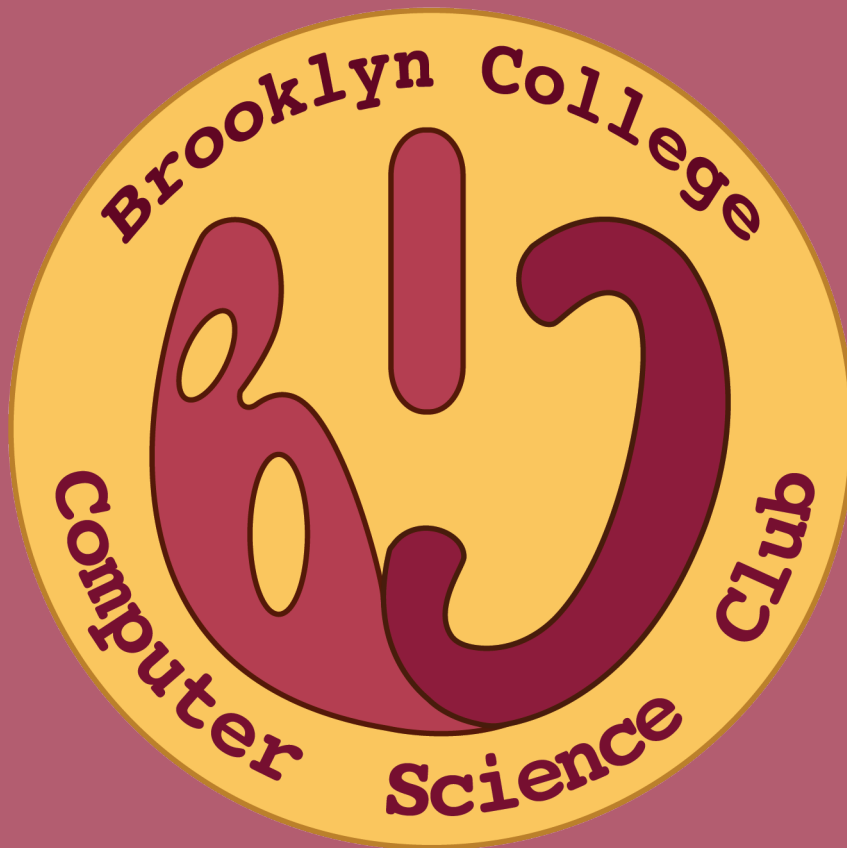


Planning Your Schedule



with the BC CS CLUB

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Classes

Class Descriptions and their prerequisites

CISC 1001 Computing and Quantitative Reasoning

3 hours; 3 credits

Description: Computers, programming, and their basis in quantitative reasoning. Information representation, base systems and numeric conversions between bases. The nature of algorithms; use of graphs to compare performance of algorithms. Designing and writing programs to solve mathematical problems. Feasibility and computability based on mathematical analysis. Drawing inferences from results. Computer and network security and privacy, including encryption techniques and lockout algorithms based on algebraic methods and mathematical logic. Satisfies Pathways Required Core Mathematics and Quantitative Reasoning requirement.

CISC 1003 Exploring Robotics

3 hours; 3 credits

Description: Introduction to programming through the use of project-based educational robotics activities. Small group work on a series of multi-week creative projects involving use of robots to address meaningful and socially important issues, such as urban search and rescue or elder care. Introduction to the fundamentals of robotics (including aspects of mechanical design) and elementary programming within a graphical environment. (Not open to students who have completed Core Curriculum 3303.) 2017-2018 and 2018-2019: Satisfies Pathways College Option requirement. Starting Fall 2019 Satisfies Pathways Flexible Core Scientific World requirement.

CISC 1050 Introduction to Computer Applications

3 hours; 3 credits

Description: Introduction to the use of the computer in the home and office. Computer literacy. Word processing, database systems, and spreadsheets. Examination and evaluation of computer peripherals and software for personal computers. (Not open to students who are enrolled in or have completed Computer and Information Science 3800 [13.2].)

