

# ***ADVICE to UNDERGRADUATES***

*Java version:  
for students starting CISC courses in or after Fall 2017*



**Computer and Information Science**  
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This brochure is intended to be a summary of the rules applicable to undergraduate study in computer science at Brooklyn College. as of the date of its publication. The Brooklyn College Bulletin (<http://www.brooklyn.cuny.edu/pub/bulletins.htm>) is the official statement of the rules and regulations and should be consulted for final resolution of any questions.

This brochure has been updated to the new course numbers effective September, 2010. For a form matching new course numbers to old course numbers, go to [http://www.brooklyn.cuny.edu/courses/new\\_crs\\_num.jsp](http://www.brooklyn.cuny.edu/courses/new_crs_num.jsp)

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## WHY STUDY COMPUTER SCIENCE AT BROOKLYN COLLEGE?

In August, 2007, an article on aol.com said, "Computer science is now hip and chic, thanks in part to high job availability and salary potential. According to the National Science Foundation, computer science graduates at the bachelor's level are more likely than graduates in other fields to be employed full time after graduation, and upon entering the workforce, they are rewarded with higher salaries. The U.S. Bureau of Labor & Statistics reports the median annual earnings of computer applications software engineers who worked full time in May 2004 were about \$74,980. The middle 50 percent earned between \$59,130 and \$92,130. The lowest 10 percent earned less than \$46,520, and the highest 10 percent earned more than \$113,830."

Brooklyn College has the largest computer science program in CUNY, and the department is also recognized for excellence. An outside evaluation by a group of distinguished computer science faculty ranked Brooklyn College's Computer and Information Science (CIS) Department as one of the best in the New York metropolitan area. The faculty is actively engaged in research in which students may become involved. Moreover, we offer relatively small classes and excellent computing facilities.

The prospective student should understand that "computer science" is quite different from "data processing" or simply "programming." In our programs, we stress the practice of computing, but we are also concerned with the underlying theory and the mathematics of computation. These concerns are not usually present in a program that exclusively emphasizes the use of computers in commercial installations. We try to make the student a competent programmer and analyst, but we also want to provide an understanding of the theoretical foundations of our subject. This balanced program of commercial, scientific, and theoretical courses enables our graduates to grow professionally and to keep pace with rapid

## ADVICE TO TRANSFER STUDENTS

Students who plan to transfer to Brooklyn College and major in CIS are advised to take courses in Java, math courses such as precalculus or calculus, and other courses that are equivalent to courses in the Brooklyn College CIS majors. Transfer students who receive advanced elective credit for courses at other institutions must nevertheless take an additional 24 advanced elective credits (numbered CISC 2000 and higher) at Brooklyn College.

Students in a community college who wish to transfer to Brooklyn College are strongly advised to obtain an A.S. or A.A. degree, rather than an A.A.S. degree. Students coming to Brooklyn College with an A.A. or A.S. degree will be exempt from nine lower-tier Core courses at Brooklyn, but students with an A.A.S. degree will likely have to take a good number of these courses.

Transfer students who have taken a programming course but who have not taken a course in Java before transferring should take CISC 1170 before taking any other CIS course at Brooklyn College numbered above 2820.

Students planning to transfer to Brooklyn College should consult a transfer advisor at their school, or email one of the Deputy Chairs (addresses on the cover) to make sure their community college program is appropriate for their goals. After transferring, transfer students should consult a Deputy Chair as soon as possible for counseling and evaluation of credits.

changes in the field. In the Information Systems major, we also include knowledge of the business world and of accounting and finance. In the Multimedia major, we include familiarity with the arts and with web design.

Students who graduate from our program are prepared for a variety of endeavors, either for graduate school leading to a career in the academic world or research or for management positions in industry, or for entry into the business community. Graduates of the Brooklyn College CIS Department are teaching at a number of prestigious universities, working at Microsoft, Google, Verizon, AT&T, Citibank, IBM, Metropolitan Life, National Grid, Con Edison, the Port Authority, CBS, J. P. Morgan Chase, and other major corporations.

For information on potential careers in computing, please see the ACM Careers web site at <http://computingcareers.acm.org/>.

# I. UNDERGRADUATE PROGRAMS

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The Department of Computer and Information Science (CIS) offers a very rich undergraduate program in computer science, as well as a graduate program leading to advanced degrees.

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## Undergraduate Programs

- a major in Computer Science, leading to the B.S. degree
  - a joint major with the Department of Business in Information Systems, leading to the B.S. degree
  - a major in Multimedia Computing, leading to the B.S. degree
  - a joint major with the Department of Mathematics in Computational Mathematics, leading to the B.S. degree
  - a minor in Data Science
  - a minor in Computer and Information Science
  - a minor in Multimedia Computing
  - a minor in Parallel and Distributed Computing
  - a minor in Cognitive Science
- 

The undergraduate offering at Brooklyn College is quite extensive and includes some courses that are offered only at the graduate level in many other schools. There is a very strong emphasis on the discipline of programming, with substantial practical assignments in many of the courses. The programming language emphasized throughout the undergraduate program is Java, and a course in C++ is required. A number of other languages may be taken as electives

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## Declaring a Major

Choosing a major is typically done during the sophomore year. Students who wish to declare themselves as CIS majors should do so through the Brooklyn College WebCentral portal, <http://www.portal.brooklyn.edu>. Anyone wishing to consult an advisor should see Professor Ira Rudowsky (day: room 1417N, 951-5000x2062, [rudowsky@sci.brooklyn.cuny.edu](mailto:rudowsky@sci.brooklyn.cuny.edu)) or Professor Joseph Thurm (evening; room 2109N, 951-5657; [thurm@sci.brooklyn.cuny.edu](mailto:thurm@sci.brooklyn.cuny.edu)). Students interested in the Information Systems major should contact Professor Ira Rudowsky (room 1417N, 951-5000x2062; [rudowsky@sci.brooklyn.cuny.edu](mailto:rudowsky@sci.brooklyn.cuny.edu)). Their office hours are posted outside the department office, room 2109N.

Students interested in graduate (Master's and/or Ph.D.) programs should contact the Graduate Deputy Chairperson, Professor James Cox, room 2112cN, 951-5000x2047, [cox@sci.brooklyn.cuny.edu](mailto:cox@sci.brooklyn.cuny.edu).

## II. The Major in Computer Science (HEGIS code 0701)

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This major is designed for students who have a general interest in computers and programming. It is suitable for those who want to work as a programmer or systems analyst, or for someone with an interest in going to graduate school in computer science. It is preparation for all non-specialized fields of computing.

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### Computer Science Major Requirements (54-60 credits)

One of the following:  
CISC 1115 or 1170

All of the following:  
CISC 2210, 3115, 3130, 3140, 3142, 3305 or 3310, 3320  
CISC 3220 or 3230  
CISC 4900 or 5001

CISC 2820W or PHIL 3318W

MATH 1201 and 1206; or 3.20 and 4.20 and 1211  
MATH 2501 or 3501

Three additional courses in CIS numbered between 3000 and 4899.

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The department chair, with the approval of the chair of the department's undergraduate curriculum committee, may allow substitutions for one or more of these requirements consistent with the educational goals of the program. For titles and prerequisites of these CIS courses, see Section IV of this brochure. For descriptions, see the Brooklyn College Bulletin.

Mathematics 1201 (3 credits) and 1206 (4 credits) are courses in calculus; Mathematics 2501 (3 credits) and 3501 (3 credits) are courses in probability and statistics. Transfer students who receive credit for Mathematics 3.20 and 4.20 are required to take Mathematics 1211 and either 2501 or 3501 to satisfy the mathematics requirement for the B.S. degree in Computer and Information Science. Students may be required to take Mathematics 1011 (precalculus) before taking Mathematics 1201.

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**Important Note:** To enroll in a CIS course, a student must have passed all prerequisite courses in the CIS department with a grade of C or higher. This is different from the policy of many other departments. This requirement does not apply to Math prerequisite courses, which must be passed with a D- or better.

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## **Additional Requirements for B.S. in CS, MMC or Computational Math**

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CIS candidates for a CIS B.S. degree in Computer Science, Multimedia Computing, or Computational Math must complete at least 60 credits in science and mathematics; 24 of these 60 credits must be advanced courses numbered 2000 and above taken in the CIS Department at Brooklyn College and completed with a grade of C or higher in each course. For the B.S. in Computational Math, these 24 credits must be in the CIS Department and/or the Math Department.

Transfer students should plan their schedules carefully to ensure that they take 24 advanced CIS electives at Brooklyn College.

Ordinarily, a Brooklyn College CS or MMC major will meet the 24-credit requirement through required CIS courses and will not require additional CIS courses. Additional CIS, math, and science courses, of course, are always helpful. Students should make sure that they meet the 60-credit science requirement.

The following courses may be credited as science courses for the B.S. degree: All courses in the Departments of Biology, Chemistry, Computer and Information Science, Geology, Mathematics, Physics, and Psychology; B) Courses in the Dept. of Health and Nutrition Sciences marked with a (#) in the Bulletin; Anthropology and Archaeology 2200, 3199, 3230, 3240, 3250, 3260, 3265, 3266, 3425, 3440, 3470, 4665; Economics 3400, 3410, 4400, 4422; Philosophy 3203, 3204, 3231, 3232, 3422, 3423, 3601, 3605, 3610; Physical Education and Exercise Science 3023, 3271, 3275, 3281, 4229, 4251; and Sociology 2701.

## **Department Recommendations**

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- CIS majors must complete the Brooklyn College General Education (Pathways) Curriculum.
- Incoming students who have programming experience should consult a department advisor.
- Each student should, with counseling, take additional elective courses that will satisfy the student's special interests. These may include courses in computer and information science as well as courses in mathematics, economics, accounting, physics, biology, psychology, health and nutrition sciences, or other departments. (See "Personalizing Your Major," below.) By taking these courses, the student will also be prepared to apply computing to a particular field.
- Any student who is not familiar with Microsoft Word, Excel, Access and/or PowerPoint is advised to also take CISC 1050 during his or her college studies.

**Seniors with good grades may also take graduate courses, with permission.**

Students should try to gain experience on as many computer platforms as possible. In the CIS Department, we offer courses on personal computers running Windows and Unix workstations. It is to your advantage to take courses using both platforms so that you are broadly knowledgeable and have the widest experience and career choice possibilities.



