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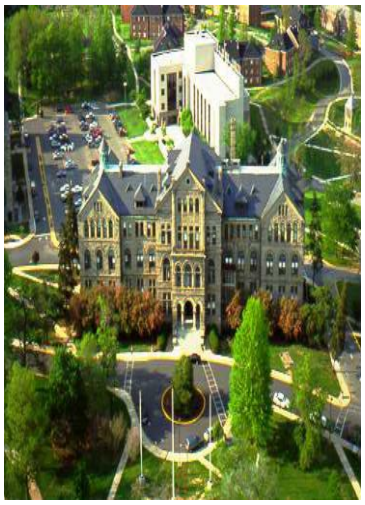
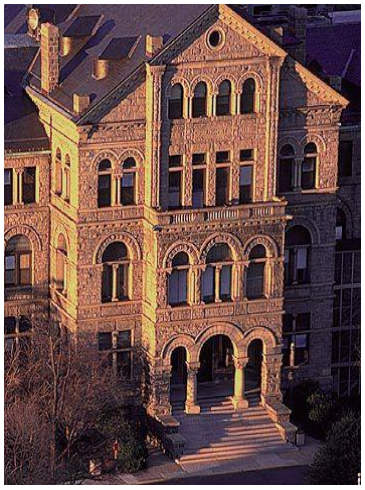


UNDERGRADUATE HANDBOOK

Biology Department

Academic Year 2014-2015



Handbook for Undergraduate Majors in Biology

Introduction:

Welcome to the Department of Biology at CUA. This handbook is intended to provide useful information for students majoring in Biology, and serves as a supplement to the essential information that is provided in the Arts & Sciences "Advising Handbook" (http://www.arts-sciences.cua.edu/advising/). The items covered here contain information that is nowhere else gathered into a user-friendly format, and that may be otherwise hard to find.

Biology is a small, research-active department in which students are known by the faculty, and interact with the faculty. Undergraduate courses are taught by faculty who take their teaching duties seriously. Faculty are readily available for consultation outside of the classroom. Graduate students, under the direction of faculty, serve as teaching assistants in the laboratory portions of courses, but do not teach the courses.

Those who receive a B.S. or B.A. degree in Biology at CUA are well prepared for a variety of career options, and for graduate-level training in modern biology, medicine, dentistry, veterinary science, physical therapy and other fields. A rigorous program of pre-medical advising (see Pre-Medical Advising Program,) across the four years of undergraduate study prepares students for application to medical school and related programs.

Opportunities exist for undergraduate involvement in ongoing faculty research programs (for example, see Research Problems, below). Research participation provides valuable, hands-on engagement in the scientific process, and is an essential part of college-level science education. Undergraduate students who have sustained involvement in a research program have become authors on scientific papers published in scholarly journals.

The atmosphere within the Department is one of collegiality. Each semester social events (dinners, ice cream social, *etc.*) are held that foster interaction among the students and faculty, and which are intended to foster the sense of community within the department. Students are fully encouraged to participate in all aspects of the Biology community.

Academic Advising:

Upon matriculation, each student who has indicated a desire to major in Biology is assigned to a member of the faculty who will normally serve as the student's academic advisor for the full, four years of undergraduate study. Under circumstances in which an advisor is on leave from campus, advisees are assigned to another advisor for the duration of their regular advisor's absence.

Your academic advisors consider their role to be an important one, and will help you plan a successful path toward graduation. Active, responsible involvement of the student in this process is, however, essential. Students must meet with their academic advisors prior to course registration for each new semester, but are encouraged to consult with their advisors whenever questions need to be resolved. Your advisor serves as a useful resource in helping you complete your degree program, and in helping you plan for life after graduation.

Students who feel that their needs would be better met by being assigned to a different academic advisor can easily arrange to make such a switch by consulting with the department's Advising Coordinator, Ms. Marion Ficke (McW 212; 202-319-5870; ficke@cua.edu). It is understood that a student may feel more comfortable interacting with a different advisor, and there are no problems involved with making such a change.