CISC 1115 Introduction to Programming Using Java

3 hours lecture, 2 hours lab; 4 credits

Description: Algorithms, computers and programs. Writing, debugging, and testing programs. Loops and conditional control structures. Method definition and parameter passing. Arrays, ArrayLists, and Strings. Sorting, searching and other basic algorithms. Input and output. Programming applications selected from various disciplines. History and basic concepts of computer science. (Not open to students who have completed Computer and Information Science 1110 [1.5]. Completion of this course prohibits a student from receiving credit for CISC 1110.)

CISC 1215 Introduction to Programming Using Python

2 hours lecture, 2 hours lab; 3 credits

Description: The Python programming language. Algorithms, computers and programs. Writing, debugging, and testing programs. Loops and conditional control structures. Function definition and parameter passing. Strings, Lists, and Tuples. Sorting, searching and other basic algorithms. Input and output. Programming applications selected from various areas. Python tools. History and basic concepts of computer science.

CISC 1600 Introduction to Multimedia Computing

3 hours; 3 credits

Description: Introduction to multimedia topics, including: web design, game design, animation, data visualization, simulation and robotics. Introduction to multimedia hardware and software, including game boxes. Human interface design and input using multimedia devices. Graphical and other forms of output to multimedia devices. Emphasis on design and creation of web pages with HTML and cascading style sheets; interactive, graphical web-based programs; simple computer games, movies and narratives. Computer-based sound editing. Introduction to agent-based programming for simulations and robotics. Uses of multimedia in industry. Hands-on exercises.

CISC 2210 Introduction to Discrete Structures (D,E)

3 hours; 3 credits

Prerequisites: Computer and Information Science 1.10 **or** 1.20 **or** 1110 [1.5] **or** 1115 **or** 1170 **or** 1215, **and** Mathematics 1011 [2.9] **or** 1012 **or** 2.92 **or** assignment to Mathematics 3.20, 1201 [3.3], **or** 4.10 by the Department of Mathematics.

Description: Elementary set theory, functions, relations, and Boolean algebra. Switching circuits, gating networks. Definition and analysis of algorithms. Applications of graph theory to computer science. Related algorithms. Introduction to combinatorial computing and counting arguments. Introduction to error analysis.

CISC 2820W Computers and Ethics

3 hours; 3 credits

Prerequisites: Core Curriculum 1312 [3.12] or Core Studies 5.1 or Computer and Information Science 1000 [1.0] or Computer and Information Science 1110 [1.5] or 1115, and English 1012 [2].

Description: Analysis of ethical issues pertaining to computers and the workplace, anonymity and privacy, copyright and patent law (as applied to software), computer crime, security, unauthorized use, codes of conduct for computer professionals, access and availability of computing technologies. Application of theoretical frameworks such as virtue ethics, deontological theories and utilitarianism to the ethical problems encountered in computing technologies. Writing intensive course. (This course is the same as Philosophy 3318W.)

CISC 3115 Introduction to Modern Programming Techniques

4 hours; 4 credits

Prerequisites: **Computer and Information Science 1115.**

Description: A second course in programming. Programming techniques emphasizing reliability, maintainability, and reusability. Multi-file programs. Abstract data types. Objects, classes, and object-oriented design. Test suites, test drivers, and testing strategies; debugging, assertions, and an introduction to formal techniques. Recursion, event-driven programming and threads, GUI programming, and simple network programming (Not open to students who are enrolled in or have completed Computer and Information Science 3110 [15]. Completion of this course prohibits a student from receiving credit for CISC 3110.)

CISC 3130 Data Structures

4 hours; 4 credits

Prerequisites: **Computer and Information Science 3115; or 3110 and 1170.**

Description: Container classes: their design, implementations, and applications. Sequences: vectors, linked lists, stacks, queues, dequeues, lists. Associative structures: sets, maps and their hash and tree underlying representations. Sorting and searching techniques. Collection frameworks and hierarchies.

