

Information and Advice for Computer Science Majors and Minors

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Information and Advice for Computer Science Majors and Minors

Bachelor of Science (BS) in Computer Science (CS) Requirements

Students must complete the following courses (47 credits):

- ICS 111, 141, 211, 212, 241, 311, 312, 313, 321, and 331
- At least five ICS or other approved courses at the 400 level or above

Substitutions are permitted with the written approval of a faculty adviser.

Waiver of certain requirements, such as by Advanced Placement CS exam, must be approved by the faculty adviser.

Bachelor of Arts (BA) in Information and Computer Sciences (ICS) Requirements

Students pursuing this degree are required to submit a short proposal listing the courses they intend to take to complete their ICS major. An ICS faculty adviser must approve this proposal in writing. Samples of course proposals are available at the ICS department Office. Students must complete the following courses (49 credits):

- ICS 111, 141, 211, 212, 241, 311, 312, 313, and 321
- At least three ICS courses at the 400-level or above,
- Four upper division (300-level or above) courses in some area of concentration. The area of concentration courses do NOT have to be from the same department. Note that they may include ICS courses.

There are two new options in the ICS department. The first is the BA in ICS with IT Focus. It puts less emphasis on programming and more emphasis on using computer systems, especially networks. The second is the BA in ICS with Bioinformatics Focus. It provides strength in both computer science and biology, to prepare students for work in this exciting new area.

Bachelor of Arts (BA) in Information and Computer Sciences (ICS) IT Focus Requirements

- ICS 111, 141, 211, 210, 215, 315, 321, 351, 413, 414, 425, 426, and 463
- At least three additional ICS courses at the 300-level or above,

Bachelor of Arts (BA) in Information and Computer Sciences (ICS) Bioinformatics Focus Requirements

- ICS 111, 141, 211, 212, 241, 311, 312, 313, 321, 475, 476, and 499,
- Biology 172, 265, 275, 375
- Three more biology classes above the 300 level chosen from a list of approved courses.

Minor Requirements

A cumulative GPA of at least 2.0 and a grade of B (not B-) or higher in ICS 111 in computer science are required for admission.

Students must complete ICS 211, 212, and 241 and their prerequisites, 111 and 141, and three ICS courses at the 300 level and above with a grade of C (not C-) or better.

Here is a list of all the ICS courses below the 400 level that are required in at least one of the above programs:

ICS 111 Introduction to Computer Science I (4) Pre: Recommended: computer experience.

ICS 110 is recommended, if students do not have any experience with computers.

ICS 141 Discrete Mathematics for Computer Science I (3)

ICS 210 Information Systems in Society (3) Pre: 211 or consent.

ICS 211 Introduction to Computer Science II (3) Pre: grade of "B" or higher in 111 or consent.

All students wishing to enroll in ICS courses above 211 (except ICS241) must meet the prerequisite grade requirement of B or higher in ICS 111 and 211 prior to registering for the course.

ICS 212 Program Structure (3) Pre: 211 or consent.

ICS 215 Introduction to Scripting (3) Pre: 211 or consent.

ICS 241 Discrete Mathematics for Computer Science II (3) Pre: 141 or consent.

ICS 311 Algorithms (3) Pre: 211 and 241, or consent.

ICS 312 Machine-Level and Systems Programming (3) Pre: 212 (or concurrent), or consent.

ICS 315 Web Design and Management (3) Pre: 211 and 215 or consent

ICS 313 Programming Language Theory (3) Pre: 212 and 241, or consent.

ICS 321 Data Storage and Retrieval (3) Pre: 211 and 241, or consent.

ICS 331 Logic Design and Microprocessors (4) Pre: 312 or consent.

ICS 351 Network Design and Management (3) Pre: 211 and 215 or consent.

Ordinary Program for BS degree:

1st Semester: ICS111, ICS141

2nd Semester: ICS211, ICS241

3rd Semester: ICS212, and one of ICS311, ICS312, and ICS321

4th Semester: The remaining two of ICS311, ICS312, and ICS321

After that, you should take ICS313 and ICS331 soon, and take ICS 400-level courses two or three courses per semester for about three semesters. After taking ICS 3xx level courses, you should start looking at which 4xx level courses are being offered the following semester(s). If there is a 4xx course that you are particularly interested in and you have completed all of the prerequisites for that 4xx course, then you should strongly consider taking it the next semester rather than waiting. Many 4xx courses are only offered every second or third semester; so if you wait,

you may graduate before it is offered again.

If you had considerable computer experience you should not delay taking ICS111. In order to do the work in ICS111, you must know how to do simple file operations like locating, copying, deleting, and downloading files. You must be able to do basic word processing. You must know how to use email and how to use the internet, including searching. It is expected that you know how to do these operations in ICS111 but they will not be taught in ICS111. ICS101 covers these things and considerably more, including spreadsheets, presentation software (PowerPoint), and some experience with media files (photos and video). There is no reason why you should not take ICS101 and ICS111 concurrently if you are prepared for ICS111.

We have a new course ICS110 Programming through Animations which introduces programming in a simpler environment than ICS111. It is aimed at two types of students, 1) students who are not CS majors and want an exposure to the concepts of computer science, and 2) students who are considering majoring in CS but have very little background. Taking ICS110 will definitely make ICS111 easier.

Ideally you should take ICS111 and ICS141 the first semester and then ICS211 and ICS241 the second semester. There isn't much flexibility here. If you took ICS111 but not ICS141, it is recommended that you take ICS211 and 141 concurrently, and then take ICS241 and ICS212 the next semester.