The following members of the Biology faculty currently serve as academic advisors:

Ms. Marion Ficke - Advising Coordinator *(Rm. 212 McCort-Ward, 202-319-5870, ficke@cua.edu)*
Dr. Ann Corsi *(Rm. 206 McCort-Ward, 202-319-5274, corsi@cua.edu)*
Dr. John Choy (*Rm 105 McCort Ward 202-319-5278, choy@cua.edu*)
Dr. John Golin *(Rm. 260B Nursing-Biology, 202-319-5722, golin@cua.edu)*
Dr. Barbara Howard *(Rm. 111 McCort-Ward, 202-319-5270, howardb@cua.edu)*
Dr. J. Michael Mullins *(Rm. 356 Nursing-Biology, 202-319-5279, mullinsj@cua.edu)*
Dr. Pamela Tuma *(Rm. 260A Nursing-Biology, 202-319-6681, tuma@cua.edu)*

B.S. vs. B.A. Degree Programs in Biology:

Degree programs available through the Department of Biology include: B.A. in Biology, B.S. in Biology. Two 5-years combined B.S/M.S. are available in Cell and Microbial Biology and in Biotechnology (http://biotechnology.cua.edu/dual-degree.cfm).

Students who choose to major in Biology have the option of following either a Bachelor of Science (B.S.) or Bachelor of Arts (B.A.) degree program. In deciding which of these programs you wish to choose, you should know that in terms of future career goals there is no particular advantage to one over the other. That said, there are certainly personal and practical considerations that are important in choosing the B.A. or B.S. program.

When you entered the Department you were given sample tracking sheets for each degree program. If you have misplaced these sheets, log on to Cardinal Station on the CUA web site and click on Degree Progress. This allows you to see your completed and current courses assigned to either the B.S. or B.A. program tracking sheets. If you compare the two sets of tracking sheets you will find the following differences among required course categories (Requirements that are identical between the two programs are not included in this comparison):

	Number of Courses Required	
Course Category	B.S.	B.A.
Biology Electives	4	2
Philosophy	2	4
Humanities	1	3
Social/Behavioral Sciences	2	4
Non-Science Electives	2	0
Free Electives	4	2

On a personal level, one of the two Biology degree programs may appeal to you more. On a practical level, many students opt for the B.S. program because there is more elective choice in the B.S. program, where biology and free electives give you considerable freedom in selecting four courses.

Suggested B.A. and B.S. Course Sequences:

The course sequences listed below work well, but for many courses there is flexibility as to when the course may be taken. Students should always consult with their academic advisors to determine whether a change in the standard course sequence is recommended.

Year	First Semester	Second Semester
First Year	1. Biol 105 2. Chem 103 & 113 3. Language OR Distribution 4. Phil 201 5. English 101/ TRS 201	1. Biol 106 2. Chem 104 & 114 3. Language OR Distribution 4. Phil 202 5. TRS 201/ENG 101
Second Year	1. Biol 207 2. Biol 217 3. Chem 203 & 213 4. Math 111 or 121* 5. Language if needed or select from Distribution req.**	1. Biol 317 2. Chem 204 & 214 3. Math 112 or 122 4. Language if needed or select from Distribution req. 5. Select from Distribution req.
Third Year	1. Biol 549 2. Phys 205 & 225 3. Biol or Free Elective 4 . Select from Distribution req. 5. Select from Distribution req.	1. Biol Elective 2. Phys 206 & 226 3. Biol or Free elective 4. Select from Distribution req. 5. Select from Distribution req.
Fourth Year	1. Biol 554 2. Biol or Free Elective 3. Select from Distribution req. 4 . Select from Distribution req. 5. Select from Distribution req.	1. Biol 452 2. Biol or Free Elective 3. Select from Distribution req 4 . Select from Distribution req. 5. Select from Distribution req.

*** The online Math placement test must be taken before enrolling in calculus. Students who do not place into calculus will take Math 108 first. That course can be only a free elective. Math can also be taken during Junior year.**

**** "distribution requirements" include TRS and Philosophy**

Advanced Placement Credits and College-Level Credit in Biology:

If you took Advanced Placement (AP) Biology in high school, and received a score of 4 or 5 on the AP Biology test, then you are eligible to receive credit for one elective. In the B.S. this can be either a Biology elective or a Free elective. In the B.A. it is a Free elective.

Minimum Grade Requirements for Pre-requisite Courses:

Enrollment in some biology courses requires that a student receive a grade of C- or higher in a pre-requisite course. Biology 105 (Mechanisms of Life I) and Chemistry 103 (General Chemistry I) serve as pre-requisites for Biology 106 (Mechanisms of Life II). To be enrolled in Biol.106 a student must have received a grade no lower than C- in either of these courses. Similarly, a grade no lower than C- in Biol. 106 is required for enrollment in Biol. 207 (Genetics) and Biol. 217 (Molecular Genetics and Proteins Engineering). Since registration for a coming semester is normally done prior to the issuance of final course grades, anyone lacking the C- minimum grade who has already registered for the next course in sequence will have to drop that course. Future enrollment in the course will depend upon successful completion of the pre-requisite.