CISC 3140 Design and Implementation of Large-Scale Web Applications

3 hours; 3 credits

Prerequisites: **Prerequisite: Computer and Information Science 3130; 1115 or 1170, or 3115.**

Description: Overview of full-stack implementation of large scale web applications. Team-based software development methodologies, tools and practice. Introduction to modern HTML, CSS. Separation of structure, style and behavior. JavaScript, dynamic types, functional programming, prototypal classes, and closures. HTTP client-server communication, synchronous and asynchronous communication. Java Server Pages, simple database creation, programmatic queries and updates.

CISC 3142 Programming Paradigms in C++

3 hours; 3 credits

Prerequisites: **Computer and Information Science 1115, 3130, and 3310.**

Description: An introduction to C++ and its roles providing support for object-oriented programming, generic programming, procedural programming, and low-level programming. The C++ memory model, and topics in explicit memory management. Storage classes, scope, and compilation stages. The Standard Template Library. Comparison with Java. (Not open to students who have completed Computer and Information Science 3110.)

CISC 3160 Programming Languages

4 hours; 4 credits

Prerequisites: **Computer and Information Science 3142.**

Description: The design, implementation, and evolution of programming languages. Language features and their effects upon translation and run-time environments. Languages studied are chosen for their historical and current significance, programming paradigm, and run-time environment. Syntax and semantic specification; formal grammars.

CISC 3171 Introduction to Software Engineering

3 hours; 3 credits

Prerequisites: **Computer and Information Science 3130 [22]**.

Description: A broad view of software engineering that introduces a variety of software engineering techniques that can be applied to practical software projects. Topics include: process models, software specification, software design, software development methods and tools, verification and validation, reliability, and human factors.

CISC 3220 Analysis of Algorithms

3 hours; 3 credits

Prerequisites: **CISC 2210 and CISC 3130 and MATH 1201**

Description: Algorithms, data structures, and their analysis. Applications for and solution to recurrence problems. Upper and lower bounds on complexities of various problems. Classification by design structures. Sorting methods, graph and selection algorithms. Pattern matching. Efficient computation of transitive closure and equivalences. NP-completeness.

CISC 3225 Data Tools and Algorithms

3 hours; 3 credits

Prerequisites: **Computer and Information science 1215; Computer and Information science 2210 or Mathematics 2001.**

Description: Tools for effective programming in Python. Data acquisition, munging, and visualization. Major categories of data algorithms including ranking algorithms, tree algorithms, network algorithms and clustering algorithms. Visualization of data. Introduction to important methods of artificial intelligence including machine learning and neural networks to reach logical conclusions from data aggregations.

CISC 3230 Theoretical Computer Science

3 hours; 3 credits

Prerequisites: CISC 2210 and CISC 3130 and MATH 1201.

Description: Overview of theoretical computer science. Formal language theory, computability theory. Finite automata, context-free and regular grammars, push-down automata, and Turing machines. Other models of computation, including recursive functions. Universal program and unsolvability.

CISC 3305 Computer Organization

3 hours; 3 credits

Prerequisites: Computer and Information Science 4 or 1341 [4.1]; and 2210 [11].

Description: Basic digital circuits. Boolean algebra and combinational logic, data representation and transfer, and digital arithmetic. Digital storage and accessing, control functions, input-output facilities, system organization, and reliability. Description and simulation techniques. Features needed for multiprogramming, multiprocessing, and real-time systems. Other advanced topics and alternate machine organizations. (Not open to students who are enrolled in or who have completed Computer and Information Science 3315 [28].)

