ABET
Annual Report

for the

B.S. in Computer Science

at

Lamar University

Beaumont, Texas

August 25, 2017

CONFIDENTIAL

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BACKGROUND INFORMATION

A. Contact Information

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B. Program History

Computer Science was established as a Division in the College of Engineering in 1976. In 1979 it became the Department of Computer Science. Dr. Bill Nylin served as the first Chair of from 1976 to 1979. Dr. Bobby Waldron served as Chair from 1979 to 1988. Dr. David Reed served as interim Chair from 1988 to 1989. Dr. Ronald King served as Chair from 1989 to 1993. Dr. Lawrence Osborne served as Chair from 1993 to 2012. The current Chair is Dr. Stefan Andrei.

Major changes in the Department include:

1. First ABET accreditation in 2001.
2. Moved from College of Engineering to College of Arts and Sciences in 2004.
3. Employment of two permanent full-time non tenure-track faculty members in 2007.
4. Employment of full-time system administrator in 2008.
5. Development of online classes beginning in 2009.
6. Offered Bioinformatics concentration starting in 2010.
7. Adopted 4 courses in game development in 2013 in preparation for adding a Game Development concentration in 2014.
8. Added two elective courses in Android programming in 2016.
9. Proposed and received approval for new B.S. in Computer Game Development degree in 2017.

The last ABET review was in 2013. The program was re-accredited for six years.

C. Options

Students have an option to select four computer science electives and one free elective.

D. Organizational Structure

At the department level, the instructor of record has authority over each of his/her courses during the semester taught. For each course there is a course coordinator who assures the correct material is covered. The Undergraduate Curriculum Committee oversees the undergraduate curriculum as a whole. Changes to the curriculum or other curriculum issues are voted on by the Undergraduate Curriculum Committee before going to the faculty for a vote. The Department Chair is the chief administrator in the Department and reports to the Dean of the College of Arts and Sciences. The structure from department to upper administration is shown in Figure 1-1.

E. Program Delivery Modes

Courses in the program are taught during both the day and evening. The delivery mode is traditional lecture/laboratory. In addition, the Department offers a sufficient number of online courses to enable a student to graduate with a degree from the program by taking program courses entirely online.

F. Program Locations

All computer science courses are offered on the main campus of Lamar University.

G. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them

As a result of the most recent ABET visit in 2013, the following changes were made (text summarized from Final Statement from ABET to Lamar University, dated August 7, 2014).

1. The visiting team from ABET that came in October 2013 found one program weakness related to the Program Educational Objectives (PEOs). The team was concerned that the program Advisory Board was not regularly allowed to review and provide input regarding the PEOs.
    a. This was resolved and reclassified from a weakness to a concern. The department has altered the Advisory Board's procedures so that the board will review program educational objectives every two years. In designated years, the department will electronically forward a copy of the current PEOs prior to the board's spring meeting. At the spring meeting, the board will specifically discuss PEOs and recommend changes. The department forwarded the current PEOs in October of 2013 in preparation for the 2014 spring meeting. The department provided emails from board members with initial feedback.

2. The visiting team from ABET that came in October 2013 found one program weakness related to the assessment of student's ability to communication effectively with a range of audiences for students in online classes only.
    a. This was resolved and reclassified from a weakness to a concern. The department now requires faculty members who teach on-line to utilize one of two software

packages that allow enablement of student oral communication skills. The department will utilize the same rubric to assess oral communication in both online and on-ground sections. The response included a spring 2014 syllabus that shows the required utilization of these software packages to enable oral communication in on-line courses.

H. Joint Accreditation

The program is jointly accredited by ABET and by the Commission on Colleges of the Southern Association of Colleges and Schools (SACS). SACS accredits Lamar University to award degrees including Bachelor's degrees. The program's last ABET accreditation was in 2013. The University's last SACS accreditation was in 2010.

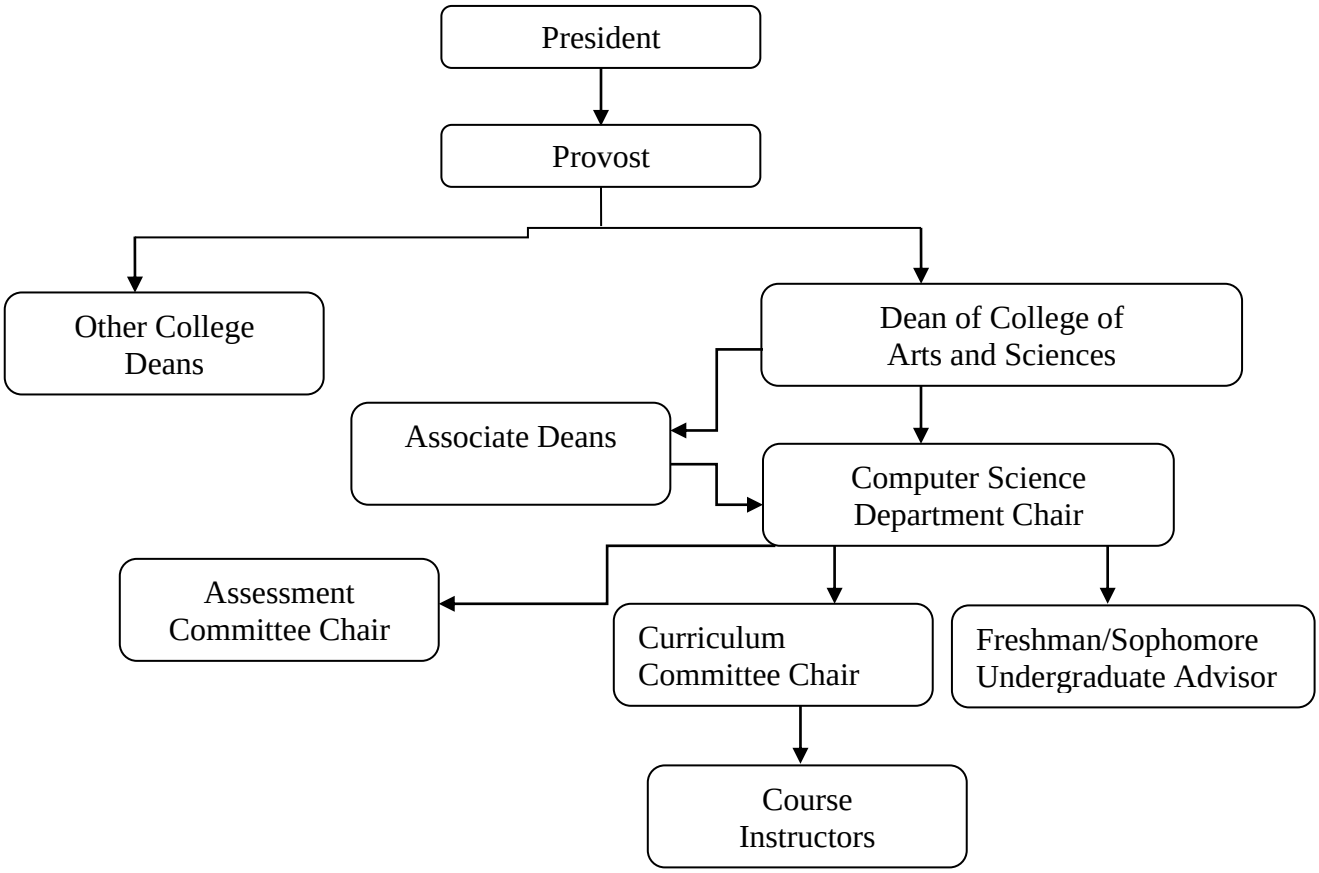


Figure 1-1. The administrative structure of the Department of Computer Science at Lamar University

GENERAL CRITERIA

SECTION 1. STUDENTS

A. Student Admissions

All interested students must apply to Lamar University and satisfy the University admission requirements. Students can indicate at the time of the initial application their interest in the Computer Science program, or they may declare their interest at any time thereafter. Students who are already admitted and wish to declare Computer Science as their major must first go to the University Records Office and fill out a "Declaration/Change of Major" form. Once this form is completed, or if the student indicated his/her desire to be in the Computer Science program upon admission, the student is automatically considered to be a Computer Science student. There is no other specific procedure for admission into the undergraduate computer science program.