This restriction prohibits a student from taking Biol. 106, 207 or 217 without having received the minimum acceptable grade in prerequisite courses. It should be noted, however, that the minimum acceptable grade for all required Biology and Chemistry courses is a C- if the course is to count for credit towards graduation. Thus, if a grade of D is received in any of these required courses, the same course will have to be retaken and passed with a grade no lower than C-. The D grade originally received will remain on the student's transcript, but only the newer grade will be used to calculate the GPA if the course is taken at CUA.

Biology Elective Courses:

All Biology majors are required to enroll in 4 (B.S.) or 2 (B.A.) Biology Elective courses. The PARTIAL list below provides the courses that currently can be used as Biology Electives. Consult your academic advisor regarding the suitability of any other course that you feel would be appropriate for credit as a Biology elective. One Biology elective must be a 500 level lecture course (see line 9 on the Tracking Sheet).

Biology Electives:

Biol 223 Microbiology (when space is available)
518 Physiology
538 Gene Organization and Expression
540 Mechanisms of Gene Mutation & Transmission
559 Cell Structure and Function
563 Developmental Biology
565 Model Organisms and Human Disease
566 Immunology
574 Virology
577 Research Problems in Biology I
578 Research Problems in Biology II
579 Principles and Practice of Biotechnology
580 Entrepreneurial Biotechnology
581 Essentials of Biotechnology Project Management
583 Regulatory Processes for Domestic and Global Biotechnology
584 Mechanisms of Bacterial Pathogenesis
586 Molecular Genetics and Recombinant DNA
589 Introduction to Nanobiotechnology

596 Computational Genomics
598 Membrane Trafficking & Disease
599 Signal Transduction and Biomembranes

Free Elective Courses:

FREE ELECTIVES allow students to explore a wide variety of subjects that include both science and non-science disciplines. As is true of all courses used for your degree, only courses of a minimum of 3 credits can be used.

Some students will use language courses below the 103 level as Free Electives. MATH 108, when it is required, is a Free Elective.

Free electives can even be chosen from among available Biology electives and courses in other sciences (see list below). Students in the B.A. program cannot exceed a total of 14 courses in BIOLOGY on their Tracking Sheet.

The following is a non exhaustive list of courses that biology students find interesting. They can be taken as "Free Electives":

Chem	202 Forensic Chemistry
	317 Principles of Environmental Science *(NOTE - This course is-not a Biology Elective")*
	Higher level Chem Courses
CSC	Most 100-level CSC courses are acceptable.
Phys	103 Astronomy
Psy	304 Brain and Behavior
	345 Clinical Neuroscience
Anth	Courses in Physical and Cultural Anthropology

Statistics:

Math	114 Probability and Statistics
Psy	322 Introductory Statistics
Soc	503 Social Statistics

Selected other courses in the Departments of Biology, Chemistry, Computer Science, and Mathematics, or The School of Engineering may be suitable for use as Free Electives. Approval for any unlisted courses must be obtained from Ms. Marion Ficke, the Advising Coordinator (202-319-5870, ficke@cua.edu).

Limitations for use of Biol 232/233 as Biology electives

Biol 232 and Biol 233 (Anatomy and Physiology I and II) are courses that are taught for freshman students in the School of Nursing. These courses are not typically open to Biology majors. Further, freshman-level courses are not accepted as Biology electives. However, Biology majors with career plans that **require** these courses as prerequisites for admission to other programs (*e.g.*, physical therapy or physician assistant programs) may be granted permission. In this event, the courses will be placed on the tracking sheet according to the following:

- If a student is earning a B.A., then Biol 232/233 must be free electives.
- If a student is earning a B.S. then two of the Biology electives can be Biol 232/233, with permission.
- If a student is earning a BS and receives credit for Biol 518 as a Biology elective, then only Biol 232 can be used as a Biology elective, and Biol 233 would then be a free elective.

Research Problems (During the academic year or summer):

Biol. 577 and 578 (Research Problems in Biology I and II) provide Biology majors with the opportunity to engage in independent laboratory research under the direction of a member of the Biology faculty. The specific research projects that may be undertaken will depend upon the research interests of the member of the faculty who serves as your Research Problems mentor.

