



A Software Oriented Computer Science Program

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ABSTRACT

Many Computer Science programs are mainly concerned with hardware and software theory. Computer Software especially is studied with very little application.

American Technological University has attempted to breach the gap in the area of qualified software computer science graduates by tailoring the courses to allow students to study or write, and/or modify operating systems. This is accomplished by selected course work and "hands on" use of the 370/145. Junior, senior and graduate level students are allowed to sign up for blocks of time between 10:00 p.m. and 6:00 a.m. Monday through Friday when available and on most week-ends. A description of courses, the philosophy of teaching, the computer facilities, and a critique of our former students is presented.

INTRODUCTION

There has been considerable discussion concerning the naming and the scope of a 'Computer Science' curriculum. This discussion will not be centered on the "pros and cons" of a Computer Science curriculum but rather on the emphasis and method of achieving a level of competency in computer science at American Technological University.

FACULTY

Many Computer Science programs have failed to provide the computer science student with the necessary tools (applied) to compete in the ever-expanding field of computer science. This is due mainly to the quality of instructors utilized. Many instructors and professors have only minimal or very narrowed experience and formal education in the computing field. The result is students with the same narrow or limited understanding in this field.

This problem has been overcome at American Technological University through highly selective faculty recruitment.

Only terminal degrees in Computer Science are utilized for the direction of individual research. A minimum of Master of Science Degrees in Computer Science for instruction of undergraduate level courses is required.

COMPUTER SCIENCE AS A SERVICE AREA

Although the graduate instruction is tailored toward applied software proficiency, the undergraduate program has been structured to include five or six service courses for the many non-major students taking computer science courses each semester. Three graduate courses also have been structured so that graduate students of closely related fields can take these courses without complete jeopardy.

The service courses are taught with "service" in mind. Majors are not allowed to take these courses alleviating undue competition for grades. The course content is tailored specifically for the non-major only lightly touching subjects that are taught in great detail to majors. These courses are designed to give the non-major an overview of the computing field and a tool for research through specific language instruction.

PHILOSOPHY OF COURSE WORK

Examination of the course descriptions in Appendix A allows one to grasp the emphasis which is placed on applied software development. After a student has taken the introductory courses and is proficient in several computer languages, he is required to take the series of courses which is designed to train him in the principles of software and to give him practical work in writing and modifying assemblers, compilers, interpreters, etc. These courses require the "hands on" use of the complete system. Graduate students are required to have these courses, or a knowledge of their content, before proceeding into graduate level computer courses.

All computer science courses require several practical lab assignments on term projects to put emphasis on actual software applications in lieu of theory. In

the advanced courses, a student may elect to solve his problems using the language which he feels will be most appropriate for the application.

UNDERGRADUATE PROGRAMS

The undergraduate program consists of two options, scientific and commercial. The scientific option, as shown in Appendix B, requires 133 semester hours. The student that elects to follow this option will take all of the undergraduate computer science courses, the normal amounts of english, history, and other required courses, and still have a choice of minoring in mathematics, education, business or one of the sciences.

The commercial option requires 133 semester hours and allows the student to also take all of the undergraduate computer science courses and the normal required courses. In addition, he will need two semesters of advanced math and a minor in business which will include accounting, management, business law, and economics. All students are required to have a high proficiency in mathematics and science, regardless of their minor.

REQUIREMENTS FOR GRADUATE WORK IN COMPUTER SCIENCE

Graduate work in Computer Science presupposes considerable undergraduate preparation in digital computer programming. Prior to scheduling graduate work, the student should be fluent in FORTRAN, COBOL, and Assembly language programming.

Proficiency in programming may be acquired through formal course work, or by related experience. In cases of doubt about programming proficiency, the student may be requested to demonstrate such proficiency by examination.

Any version of FORTRAN or COBOL will generally suffice for satisfying these prerequisites, as long as the applicant has sufficient proficiency in them. Assembly language programming ability for the IBM 360/370 series is required prior to scheduling the first graduate level Computer Science course offered.

Applicants who have not acquired the background indicated in the first paragraph may be admitted to the graduate program. However, some time will be required to make up the deficiencies before scheduling work. Since the Computer Science graduate program requires a minor, it is generally possible to schedule graduate level courses in the minor field at the time he is completing undergraduate computer science requirements. Grades of C or better are required of all who schedule undergraduate courses to prepare for graduate work.

COMPUTER CENTER FACILITIES

The Computer Center available to American Technological University has the following equipment:

- (1) IBM System 370/145 with 512K real memory, operating under VS1. The system is front-ended with a Hewlett Packard 2200 minicomputer as the interface for extensive teleprocessing applications.
- (2) IBM System 360/40 with 256K main memory, running under DOS. The system interfaces also with the Hewlett Packard 2200 minicomputer for communications.

STUDENTS AND FORMER STUDENTS

During 1973 Fall semester, American Technological University Computer Science Department had 247 undergraduate, 41 Masters, and 3 Ph. D. students. We anticipate having over 60 graduate students for the Spring 1974 semester, based on applications.

Since the Fall semester of 1968, American Technological University had 36 Baccalaureate and 9 Master's degrees awarded. The following table gives the areas in which our graduates are working:

<u>JOB AREA</u>	<u>PERCENTAGE</u>
Education	17
Industry	14
Graduate School (for Ph. D.)	17*
Government Agencies	26
Computer Manufacturers	6
Unknown	20

* Note: Some students in the Ph. D. program are also counted in the other percentages.