All prospective Lamar University students who apply to the Lamar University should do so online using the statewide "Apply Texas" system. Incoming students submit a complete high school transcript or GED scores, transcripts of previous college work where more than 18 hours of college credit was earned as well as ACT or SAT scores. This requirement also applies to students with high school dual credit. To qualify for unconditional admission, a student's high school coursework must include: four units of English, three units of math, two units of laboratory sciences, 2 ½ units of social sciences, and 2 ½ credits in college preparatory electives (preferably 2 of those units in coursework related to a foreign language), satisfy the State of Texas Uniform Admission Policy, and graduate in the top 10 percent of their high school class or achieve a minimum composite score on the SAT or ACT exam. Students who are lacking in the course requirements may be admitted at the University's discretion, with a variety of additional enrollment conditions that are imposed to improve opportunities for success at Lamar University. During registration for classes, students accepted through Individual Approval will meet with an advisor who will explain the guidelines, agreements and requirements necessary for enrolling at Lamar University.

New students should also attend an Orientation in the semester before enrolling. Before Orientation, the students should take a Texas Success Initiative (TSI) assessment test to demonstrate readiness for college-level courses. More information on Admissions can be found at the Lamar website at http://beacardinal.lamar.edu/how-to-apply and at http://catalog.lamar.edu/undergraduate-admissions/index.html.

B. Evaluating Student Performance

Students are evaluated based on their performance on tests, quizzes, lab and programming assignments, and written assignments such as essays and research papers. Every course does not necessarily use all of these assessment items. Students enrolled in COSC 4172 (Senior Seminar) also take the ETS Computer Science Major Field Test. This test is given to

graduating seniors, but the scores are used only for assessment of the programs, not for individual grades.

When students first enter the program, they are advised by the Department's designated advisor. Upon making sufficient progress toward their degree (generally upon completion of COSC 2336 (CS 3: Data Structures)), they are assigned a permanent faculty advisor. The University has an online system for students to enroll in courses. Students cannot use the system until their advisor removes the student's advisement hold. The advisor makes sure that students are meeting prerequisites. In addition, the online system will not allow students to register for courses unless the student has successfully completed the corresponding prerequisites. Under extenuating circumstances (e.g., a transfer student with good grades), students may be allowed to take a course normally considered a prerequisite as a co-requisite. This requires approval by the student's advisor or department Chair. If a student has not met the prerequisite for a course and a mistake was made by the online system or human error, the instructor of record may ask the student to drop the course.

Majors are expected to be successful in their chosen discipline. Students who have attempted at least twelve hours of computer science courses and whose GPA in such courses drops below 2.00 will be advised by Student Advising and Retention Services (STARS). These students will be advised by the Department until their GPA increases above 2.0. Students receiving a B.S. in Computer Science are required to have an overall GPA of at least 2.25 and a GPA of at least 2.25 for all courses required for successful completion of the degree program.

No freshman student is allowed to take any senior-level computer science course. A student may not register for the same class more than four times. If a student is registered on the first class day, the course will appear on the student's transcript. Even if the student later drops the course or withdraws from school for that semester (receiving a "Q", or "W" for that course), the course counts as one attempt.

Lamar University has a Grade Replacement Policy which states that students may replace an undergraduate course grade by repeating a course. If a student repeats a course, the official grade is the higher one, although all grades remain on the transcript. Eligibility for university honors is determined on the basis of a cumulative GPA that includes those grades that were replaced. Repeating a course after taking a more advanced class in the same subject is not permitted. Once a degree has been conferred, a student may not replace a grade for any course that was used to award the degree or calculate the cumulative grade point average.

C. Transfer Students and Transfer Courses

<u>Transfer Applicants with Fewer than 18 Credit Hours</u>

Undergraduate students who are transferring with fewer than 18 credit hours of college-level coursework must also satisfy admission requirements for entering freshmen including a satisfactory high school transcript. They submit an online application through the statewide "Apply Texas" system. They should have official copies of all prior college and university

transcripts sent to Lamar regardless of the length of attendance and whether credit was earned. Students transferring with fewer than 18 credit honors also should have SAT or ACT test scores sent to the University.

Transfer applicants who have been academically dismissed from the last institution they attended but meet the GPA requirements listed above are not considered for admission until at least one regular semester (fall or spring) has elapsed. After this period, these applicants must submit a new application.

Students who meet the high school requirements but do not have a 2.00 GPA on attempted college coursework may be considered for admission. These applicants are reviewed by the office of Student Advising and Retention Services. Students' major, types of courses taken, and pattern of progress, as well as high school records and standardized test scores, are considered in the admissions process.

Transfer Applicants with 18 Credit Hours or More

Students who are transferring with 18 or more credit hours of college-level coursework must meet the following requirement: Have earned an overall combined 2.00 GPA (as computed by Lamar University) on all transfer hours attempted and be eligible to re-enter all colleges and universities previously attended. Students who have failed any college readiness coursework are not eligible for admission until they have completed these courses with a passing grade.

Students who do not meet the requirement above can be considered for admission at the discretion of the University on an individual basis. These applicants write a one- to two- page statement in which they account for past academic shortcomings, suggest steps they will make to address those weaknesses, and specify the academic goals they plan to achieve while studying at Lamar University. Students may also include letters of recommendation from people familiar with their academic background and pertinent information such as participation in extra-curricular activities or specialized skills.

The Admissions Office evaluates transfer students' transcripts to determine transfer credit for the general education requirements and some lower-division courses. The Department's designated advisor, Dr. Bo Sun, checks transfer students' syllabi and grades to determine transfer credit for most major courses.

At the present time, there are no state-mandated articulation requirements impacting transfer students. We do have Articulation Agreements with Lamar State-Orange and Lee College.

Transfer students can use an online credit evaluation tool to determine how completed coursework will be counted towards a degree at Lamar. Credit earned at other accredited institutions is judged for Lamar University credit using the following guidelines:

1. All courses are used to calculate the transfer GPA, which is used to determine admission status.

2. Grades of D are transferable, but departments may refuse to accept the grades toward a degree.
3. Transfers from a two-year college are limited to 66 semester hours of transferable credit. No two-year college credits will be accepted for junior-senior credits.
4. Transfer students can expect to be informed of the amount of transfer credit awarded within two weeks of acceptance. In some circumstances, evaluation may take a longer time, but it must be completed by the end of the student's first academic semester at Lamar University.

   More information on procedures for Transfer students can be found at http://beacardinal.lamar.edu/how-to-apply/transfers.html.