Laboratory research at this level offers an excellent learning experience, and integrates what you have learned in lecture courses, and their associated teaching laboratories, into pursuit of an actual scientific goal.

If you are interested in participating in Research Problems, please keep the following facts in mind:

1. Before registering for either of these courses make appointments with the members of the faculty with whom you might like to work. Check the on-line descriptions of Biology faculty research interests (http://www.biology.cua.edu/) to get an idea of the kinds of work that are underway in each laboratory. Find out whether a professor has room in the laboratory for a Research Problems student in the coming semester, and get an idea of the types of project on which you might work.
2. Never register for Biol. 577 or 578 without having come to a clear agreement with a member of the faculty who has agreed to be your mentor for a research project. This course requires departmental consent. When a faculty member has agreed to take a student in his/her lab for Research Problems: (1) the faculty member must email Ms. Ficke to inform her of the agreement, and; (2) the student should contact Ms. Ficke and provide his/her ID number so that the departmental consent can be entered in Cardinal Station. Only after this will the student will be able to register.
3. Be prepared to put in sufficient time in the laboratory to allow you to make progress on your project. For laboratory sections associated with lecture courses the rule of thumb is that you get one hour of academic credit for each two to three hours that you spend in the laboratory. Application of this rule to the 3 credit hours offered for Biol. 577 or 578 indicates that you should expect to spend a minimum of 6-9 hours each week working on your project. Be prepared to show

some flexibility in this regard since some weeks may require a bigger commitment of time and others less, depending on what is happening with your project. Be sure that you have sufficient flexibility in your weekly schedule to allow a research project to be undertaken.

4. Grades for Biol. 577 and 578 are based on a variety of factors, including commitment, demonstration of knowledge on the research topic, initiative and innovation, and research progress. Each faculty member will have certain expectations. A final report, in which you analyze and discuss your research data may be required. Discuss the criteria for determining the final grade with the faculty member who will serve as your advisor, so that you are sure what will be expected of you.
5. Research Problems can only be taken twice. However, for students who demonstrated **exceptional** progress in their research, permission can be granted to take Research Problems for a 3rd semester. This 3rd semester must be used as a Free Elective.

Summer Courses for Academic Credit in the Biology Curriculum:

Required Biology courses must be taken at CUA. Approval to take these courses elsewhere is granted only under exceptional conditions, and should not be expected. Other courses taken off-campus must be pre-approved for transfer if they are taken to fill a specific degree requirement. For information on this process, consult the Arts & Sciences, on-line, Advising Handbook (http://www.arts-sciences.cua.edu/advising/)

Study Abroad and the Biology Curriculum:

Biology majors do participate in CUA programs in other countries. Given the full, four-year, Biology curriculum that builds from semester to semester, however, study abroad requires very careful, advance planning. At this time none of the study abroad programs offers courses that will substitute for required biology courses, and only a few programs offer courses that can be used as biology or science electives. Therefore, participation in study abroad may require that the student obtain some credits through courses taken in the summer, or by over-electing (taking six instead of five courses in a given semester). Early consultation with your academic advisor is recommended if you wish to include study abroad in your program for graduation. It should be emphasized that Catholic University has specific requirements for participation in study abroad programs that must be met, and that not all applicants may be accepted in a given year.

Acceptance as a Biology Major:

Undergraduate students at CUA must be accepted into a major program by the end of their sophomore year of study. In addition to the requirements spelled out in the Undergraduate Advising Handbook, each department or program has requirements that must be met for acceptance of a student as a major in that field. To be accepted as a major in the Department of Biology, a student should normally have completed four semesters of biology and four semesters of chemistry with a minimum science GPA of 2.5 and a minimum cumulative GPA of 2.0. Students transferring to biology from another major, or who have been undecided majors, as well as students who are transferring from another institution, will be expected to have maintained the same grade point average, though course requirements may be modified.

Senior Comprehensive Assessment:

CUA requires that all seniors undertake, and pass, some form of a Senior Comprehensive Assessment prior to graduation. The format for the comprehensive assessment is decided by each department or school. In the Department of Biology each senior student is given a specific, scientific topic in September, and then works in conjunction with a faculty advisor to explore the scientific literature on this topic in depth, and to use the information obtained to prepare a scholarly essay. This process continues until the end of February in the senior year.