## **Personalizing Your Major**

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### **Scientifically Inclined?**

Those CIS majors who want to specialize in scientific applications would do well to include in their program of study courses from the following list:

CISC 1150, 2810, 3350, 3820, 4335  
MATH 2101, 2201, 2206, 4201

### **Going to Graduate School?**

Students interested in graduate study in computer science should consider taking CISC 3160, 3220, 3230, and 3390

### **Going into Business?**

Those CIS majors who want to specialize in business, commercial, and economic applications would do well to include in their program of study courses from the following list:

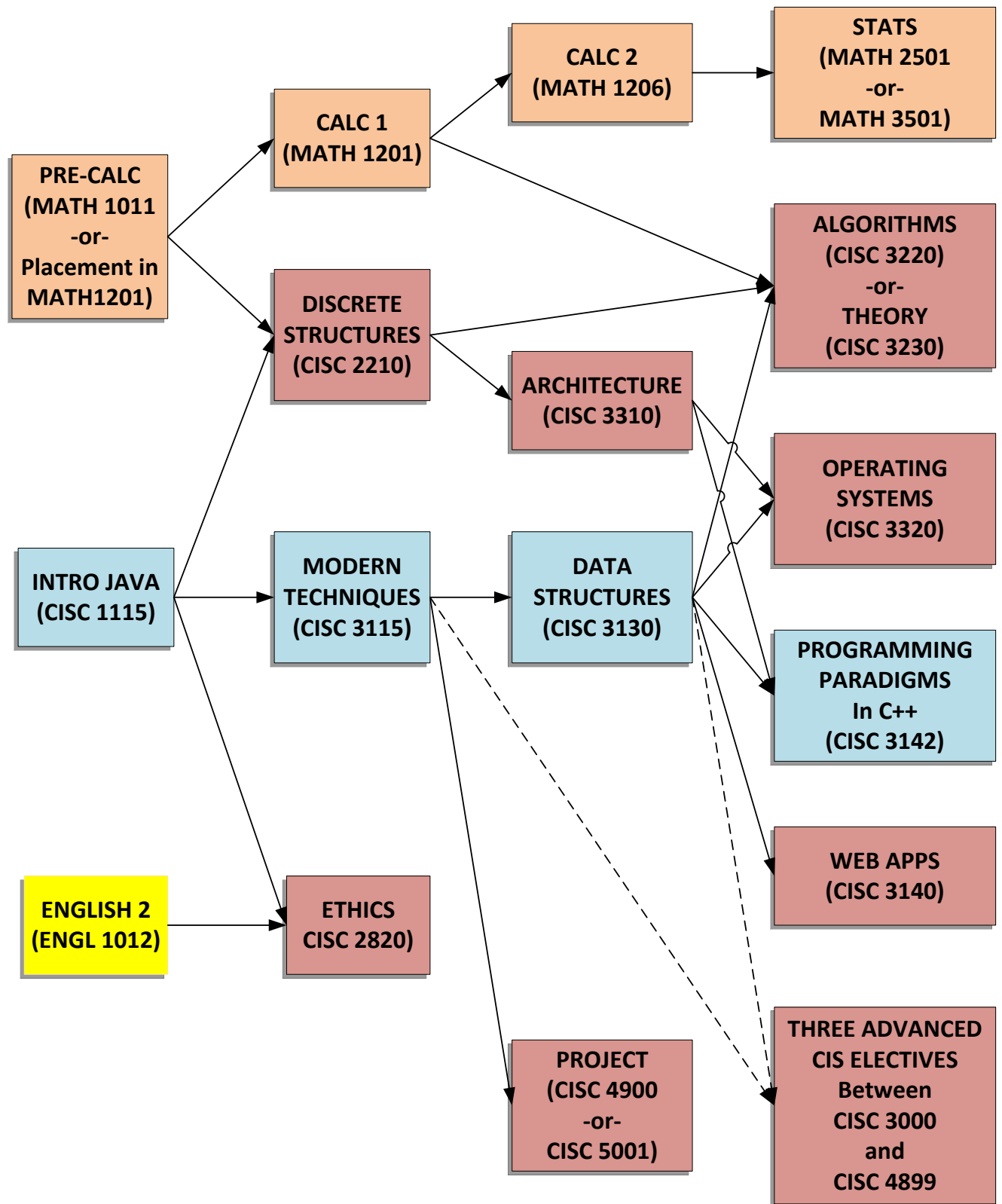
CISC 1050, 1530, 1590, 1595, 1597, 2531, 3810, 3820  
ECON 2100, 3320, 3400  
ACCT 2001, 3001, 3041  
BUSN 3100, 3200, 3230, 3310, 3430

### **Politically Motivated?**

CIS majors who want to specialize in urban administration and information science should include as many courses as possible from the following list:

CISC 1050, 3810, 3820  
POLS 1001 or 1002 or 1230, 3120, 3123, 3140, 3141, 3143, 3144, 3150, 3152, 3610, 3611

## Prerequisite Flowchart for the BS in Computer Science



## Possible Schedules for the CS Major

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Students wishing to major in CIS are encouraged to see a department counselor as early as possible. *Note that the sample schedules in this section are appropriate for non-transfer students. Transfer students should consult with an advisor to plan their schedule at Brooklyn College.*

The following suggestions are offered to help a student arrange the required courses into a feasible schedule. Many other arrangements are possible, and each student should consider the prerequisites for the individual courses before planning his or her schedule. Students should also take General Education (Pathways) courses as appropriate. Students may also take other advanced elective courses that are not required for the major.

It is important to move speedily through the CISC 1115, 3115, 3130 sequence, as completing that set of courses allows a student to take most other courses in the department.

In the schedules below, elective means any course in CIS numbered from 3000 to 4899.

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### Four Year Schedule

First semester:	CISC 1115, and MATH 1011 or 1201
Second semester:	CISC 2210, CISC 3115, and MATH 1201 or 1206
Third semester:	CISC 2820W, CISC 3130
Fourth semester:	CISC 3305 or 3310, and MATH 1206 or 2501
Fifth semester:	CISC 3142, and either CISC 3220 or CISC 3230
Sixth semester:	CISC 3150, CISC 3320, and MATH 2501 (if necessary)
Seventh semester:	CISC 4900 or 5001, and one elective
Eighth semester:	one or more electives, possibly CISC 4905 or 5002

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For students who decide to major in CIS in their second year, we recommend the following schedule of required courses:

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### Three Year Schedule

Third semester:	CISC 1115, MATH 1011 or 1201
Fourth semester:	CISC 2210, CISC 3115, MATH 1201 or 1206
Fifth semester:	CISC 2820W, CISC 3130, CISC 3305 or 3310, MATH 1206 or 2501
Sixth semester:	CISC 3220 or 3230; CISC 3320 or 3150, MATH 2501 if needed
Seventh semester:	CISC 3142, CISC 3320 or 3150, and one elective
Eighth semester:	CISC 4900 or 5001, and one elective

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Although not recommended, the following schedule is feasible for students who take CISC 1115 in their fourth semester. Since this program is very difficult to handle, it is critical that the student see a counselor before undertaking this schedule and every semester thereafter.

#### **Two-and-One-Half Year Schedule**

Fourth semester:	CISC 1115, CISC 2820W, and MATH 1011 or 1201, CISC 3800
Fifth semester:	CISC 2210, CISC 3115, MATH 1201 or 1206, CISC 3800
Sixth semester:	CISC 3130, CISC 3310, MATH 1206 or 2501
Seventh semester:	CISC 3142, CISC 3220 or 3230, CISC 3320 or 3150, MATH 2501 if needed
Eighth semester:	CISC 3320 or 3150, CISC 4900 or 5001, one or more electives

**Note:** MATH 1011 or placement in MATH 1201 by the Dept. of Mathematics, is a prerequisite for CISC 2210.

Freshmen and sophomores are also encouraged to complete Pathways requirements and to start the Math requirements for the CS major.

Students who are required to take a foreign language should satisfy that requirement as quickly as possible.

### III. The Major in Multimedia Computing (HEGIS code 0799)

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This major is designed for students interested in the types of computing that are used for entertainment, art and aesthetics. The major melds work in the Arts, Mathematics and Computer Science to produce students who are comfortable applying computing to non-traditional applications such as robotics, computer gaming, web production, and arts production. Building on our several-year-old minor in the field, the new major is designed to provide preparation for the increasing number of computing careers in the arts and entertainment industries.

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#### MULTIMEDIA COMPUTING MAJOR REQUIREMENTS (60-63 credits)

All of the following:

CISC 1115 or 1170

CISC 1600, 2210, 3115, 2820W, 3115, 3130, 3220, 3620, 3630

CISC 4900 or 5001

All of the following:

MATH 1201; 1711 or 1206; 1716 or 2501

One of the following:

CISC 3650, 3660, 3665

Three additional courses chosen from the following:

CISC 3140, 3142, 3410, 3415, 3610, 3650, 3660, 3665, 3810, 4610

Two courses chosen from among the following:

Art (ARTD) 2811, 2812, 2820, 2821, 3812

Music (MUSC) 3260, 3261, 3262, 3322

FILM 1201, 2701

Television and Radio (TVRA) 2420, 3861, 3871, 3951

A candidate for this degree must also fulfill the science requirements listed on page 8.