D. Advising and Career Guidance

All new students go through an orientation process either as a part of the University's New Student Orientation sessions or with the Department upon their arrival. During this orientation process, students are walked through all degree requirements and are told how to obtain further information. Each new student is also given an information packet that includes a summary of all of the degree requirements. Initially, all incoming students (new or transfer) are advised by the Department's designated advisor, Dr. Bo Sun, and by the Undergraduate Advising Center. A schedule for the Fall 2013 University Communication Advising Plan is shown in Appendix L-2**.** The Undergraduate Advising Center is responsible for the initial orientation process, and its services are available at any time for incoming students who have questions or need extra assistance in making the transition from high school. Services available include time management and tutoring. Students with poor academic backgrounds must sign an "I WILL" agreement and take University approved one credit hour course to improve their study habits. Appendix L shows the forms used by the Undergraduate Advising Center for the "I WILL" program, advisement, retention, and tutoring requests.

Dr. Bo Sun advises all of the majors in Computer Science during the first two years in which the student is accepted as a major. A permanent faculty mentor/advisor is assigned to the student upon completion of COSC 2336 (Computing Fundamentals III: Data Structures), or as circumstances warrant. The faculty mentor then handles advising duties for the student for the rest of his or her academic career at the University. All advisors are available year-round to mentor and guide students. When the student is ready to apply for graduation, Dr. Bo Sun checks over the degree plan to ensure that all requirements have been met. He then submits a degree plan for the student to the Graduation Officer in the Office of the Registrar. Students take COSC 4172 (Senior Seminar) during their last semester, which makes it easy to communicate with seniors planning on graduation. A flowchart for the Advisement Procedures in the Department of Computer Science is shown in Figure 1-2.

The University has an online degree audit tool called DegreeWorks that supports advising. In particular, the tool lists the outstanding courses that a student needs to graduate. Courses are subdivided into the categories of General Education requirements, College of Arts and

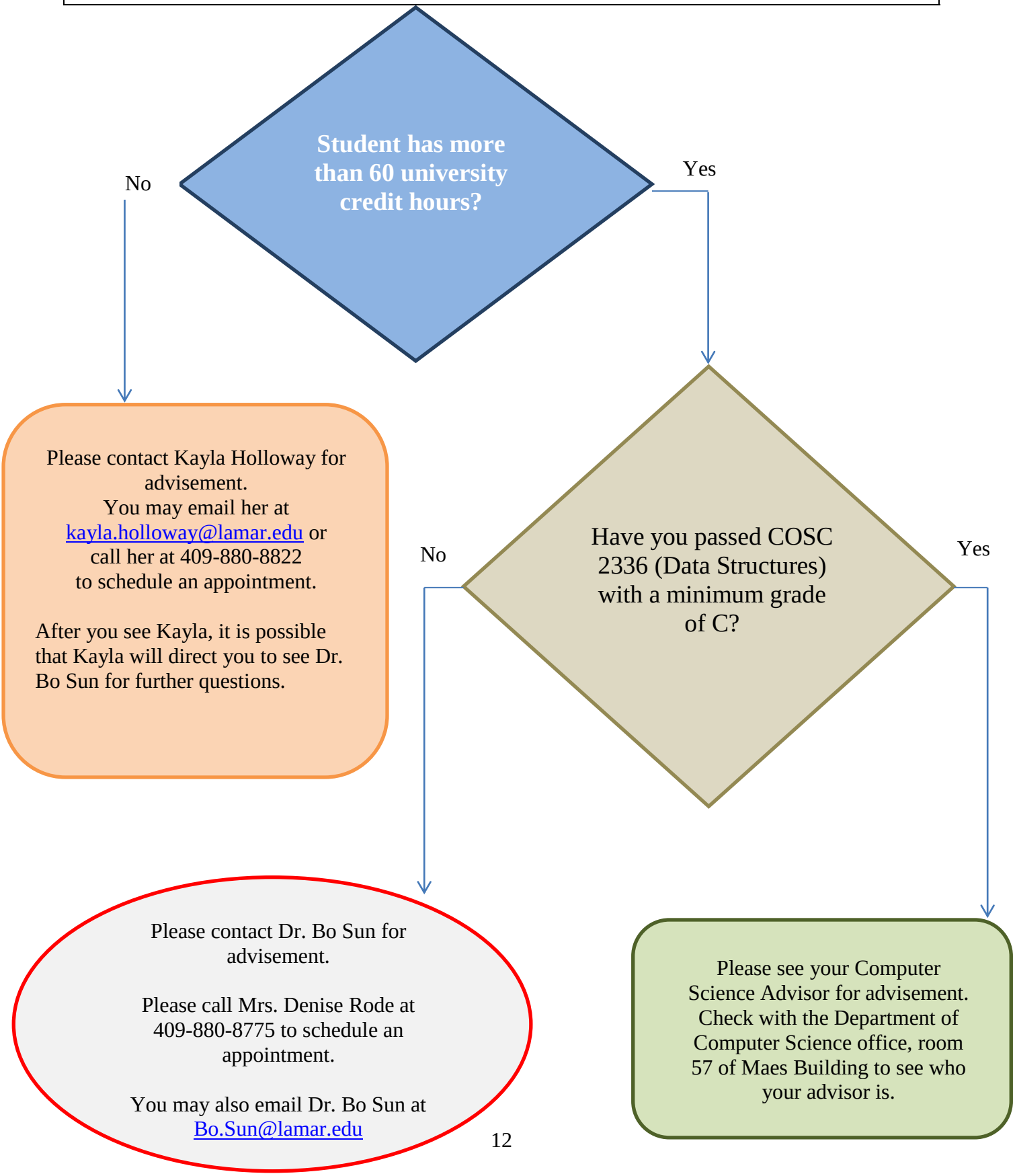
Sciences requirements, and Computer Science major requirements. Both advisors and students may access DegreeWorks from any Internet-connected computer.
Towards the end of every semester, students are required to contact their advisor to review which courses they need to take the next semester. During this time, advisors ensure that students are on the right track for graduation, advise them on how to best complete the requirements given the upcoming course offerings, and inform students of any upcoming changes that may affect their ability to complete the degree. Unless students contact the advisor assigned to them, they are unable to register for classes. The Department's designated advisors are available for backup in case the student's advisor of record is unavailable. In addition, students have access to the University's online undergraduate catalog and online unofficial transcripts and a departmentally produced master checklist for the degree. These items allow students to easily keep track of where they are in the program, allowing them to perform some measure of self-advising.

E. Work in Lieu of Courses

If a student requests credit for work experiences in lieu of enrolling in a class, the student must pass a credit exam in the course for which they wish to receive credit. An exception to this rule is if the student has taken the Advanced Placement Test in Computer Science. Credit is given according to the rules given below to those students who have completed an Advanced Placement Test in computer science.

Test	Score	Courses for which Credit Is Assigned
Computer Science A test	4 or 5	COSC 1336
Computer Science AB test	4 or 5	COSC 1336, COSC 1337

Figure 1-2. Advisement Procedure for Students



F. Graduation Requirements

The name of the degree offered by the Department of Computer Science is the Bachelor of Science in Computer Science. To obtain the degree, a student must successfully complete 121 semester hours of credit. There are two categories of requirements that students must complete: Core Curriculum requirements (48-50) hours and Computer Science major requirements (84-85 hours). The Core Curriculum requirements in Mathematics and Science are satisfied by Computer Science major requirements. These requirements are summarized below.