Honors Track in Biology:

Students whose work is of high quality and who fulfill the set of requirements listed below will be invited to present an Honors research talk. Upon successful completion of the talk, they are awarded departmental honors. The Honors research presentations are given during the week after final examinations (Senior Week). Each talk lasts about 20 minutes and is followed by a discussion period during which faculty and students can ask questions about the research.

STUDENTS WHO JOINED THE DEPARTMENT **IN OR AFTER FALL OF 2010**:

1. Students must achieve a GPA of 3.50 in all of their biology courses. The GPA will not be rounded up unless there are extenuating circumstances. A student may not receive a C grade or less in any of these courses. This means that a student who had to repeat a requirement because of a D or F in a major required course is excluded from honors.
2. Students must take two 500-level biology lecture elective courses from the offerings of the Biology Department. A 500-level course in the Chemistry, Biomedical Engineering, or Physics departments with a biological emphasis that fulfills a biology elective requirement is also acceptable. Research Problems (Biol 577, 578) does not fulfill this requirement.
3. A student must complete a significant amount of independent research. In general, this would mean completing two semesters of Research Problems or one semester of Research Problems and a summer of research in a faculty member's laboratory. The Department, however, reserves the right to modify this policy. Simply electing research problems for two semesters or doing research in the summer without progress does not entitle a student to honors. The research mentor must feel that the student's consistent progress merits recognition.
4. Oral presentation of the work accomplished in Research Problems. The presentation is given at the end of the spring semester of the senior year.
5. Successful completion of all other degree requirements, including the Senior Comprehensive Assessment.

STUDENTS WHO JOINED THE DEPARTMENT **BEFORE FALL 2010**:

Requirements:

1. Overall grade point average of at least 3.4 at the end of the semester prior to graduation
2. Successful completion of at least two, 500-level Biology electives, not including enrollment in Research Problems (Biol. 577/578)

3. Successful completion of at least one semester of Research Problems (Biol. 577 or 578).
4. Oral presentation of the work accomplished in Research Problems. The presentation is given at the end of the spring semester of the senior year.
5. Successful completion of all other degree requirements, including the Senior Comprehensive Assessment

Pre-Medical Advising Program:

Admission to medical school requires planning, determination, aptitude and suitable preparation. The number of applicants to medical school has increased, and competition remains intense.

The Pre-medical Program at CUA offers students a sound preparation for entrance into medical school. Students enjoy a wide choice of curricula in keeping with the requirements of most medical schools that applicants have a broad background in the liberal arts.

Traditionally, the pre-medical student at CUA has majored in biology, bio-chemistry, chemistry, medical technology, psychology or biomedical engineering. CUA pre-medical students, however, may major in fields as diverse as English, music, nursing and philosophy.

Questions should be directed to Ms. Marion Ficke (McW 212; 202-319-5870; ficke@cua.edu) who serves as the Pre-Medical Coordinator, and supervises the program.

For additional information about application to medical school, see http://careers.cua.edu/gradinfo/MedSchool.cfm

Biology Club:

The CUA Biology Club is an organization for all those interested in the life sciences. During the academic year the Biology Club organizes a combination of social and educational activities that provides opportunities for students to interact with invited guests, the faculty, and with each other. The club sponsors lecture series addressing current issues and other topics of interest, and provides members with opportunities to establish contacts with professionals in the life sciences.

A sampling of recent Club activities includes: Welcoming party at the beginning of the academic year; career talks; fall and spring dinners; lecture series and pre-med-oriented programs.

Annual Biology Department Awards:

The Department of Biology presents two awards to graduating seniors each year. Academic Excellence Award in Biology: This award is presented annually to graduating Biology major who has achieved an outstanding academic record in Biology and other course work, and in other scholarly activities. To be considered for the Academic Excellence Award a student must have a minimum GPA of 3.5 in required Biology courses, as well as an overall GPA of 3.5. The Biology faculty strongly consider GPA in deciding to whom this award will be given, as well as a student's participation in laboratory research, performance in courses required for the Honors in Biology distinction, and demonstration of originality and analytical skills in Senior Seminar and the Senior Comprehensive Assessment.

Nils Steensen Award: This award is presented to the senior who has contributed to the activities of the Biology Club and to other functions which promote a spirit of unity and augment the academic welfare of the students in the Department. To be considered for the Steensen award a student must have achieved a minimum GPA of 3.00 in Biology courses, and 2.75 overall.