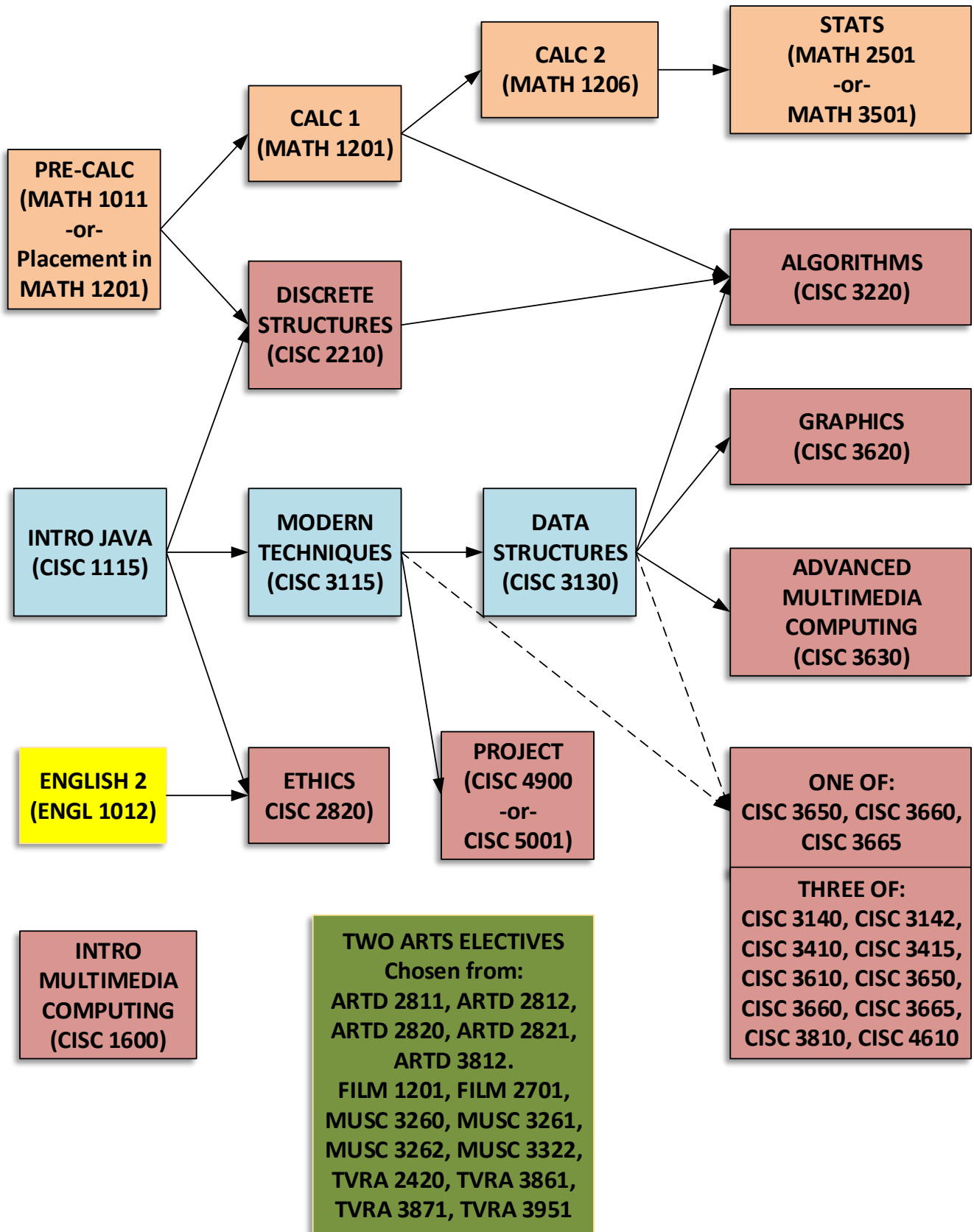
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**Important Note:** To enroll in a CIS course, a student must have passed all prerequisite courses in the CIS department with a grade of C or higher. This is different from the policy of many other departments. This requirement does not apply to Math prerequisite courses, which must be passed with a D- or better.

The department chair, with the approval of the chair of the department's undergraduate curriculum committee, may allow substitutions for one or more of these requirements consistent with the educational goals of the program.

For titles and prerequisites of these CIS courses, see Section IV of this brochure. For descriptions, see the Brooklyn College Bulletin.

## Prerequisite Flowchart for the BS in Multimedia Computing



## Possible Schedules for the MMC Major

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Students wishing to major in Multimedia Computing are encouraged to see a department counselor as early as possible. *Note that the sample schedules in this section are appropriate for non-transfer students. Transfer students should consult with an advisor to plan their schedule at Brooklyn College.*

The following suggestions are offered to help a student arrange the required courses into a feasible schedule. Many other arrangements are possible, and each student should consider the prerequisites for the individual courses before planning his or her schedule. Students should also take Core courses as appropriate. Students may also take other advanced elective courses that are not required for the major.

It is important to move speedily through the CISC 1115, 3115, 3130 sequence, as completing that set of courses allows a student to take most other courses in the department.

In the schedules below, a CIS MMC elective is an additional course chosen from among CISC 3140, 3150, 3410, 3415, 3610, 3650, 3660, 3665, 3810, 4610

### Four Year Schedule

First semester:	CISC 1115, CISC 1600, ENGL 1010, MATH 1011
Second semester:	MATH 1201, ENGL 1012
Third semester:	CISC 2820W, CISC 3115, MATH 1206
Fourth semester:	CISC 2210, arts elective
Fifth semester:	CISC 3130; CISC 3630, MATH 2501
Sixth semester:	CISC 3220, CISC 3650 or 3660 or 3665, arts elective
Seventh semester:	CISC 3620, MMC elective, CISC 4900 or 5001
Eighth semester:	CIS MMC elective; CISC 4905 or CISC 5002 (optional)

For students who decide to major in Multimedia Computing in their second year, we recommend the following schedule of required courses:

### Three Year Schedule

Third semester:	CISC 1600, MATH 1011, arts elective
Fourth semester:	CISC 1115, MATH 1201, arts elective
Fifth semester:	CISC 2210, CISC 2820W, CISC 3115, MATH 1206
Sixth semester:	CISC 3630, MATH 2501
Seventh semester:	CISC 3130, CISC 3650 or 3660 or 3665; CIS MMC elective
Eighth semester:	CISC 3220, CISC 3620, CIS MMC elective; CISC 4900 or 5001

**Note:** Mathematics 1011 or placement in MATH 1201 by the Dept. of Mathematics, is a prerequisite for CISC 2210.

Freshmen and sophomores are also encouraged to complete their General Education and English requirements and to start the Math requirements for the MMC major.

Students who are required to take a foreign language should satisfy that requirement as quickly as possible.



## IV. The Major in Information Systems (HEGIS code 0702)

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This major, offered in a program taught jointly between the CIS department and the Dept. of Finance and Business Management, is designed for students who want to use their computing skills in the field of business and organizational management. Combining a broad education in computing with the extensive "business intelligence" that today's organizations are seeking from their information technology staffs, the major will prepare students for such careers as Business Analyst, Systems Analyst, Database Administrator, Information Technology Specialist, and Information Consultant.

### INFORMATION SYSTEMS MAJOR REQUIREMENTS (63-67 credits)

All of the following:

CISC 1115 or 1170  
CISC 3115, 3130, 3810  
CISC 4900 or 5001

Students unfamiliar with PC application software (word processing, spreadsheet software, database management software, and presentation software) should also complete CISC 1050. Knowledge of such software is prerequisite for CISC 3810.

Three courses chosen from the following:

CISC 3140, 3150, 3171, 3340, 3345, 3410, 3800, 3820.

With permission of the chairperson of the Department of Computer and Information Science, the student may substitute one of the following courses for any course in the three-course choice above: CISC 3160, 3220, 3310, 3320, 3610, 3630.

All of the following:

CISC 2820W/Philosophy (PHIL) 3318W  
CISC 1590/Business (BUSN) 3420  
CISC 2531/BUSN 3430  
CISC 1530/BUSN 3120 or CISC 2532/BUSN 2432  
BUSN 4202W/CISC 1580W  
ECON 2100/BUSN 2100 and ECON 2200/BUSN 2200 and BUSN 3200  
Finance (FINC) 3310  
Accounting (ACCT) 2001  
BUSN 3400/ECON 3400 or MATH 2501 or MATH 3501 or Psychology (PSYC) 3400  
BUSN 3410/ECON 3410 or MATH 1201 or BUSN 3421 or CISC 2590

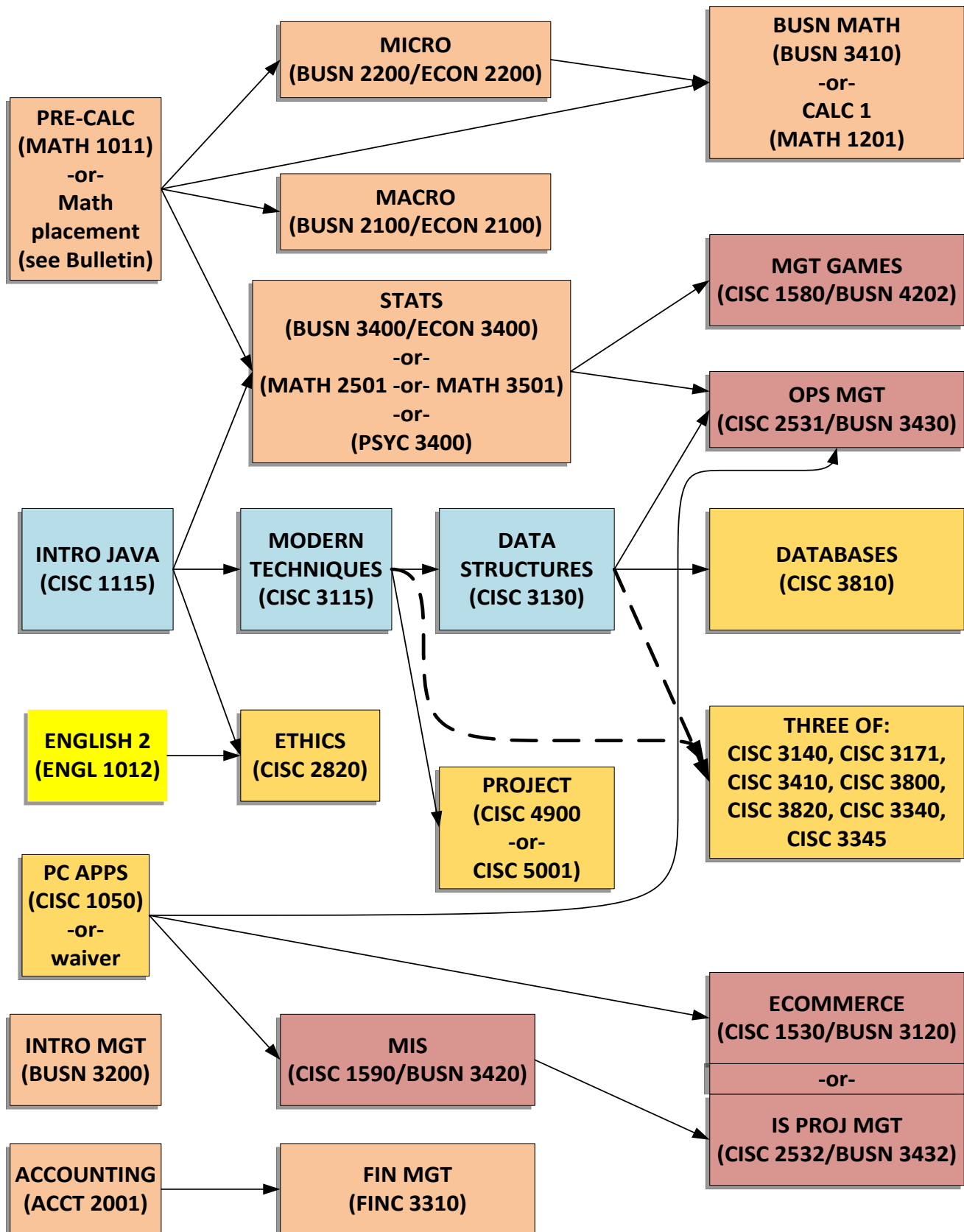
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**Important Note:** To enroll in a CIS course, a student must have passed all prerequisite courses in the CIS department with a grade of C or higher. This is different from the policy of many other departments. This requirement does not apply to MATH prerequisite courses, which must be passed with a D- or better.