Of the courses ICS212, 311, 312, 321, you will have the prerequisites for all of them after taking ICS211. (If you take ICS312 before ICS212, you must take ICS212 concurrently.) These are all difficult courses that present a lot of new material and programming. You are strongly advised not to take three or more of those courses in one semester.

If you take course A first and concurrently or later take course B that is listed as a prerequisite for A, that is called backtracking. You will not get credit for course B toward the requirement for 124 credits total. Note that if course B is required for the major, or for any other reason, you will still have to take it. If you already have too many credits, this is not an issue.

Math 301 Discrete Math and Math 371 Probability may be substituted for ICS141 and ICS241. If you are going to double major in math, or even minor in math, these math courses are the better choice. You need to ask your ICS advisor whether he/she are willing to waive ICS141 and 241 if you take Math 301 and 371 and count them towards the math program.

If you wish to double major with a BS in ICS and BS in Math, then there is a requirement for math, for 24 credits in a field related to math (See UHM catalog). There is a special arrangement whereby the ICS 400-level courses can be counted double--both to meet the ICS requirement for 400-level courses and the math

requirement for courses related to math. If you like math and can do well in it, this combination can be very valuable in many areas of computer science. It is especially true for working in the area of bioinformatics.

If you choose the BA degree, you are required to take 12 credits above 300 in a related field. The 12 3xx-level or higher credits for the BA area concentration can be in any field(s) including ICS. The only requirement is that those courses along with the 3 ICS 4xx electives must form a coherent plan of study. You are supposed to make a written plan and have it approved by a faculty member. There are precedents for almost any reasonable plan. The courses that you select now are not set in stone and you are free to change the courses in your proposal at any time simply by submitting a revised proposal and getting it approved by an ICS advisor. This is often necessary because the courses that that you first selected may not be available at the time you need them or other courses that are more suitable to your area of concentration may come along (e.g., a 491 Special Topics course or a new course in the chosen area). You are even free to choose a totally different area with completely different courses for the BA (just submit a new proposal). The reason why a proposal is initially required rather than waiting is so that you will know that the selected pre-approved courses will meet the BA in ICS requirements. Also, most 3xx level courses will have 1xx and/or 2xx level prerequisites, which you will have to take before you can take those 3xx level courses. So when you are taking only two ICS courses/semester (e.g., 111&141 or 211&241), it is advised that you also take those prerequisite courses for the area concentration.

If you have transfer credits or non-trivial questions about the general requirements for the degree, it is best to see an Arts and Sciences advisor in the Queen Liliuokalani Center for Student Services, Room 113. These advisors take notes on the advice that they give and keep them in your official file until you graduate.

With respect to counting transfer credits toward the major requirements, be sure that an advisor evaluates and approves. Don't assume that they will be OK, unless a record of transfer credits shows a specific ICS course equivalent.

Undergraduate students may take graduate courses. If you are considering this, you need permission. The department of ICS requires that the student have a B average in ICS courses, the prerequisites for the course, and permission from the instructor. The instructor can process the necessary override.

Here is a list of 400-level courses with the prerequisites shown:

ICS 412 Operating Systems (3) Pre: 212 and 312, or consent.

ICS 413 Software Engineering I (3) Pre: 311 or consent.

ICS 414 Software Engineering II (3) Pre: 413.

ICS 415 Introduction to Programming for the Web (3) Pre: 311 or consent.

ICS 421 Database Systems (3) Pre: 311 and 321, or consent.

ICS 422 Data Processing (3) Pre: 321, or consent.
ICS 424 Application Frameworks (3) Pre: 212, and 311, or consent.
ICS 425 Computer Security and Ethics (3) Pre: At least two ICS 300-level courses or consent
ICS 426 Computer System Security (3) Pre: ICS 351 or ICS 451 or consent
ICS 431 Computer Architecture (3) Pre: 331, or consent.
ICS 432 Concurrent and High-Performance Programming (3) Pre: 331, or consent.
ICS 441 Theory of Computation (3) Pre: 313.
ICS 442 Analytical Models and Methods (3) Pre: 311 or consent.
ICS 451 Data Networks (3) Pre: 212 and 311, or consent.
ICS 461 Artificial Intelligence I (3) Pre: 311.
ICS 463 Human Computer Interaction (3) Pre: 311 or consent.
ICS 464 Introduction to Cognitive Science (3) Pre: 311 or consent.
ICS 465 Introduction to Hypermedia (3) Pre: 311.
ICS 466 Design for Mobile Devices (3) Pre: 311 or consent.
ICS 471 Probability, Statistics, and Queuing (3) Pre: 241 and 311, or consent.
ICS 475 Introduction to Bioinformatics Sequences and Genomes Analysis (3) Pre: 311 or consent
ICS 481 Introduction to Computer Graphics (3) Pre: 311 and either MATH 216, MATH 242, or MATH 252A; or consent.
ICS 483 Introduction to Computer Vision (3) Pre: 212 and 311, or consent.
ICS 491 Special Topics (3) Pre: at least two 300-level ICS classes or consent.
(Depending on the topic)
ICS 499 Computer Project (V) Pre: Consent.

The faculty collectively has a great deal of valuable experience and knowledge. You are encouraged to learn as much as you can from each faculty member. You will very likely find that some of the things that you were not enthusiastic about as a student will prove to be valuable to you later. You are encouraged to ask around about instructors' reputations and be selective when possible. Don't hesitate to ask for help and advice. It is the ICS faculty's job to provide students a good education. The faculty take this responsibility seriously. It is what they want to do.