Core Curriculum

- **English Composition**—six semester hours from ENGL 1301, 1360 (Honors), 1302, 1361 (Honors) or 1374
- **Language, Philosophy and Culture**—three semester hours.
- **Communication or Modern Language**—three semester hours from COMM 1315, 1360 (Honors), 1321, FREN 1311, SPAN 1311 or DSDE 1371.
- **American History**—six semester hours from HIST 1301, 1302, 1361 (Honors), 1362 (Honors), 2301
- **Creative Arts**—three semester hours from ARTS 1301, ARTS 1303, DANC 2304, PHIL 1330, MUSI 1306, or COMM 1375.
- **Social Science** – three semester hours from ECON 1301, 2301, 2302, PSYC 2301, SOCI 1301, BULW 1370, or COMM 1375.
- **Political Science**—six semester hours: POLS 2301 and 2302
- **Mathematical Science**—Six to seven semester hours at or above MATH 1314 or 1414 and three to four semester hours in mathematics (at or above the content level of trigonometry, MATH 1316) or quantitative analysis (BUAL 3310, MATH 1342, MATH 3370 or PSYC 2471).
- **Laboratory Sciences**—eight semester hours from BIOL 1406, 1407, 1408, 1409, 2401, 2402, CHEM 1406, 1408, 1411, 1412, 1460 (Honors), GEOL 1403, 1404, PHYS 1401, 1402, 1405, 1407, 1411, 2425, 2426.

Computer Science Major

- **Mathematics (20 hours)** — MATH 2413, MATH 2414, MATH 3328, MATH 3370, MATH 3322 or MATH 3435, and COSC 2375.
- **Laboratory Sciences (12 hours)** — Three lecture/lab courses from the collection PHYS 2425, PHYS 2426, CHEM 1311/111, CHEM 1312/1112, BIOL 1406, AND BIOL 1407.

- **Computer Science (56 hours)** – COSC 1172, 1173, 1174, 1336, 1337, 2336, 2372, 3302, 3304, 3308, 3325, 4272, 4302, 4310, CPSC 3320, 4340, 4360, and four COSC/CPSC/ELEN electives

Academic electives are used to complete the 121 semester hours. In addition, seniors are required to take the ETS Computer Science Major Field Test the same semester that they take COSC 4272. More information about the Core Curriculum can be found at http://catalog.lamar.edu/undergraduate-academic-policies/index.html#philosophy. According to the University Catalog, "students who transfer to Lamar University from another Texas public institution of higher education shall be governed by the provisions of Texas Senate Bill 148 (75th Legislature). Lamar will accept, *en bloc*, an approved core curriculum successfully completed at another Texas public institution of higher education in lieu of Lamar´s core curriculum. Any student who transfers to Lamar University before completing the core curriculum of another Texas public institution of higher education shall receive academic credit at Lamar for each of the courses that the student has successfully completed in the core curriculum of the other institution; however, the student shall be required to complete Lamar´s core curriculum. Students transferring to Lamar from institutions of higher education outside of Texas or from private institutions within Texas shall be subject to the requirements of Lamar University´s core curriculum."

All students who wish to graduate have a University procedure to follow which helps ensure that all requirements have been met. Students and advisors can access the online DegreeWorks tool at any time to check which courses have been completed successfully and which courses are still remaining. Once a student (with assistance from the student's advisor) determines they are close to graduating, the student submits an "Application to Graduate" form to the Registrar's Office indicating the expected graduation semester. The University then reviews the student's records and completes a "Summary of Coursework Remaining" that is then mailed to the student. This summary is the University's official listing of what requirements the student has left to complete for the degree. If there are any inaccuracies or questions about the remaining requirements, Dr. Bo Sun acts as an interface between the student and the University. Once the advisor is certain that the student understands the remaining requirements, both the advisor and the student sign the Degree Plan, which is then returned (by the student) to the University.

From this point forward the University monitors the student's courses. If the student does not sign up for all remaining classes and/or does not complete all requirements during the final semester (as listed on the Degree Plan), the University mails the student a letter. The student must immediately register for the remaining courses and handle any other remaining requirements or risk not graduating that semester.

If at any time there are changes made to either the Degree Plan or the Summary of Coursework Remaining, it is the responsibility of the party making the change to inform the other interested parties as soon as possible. This includes (but is not limited to) the student transferring in additional courses from outside the University, the advisor agreeing to a

change in the requirements for the student, and the University uncovering a discrepancy in the remaining requirements.

SECTION 2. PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statement

University

Lamar University is a comprehensive public institution educating a diverse student body, preparing students for leadership and lifelong learning in a multicultural world, and enhancing the future of Southeast Texas, the state, the nation, and the world through teaching, research and creative activity, and service.

Values

To provide a learning environment of the highest quality and integrity, Lamar University values:

- Our STUDENTS, including their curricular and extracurricular activities;
- Our FACULTY and STAFF, high quality employees who are committed to educating and serving our students;
- Our commitment to DIVERSITY in ideas, people, and access;
- Our collegial ENVIRONMENT with contemporary, functional, and pleasing facilities, a safe campus, and responsible fiscal management;
- Our bonds with SOUTHEAST TEXAS, the STATE, the NATION, and the WORLD, including our alumni and friends, through economic and educational development, research and creative activity, service and outreach.

College

The College collectively involves students in an academic experience of the highest quality based on the following principles:

- To provide an excellent learning environment wherein all students may refine the knowledge and skills essential to cultivate their ability to think critically, communicate effectively, and advance their appreciation of artistic and scientific inquiry;
- To provide a contemporary education through the integration of information technology into the study of disciplines traditionally associated with the arts and sciences; and
- To stress the importance of lifelong learning through community outreach, service, research and creative endeavors.

B. Program Educational Objectives

Program Objectives

Published on the Department of Computer Science website:
Within a few years of graduation, graduates of the computer science program will achieve the following:

1. Graduates of the Computer Science Program will develop the professional skills and the necessary technical knowledge both in breadth and in depth to prepare them for employment and advanced study in Computer Science.
    - Measurement: using Student Learning Outcomes 1, 2 and 3.
2. Graduates of the Computer Science Program will have sufficient awareness of the local and global societal impact of technology and of the related legal and ethical issues in computer science to make decisions regarding their personal and professional responsibilities.
    - Measurement: using Student Learning Outcomes 4 and 5.
3. Graduates of the Computer Science Program will have the critical thinking, communication, teamwork, and leadership skills necessary to function productively and professionally.
    - Measurement: using Student Learning Outcomes 6, 7 and 8.
4. Graduates of the Computer Science Program will demonstrate intellectual curiosity and the independent study skills necessary for life-long learning.
    - Measurement: using Student Learning Outcome 9.

Student Learning Outcomes

See Criterion 3. Student Outcomes

C. Consistency of the Program Educational Objectives with the Mission of the Institution

The educational objectives of the Department of Computer Science align with the Lamar University Mission and the College of Arts and Sciences Mission statements since the Department of Computer Science seeks to produce graduates who can be productive in careers in the Computing Sciences and who embrace and excel at lifelong learning. Our program provides students both theoretical and practical foundations needed to be successful. Through classroom and lab activities, opportunities for research, and early involvement in professional organizations, including programming competitions, the Department of Computer Science seeks to educate a well-rounded computing professional capable of independent thinking.

D. Program Constituencies

The program constituencies are students, faculty, staff, and industry partners.

The educational objectives meet the needs of students by providing them with the opportunities necessary to advance their skills to the point they are able to find a job in computing upon graduation from the program. Alternatively, the program also prepares students for graduate study in computer-related disciplines.

The educational objectives meet the needs of faculty by providing opportunities for faculty to impart their knowledge of computing and advance their careers in academia. In addition, for faculty interested in research, the program offers students opportunities to engage with faculty in faculty-sponsored research.

The educational objectives are enhanced by the work of staff since all students need to interact with staff members on academic issues, such as maintaining the grade records, advisement records, preparing the payment for all undergraduate and graduate assistants, and more administrative tasks.