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A candidate for this degree must complete 24 credits in advanced courses in the Departments of Accounting, CIS, Economics, and/or Finance and Business Management. These courses must be completed at Brooklyn College with a grade of C or higher.

## Prerequisite Flowchart for the BS in Information Systems



## Possible Schedules for the IS Major

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Students wishing to major in Information Systems are encouraged to see a department counselor as early as possible. *Note that the sample schedules in this section are appropriate for non-transfer students. Transfer students should consult with an advisor to plan their schedule at Brooklyn College.*

The following suggestions are offered to help a student arrange the required courses into a feasible schedule. Many other arrangements are possible, and each student should consider the prerequisites for the individual courses before planning his or her schedule. Students should also take Core courses as appropriate. Students may also take other advanced elective courses that are not required for the major.

It is important to move speedily through the CISC 1115, 3115, 3130 sequence, as completing that set of courses allows a student to take most other courses in the department.

In the schedules below, a CIS IS elective is CISC 3800 or 3120 or 3140 or 3171 or 3410 or 3820 or 3340 or 3345.

### Four Year Schedule

First semester:	CISC 1115, CISC 1050, MATH 1011, ENGL 1010
Second semester:	CISC 1530, CISC 3110, BUS 2100, ENGL 1012
Third semester:	CISC 2820W, CISC 3130, BUS 2200, BUS 3200
Fourth semester:	CISC 1590, CISC 3810, CISC 3142, BUS 3400
Fifth semester:	CISC 2531; CISC 3150; one CIS IS elective
Sixth semester:	one or more CIS IS electives; BUS 3410
Seventh semester:	CISC 1580W; CISC 4900 or CISC 5001; ACCT 2001
Eighth semester:	CISC 4905 or CISC 5002, additional CIS or Business electives, BUS 3310

For students who decide to major in Information Systems in their second year, we recommend the following schedule of required courses:

### Three Year Schedule

Third semester:	CISC 1115, CISC 1050, MATH 1011, BUS 3200
Fourth semester:	CISC 1530, CISC 1590, CISC 3115, BUS 2100
Fifth semester:	CISC 2820W, CISC 3130, BUS 2200, BUS 3400
Sixth semester:	CISC 2531, CISC 3810, one CIS IS elective, BUS 3410
Seventh semester:	CISC 3150; one or more CIS IS electives; ACCT 2001
Eighth semester:	CISC 1580W; CISC 4900 or CISC 5001; BUS 3310

Although not recommended, the following schedule is feasible for students who take CISC 1115 in their fourth semester. Since this program is very difficult to handle, it is critical that the student should see a counselor before undertaking this schedule and every semester thereafter.

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### **Two-and-One-Half Year Schedule**

Fourth semester:	CISC 1115, CISC 1050, MATH 1011, BUS 3200
Fifth semester:	CISC 1530, CISC 1590, CISC 3115, BUS 2100, ACCT 2001
Sixth semester:	CISC 2820W, CISC 3130, BUS 2200, BUS 3400
Seventh semester:	CISC 2531, CISC 3810, one CIS IS elective, BUS 3410, BUS 3310
Eighth semester:	CISC 3150, one CIS IS elective, CISC 1580W; CISC 4900 or 5001

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**Note:** Mathematics 1011 or placement in MATH 1201 by the Dept. of Mathematics is a prerequisite for CISC 2210.

Freshmen and sophomores are also encouraged to complete their General Education and English requirements and to start the Math requirements for the IS major.

Students who are required to take a foreign language should satisfy that requirement as quickly as possible.

## V. The Minor in Computer Science

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Students can officially minor in CS by taking 12 credits in CIS electives whose course numbers are above 2000, including at least one of 3130 or 3310. At least 6 of the credits presented for the minor must be completed at Brooklyn College. The 12 advanced elective credits must be completed with an average of C or better.

Three possible minors are the following:

- a) CISC 1115, 2210, 3115; 3130; and 3310
- b) CISC 1115, 1050; 2531 or 2210; 3800, 3115; and 3130 or 3630
- c) CISC 1115, 3115; 3130; and two additional courses numbered 2000 or above (however, make sure that you fulfill any prerequisites).

Any student who is not familiar with Microsoft Word, Excel, Access and/or PowerPoint is advised to also take CISC 1050 during his or her college studies.

## VI. The Minor in Multimedia Computing

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A student with a major in CIS or another field may take a minor in Multimedia Computing. Any minor at BC requires completing 12 advanced elective credits with an average of C- or better. The minor requires 21-23 credits and includes the following courses.

### MULTIMEDIA COMPUTING MINOR REQUIREMENTS

All of the following:

CISC 1115 or 1170

CISC 1600, 3115, 3130

CIS 3620 or 3630

Three courses chosen from among the following:

CISC 3610, 3620, 3630, 3650, 3660, 3665, 4610

Courses presented for the major in CIS may also be used to satisfy the minor in multimedia computing.

## VII. The Minor in Cognitive Science

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The CIS Department offers a minor in Cognitive Science. The minor requires 12-13 credits in advanced electives. The 12 advanced elective credits must be completed with an average of C- or better. This is an interdepartmental minor, offered by the CIS, Philosophy and Psychology departments. The minor includes the following courses.

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### COGNITIVE SCIENCE MINOR REQUIREMENTS

All of the following:

PHIL 3422  
CISC 1115  
PSYC 1000 and 3530

One from each of the following groups, a) and b):

- a) PHIL 3123, 3410, 3401, 3420, or 3601.
  - b) CISC 1410 or 3410; or PHIL 29, or PSYC 3580.
-

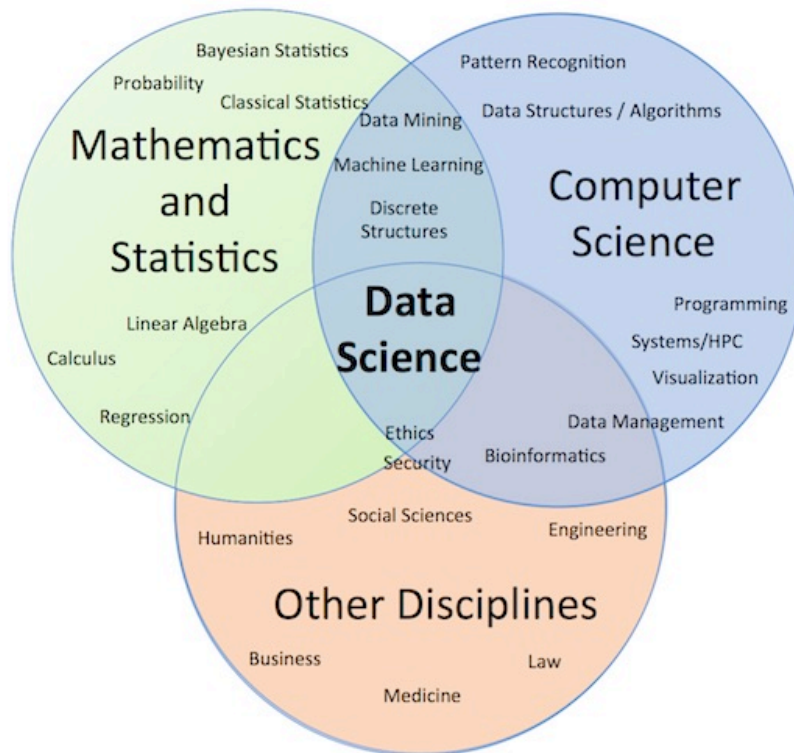
## IX. The Minor in Data Science

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Data Science has become an important field of study combining elements of computer science, mathematics, statistics, and artificial intelligence, with applications to social science data analytics.

The Brooklyn College Minor, under the joint auspices of the Departments of CIS and Mathematics, provides recognition to students who may want to study this new field. Any student at the College may choose to minor in Data Science.

This figure looks at data science from the perspective of the computing disciplines, but recognizes that other views contribute to the full picture.



Data Science often uses the Python programming language and the R database system. These are included in the minor. The Minor also requires courses in Calculus (already required by the majors in CIS and Math) and in Linear Algebra, a mathematics tool that is useful in solving analytic problems, including many in the social sciences.

A new practical applied course in Statistics has been developed for the minor. A new Data Science Algorithms course is also included. Artificial Intelligence is represented by a CIS elective in Machine Learning, which forms the core of AI methodology in the area of expanding the capabilities of practical computer systems and applications.



The minor requires 18-19 credits.

Prerequisite requirements for the minor: MATH 1201, 1206, 2101; CISC 1215

#### **DATA SCIENCE MINOR REQUIREMENTS**

All of the following:

CISC 3225 and 3440.

MATH 4531.

Either MATH 2001 and MATH 3501, or CISC 2210 and MATH 2501.

One additional course, chosen from among the following:

BUSN 2200 or 4400W

CISC 1410 or 3130

FINC 3377

ECON 2200 or 3370 or 4422 or 4400W

MATH 3601 or 4101 or 4501

PHIL 3203 or 3204 or 3423

POLS 3014W or 3421 or 3423

PSYC 3510 or 3520 or 3530 or 3580 or 4400

SOCY 3506 or 3604

Courses presented for the major in CIS may also be used to satisfy the minor in data science.