Letters of Recommendation:

Whatever you decide to do professionally after the completion of your baccalaureate degree, you will probably need letters of recommendation from some of the Biology faculty. One of the benefits of majoring in this Department is that students are well known to the faculty, and so you are recognized to be an actual individual who is part of the Department, rather than simply a student ID number and a grade-point average. Faculty will be pleased to write the best letter of recommendations for you that they can. That fact notwithstanding, there are guidelines that should be followed to make the letters-of-recommendation process successful.

1. If, after 3-plus years of majoring in Biology you have never asked a question in class, showed some definite interest in course subject matter, taken an active part in social and other events within the department, or had conversations with the members of the faculty, it will be hard for the faculty to write effective letters. A letter that can state only, "Ms. X always attended my class, took all the exams, received a solid grade of B, and never once asked a serious question or seemed genuinely interested in the material." will probably not much impress the reader. The preferable situation is to have created the situation so that a professor can write, "Ms. X was always actively engaged in the classroom, asking penetrating questions that showed she was thinking well beyond the material presented in lecture." Your active participation in all aspects of the educational process will increase your level of knowledge, enhance your sense of self-confidence, and greatly improve the quality of letters of recommendation that are written in support of your later efforts.
2. Faculty are busy people (No, they actually don't get the whole summer off - summer is a time when they are working hard to accomplish research and write scientific papers). A good letter of recommendation takes time to write. Give the faculty as much lead time as possible before a letter of recommendation is due; a *minimum* of four weeks is a reasonable guideline. Asking for a letter that is needed in two days' time will certainly not make a favorable impression, and may well result in a letter not being sent, or a letter of lower quality than one written with more time for thought and organization. In particular, December is not a good time to request letters.
3. Provide a resume, C.V., or other source of supplemental information about yourself. The faculty know how you did in their classes, and have experience interacting with you in other venues at CUA, but letters of recommendation are much more effective if the writer has a broader knowledge of your interests and accomplishments. Provide such information when you request a letter, and so provide the faculty the opportunity to do the best job for you that they can.

The Minor in Biology

To minor in Biology students must successfully complete a six-course sequence that consists of the following:

1. Required, Core Courses (3):
   Introductory Biology: Biol. 105 and 106.
   Genetics: Biol. 207
2. Elective Courses (3):
   The three elective courses may be selected from the list below. Some courses may have prerequisites.

Biol. 232 and 233	Human Anatomy and Physiology
Biol. 518	Physiology
Biol. 549	General Microbiology
Biol. 554	Biochemistry (must include enrollment in the Biol. 556 laboratory)
Biol. 559	Cell Structure and Function
Biol. 563	Developmental Biology
Biol. 565	Model Organisms and Human Disease
Biol. 566	Immunology
Biol. 574	Virology
Biol. 579	Principles and Practice of Biotechnology
Biol. 580	Entrepreneurial Biotechnology
Biol. 581	Essentials of Biotechnology Project Management
Biol. 583	Regulatory Processes for Domestic and Global Biotechnology
Biol. 586	Molecular Genetics and Recombinant DNA
Biol. 589	Introduction to Nanobiotechnology
Biol. 596	Computational Genomics
Biol 598	Membrane Trafficking and Disease
Biol. 599	Signal Transduction and Biomembranes

In addition to this list of electives, it may be possible to substitute other courses, provided that they are officially approved by the Department of Biology. Students seeking such approval should submit a request by email to Ms. Ficke (ficke@cua.edu), providing the name and number of the course, the school at which it is to be taken, a catalog description of the course, and a copy of the syllabus. The student should also stipulate the reason for wishing to substitute this course for one of the standard electives.

Campus Resources

Calculus café:	Math Department, 207 McMahon Hall; Tel: 202-319-5221 http://faculty.cua.edu/glenn/cafe/cafeannounce.html
Career Services, office of:	127 Pryzbyla Center; Tel: 202-319-5623 http://careers.cua.edu/
Center for Academic Success:	201 Pryzbyla Center; Tel: 202-319-5655 http://success.cua.edu/
Computer Center (CPIT):	200 Leahy Hall; Tel (help desk):202-319-4357 http://computing.cua.edu/
Counseling Center:	127 O'Boyle Hall; Tel: 202-319-5765 http://counseling.cua.edu/
Disability Support Services:	207 Pryzbyla Center; Tel: 202-319-5211 http://dss.cua.edu/
Tutoring:	See Center for academic Success (http://success.cua.edu/tutoring/index.cfm)
Writing Center:	202E PRYZ; Tel: 202-319-4286 http://english.cua.edu/wc/