The educational objectives meet the needs of industry partners since graduates of the program are well prepared to enter the workforce. Since the program receives and evaluates continual feedback from industry partners, the program is kept up-to-date with and responds to industry needs.

E. Process for Review of the Program Educational Objectives

Undergraduate Curriculum Committee

The Undergraduate Curriculum Committee meets regularly each academic year to review how various components of the program continue to meet the educational objectives of the program. These include review and adoptions of textbooks, proposals for the deletion or addition of courses to the program, and student feedback.

Assessment Committee

The Assessment Committee meets regularly each academic year. The committee reviews proposals for changes to the assessment procedures for the program based on feedback from students and instructors. The committee also reviews feedback from other sources included, but not limited to the program Advisory Board, other University departments and University administration. As the content of some courses may change or evolve over time, the committee makes sure the assessment procedures for each course are aligned with the educational objectives of the program. At the end of each academic year, the committee reviews assessment data gathered for the program and decides on changes, if any. For this reason, the committee is one of the most important venues for changes that ensure continuous program improvement.

Advisory Board

The program has an Advisory Board consisting of representatives of local, regional, and national companies. Many of the Advisory Board members are Alumni of Lamar University. Each spring the Advisory Board meets for a one-day conference on the Lamar campus. Faculty members, including the Chair of the program, make presentations to highlight important changes in the program such as new facilities, new courses, and progress on research grants or new faculty members hired. The Advisory Board provides feedback to the Department Chair on the state of the program and any recommended changes. The Chair is responsible for presenting any significant feedback from the Advisory Board to the full faculty of the Department. If feedback from the Advisory Board is related to the educational objectives of the program, the Chair is responsible for moving any recommendations to the appropriate Department committees for further consideration and possible action.

All recommendations and proposed changes by the above committees are presented to the faculty and are subject to vote.

SECTION 3. STUDENT OUTCOMES

A. Student Outcomes

Published on the Department of Computer Science website:

1. Software Fundamentals: Graduates will demonstrate their ability to use fundamental computer science knowledge to design, document, implement, and test software solutions to a wide range of problems, using at least two high-level programming languages.

2. Computer Science Technology Skills: Graduates will demonstrate expertise in the main content areas of computer science including.
    - Discrete and continuous mathematics including skills in logic and proof writing
    - Analysis and design of algorithms
    - Formal languages and computability theory
    - Operating systems
    - Database systems
    - Computer architecture
    - Computer networks and distributed computing concepts

3. Scientific Method: Graduates will be able to gather requirements, analyze, design and conduct simulations or other computer experiments and evaluate and interpret the data generated.

4. Societal Awareness: Graduates will be aware of and understand the impact of computer technology on society at large, on the workplace environment, and on individuals.

5. Ethical Standards: Graduates will be able to recognize and understand the importance of ethical standards as well as their own responsibilities with respect to the computer profession.

6. Collaborative Work Skills: Graduates will demonstrate the ability to work effectively in teams to conduct technical work through the exercise of interpersonal communication skills.

7. Oral Communication Skills: Graduates will demonstrate their ability to communicate clearly.

8. Written Communication Skills: Graduates will demonstrate their ability to write effectively both technical and non-technical materials with appropriate multimedia aids.

9. Continuing Education and Lifelong Learning: Graduates will demonstrate that they can independently acquire new computing related skills and knowledge in order to pursue either further formal or informal learning after graduation.

B. Relationship of Student Outcomes to Program Educational Objectives

Table 3-1 illustrates how ABET criteria are related to the 4 program educational objectives listed in Section 2.B and the 9 student outcomes listed in Section 3.A.

Table 3-1. Mapping of ABET criteria to program educational objectives.

2015-2016 ABET Criteria	Lamar Program Educational Objectives and Student Outcomes
(a) An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline	Objective 1, Student Outcomes 1 and 2
(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution	Objective 1, Student Outcome 1
(c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs	Objective 1, Student Outcomes 1, 2, and 3
(d) An ability to function effectively on teams to accomplish a common goal	Objective 3, Student Outcome 6
(e) An understanding of professional, ethical, legal, security, and social issues and responsibilities	Objective 2, Student Outcome 5
(f) An ability to communicate effectively with a range of audiences	Objective 3, Student Outcomes 7 and 8
(g) An ability to analyze the local and global impact of computing on individuals, organizations, and society	Objective 2, Student Outcome 4
(h) Recognition of the need for and an ability to engage in continuing professional development	Objective 4, Student Outcome 9
(i) An ability to use current techniques, skills, and tools necessary for computing practice	Objective 1, Student Outcomes 1,2, 3
(j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.	Objective1, Student Outcomes 1,2, and 3
(k) An ability to apply design and development principles in the construction of software systems of varying complexity	Objective 1, Student Outcomes 1, 2.2

C. Process for the Establishment and Revision of the Student Outcomes

All course instructors who teach courses with outcomes tied to the program student learning outcomes assess and evaluate their courses each semester. This data is entered on the Department assessment website for archival. At the end of the academic year the Assessment Committee reviews these data to see if changes are needed either to specific courses or to the outcomes themselves. In addition, instructors can suggest changes to course content, delivery methods or assigned student learning outcomes. The Assessment Committee review both annual data and ongoing instructor feedback. If changes are recommended by the committee, any such recommendations are sent to the full faculty for

discussion and voting. See Appendix H for a chart showing which courses in the program are used to evaluate student learning outcomes.

D. Enabled Student Characteristics

The 11 ABET Student Outcomes are mapped to the Department Student Outcomes in Table 3-1. The 9 student outcomes are mapped to the four Program Educational Objectives in Table 3-2. The 9 Student Learning Outcomes are mapped to performance criteria in one or more required courses in the program as shown in the Curriculum Map in Appendix H.

Table 3-2. Mapping of program student learning outcomes to program educational objectives.

Student Learning Outcomes	Program Educational Objectives			
	1	2	3	4
1	•			
2	•			
3	•			
4		•		
5		•		
6			•	
7			•	
8			•	
9				•

SECTION 4. CONTINUOUS IMPROVEMENT

The mission of the Bachelor of Science in Computer Science (BSCS) program is to provide graduates with the fundamental knowledge and habits of critical thinking required for future leadership roles in the numerous fields that depend on the underlying discipline of computer science. We intend to give each graduate a foundation in both the theory and the practice of computer science and to prepare each graduate to take advantage of opportunities for generating new knowledge after graduation. We intend to introduce each graduate to the challenges and joys involved in research that leads to new kinds of computer software and hardware. We intend to provide the knowledge and skills necessary to foster a commitment to lifelong learning and ethical behavior. The faculty believes the mission can only be accomplished through a commitment to assisting student learning through analysis and application, continuous improvement of the program through assessment and evaluation of student needs, and responsiveness to changes in the discipline within a global, social and ethical context.

Our process for regular assessment and evaluation is adopted from the ABET 2012 Symposium sample Self-Study Report from the Lebanese American University and follows the flow shown in Figure 4-1. Definitions of terms used in the flow chart are shown in Table 4-1. The definitions are consistent with similar terms in the ABET Self-Study Questionnaire: Template for a Self-Study Report 2015-2016 Review Cycle.