## **X. The Major in Computational Mathematics (HEGIS code 1701)**

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The Computational Mathematics program, offered jointly by the Department of Mathematics and the Department of Computer and Information Science, prepares the student for a wide range of future careers and opportunities for graduate study. The Computational Option enables students to apply mathematical and computational skills to the physical, biological, social and behavioral sciences. It is designed for the education of applied mathematicians who plan to enter careers in scientific computing, or who wish to enroll in graduate programs in computationally oriented applied mathematics or in computer science. The Theoretical Option is designed for those interested in the more abstract parts of computer science, and for those interested in college teaching and research.

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### **COMPUTATIONAL MATHEMATICS PROGRAM REQUIREMENTS (54-60 credits)**

#### **Option I. Computational**

One of the following mathematics sequences, a) or b):

- a) MATH 1201 and 1206
- b) MATH 3.20 and 34.20 and 1211

All of the following:

- MATH 2001, 2101, 2201, 2206, 4201, 3501, and 4701
- CISC 1115 or 1170
- CISC 3115, 3130, 3220

Three courses chosen from the following:

- CISC 3240/MATH 3107, CISC 3142, 3150, 3160, 3230, 3310, 3330, 3350, 3820, 4335
- 

**Recommendations:** Students choosing Option 1 are also encouraged to minor in Distributed and Parallel Computing.

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#### **Option II. Theoretical**

One of the following mathematics sequences, a) or b)

- a) MATH 1201 and 1206
- b) MATH 3.20 and 34.20 and 1211

All of the following:

- MATH 2001, 2101, 2201, 3101, 4101, and 4201
- CISC 1115 or 1170
- CISC 3115, 3130, 3220, 3230, 4900
- CISC 4900 or 5001

Three of the following:

- CISC 3240/MATH 3107; CISC 3142, 3150, 3160, 3330, 3350, 3820, 4335
- 

**Important Note:** Candidates for a degree in Computational Mathematics must also fulfill the requirements listed on page 8 of this brochure.

**RECOMMENDATIONS:** MATH 4501 is recommended. It is recommended that students should choose electives in departments that prepare them to apply computer science to a particular field of interest. Majors in Computational Mathematics may substitute MATH 2001 for CISC 2210 as a prerequisite for CIS courses.

**Warning:** Since many Mathematics and some CIS courses (e.g., CISC 3820), are offered no more than once a year or even two, students majoring in Computational Mathematics should plan their schedules accordingly.

## **XI. ANSWERS TO COMMON QUESTIONS ABOUT CIS**

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**I've heard a lot of conflicting opinions about the job and career prospects in computing. I need accurate information. Are jobs available, and does computing make sense as a lifetime career? Where can I learn more about this subject?**

Yes, there are jobs available in computing. Even when the number of jobs in the field was at its lowest point in 2002-03, there was less unemployment in the Information Technology sector than in the overall U.S. economy.

Today, there is increasing demand for computing professionals, and a significant shortage of skilled personnel. Thus there is great opportunity for our graduates. Many people who start out in IT jobs move into managerial positions in their organizations. The key to any successful career, including a computing career, is keeping up with the field and continuing education throughout your working years. An excellent source for information about computing careers is at <http://computingcareers.acm.org>. Look at the Frequently Asked Questions on that site for detailed answers to many of your questions about the computing job and career situation.

**Which introductory course should the student who intends to major in CIS take?**

A student who intends to major in CIS should start by taking CISC 1115, Introduction to Computing Using Java.

CISC 1115 is an introduction to programming, using the Java programming language. The programming assignments do not assume that the student has a mathematical background beyond high school mathematics. The Java language is used heavily in later courses in the curriculum, as well as in industry.

There are currently two versions of CISC 1115. One section emphasizes scientific applications, and is intended for students interested in STEM fields (Science, Technology, Engineering, and Mathematics). Only students in the Coordinated Engineering Program or Science/Math Majors (not Computer Science) who have completed pre calculus or been placed in Calculus I may take this section. All other students should enroll in any of the other sections. The standard version of CISC 1115 is not geared to a particular application area, but rather uses examples from a variety of fields.

**What are those other introductory courses?**

The department offers several other introductory courses, but they are not appropriate first courses for a CIS major. They are:

- CISC 1000, Computing: Its Nature, Power and Limits
- CISC 1001, Computing and Quantitative Reasoning
- CISC 1002, The Outer Limits of Reasoning
- CISC 1003, Exploring Robotics
- CISC 1050, Introduction to Computer Applications.

CISC 1000 is designed for students who do not intend to major in CIS or in the sciences. CISC 1001, 1002, and 1003 fulfill Pathways requirements. CISC 1050, which can be taken by a CIS major, teaches office applications like Windows, Word, Excel, Access, and Powerpoint.

Students can take CISC 1050 in the same semester as CISC 1115.

**Is CISC 1115 an easy course?**

No, the student should expect substantial

programming assignments requiring a good deal of time. In addition to the hours spent in class, **at least 10 to 12 hours per week** will be needed to write, run, and correct programs, either on computers on campus or at home. Programming can only be learned by writing programs, and this is a painstaking, time-consuming task requiring intellectual rigor and discipline. One primary goal of the course is to give students a good understanding of the nature of programming before they decide to make a lifetime career out of working with computers.

### **Do I need to know much mathematics in order to take CISC 1115?**

No, not much in the way of college level courses is necessary for CISC 1115. However, the student should have done well in high school mathematics and other introductory courses.

### **What course should I take first if I have had an introductory computing course at some other college?**

If you have taken an approved introductory programming course, but in some language other than Java, you should initially take CISC 1170, Introduction to Java for Programmers. This course presumes a general knowledge of programming in some language other than Java. Typically, this other language would be Pascal, C, C++, or Visual BASIC.

Since the demand for CISC 1170 is low, students registering for the course are advised to sit in on any section of CISC 1115 and do all the assignments and exams for a grade.

If you are in doubt about whether the introductory course you took is acceptable, you should speak to a department counselor. Briefly, to take a course beyond CISC 1115 or 1170, you should be comfortable with such programming concepts as nested loops, functions and

parameter transmission, arrays, simple searching and sorting techniques, logical and relational operators, and other control structures.

In all cases, if you have had a first course elsewhere, you should speak with a counselor in planning the rest of your program as a CIS major. You should seek guidance prior to the registration period.

### **What other first steps should the prospective CIS major take?**

Move ahead on satisfying the mathematics requirements. Take MATH 1201 as soon as possible. See a counselor in the Department of Mathematics with regard to any prerequisite courses that must be completed before taking MATH 1201. Many students will have to take MATH 1011 before MATH 1201.

### **How do I declare myself a CIS major?**

During your sophomore or junior year, you will be asked to declare a major. Students who wish to declare themselves as CIS majors should do so through the Brooklyn College WebCentral portal, <http://www.portal.brooklyn.edu>. Day students wishing to consult an advisor should see Prof. Ira Rudowsky (1417N, 951-5000 x2062, [rudowsky@sci.brooklyn.cuny.edu](mailto:rudowsky@sci.brooklyn.cuny.edu)). Evening or weekend students should see Prof. Joseph Thurm (2109N, 951-5657; [thurm@sci.brooklyn.cuny.edu](mailto:thurm@sci.brooklyn.cuny.edu)). Their office hours are posted outside the department office, room 2109N. If you have not yet taken CISC 1115 or 1170, but wish to major in CIS, defer your major declaration and take one of these courses as soon as possible.

### **What second course(s) should be taken by a CIS major?**

CISC 2210 (Introduction to Discrete Structures) and CISC 3115 Introduction to Modern Programming Techniques) are good second courses. CISC 3115

continues the study of Java programming and also introduces the student to the study of data structures. This course includes substantial programming assignments. CISC 2210 covers some of the mathematical and logical constructs that underlie computing. CISC 2210 has a prerequisite of MATH 1011 or placement into MATH 1201 by the Math Department.

### **Can an undergraduate student take a graduate course?**

Advanced (senior year) students with good records can consider taking a CIS graduate course as an advanced elective, if they satisfy the prerequisite conditions. This requires the approval of both the department and the Academic Advisement Center. See the Graduate Student Counselor. A large variety of graduate courses are offered every semester, including courses in artificial intelligence, databases, and computer networks.

### **Where can I learn C++?**

CISC 3142 teaches advanced programming concepts in C++.

### **How can I learn other programming languages besides Java and C++?**

You may take CISC 3160 which includes an introduction to other languages. You may also take a CIS course numbered between 1150 and 1200 to learn a specific new language.

### **Is there any opportunity to do research at the undergraduate level?**

Yes. There are a number of faculty laboratories in the CIS department with ongoing research projects. Students can do independent work with these faculty and receive credit for CISC 4900, 4905, or 5001; superior students may apply for honors credit in any CIS course, enroll in the honors courses CISC 4940 to 4955, or enroll in one of the supervised research

project courses, CISC 5001 to 5004. These projects offer students the opportunity to get involved in hands-on practical work with both hardware and software. The projects can provide you with skills and contacts that can enhance your career opportunities or your choice of graduate schools. Getting involved in research is especially important for those students who want to continue on to graduate school in computer science. It is a good idea to start looking into a project early in your CIS career. Talk to your professors about their work, or contact professors who are doing work consistent with your interests.

### **How should I prepare myself for graduate school in computer science?**

A student intending to go to graduate school in computer science should take CISC 3220, CISC 3390, and CISC 3230. It is also a good idea to take as many CIS electives as possible, and to do a research project with a CIS faculty member for CISC 4900, 4940, 4945, 4950, 4955, 5001 or 5002. If you plan to take the Graduate Record Exam in computer science, you should complete CISC 3230 before taking the exam.

### **Who should consider entering a computer-related profession?**

Most importantly, you should be interested!—either in the computer per se, or in the enormous variety of applications to which it is put. If you're interested in a career involving programming, you should find programming interesting and (mostly) fun. If you enjoy solving puzzles and complex problems, you may find programming work very satisfying. Of course, it helps to be orderly and disciplined in your approach—when dealing with machines, nothing useful can be achieved by vague or fuzzy thinking; similarly, you should be comfortable with doing painstaking, detailed-oriented tasks.