APPENDIX A

CS 344 ADVANCED ASSEMBLY LANGUAGE PROGRAMMING

Advanced assembly language techniques with emphasis on design of software through macro definitions. Includes a detailed study of the macro assembler, of the functions and applications of executive macros, of physical level I-O, and the development of I-O control systems.

CS 338 COMPUTER PROGRAMMING SYSTEMS

Advanced FORTRAN and COBOL programming techniques, including algorithmic and heuristic solutions of problems. Representation of algorithms in narrative form, as flowcharts and computer programs. Communications procedures with automatic languages. Iterative and recursive algorithms will be developed, tested and compared.

CS 446 SYSTEMS SOFTWARE*

Includes the historical development of hardware and corresponding software systems. Among the topics to be covered are design and implementation of operating systems, communication systems, systems service and utility routines, the structure of system libraries, job control, and the structure of interrupt systems.

CS 443 LANGUAGE PROCESSORS

A study of single and multi-pass assembly systems, generators, translators, interpreters, emulators, and compilers. In addition the course will emphasize the use of formal notation being applied in these areas of study. Students will be assigned projects directly related to the compilation of FORTRAN and COBOL programs, the assembly of a symbolic language program, and the simulation of a hypothetical machine.

*For Graduate or Undergraduate credit. Not open to students below junior level.

APPENDIX B

Freshman Year

FIRST SEMESTER	Hours
Subject	
Intro. to Computer Science & Computer Programming 143	4
Computers and Society 120	2
English 131	3
**Math option	3
History 131 or Bus. Mgmt. 131	3
Physical Education	1
Psychology 111	1
	<u>17</u>

SECOND SEMESTER	Hours
Subject	
COBOL Programming 138	3
Computer Op. and Org. 139	3
English 132	3
**Math option	3
History 132 or Tech. Elective	3
Physical Education	1
	<u>16</u>

Sophomore Year

FIRST SEMESTER	Hours
Subject	
Advanced COBOL 234	3
Assembler Language Programming 243	4
Math 231	3
Government 231	3
Physics or Approved Science	4
Physical Education	1
	<u>18</u>

SECOND SEMESTER	Hours
Subject	
+Computer Science elective	3(4)
Systems Analysis 238	3
Math 232	3
Government 232	3
Physics or Approved Science	4
Physical Education	1
	<u>17 (18)</u>

Junior Year

FIRST SEMESTER	Hours
Subject	
Statistics and Prog. Appl. 330	3
FORTRAN Programming 336	3
*Elective	3
*Elective	3
Education 431	3
	<u>15</u>

SECOND SEMESTER	Hours
Subject	
++Computer Operations 340	4
Computer Prog. Systems 338	3
*Elective	3
*Elective	3
Education 432	3
	<u>16</u>

Senior Year

FIRST SEMESTER	Hours
Subject	
Info. Storage & Retrieval 445	4
Teleprocessing 442	4
Comp. Meth. in Appl. Math 432	3
Education 433	3
*Elective	3
	<u>17</u>

SECOND SEMESTER	Hours
Subject	
Linear Programming 441	4
Language Processors 443 or Systems Software 446	4
Adv. Comp. Meth. in Appl. Math or Approved higher level Math	3
Education 434	3
Approved Elective	3
	<u>17</u>

* Department Directors will select elective to correspond to their individual four year program.

**Math option - two year students may take Math 131 and Math 135, four year students must take Finite Math 135 and 136.

+ Two year students may take either CS 237 or CS 344, four year students must take CS 344.

++CS 347 Data Structures may be substituted for CS 340.

APPENDIX C

Freshman Year

FIRST SEMESTER	Hours
Subject	
Intro. to Computer Science & Computer Programming 143	4
Computers and Society 120	2
English 131	3
**Math option	3
History 131 or Bus. Mgmt. 131	3
Physical Education	1
Psychology 111	1
	<u>17</u>

SECOND SEMESTER	Hours
Subject	
COBOL Programming 138	3
Computer Op. & Org. 139	3
English 132	3
**Math option	3
History 132 or Tech. Elective	3
Elective	3
Physical Education	1
	<u>16</u>

Sophomore Year

FIRST SEMESTER

Subject	Hours
Advanced COBOL 234	3
Assembler Lang. Programming 243	4
Accounting 241	4
Government 231	3
Economics 231	3
Physical Education	1
	<u>18</u>

SECOND SEMESTER

Subject	Hours
+Computer Science Elective	3(4)
Systems Analysis 238	3
Accounting 242	4
Government 232	3
Economics 232	3
Physical Education	1
	<u>17(18)</u>

Junior Year

FIRST SEMESTER

Subject	Hours
Statistics and Prog. Appl. 330	3
FORTTRAN Programming 336	3
*Elective	3
*Elective	3
Education 431	3
	<u>15</u>

SECOND SEMESTER

Subject	Hours
++Computer Operations 340	4
Computer Prog. Systems 338	3
*Elective	3
*Elective	3
Education 432	3
	<u>16</u>

Senior Year

FIRST SEMESTER

Subject	Hours
Info. Stor. & Retrieval 445	4
Teleprocessing 442	4
Business Law 330	3
Education 433	3
*Elective	3
	<u>17</u>

SECOND SEMESTER

Subject	Hours
Linear Programming 441	4
Language Processors 443 or Systems Software 446	4
Business Law 331	3
Education 434	3
Elective	3
	<u>17</u>

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