CISC 3310 Principles of Computer Architecture

4 hours; 4 credits

Prerequisites: Computer and Information Science 1110 [1.5] or 1115 or 1170 or 1180 [2.80]; and 2210 [11]

Description: Introduction to digital logic. Basic digital circuits. Boolean algebra and combinational logic, data representation and transfer, digital arithmetic. Instruction sets. Introduction to assembly languages: ALU and memory reference instructions, flow control, subroutine linkage, arrays and structures. Memory. I/O systems. Performance. Relationship between software and architecture. (Not open to students who are enrolled in or have completed Computer and Information Science 3305 [27] or 3315 [28].)

CISC 3320 Operating Systems

3 hours; 3 credits

Prerequisites: **Computer and Information Science 21 or 3130 [22]; and 3305 [27] or 3310 [27.1] or 3315 [28].** It is recommended that students be acquainted with at least two computing platforms (e.g., PC, Macintosh, UNIX workstation, IBM mainframe) before taking **Computer and Information Science 3320 [25].**

Description: Design and implementation of operating systems for large computers. Multiprogramming, multiprocessing, time sharing. Resource allocation and scheduling. Communications, conversational computing, computer networks. Memory protection, interrupts, segmentation, paging, and virtual memories.

CISC 3325 Information Security

3 hours; 3 credits

Prerequisites: **Computer and Information Science 3320.**

Description: Principles and practices of computer and network security. Fundamental concepts and principles of computer security, basic cryptography, authentication and access control, Internet vulnerability (malware, DoS attacks, etc), intrusion detection systems, firewalls, software and operating system security, database security, web and wireless security, managerial and ethical issues in computer security. Lab and project activities such as the use of network probing for illustrative and diagnostic purposes; security tool choice, deployment and configuration; secure programming techniques.

CISC 3350 Workstation Programming

3 hours; 3 credits

Prerequisites: **Computer and Information Science 3130 [22].**

Description: Programming techniques for development of applications on networks of workstations. Process environments, file system issues. Concurrent programming, interprocess communication. Graphical user interfaces, event-driven programming. Distributed programming; remote process creation, the client-server model, message passing.

CISC 3410 Artificial Intelligence

3 hours; 3 credits

Prerequisites: **Computer and Information Science 21 or 3130 [22].**

Description: Techniques for making computers exhibit intelligent behavior. Topics covered are taken from the areas of problem solving, perception, game playing, knowledge representation, natural language understanding, programs that learn (adaptive programs), expert systems, and programming languages for work in artificial intelligence.

CISC 3415 Principles of Robotics

3 hours; 3 credits

Prerequisites: **Computer and Information Science 3130 [22] and 2210 [11].**

Description: Basic principles of mobile robotics: architectures, mathematical foundations, control algorithms, human robot interaction, and practical applications. Applications include robots in the home, and robots in search and rescue work. Involves programming different kinds of robots.

CISC 3440 Machine Learning

3 hours; 3 credits

Prerequisites: **Computer and Information Science 3130 or 3225; MATH 2501 or 3501 or Computer and Information Science 2210.**

Description: An introduction to machine learning for students with some mathematical maturity. Topics include: machine learning in relation to artificial intelligence, data sources and characteristics, linear and non-linear regression, machine learning concepts like the bias-variance tradeoff, linear and non-linear classification, hidden Markov models and the expectation-maximization algorithm, unsupervised learning, and deep learning. Examples will be drawn from several domains including natural language processing.

CISC 3610 Introduction to Multimedia Programming

3 hours; 3 credits

Prerequisites: **Computer and Information Science 3110 [15] or 3115**

Description: In-depth study of multimedia programming. Multimedia authoring tools. Graphical user interface design. Multimedia project development. Effective use of media elements in a computer application and on the World Wide Web.