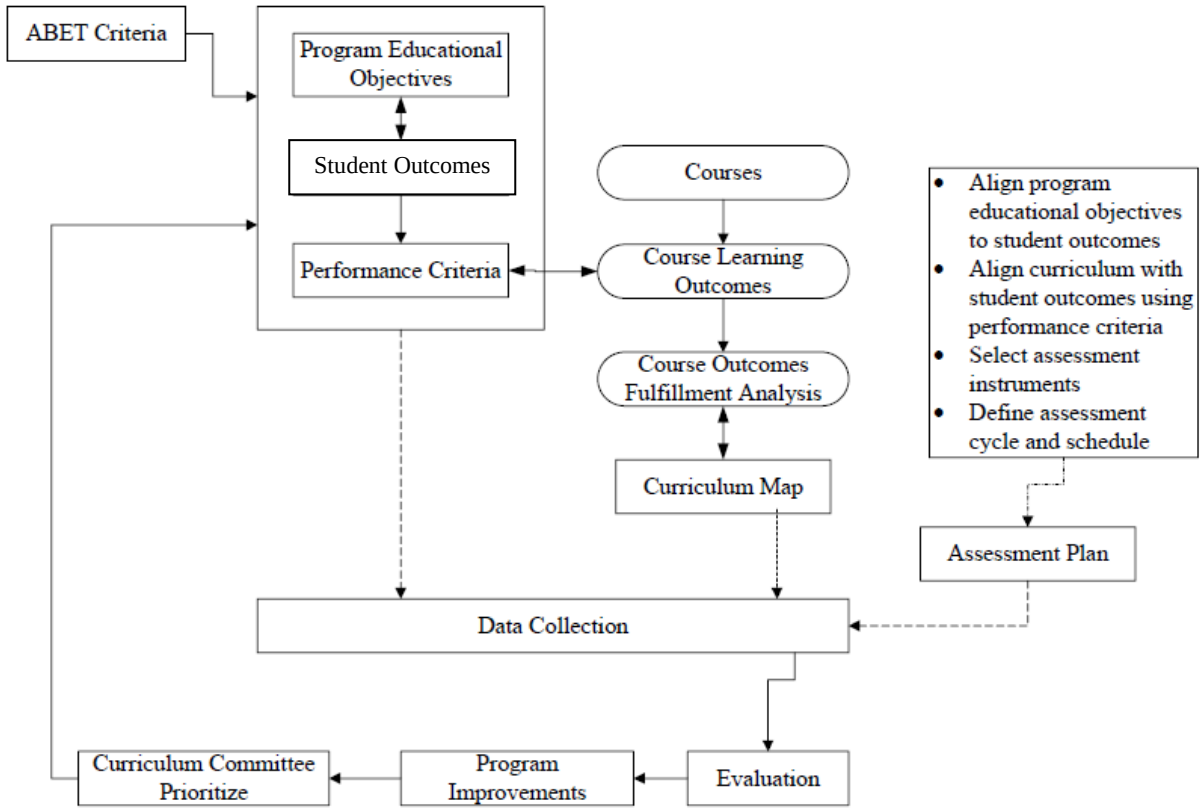


Figure 4-1. The Department's continuous improvement process.

Table 4-1. Definition of terms (from the ABET 2012 Pre-Symposium Workshop).

ABET Terms	Definitions
Program Educational Objectives	Broad statements that describe what graduates are expected to attain within a few years after graduation. They are based on the needs of the program's constituencies.
Student Outcomes	Student outcomes describe what students are expected to know and able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program.
Performance Indicators	Specific, measurable statements articulating the key characteristics of the outcome. They enable faculty to "know it when they see it."
Assessment	Assessment is one or more processes that identify, collect, and prepare data to evaluate the attainment of student outcomes and program educational objectives. Effective assessment uses relevant direct, indirect, quantitative and qualitative measures as appropriate to the objective or outcome being measured. Appropriate sampling methods may be used as part of an assessment process.
Evaluation	Evaluation is one or more processes for interpreting the data and evidence accumulated through assessment processes. Evaluation determines the extent to which student outcomes and program education objectives are being attained. Evaluation results in decisions and actions regarding program improvement.

A. Program Educational Objectives and Student Outcomes

Table 4-2 shows the frequency with which the assessment processes from Figure 4-1 are carried out, and the program constituents responsible for providing the feedback.

Table 4-2. Frequency of Assessment Data Collection.

Constituent Providing Feedback	Assessment Process	Frequency
Instructors	Student Performance in CS Courses on Program SLOs	Once per long semester
Students	Student Course Evaluations	Once per long semester
Students (graduating seniors)	Exit Interview	Once per year
Students (graduating seniors)	Exit Survey	Once per year
Alumni	Alumni Survey	Once per year
Advisory Board	Advisory Board Questionnaire	Once per year
Educational Testing Service (ETS)	Major Field Test	Once per long semester

Below we present each of the assessment processes listed in Table 4-2 in more detail, including:

1) How the data is collected;
2) Is the data direct or indirect;
3) What is the target level of attainment;
4) How the results are documented and maintained.

Student Performance in CS Courses on Program SLOs

This data is collected by instructors during the semester the course is taught and is a direct assessment of student learning outcomes. The procedure for assessment of student performance varies by outcome and by course and can include performance measurements from assignments, tests and rubrics. Those procedures are listed in Appendix E.1. Student performance data is only included in these assessments for students who successfully pass the course. For COSC 1336 and 1337 a grade of 'B' or better is required to pass the course. Otherwise, students are required to retake the course. For all other courses, a 'C' or better is required to pass a course. We take this approach because we want to assess the quality of performance for students who are at least minimally progressing through our program. For students below the minimal level of progression, we do not feel it is appropriate to include that data since it would not provide an accurate overall view of student performance for students who complete our program of study.

Our target for the level of attainment of student performance on course assessment instruments is 80% or better.

The results of these direct assessments are uploaded at the end of each semester on our internal Department assessment website. Also, each summer, an extensive annual ABET report is created (similar in scope to this self-study) and archived on the Department website. These annual assessment reports are available to the public.

Student Course Evaluations

This data is collected via an online submission system for evaluations administered by the University. This data is an indirect assessment of student learning outcomes. A common evaluation form is used for all computer science courses and is listed in Appendix F.1.

Our target for the level of attainment on student evaluations for each course is 3.75 or better on a 5.0 scale.

The results of these indirect assessments are sent to the Department Chair after the conclusion of each long semester via an email link that allows both the Department Chair and individual instructors to view the assessment data in a web-hosted environment. This online data is archived by the University and can be reviewed when needed. In addition, this data is included in the Department Annual ABET Report. Data from this year (2015-2016) is listed in Appendix G.3.

Exit Interview & Exit Survey

This data is collected in COSC 4272 and indirect assessments. A common form is used for both the Exit Interview and Exit Survey. The Exit Interview form is listed in Appendix F.2. The Exit Survey Form is listed in Appendix F.3.

See Appendix E.2 (Criteria for Satisfactory Performance) for a complete listing of the targets for level of attainment on the Exit Interview and Exit Survey.

Results are maintained by the Department secretary and a summary of the results are included in the Department Annual ABET Report. Data from this year (2015-2016) is listed in Appendix G.4 (Exit Interview) and G.5 (Exit Survey).

Alumni Survey

This data is collected via U.S. mail and is an indirect assessment. A common form is used and is listed in Appendix F.4. The survey is sent to alumni who have graduated at least 3 years previous and not more than 8 years and who have not responded to another alumni survey.

See Appendix E.2 (Criteria for Satisfactory Performance) for a complete listing of the targets for level of attainment on the Alumni Survey.

Results are maintained by the Department secretary and a summary of the results are included in the Department Annual ABET Report. Data from this year (2015-2016) is listed in Appendix G.6.

Advisory Board Questionnaire

This data is collected by providing Advisory Board members a paper copy of the questionnaire during the day-long Advisory Board meeting each spring. The questions and responses for this year are listed in Appendix G.7.