It is not necessary to have extensive

mathematical knowledge for most professional programmer jobs, and many have entered the field with undergraduate majors in such diverse areas as psychology, history, English literature, etc. But an undergraduate degree in computer science can be a very solid foundation.

**Do I need a grade of C or better in every single CIS course to complete the major?**

No. You need a grade of C or better in 24 advanced elective credits at Brooklyn College for the B.S. in Computer and Information Science. All courses not

marked with an asterisk in Section IV or in the Bulletin are advanced electives. You need a C or better in any course that is a prerequisite to any other CIS course. For example, you need a C in CISC 3130, since it is a prerequisite for CISC 3142, but you do not need a C or better in CISC 3180 (because it is not a prerequisite for anything), as long as you have 24 other advanced electives with a grade of C or better.

See the Mathematics department about grade requirements for mathematics courses.

## XII. COURSES OFFERED BY THE CIS DEPARTMENT

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CISC courses numbered 2000 and above, taken at Brooklyn College, count towards the B.S. requirement of 24 credits in advanced courses. Descriptions of courses can be found in the [Undergraduate Bulletin](#). A form matching new and old course numbers can be found at [http://www.brooklyn.cuny.edu/courses/new\\_crs\\_num.jsp](http://www.brooklyn.cuny.edu/courses/new_crs_num.jsp)

The Schedule of Classes published each term lists courses offered in that particular semester. Not all courses are offered each term.

The first digit of a course number indicates its general level of difficulty:

- 1000 Introductory Courses
- 2000 Lower-Intermediate Courses
- 3000 Upper-Intermediate Courses
- 4000 Specialized Courses
- 5000 Honors/Research Courses

The hundred's digit indicates the area of Computer Science it addresses:

- 000 Service
- 100 Programming
- 200 Theory
- 300 Hardware/Software Systems
- 400 Intelligent Systems
- 500 Information Systems
- 600 Multimedia
- 800 Other Topics

**\*1000 Computing: Its Nature, Power and Limits**  
(3 hours; 3 credits)

Not open to students who are enrolled in, or have completed, any CIS course—other than CISC 1050—with a C or higher, or who have completed CORC 1312 or Core Studies 5 or 5.1.

**\*1001 Computing and Quantitative Reasoning**  
(3 hours; 3 credits)

**\*1002 The Outer Limits of Reasoning**  
(3 hours; 3 credits)

Not open to students who are enrolled in or have completed CORC 3310

**\*1003 Exploring Robotics**  
(3 hours; 3 credits)

Not open to students who are enrolled in or have completed CORC 3303

**\*1030 The Internet**

(2 hours lecture, 2 hours lab; 3 credits)

Prerequisite: CORC 1312 or Core Studies 5 or 5.1 or any course in computing.

Not open to students who have completed CIS 13 or higher.

**\*1035 Multimedia Production for the World Wide Web**

(1 hour recitation, 1 hour lecture; 2 hours lab; a minimum of 4 hours independent computer laboratory work: 3 credits)

Prerequisite: CORC 1312 or Core Studies 5 or 5.1 or any course in computing.

Not open to students who are enrolled in or have completed CISC 3800 or 3630.

**\*1050 Introduction to Computer Applications**  
(3 hours; 3 credits)

Not open to students who are enrolled in or have completed CISC 3800.

**\*1060, \*1062 Computing Workshop 1, 2**

(10 hours; 3 credits)

Prerequisite: CORC 1312 or 3303, or Core Studies 5 or 5.1, or any course in CIS; and permission of the



chairperson.

**\*1070, \*1072 Special Topics in Computing**

(3 hours; 3 credits)

Prerequisite: varies with each topic offered.

**\*1110 Introduction to Computing Using C++**

(3 hours lecture, 2 hours lab; 4 credits)

Not open to students who are enrolled in or have completed CIS 1.10 or 1.20 or 16 or CISC 1180 or 3110.

**\*1115 Introduction to Computing Using Java**

(3 hours lecture, 2 hours lab; 4 credits)

Not open to students who are enrolled in or have completed CISC 1110 (1.5).

**\*1150 UNIX Shell Programming**

(2 hours; 2 credits)

Prerequisite: CISC 1170 or 3110 or 3115.

**\*1155 Programming in Perl**

(2 hours; 2 credits)

Prerequisite: CISC 3130.

**\*1160 Visual Programming and Windowing**

Applications

(2 hours; 2 credits)

Prerequisite: CISC 3130

**\*1170 Java for Programmers**

(2 hours; 2 credits)

Prerequisite: an introductory programming course in a language other than Java, and permission of the chair.

Not open to students who are enrolled in or have completed CIS 1115 or 3115.

**\*1180 Introduction to C++ for Programmers**

(2 hours; 2 credits)

Prerequisite: An introductory programming course in a language other than C++ or C.

Not open to students who are enrolled in or have completed CISC 1110 or 3110.

**\*1215 Introduction to Programming Using Python**

(2 hours lecture, 2 hours lab; 3 credits)

**\*1341 Assembly Language Programming for**

Microcomputers [INACTIVE]

(3 hours; 3 credits)

Prerequisite: CIS 1.10 or 1.20 or 2.40 or CISC 1110 or 1115 or 1180.

**\*1400 Elementary Robotics**

(3 hours; 3 credits)

Prerequisite: CORC 1311 or MATH 1311 or 1026 or 1201 or permission of the chairperson.

**\*1410 Philosophy and Artificial Intelligence**

(3 hours; 3 credits)

Prerequisite: CORC 1312 or Core Studies 5 or 5.1 or a course in CIS; and CORC 1210 or Core Studies 10 or a course in philosophy; or permission of the chairperson.

Not open to students who have completed CIS 32.1.

**\*1530 Electronic Commerce**

(3 hours; 3 credits)

Prerequisite: CISC 1050 or CISC 1110 or CISC 1115 or any course in computing.

**\*1580W Seminar in Computer-Assisted Management Games**

Prerequisite: ENGL 1012.

Prerequisite or corequisite: BUSN 3400 or MATH 2501 or 3501; and BUSN 3430 or CISC 2531; and CISC 1050 or 1110; and senior standing; and at least 34 credits in CIS and/or Business courses required for the B.S. degree in CIS or the B.S. degree in business, management, and finance.

Not open to students who have completed Economics 80.3.

**\*1590 Management Information Systems**

(3 hours; 3 credits)

Prerequisite: CISC 1050 and at least sophomore standing or permission of the chairperson.

Not open to students who have completed BUSN 3420.

**\*1595 Management of New and Emerging Technologies**

(3 hours; 3 credits)

Prerequisite: CISC 1050 or permission of the chairperson.

Not open to students who have completed Economics 50.8

**\*1597 New Media and Business**

(3 hours; 3 credits)

Prerequisite: sophomore status or departmental permission.

**\*1600 Introduction to Multimedia Computing**

(3 hours; 3 credits)

**2210 Introduction to Discrete Structures**

(3 hours; 3 credits)

Prerequisite: CIS 1.10 or 1.20 or 1110 or 1115 or 1170 or 1215; and MATH 1011 or 1012 or 2.92 or assignment to MATH 3.20 or 1201 or 4.10 by the Department of Mathematics.

**2531 Operations Management**

(3 hours; 3 credits)

Prerequisites: CORC 1312 or Core Studies 5.1 or CIS 100 or 1050 or 1110 or 1115; CISC 2210 or BUSN 3400 or ECON 3400 or MATH 2501 or MATH 3501.

Not open to students who are enrolled in or have completed MATH 3606 or Economics 31.4.

### **2532 Information Systems Project Management**

(3 hours; 3 credits)

Prerequisites: CISC 1590 or BUSN 3420.

### **2590 Foundations of Business Analytics**

(3 hours; 3 credits)

Prerequisites: Business 3400, Economics 3400, Mathematics 1501, Psychology 3400, or an equivalent statistics course with a grade of C or better; and Computer and Information Science 1050 or proficiency with spreadsheets.

### **2810W Macromolecular Structure and Bioinformatics**

(3 hours; 3 credits)

Prerequisites: English 1012, Biology 1001, Biology 1002, and permission of the instructor.

### **2820W Computers and Ethics**

(3 hours; 3 credits)

Prerequisite: CORC 1312 or Core Studies 5.1 or CIS 1000 or 1110 or 1115, and ENGL 1012.

### **2830 Introduction to Natural Language Processing**

(3 hours; 3 credits)

Prerequisite: CISC 1110 or 1115

Prerequisite or corequisite: CISC 2210 and Linguistics (LING) 2001.

### **3110 Advanced Programming Techniques**

(4 hours; 4 credits)

Prerequisite: CISC 1110 or 1180.

Not open to students who are enrolled in or have completed CISC 3130.

### **3115 Introduction to Modern Programming Techniques**

(4 hours; 4 credits)

Prerequisite: CISC 1115 or 1170.

Not open to students who are enrolled in or have completed CISC 3110.

### **3120 Design and Implementation of Software Applications 1**

(3 hours; 3 credits)

Prerequisite: CISC 3110.

### **3130 Data Structures**

(4 hours; 4 credits)

Prerequisite: CISC 3115; or CISC 3110 and 1170.

### **3140 Design and Implementation of Large-Scale Web Applications**

(3 hours; 3 credits)

Prerequisite: CISC 3130; and either 1115, 1117, 11170, or.

### **3142 Programming Paradigms in C++**

(3 hours; 3 credits)

Prerequisite: CISC 3115, 3130, and either 3310 or permission of the chair.

Not open to students who have completed CISC 3110.

### **3144 Modern JavaScript**

(3 hours; 3 credits)

Prerequisite: CISC 3140.

### **3146 Engineering Mobile Software Applications**

(3 hours; 3 credits)

Prerequisite: CISC 3130.

### **3150 Object-Oriented Programming**

(3 hours; 3 credits)

Prerequisite: CISC 3130.

### **3160 Programming Languages**

(4 hours; 4 credits)

Prerequisite: CISC 3142.

### **3171 Introduction to Software Engineering**

(3 hours; 3 credits)

Prerequisite: CISC 3130.

### **3220 Analysis of Algorithms**

(3 hours; 3 credits)

Prerequisite: CISC 2210; CIS 21 or CISC 3130; MATH 3.20 or 1201 or 4.10.