CISC 3620 Computer Graphics

3 hours; 3 credits

Prerequisites: **Computer and Information Science 3130 [22]; and Mathematics 1011 [2.9] or 1026 [2.92] or assignment to Mathematics *1201 [3.3] by the Department of Mathematics.**

Description: Fundamentals of computer graphics programming. Graphics hardware and software standards. 2D geometric primitives and raster images. 3D object representations. Data structures, algorithms, and the graphics pipeline. Graphical user interfaces. Underlying concepts in computer graphics systems, including games, animation, modeling, rendering, and paint systems.

CISC 3630 Multimedia Computing

3 hours; 3 credits

Prerequisites: **Computer and Information Science 3130 [22].**

Description: A survey of the interrelationship of state-of-the-art communication and computer technology. Hardware, software, and system design issues in the multimedia presentation of information. Multimedia standards. Audio and video compression techniques. Hypermedia database systems. Programming and the use of multimedia authoring systems. Survey of representative hypermedia applications.

CISC 3650 Human-Computer Interaction

3 hours; 3 credits

Prerequisites: **Computer and Information Science 3115 or 3120.**

Description: Overview of human-computer interfaces with an emphasis on classical and state-of-the-art approaches. Principles of human-computer interaction and human-robot interaction. Ubiquitous computing and interfaces for mobile devices. Interfaces employing speech recognition and computer vision. Sensor and robotic technologies. Computer supported cooperative work. Virtual and augmented realities.

CISC 3660 Game Programming

3 hours; 3 credits

Prerequisites: **Computer and Information Science 3130 [22].**

Description: Game programming techniques. 2D and 3D games. Data representations of virtual elements. Visualizing the 3D game environment. Controlling motion and behaviors. Interaction control. Game architectures, including multi-player games and message passing. Managing complexity. Teamwork to create a 3D game using a 3D multi-player game engine. Interaction with game development professionals regarding state-of-the-art hardware and software technology for game creation and adaptation. (Not open to students who have taken Computer and Information Science 3667.)

CISC 3665 Game Design

3 hours; 3 credits

Prerequisites: **Computer and Information Science 3130, and Mathematics 1011 or 1201.**

Description: Introduction to designing the intelligence behind computer games. Fundamentals of designing, programming and troubleshooting game behavior. Documenting and critiquing design. Multi-week small-group projects in game design. (Not open to students who have taken Computer and Information Science 3667.)

CISC 3667 Game Design and Development

4 hours; 4 credits

Prerequisite: **Computer and Information Science 3130.**

Description: An introduction to game design and programming. Topics include analysis of existing games, game mechanics, social games. Game development using a game engine, including the use of assets and prefabs, movement, animations, audio and data persistence. Multi-week individual and small group assignments in game design and development. (Not open to students who have taken Computer and Information Science 3660 or Computer and Information Science 3665.)

CISC 3810 Database Systems

3 hours; 3 credits

Prerequisites: **Computer and Information Science 3130 [22].**

Description: Introduction to database systems. Comparison to file processing systems. Data models. Relational, hierarchical, and network systems. Database design. Normal forms. Study of several real-world database management systems, with an emphasis on microcomputer applications. Database recovery query and transaction processing, concurrency. Distributed and object-oriented databases.

CISC 4331 System and Network Administration

3 hours; 3 credits

Prerequisites: **Computer and Information Science 3320 or 3350 or permission of the chairperson.**

Description: Installation, configuration, and maintenance of an operating system. Configuration of routers, networks, and sub-networks. Installation, configuration, and maintenance of network utilities such as email, web server, and other services. Use of network diagnostic tools. Identification and repair of network and configuration problems.

CISC 4610 Multimedia Databases

3 hours; 3 credits

Prerequisites: Computer and Information Science 3810 [45], 3635 [36] or 3630 [52]

Description: Multimedia data types and formats. Multimedia computer database design issues. Indexing and automated retrieval of text documents, audio files, images and video. Techniques and data structures for efficient multimedia similarity search. System support for distributed multimedia databases. Measurement of multimedia information retrieval effectiveness. Products, applications, and new developments.