Since this data is neither a direct nor an indirect measure of the program, there is no specific level of attainment expected. The information gathered is used by the Department to better understand more fully the needs of these constituents. Thought-provoking ideas are relayed to the general faculty for discussion as appropriate.

Results of the questionnaire are included in this self-study, and we expect to continue to document these results in each annual ABET report.

Major Field Test

This data is an indirect measure of the program. The test and the contents of the test are administered by the Educational Testing Service (ETS).

See Appendix E.2 (Criteria for Satisfactory Performance) for a complete listing of the targets for level of attainment on the Major Field Test.

Results are maintained by the Department secretary and a summary of the results are included in the Department Annual ABET Report. Data from this year (2015-2016) is listed in Appendix G.8.

B. Continuous Improvement

The process of gathering, archiving, assessing and summarizing the data used to continuously improve the program culminates in meetings of the Department Assessment Committee during the spring and summer semesters. See Appendix J for a complete list of meeting minutes of this committee during the 2016-2017 year. Based on direct and indirect measures, the committee makes recommendations for improvement. These are summarized by outcome. There are 15 individual program student learning outcomes. See Appendix G.1 for a complete list by outcome of the analysis of direct and indirect results from the 2016-2017 assessment cycle as well as recommendations for actions and second-cycle results, if any. The second-cycle results represent follow-up actions based on actions recommended during the previous year assessment.

Detailed analyses of the assessment and actions taken, by outcome, are included in each annual ABET report, including this report (Appendix G.1). Annual ABET reports are available publicly at http://cs.lamar.edu/abet/abethome.htm. Following are summaries of the most important actions taken to improve the program during each of the last five years.

Changes made in 2017

These changes will take effect in the 2017-2018 academic year.

1. Based on the feedback from members during our annual Advisory Board meeting in 2017 we modified our Program Educational Outcome #4 as follows:

   PREVIOUS VERSION
   Graduates of the Computer Science Program will demonstrate intellectual curiosity and the independent study skills necessary for life-long learning.

   MODIFIED VERISON
   Graduates of the Computer Science Program will **be able** to demonstrate intellectual curiosity and the independent study skills necessary for life-long learning.

2. We removed student evaluation questions 25, 26 and 29 for CPSC 4340 for Outcome 1 from Sources of Data for Evaluations for Learning Outcomes (see Table E.2). This was done based on feedback from the primary instructor who indicated those questions were not relevant to that course.

3. Based on feedback from faculty who teach courses in which design documentation is an important part of their courses, we modified question 31 on the student course evaluations as follows:

   PREVIOUS VERSION
   This course provided you instruction on the proper documentation of source code.

   MODIFIED VERISON
   This course provided you instruction on the proper documentation of design or source code.

4. Change the networking course number from CPSC 3320 to CPSC 4317.

5. Add COSC 2375 to "Introduction" strategies in curriculum map for Outcome 2.3, performance criteria 2.3.4.

6. Removed ETS scores for Outcome 3 (Scientific Method) and Outcome 6 (Collaborative Work Skills) Sources of Data for Evaluations of Learning Outcomes – Indirect Measures (see Table E.2 and image below) based on the consensus of the Assessment Committee that this data was not particularly relevant for these outcomes.

2.6	CPSC 3320	28,30,38,39,40				
2.7	COSC 2372	27,31,35,40				
	COSC 4310	35,38,40				
3	COSC 2336 CPSC 3320 COSC 4310	37,38,40 37,38,40 35,37,38,40	3,4,6,7		3,4,6,7	~~The 3 Assessment Indicators (Programming, Computer Organization, Algorithms and Theory)~~
4	COSC 1172 COSC 3325 [illegible]	41 41 41	5,9		5,9	

7. COSC 3304 will add additional assignments on designing algorithms and a separate design exam to help better assess student's ability to develop correct and efficient algorithms.

C. Additional Information

Copies of assessment instruments for indirect measures are listed in Appendix F. Direct measure instruments include individual course rubrics plus assignments and test questions

used to assess ABET-related student learning outcomes. At the end of each semester, instructors upload and archive these assessment instruments to the Department internal website. Procedures for utilizing assessment instruments, both direct and indirect, in the Department's assessment methodology are given in Appendix E.

Meeting minutes of the Assessment Committee during 2016-2017 are listed in Appendix J. Meetings minutes of other committees are archived by the Department secretary. These include minutes from general faculty meetings as well from Undergraduate Curriculum Committee meetings if those meetings were relevant to the assessment and continuous improvement process.

SECTION 5. CURRICULUM

A. Program Curriculum

1. Our BSCS program has the following four objectives:

    a. Graduates will be able to demonstrate skills in problem solving and sufficient technical expertise to begin either immediate employment or advanced study in Computer Science.
    b. Graduates will have sufficient awareness of the societal impact of technology and of the ethical issues in computer science to make decisions regarding their personal and professional responsibilities.
    c. Graduates of the Computer Science Program will have the critical thinking, communication, teamwork, and leadership skills necessary to function productively and professionally.
    d. Graduates of the Computer Science Program will demonstrate intellectual curiosity and the independent study skills necessary for life-long learning.

    The curriculum has been aligned with the program educational objectives in the following ways:

    Clearly, we expect the curriculum to prepare our students for employment and/or graduate study. Consequently, our students must learn the material concerning analysis, design, implementation, and testing of software. Also, our students must be shown problems that require construction of mathematical models and algorithms that represent solutions. Our curriculum not only teaches students how to do this but also how to translate the solutions into computer programs. Programming Fundamentals I, II, and III, Algorithm Design & Analysis, Software Engineering, Database Design, Computer Architecture, Operating Systems, and many other courses contribute to the achievement of Objective I.

    Objective II is directly addressed in COSC 3325, the Computer Law and Ethics course, but other courses also mention issues in societal impact and ethics. Some of these courses are Computer Networking, Database Design, Thinking, Speaking, and Writing in Computer Science, and Senior Seminar.

    Objective III is addressed by a set of courses that has been designated to include oral communications, written communications, and team projects. These courses are as follows: Oral Communications: COSC 3325, CPSC 4360, and COSC 1172; Written Communications: COSC 3325, CPSC 4360, COSC 1172, CPSC 4340, and COSC 4302; Team Projects: COSC 1172, CPSC 4360, CPSC 4340, and COSC 4302.

    Objective IV is addressed in the curriculum by courses that require the student independently to find resources in the library or online to solve new problems. Courses

like Thinking, Speaking, and Writing in Computer Science, Computer Law and Ethics, Senior Seminar, and Database Design require practice in independent study skills. Lifelong learning is directly discussed with every graduating senior in COSC 4272: Senior Seminar.

Students are well prepared for graduate studies. In particular, Table 5-1 shows how required courses in the BSCS curriculum prepare our students for the core M.S. courses at Lamar University.

Table 5-1. Mapping of required BSCS courses to MS core courses

Required B.S. Courses	M.S. Core Courses
CPSC 4360 (Software Engineering)	CPSC 5360 (Software Engineering)
COSC 4302 (Operating Systems)	COSC 5302 (Advanced Operating Systems)
COSC 3304 (Algorithm Analysis and Design)	COSC 5313 (Algorithm Analysis and Design)
CPSC 3320 (Computer Networks)	COSC 5328 (Computer Networks)

3. The curriculum in the BSCS degree plan and associated prerequisite courses have been structured to support the attainment of the student outcomes

   The details of our current Curriculum Map are in Appendix H.