### **3225 Data Tools and Algorithms**

(3 hours, 3 credits)

Prerequisite: CISC 1215; CISC 2210 or MATH 2001

### **3230 Theoretical Computer Science**

(3 hours; 3 credits)

Prerequisite: CISC 2210; CIS 21 or CISC 3130; MATH 3.20 or 1201 or 4.10.

### **3240 Cryptography and Cryptanalysis**

(3 hours; 3 credits)

Prerequisite: MATH 2101 or permission of the chair.

### **3305 Computer Organization [INACTIVE]**

(3 hours; 3 credits)

Prerequisite: CIS 4 or CISC 1341; and CISC 2210.

Not open to students who are enrolled in or who have completed CISC 3315.

### **3310 Principles of Computer Architecture**

(4 hours; 4 credits)

Prerequisite: CISC 1110 or 1115 or 1170 or 1180; and CISC 2210.

Not open to students who are enrolled in or have completed CISC 3305 or 3315.

### **3315 Digital Computer Systems**

(3 hours lecture, 3 hours laboratory; 4½ credits)

Prerequisite: CIS 4 or CISC 1341; and CISC 2210.

Not open to students who are enrolled in or have completed CISC 3305.

### **3320 Operating Systems**

(3 hours; 3 credits)

Prerequisite: CIS 21 or CISC 3130; and CISC 3305, 3310, or 3315. Recommendation: experience on two platforms.

### **3325 Information Security**

(3 hours; 3 credits)

Prerequisite: CIS 3320

### **3330 Foundations of Parallel and Distributed Computing**

(3 hours; 3 credits)

Prerequisite: CISC 3142; or permission of the chairperson.

### **3340 Computer Networks and Protocols**

(3 hours; 3 credits)

Prerequisite: CISC 3130; CISC 3305, 3310, or 3315; and MATH 2501.

Not open to students who are enrolled in or have completed CISC 3343 or 3345.

### **3343 Telecommunications**

(3 hours; 3 credits)

Prerequisite: CISC 3130; CISC 3305, 3310, or 3315; and MATH 2501.

Not open to students who are taking or have taken CISC 3340.

### **3345 Computer Networks**

(3 hours; 3 credits)

Prerequisite: CISC 3130; CISC 3305, 3310, or 3315.

Not open to students who are taking or have taken CISC 3340.

### **3350 Workstation Programming**

(3 hours; 3 credits)

Prerequisite: CISC 3130.

### **3390 Compiler Construction**

(3 hours; 3 credits)

Prerequisite: one of CIS 2.10, 2.20, 2.30, 2.40, 2.85,

CISC 1150, 1170 or 3150; CISC 2210 and 3130.

### **3410 Artificial Intelligence**

(3 hours; 3 credits)

Prerequisite: CIS 21 or CISC 3130.

### **3415 Principles of Robotics**

(3 hours; 3 credits)

Prerequisite: CISC 2210 and CISC 3130.

### **3440 Machine Learning**

(3 hours; 3 credits)

Prerequisite: CISC 3130 or 3225, MATH 2501 or 3501 or CISC 2210.

### **3610 Introduction to Multimedia Programming**

(3 hours; 3 credits)

Prerequisite: CISC 3110 or 3115.

### **3620 Computer Graphics**

(3 hours; 3 credits)

Prerequisite: CISC 3130 and MATH 1011 or 1026 or assignment to MATH 1201.

### **3630 Multimedia Computing**

(3 hours; 3 credits)

Prerequisite: CISC 3130.

### **3650 Human-Computer Interaction**

(3 hours; 3 credits)

Prerequisite: CISC 3115 or 3120.

### **3660 Game Programming**

(3 hours; 3 credits)

Prerequisite: CISC 3130.

### **3665 Game Design**

(3 hours; 3 credits)

Prerequisite: CISC 3130, and MATH 1011 or 1201.

### **3667 Game Design and Development**

(4 hours; 4 credits)

Prerequisite: CISC 3130.

### **3800 Advanced Personal Computer Techniques for Business Applications**

(3 hours; 3 credits)

Prerequisite: CISC 1110 or 1115 and CISC 1050, or permission of the chairperson.

### **3810 Database Systems**

(3 hours; 3 credits)

Prerequisite: CISC 3130.

### **3820 Introduction to Modeling and Simulation**

(3 hours; 3 credits)

Prerequisite: CISC 1110; and MATH 3501.

### **4331 System and Network Administration**

(2 hours lecture; 2 hours lab; 3 credits)

Prerequisite: CISC 3320 or 3350 or permission of the chairperson.

**4335 Parallel and Distributed Computing**

(3 hours; 3 credits)

Prerequisite: CISC 3130; CISC 3305, 3310, or 3315 or permission of the chairperson; and one of CISC 1150, 1170, 3160, 3320, 3150, 3410, 3350, 3330, 3820.

**4610 Multimedia Databases**

(3 hours; 3 credits)

Prerequisite: CISC 3810, CISC 3635 or 3630.

**4800 Special Topics in Computer Science**

(3 hours; 3 credits)

Prerequisite: CIS 21 or CISC 3130; and permission of the chairperson.

**4900, 4905 Independent and Group Projects I, II**

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

Prerequisite of 4900: CISC 3110 or 3115 and permission of the chairperson.

Prerequisite of 4905: CISC 4900 and permission of the chairperson.

**4920 Programming Practicum**

(1 hour lecture, 2 hours lab; 2 credits)

Prerequisite: CISC 3130.

Pre- or co-requisite: CISC 3220

**4930, 4935 Advanced Computing Topics**

(3 hours; 3 credits)

Prerequisite: Dependent on course topic.

**4940, 4945 Seminar in Theoretical Aspects of Information Science I, II**

(3 hours recitation and a minimum of 7 hours conference and independent work; 3 credits each term)

Prerequisite: see "Honors Courses," below.

**4950, 4955 Seminar in Special Topics I, II**

(3 hours recitation and a minimum of 7 hours conference and independent work; 3 credits each term)

Prerequisite: see "Honors Courses," below.

**5001, 5002, 5003, 5004 Independent Study and Research I, II, III, IV**

(Minimum of 9 hours conference and independent work; 3 credits)

Prerequisite: CISC 3130, a minimum GPA of 3.0 overall and in CIS courses, and permission of the chairperson

### **XIII. Honors at Graduation**

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In order to receive departmental honors at graduation, a student must be recommended by the department, must have an index of at least 3.50, and must have completed either an honors course or an honors project. Although it is necessary to take an honors course or project to receive honors at graduation, honors are not guaranteed. The department must vote to award departmental honors. If awarded, *departmental honors* appears as a notation on your diploma.

#### **Honors Courses**

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Students with superior records and the recommendation of a department faculty member may apply to the chairperson for permission to register for courses described below. Students may not register for more than six credits in honors courses in the department in one term.

##### **4940, 4945 Seminar in Theoretical Aspects of Information Science I, II**

(3 hours recitation and a minimum of 7 hours conference and independent work; 3 credits each term)

Prerequisite of 4940: a superior record, including an approved program of advanced courses, and recommendation of a department faculty member and permission of the chairperson.

Prerequisite of 4945: CISC 4940 and permission of the chairperson.

##### **4950, 4955 Seminar in Special Topics I, II**

(3 hours recitation and a minimum of 7 hours conference and independent work; 3 credits each term)

Prerequisite of 4950: a superior record, including an approved program of advanced courses, and recommendation of a faculty member and permission of the chairperson. Prerequisite of

4955: CISC 4950 and permission of the chairperson.

##### **5001, 5002, 5003, 5004 Independent Study and Research I, II, III, IV**

(Minimum of 9 hours conference and independent work; 3 credits each term)

Prerequisite: CISC 3130, an advanced elective in CIS numbered 23 or above, a minimum GPA of 3.0 overall in CIS advanced electives, a declared major in the CIS department and permission of the chairperson.

#### **Honors Projects**

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A student with a 3.0 index or better may arrange to do an honors project in a CIS course he or she is taking. In the rare case where the project is undertaken with a professor different from the instructor of the course, coordination should be arranged between the professor teaching the course and the professor supervising the research project. A student who successfully completes an honors project and receives an A or B in the associated course will receive honors in the course. Completing a course with honors is indicated on the student's transcript.

## **XIV. STUDENT SOCIETIES**

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### **The Computer Science Society**

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The Computer Science Society is a school club, composed of students interested in the field of computing. Students with such an interest are invited to join, regardless of their intention to major in computer and information science.

The main activities of the Computer Science Society include the following: talks by guest speakers, club and social meetings, and access to special society offers.

For more information about the Computer Science Society, contact its officers by leaving a note in the society's mailbox in Room 2109N, or contact the faculty advisor, Prof. Murray Gross. You can sign up for the newsletter at <https://bit.ly/csclubnewsletter>

### **Upsilon Pi Epsilon Honor Society**

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Brooklyn College has a chapter of the national Computer Science Honor Society, Upsilon Pi Epsilon (UPE). Students are elected to membership in this society in their junior or senior year, based on their academic record. More information about the society and election procedures can be found on the bulletin boards outside the department office.

### **Women in Computer Science**

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The Women in Computer Science Club strives to build a strong and supportive community for women in a field where they are largely underrepresented. Through events, technical workshops, and resource sharing, we are making Brooklyn College a place where women are encouraged to pursue a career in technology. Now at over 40 members and growing, the club is constantly looking for opportunities to expand their efforts. For information and inquiries, please e-mail [bcwomenincompsci@gmail.com](mailto:bcwomenincompsci@gmail.com).

## **XV. COMPUTER AND LIBRARY FACILITIES**

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CIS graduate students have access to computer facilities at Brooklyn College and limited access to other computing facilities across CUNY.

### **CUNY Computer Facilities**

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The College of Staten Island houses the CUNY High Performance Computing Center, which makes available to CUNY faculty and students state of the art HPCC resources and expert technical assistance in support of University's research and educational activities.

### **Brooklyn College Computer Facilities**

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#### **Computer Labs**

The ITS Public Computing Labs (in the West End Building) now feature 250 new computers—including Linux workstations, Windows PCs, and Apple Macs—in an inviting open work space. Nearby are lounge areas, study rooms, classrooms, tutoring areas, and a videoconference room. Special services include scanning, DVD writing, and express printing. The lab has been specially designed acoustically to make for a quiet facility.