CISC 4900 Independent and Group Projects I

3 hours recitation and at least 6 hours independent work; 3 credits each term

Prerequisites: Computer and Information Science 3110 or 3115; and permission of the chairperson.

Description: Planning and development of a real computer systems project supervised by a faculty member. Projects may involve group participation. Achievement measured by demonstrable attainment of the project's goals. Written report.

CISC 5001 Independent Study and Research I

Minimum of 9 hours conference and independent work; 3 credits

Prerequisites: Computer and Information Science 3130 [22], a minimum grade point average of 3.0 overall and in Computer and Information Science courses, and permission of the chairperson.

Description: Independent research study or project supervised by a faculty member; approved reading; project report or written examination.

****Course not listed: CISC 4905, CISC 5002-5004, ANY CISC courses scheudled with other departments.**

Schedule Planner

Computer Science Course Requirement

CISC. 1115	Intro to JAVA Programming
CISC. 2210	Discrete Structure
CISC. 2820W	Computer and Ethics
CISC. 3115	Intro Modern Prog Techniques
CISC. 3130	Data Structures
CISC. 3140	Design&Implemntatn Web Applctn
CISC. 3320	Operating Systems
CISC. 3310	Computer Architecture/ CISC. 3305 Computer Organization
CISC. 3142	Programming Paradigms in C++
CISC. 3220	Analysis of Algorithms / CISC.3230 Theoretical Computer Sci
CISC. 4900	Independent Group Projects / CISC. 5001 Independent Study & Research

Three Additional Courses CISC. 3000 and Up.

Math Course Requirement

MATH. 1201	Calculus I
MATH. 1206	Calculus II
MATH. 2501	Elem Probability & Statistics

The following pages will show examples of a four year, three year, and two and half year schedule. While there are many ways to organize your schedule these are recommended.

Schedules

Computer Science

Four year Schedule

Year 1

First Semester

- CISC 1115
 - MATH 1011 (Pre-Calculus) or 1201 (Calculus I)
-

Second Semester

- CISC 2210
- CISC 3115
- MATH 1201 (Calculus I) or 1206 (Calculus II)

Year 2

Third Semester

- CISC 2820W
 - CISC 3130
-

Fourth Semester

- CISC 3310 or 3305
- MATH 1206 (Calculus II) or 2501 (Elem. Statistics)

Year 3

Fifth Semester

- CISC 3142
 - CISC 3220 or 3230
-

Sixth Semester

- CISC 3140
- CISC 3320
- MATH 2501 (if needed)

Year 4

Third Semester

- CISC elective 3000 and up
 - MATH 2501 (if needed)
 - CISC 4900 or 5001 (optional)
-

Fourth Semester

- CISC elective 3000 and up
- CISC elective 3000 and up
- CISC 4900 or 5001 (if not yet taken)

Computer Science

Three year Schedule

Year 2

First Semester

- CISC 1115
- MATH 1011 (Pre-Calculus)
or 1201 (Calculus I)

Second Semester

- CISC 2210
- CISC 3115
- MATH 1201 (Calculus I) or
1206 (Calculus II)

Year 3

Third Semester

- CISC 2820W
- CISC 3130
- CISC 3310 or 3305
- MATH 1206 (Calculus II)
or 2501 (Elem. Statistics)

Fourth Semester

- CISC 3220 or 3230
- CISC 3320
- MATH 2501 (if needed)

Year 4

Fifth Semester

- CISC 3142
- CISC 3140
- CISC elective 3000 and
up

Sixth Semester

- CISC 4900 or 5001
- CISC elective 3000 and
up
- CISC elective 3000 and
up

Computer Science

Two and a Half year Schedule

Year 2

Fourth Semester

- CISC 1115
- CISC 2820W
- MATH 1011 (Pre-Calculus) or 1201 (Calculus I)

Year 3

Fifth Semester

- CISC 2210
- CISC 3115
- MATH 1201 (Calculus I) or 1206 (Calculus II)