4. The flowchart shown in Figure 5-1 illustrates the prerequisite structure of our BSCS program's required courses.

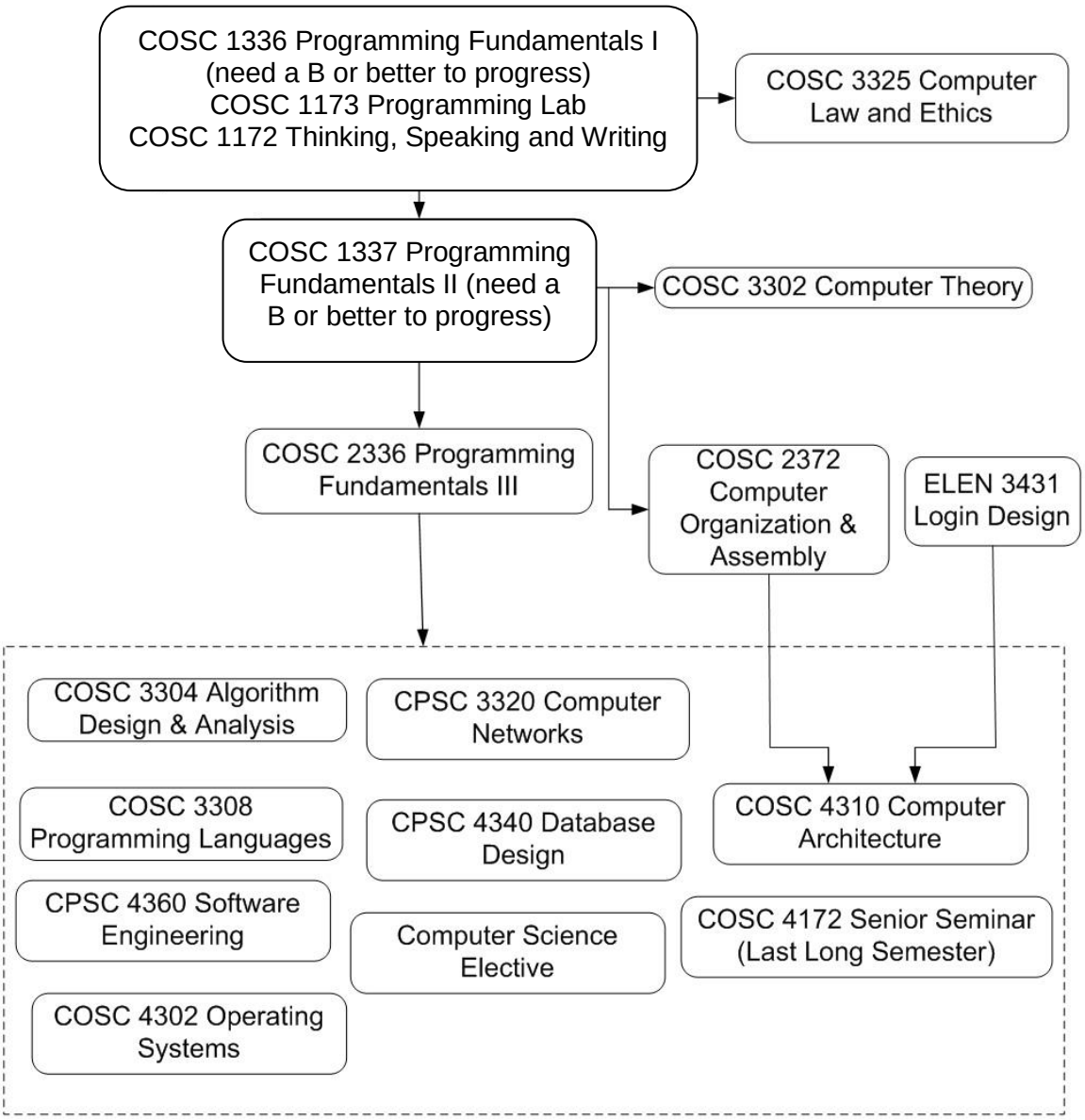


Figure 5-1. Prerequisite Chart of Computer Science Courses

5. The total credit hours required for our BSCS degree is 121 hours.

   a. Computer science: One and one-third years that must include:

      i. Coverage of the fundamentals of algorithms, data structures, software design, concepts of programming languages and computer organization and architecture.

      The core materials of our BSCS degree plan provide basic coverage of algorithms, data structures, software design, concepts of programming languages, and computer organization and architecture.

Required Computer Science courses cover these areas:

COSC 1172 Thinking, Speaking, and Writing
COSC 1173 Programming Lab I
COSC 1174 Programming Lab II
COSC 1336 Principles of Computer Science I
COSC 1337 Principles of Computer Science II
COSC 2336 Data Structure & Algorithms
COSC 2372 Computer Organization & Assembly
COSC 3304 Algorithm Design & Analysis
COSC 3308 Survey of Programming Languages
CPSC 4360 Software Engineering

ii. Introduction to a variety of programming languages and systems.

The core materials of our BSCS degree plan require the use of a variety of programming languages, such as Assembly, Java, C++, and C. In Design of Programming Languages (COSC 3308), students are introduced to a variety of language concepts used in declarative, functional, concurrent, object-oriented programming languages, and others that illustrate different language paradigms. They also require the use of a variety of systems, such as Windows, Linux, Solaris, and MacOS.

iii. Proficiency in at least one higher-level language.

Java Language is required in COSC 1336 Programming Fundamentals I, COSC 1337 Programming Fundamentals II, and COSC 2336 Data Structures. Proficiency in Java is enforced by requiring a minimum of a 'B' grade in COSC 1336 and COSC 1337. Moreover, students in some junior and senior level courses (such as CPSC 4360 Software Engineering) use Java Programming Language to finish projects. Students are expected to be proficient in Java Programming Language upon completing these courses.

iv. Advanced course work that builds on the fundamental course work to provide depth.

Students pursuing the BSCS degree may study the following advanced topics:

<u>Software Systems</u>: COSC 3304, COSC 4302, CPSC 4360.
<u>Computer Networking</u>: CPSC 3320 and two of (COSC 4345 or CPSC 4320 or Computer Forensics (which is currently running as a special topics course COSC 4301)).
<u>Database Systems</u>: CPSC 4340 and two from COSC 4301 Data Mining (special topic), COSC 4301 Bioinformatics (special topics), or any other COSC 4301.
<u>Theory of Computer Science</u>: COSC 3308, COSC 3302.
<u>Computer Architecture</u>: COSC 4310.

Students also select to take Computer Security, Real Time System, Embedded System, Graphics, Game Development, Artificial Intelligence, Machine Learning, Multimedia Processing, Network System Administration, and Simulation as COSC/CPSC electives.

b. One year of science and mathematics

i. Mathematics.

Students pursuing the BSCS degree are required to take the following Mathematics courses (21 hours):

COSC 2375 Discrete Structures
MATH 3328 Linear Algebra I
MATH 2413 Calculus and Analytic Geometry I
MATH 2414 Calculus and Analytic Geometry II
MATH 3435 Calculus and Analytic Geometry III
MATH 3370 Introduction to the Theory of Statistical Inference

ii. Science.

Students pursuing the BSCS degree are required to take three of these courses from the following Lab Science courses (12 hours), in no particular sequence:

BIOL 1406 General Biology I
BIOL 1407 General Biology II
CHEM 1411 General Chemistry I
CHEM 1412 General Chemistry II
PHYS 2425 Calculus-based Physics I
PHYS 2426 Calculus-based Physics II

6. The program does not allow cooperative education to satisfy curricular requirements specifically addressed by either the general or program criteria.