Linux accounts are automatically assigned to students enrolled in classes which require them. Students who need computer accounts for other purposes should ask at the front desk of the ITS Public Computing Facility.

#### **Other Computer Facilities**

The CIS Department maintains an Ethernet-based network of computers for use by its faculty and other researchers. The network is an Internet node. Many departments have computer-based courses. To meet the demand for computers, there are many computer labs distributed around the campus, especially in the library. The Internet Café in Whitehead Hall is open 24 hours per day.

#### **Brooklyn College Library**

The Brooklyn College Library has numerous computers (see <http://libguides.brooklyn.cuny.edu/computingsvcs>), and it also maintains the Internet Café in Whitehead Hall. There is a New Media Center on the second floor. The library also has numerous computer science research resources available online; see <http://libguides.brooklyn.cuny.edu/cis>.

## XVI. INTERNET RESOURCES

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The CIS Department's Web page is <http://www.brooklyn.cuny.edu/pub/departments/cis/>. Information about department programs is available at this site, as are links to the Web pages of various CIS faculty members.

### The CISTalk List

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There is a CIS email list, called **CISTalk**. The purpose of this list is to provide a way for CIS faculty to send to students and other faculty information on jobs, internships, and other articles of interest. Messages sent to the list are distributed via email to all subscribers to the list. The list is free, and all CIS students are encouraged to subscribe. Students may not post to the list due to abuses of the list in the past.

To subscribe to the list, unsubscribe from the list, or to access an archive of past postings to the list, go to this page: <http://www.sci.brooklyn.cuny.edu/cistalk/>.

You can also find us on our [Facebook page](#).



## XVII. FULL-TIME FACULTY PROFILES

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**David Arnow**



Distributed programming;  
simulation of physical systems;  
computer science education.

[http://www.panix.com/~arnow/brooklyn\\_college/RSCH/csrsch.html](http://www.panix.com/~arnow/brooklyn_college/RSCH/csrsch.html)  
[arnow@sci.brooklyn.cuny.edu](mailto:arnow@sci.brooklyn.cuny.edu)  
1216N 951-5000 x2040

**Amotz Bar Noy**



Design and analysis of algorithms;  
theoretical aspects of communication  
networks.

<http://www.sci.brooklyn.cuny.edu/~amotz/>  
[amotz@sci.brooklyn.cuny.edu](mailto:amotz@sci.brooklyn.cuny.edu)  
2112aN 951-5000 x2042

**Hui Chen**



Mobile wireless networks, wireless  
sensor networks, system and network  
security, software engineering,  
probabilistic modeling and simulation.

<https://huichen-cs.github.io/>  
[chen@sci.brooklyn.cuny.edu](mailto:chen@sci.brooklyn.cuny.edu)  
1432N 951-2055

**Kat Chuang**



Doctoral Lecturer

<http://www.brooklyn.cuny.edu...>  
[chuang@sci.brooklyn.cuny.edu](mailto:chuang@sci.brooklyn.cuny.edu)  
1212N 951-5000 x2069

**Eva Cogan**



Intelligent agents; logic; multiagent systems.

[http://www.sci.brooklyn.cuny.edu/~cogan/  
cogan@sci.brooklyn.cuny.edu](http://www.sci.brooklyn.cuny.edu/~cogan/cogan@sci.brooklyn.cuny.edu)  
2112bN 951-5000 x2046

**Jim Cox**



Sensory-based robotics; medical imaging; combinatorial algorithms and computational complexity theory.

[http://www.sci.brooklyn.cuny.edu/~cox/  
cox@sci.brooklyn.cuny.edu](http://www.sci.brooklyn.cuny.edu/~cox/cox@sci.brooklyn.cuny.edu)  
2112cN 951-5000 x2047

**Tzipora Halevi**



Security, privacy, human-computer interaction, embedded systems, Internet of things, signal processing.

[https://thalevi.github.io/  
halevi@sci.brooklyn.cuny.edu](https://thalevi.github.io/halevi@sci.brooklyn.cuny.edu)  
2156aN 951-1517

**Devorah Kletenik**



Algorithms; Boolean functions; machine learning/computational learning theory; serious games for CS education

[http://www.sci.brooklyn.cuny.edu/~kletenik/  
kletenik@sci.brooklyn.cuny.edu](http://www.sci.brooklyn.cuny.edu/~kletenik/kletenik@sci.brooklyn.cuny.edu)  
5316N 951-5000 x1502

## Yedidyah Langsam



Multimedia; medical informatics;  
data structures; personal  
computing and the Internet.

[http://eilat.sci.brooklyn.cuny.edu/  
langsam@sci.brooklyn.cuny.edu](http://eilat.sci.brooklyn.cuny.edu/langsam@sci.brooklyn.cuny.edu)  
2109N 951-5657

## Rivka Levitan



Natural language processing; spoken  
language processing; dialogue systems;  
prosody and discourse.

[http://www.sci.brooklyn.cuny.edu/~levitan/  
levitan@sci.brooklyn.cuny.edu](http://www.sci.brooklyn.cuny.edu/~levitan/levitan@sci.brooklyn.cuny.edu)  
3114N 951-5000 x3997

## Michael Mandel



Signal processing; machine  
learning; audio processing; noise  
robust automatic speech  
recognition; psychoacoustics.

[http://mr-pc.org/  
mim@sci.brooklyn.cuny.edu](http://mr-pc.org/mim@sci.brooklyn.cuny.edu)  
2232N 951-5000 x2053

## Rohit Parikh



Applications of logic to AI; logic and  
semantics of programs; formal languages;  
proof theory.

[http://www.sci.brooklyn.cuny.edu/cis/parikh/  
rparikh@gc.cuny.edu](http://www.sci.brooklyn.cuny.edu/cis/parikh/rparikh@gc.cuny.edu)  
1161N 951-5000 x2058

## Theodore Raphan



Modeling and simulation of eye movement control orientation; data acquisition and analysis; mechanisms; models of spatial pattern recognition and computer vision; neural networks; artificial intelligence.

<http://www.sci.brooklyn.cuny.edu/~raphan/raphan@nsi.brooklyn.cuny.edu>  
541NE 951-4193

## Ira Rudowsky



Database design, analysis and implementation; multimedia databases intelligent agents.

<https://www.brooklyn.cuny.edu...rudowsky@brooklyn.cuny.edu>  
1417N 951-5000 x2062

## Charles Schnabolk



Formal development of programs; programming languages.

<https://www.brooklyn.cuny.edu...CSchnabo@brooklyn.cuny.edu>  
2118N 951-5000 x 2064

## Dina Sokol



Algorithm design and analysis; pattern matching algorithms; computational biology; data compression.

<http://www.sci.brooklyn.cuny.edu/~sokol/sokol@sci.brooklyn.cuny.edu>  
3209dN 951-5000 x2065

## Joseph Thurm



Database management practical uses  
of computers in business.

[https://www.brooklyn.cuny.edu...  
thurm@sci.brooklyn.cuny.edu](https://www.brooklyn.cuny.edu/~thurm@sci.brooklyn.cuny.edu)  
2109N 951-5657

## Gerald Weiss



Object-oriented software development  
and patterns; programming languages  
and compilers; operating systems and  
constraint solving and programming;  
distributed programming.

[http://sci.notbc.org/~weiss/  
weiss@sci.brooklyn.cuny.edu](http://sci.notbc.org/~weiss/weiss@sci.brooklyn.cuny.edu)  
143NE 951-5000 x2664

## Noson Yanofsky



Category theory. Complexity theory.  
Higher-dimensional algebra.

[http://www.sci.brooklyn.cuny.edu/~noson/  
yanofsky@sci.brooklyn.cuny.edu](http://www.sci.brooklyn.cuny.edu/~noson/yanofsky@sci.brooklyn.cuny.edu)  
1430N 951-5000 x2070

## Gavriel Yarmish



Distributed and parallel optimization  
methods; optimization of large linear  
optimization programs.

[http://www.sci.brooklyn.cuny.edu/~yarmish/  
yarmish@sci.brooklyn.cuny.edu](http://www.sci.brooklyn.cuny.edu/~yarmish/yarmish@sci.brooklyn.cuny.edu)  
1214N 951-5000 x2071

## Neng-Fa Zhou



Programming languages abstract  
machines and compilers constraint  
solving and programming Web  
publishing.

<http://www.sci.brooklyn.cuny.edu/~zhou/>  
[zhou@sci.brooklyn.cuny.edu](mailto:zhou@sci.brooklyn.cuny.edu)  
1161N 951-5000 x2073

## Chaim Ziegler

*No photo available.*

Multimedia systems; computer networks;  
queueing theory; computer and Internet  
telephony systems.

<http://www.sci.brooklyn.cuny.edu/~ziegler/>  
[ziegler@sci.brooklyn.cuny.edu](mailto:ziegler@sci.brooklyn.cuny.edu)  
1233N 951-5000 x2074

## XVIII. STAFF AND OTHER FACULTY

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### Faculty from Other Departments

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T. Amoo	Finance & Business Mgmt	<a href="mailto:tamoo@brooklyn.cuny.edu">tamoo@brooklyn.cuny.edu</a>
V. Garnier-Denoyel	Finance & Business Mgmt	<a href="mailto:Victoire.Denoyel@brooklyn.cuny.edu">Victoire.Denoyel@brooklyn.cuny.edu</a>
A. Gotlib	Philosophy	<a href="mailto:agotlib@brooklyn.cuny.edu">agotlib@brooklyn.cuny.edu</a>
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Heneith Samuel	Telecommunication	<a href="mailto:hsamuel@brooklyn.cuny.edu">hsamuel@brooklyn.cuny.edu</a>
Shaneen Singh	Biology	<a href="mailto:ssingh@brooklyn.cuny.edu">ssingh@brooklyn.cuny.edu</a>
Pawel Walczuk	Business	<a href="mailto:pawel.walczuk@brooklyn.cuny.edu">pawel.walczuk@brooklyn.cuny.edu</a>

### Department Staff

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Tiffany Beckles	<a href="mailto:tiffany.beckles@brooklyn.cuny.edu">tiffany.beckles@brooklyn.cuny.edu</a>	951-5657