Sixth Semester

- CISC 3130
- CISC 3310 or 3305
- MATH 1206 (Calculus II) or 2501 (Elem. Statistics)

Year 4

Seventh Semester

- CISC 3142
- CISC 3220 or 3230
- CISC 3320
- CISC 3140
- MATH 2501 if needed

Eight Semester

- CISC 4900 or 5001
- CISC elective 3000 and up
- CISC elective 3000 and up
- CISC elective 3000 and up

****While a two and a half year plan is possible it is not recommended.**

Between Semesters

Along with taking your classes students trying to enter the tech field should participate in multiple extracurriculars and skill improving tasks.



Year 1

First-year students are encouraged to be focused on learning the fundamentals of programming and networking throughout your campus. Practice programming skills by creating beginner-level and participating in Hackathons.

- **Join computer science clubs.**
- **Participate in Hackathons and programming Competitions.**
- **Create an entry/intermediate level CS project outside of classroom.**
- **Look for Entry-level internships. Any work opportunity in the tech field would work.**
- **Look into Web/Mobile Development.**

Year 2

Second-year students are encouraged to be focused on learning more advanced topics in programming like OOP, Data Structures, and Algorithms. Practicing your advanced programming skills by creating collaborative intermediate/advanced-level projects that would make you more confident in your skills. Additionally, getting exposure to one more language/subfields in CS will allow you to diversify your knowledge and expose you to new interests.

- **Have Proficiency in at least one programming language (OOP).**
- **Data Structures and Algorithms.**
- **Work on intermediate/advanced collaborative project.**
- **Get exposed to one more language/sub-fields in CS. (Check out the “ Fields in CS ” section page 23)**

Year 3

Third-year students are encouraged to be focused on cementing their programming skills and preparing themselves for tech interviews by practicing tech interview questions. Learning one more language to proficiency would also add diversity to your resume. This would also be the year to look for college internships in your preferred field.

- **Look for Industry-level internships.**
- **Strong knowledge of Data Structure and Algorithms and weekly practice of tech interview questions.**
- **Have a solid proficiency in one more programming language.**
- **Explore Software Design.**

Year 4

Fourth-year students are encouraged to be focused on trying to land a job out of college by continuing practice of tech interview questions, polishing your resume, and looking out for any industry-level internships. Make sure to have confidence in all of the skills mentioned in the previous years.

- **Have confidence in all the previous points.**
- **Have Polished resume**
- **Focused time on interview preparation.**
- **Advice referrals from former internships or opportunities.**
- **Apply to jobs with university graduate in the title.**

Fields in CS

The Computer Science major can lead students into a multitude of sub-fields in the tech industry. Here are 21 examples of different specializations in CS.

1) Artificial Intelligence (Deep Learning, Machine Learning, Robotics, Natural Language Processing, Computer Vision)

2) Cybersecurity/Security Engineer

3) Database Administration and Database Management

4) Data Science (Data Processing, Statistical Modeling, Data Visualization, Data Wrangling)/Data Analysis

5) Data Engineer

6) Development Operations or System Administration (DevOps and SysAdmin)

7) Game Design and Game Development

8) Graphic Design and Multimedia

9) Information Technology

- 10)** IoT (Virtual Personal Assistants, Smart TVs, Smart Appliances, Smart Speakers) and Embedded Systems Engineering
- 11)** Product/Project Management
- 12)** Research and Development Engineers (R&D)
- 13)** Scrum Master
- 14)** Site Reliability Engineer
- 15)** Software Architect
- 16)** Software Developer and Software Engineer (Web, Mobile, Desktop)
- 17)** Solutions and Sales Engineers (Application Engineering)
- 18)** Support Engineer
- 19)** Testing/Quality Assurance Analysts (QA)
- 20)** UI/UX Designer
- 21)** Wearables (VR/AR/MR)