

INSTRUCTIONAL PROGRAM REVIEW

Spring 2016

Program Name: Computer Science

Division Name: Computer Science, Digital Media, Digital Arts, Design

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INSTRUCTIONAL PROGRAM REVIEW PROMPT: Computer Science

PROGRAM INFORMATION:

Assume the reader does not know anything about your program. Briefly describe your program and how your program supports one or more of [Golden West College's mission and goals](#). **This description will likely be used on your department's website.**

College's mission (check all that apply)

- Basic Skills
- Career Technical Education
- Transfer
- Offer Degrees/Certificates

College goals(check all that apply):

- Institutional Mission & Effectiveness
- Instructional Programs
- Student Support Services
- Library and Learning Support Services
- Student Engagement
- Student Equity
- Human Resources
- Facilities & Campus Environment
- Technology
- Fiscal Resources
- Planning Processes
- District Collaboration
- Community Relations
- Business, Industry, Governmental Partnerships

Program Contributions: Describe how your department contributes to the campus. Consider areas such as diversity, campus climate, student success, campus processes, student support, and other college goals below.

The Computer Science Department, under the Division of Career and Technical Education, offers courses to serve three student categories:

1. Transfer: Computer Science, Business major students, Engineering, and various science major students can satisfy most, if not all their first-and second year Computer Science course requirements for transferring to University of California,

California State University, or any of the other accredited four-year colleges or universities.

2. Software Development Vocation: A portfolio of up-to-date software development courses prepare students for rewarding careers in the fast growing field of computer programming, systems analysis, or a number of other computer related professions.
3. Video Game Development Vocation: As a 20-unit California State approved certificate, this career path prepares students in various careers in video game programming, 3D animation, computer simulation or 3D modeling. Our strong partnership with some of the best companies in the industry (like Shiny, Point of View, and Activision) provides students with possible internships and permanent jobs.

Computer Science department continues to add high-quality courses on campus and online to improve student access. In the fall of 2009 the intro to programming was modified to provide fundamental programming for both the traditional software path and the game programming path of instruction.

On another front, the school and department has signed and implemented a training and programming agreement with Apple computer as well. In spring 2011, we began instructional training for students to write programs in Objective-C allowing them to write apps for the iPhone and iPad.

Computer Science AS-T degree (Transfer Model Curriculum)

At the beginning of the spring semester of 2013 the department completed coordination with Cal State schools and departments for Transfer Model Curriculum. The department now satisfies the ACM/IEEE recommendation for a four semester introductory sequence of computer science courses as well as the mathematics and physics courses. Two of the four computer science courses equivalent to CS 1 (Comp 122) and CS 2(Comp 132) on the ACM/IEEE list were already in place and Computer Architecture & Organization (Comp 142) started in fall 2013. The fourth course on the list, Discrete Structures (Comp 152), started spring 2014.

External Requirements: Indicate any requirements that are imposed on your program by the state, federal regulations, or other external accrediting bodies (if applicable).

Not applicable.

REVIEW OF LAST CYCLE PROGRAM REVIEW

Provide assessment of your previous program review initiatives. Summarize any accomplishments that your program achieved. (2 pg limit)

Full time faculty. Beginning with fall 2015, the second full time faculty was added to the department. This was a tremendous achievement considering the budget improvement which allowed to offer more sections. The addition of new faculty made possible curriculum review and realignment for Video Game Development.

Curriculum development for Transfer Degree: The department obtained C-IDs for all courses that matched with the ADT Template. In addition to Computer Science C-IDs, one more ISIT C-ID was obtained for CS G130.

Outreaches: Computer Science had a much more visible presence during Preview Day. More high school students were engaged in dialog over the details of degrees and certificates offered along with opportunities for transfer and internships. During the Pathway Days, the department offered meaningful and engaging workshops. This increase of presence is due to a better collaboration between Computer Science and Digital Media, Digital Arts, and Design departments. Also, Computer Science students are increasingly more involved with the local outreaches through the Computer Science Club that was created in the spring of 2015.

FOR CTE PROGRAMS ONLY

Labor Market Demand: How is your program meeting labor market demands? Should you expand, contract or stay the same? Is there competition from other programs in the area? If yes, from what institution? How is the competition affecting your program? Are there any other external factors about which you are concerned?

The Computer Science program at GWC is fulfilling local labor market demands. Graduates of our Computer Science program have the skills that are in demand. There are similar community colleges having Computer Science programs in southern, but labor data indicates that 30% of employers and 10% of software publishing companies in California are in our area. This indicates ample opportunity for finding jobs at all levels of academic and skill development. The kinds of skills graduates of the GWC Computer Science program obtain will long be in demand in southern California. However, as southern California becomes more and more developed, there is a concern that GWC graduates will need to improve their skills past the entry level in order to secure a job.

VTEA Core Indicators: When reviewing the state VTEA core indicators, what are the trends that contribute to or impede student success? Why is this occurring?

- Core Indicator 1: Technical Skill Attainment

The Computer Science program has met the goal for Core Indicator 1 of having 87.72% of program students achieve a GPA of 2.0 or higher every year for the last three years. The program has managed to achieve relatively high success rates

among its students. The additional lab sessions and academic tutoring services that were implemented several years ago have helped increase student success rates.

- **Core Indicator 2: Completions, Certificates, Degrees and Transfer Ready**
The Computer Science program has met the goal for Core Indicator 2 of having 83% of program students earn a certificate or degree at GWC or successfully completing 60 UC/CSU transferable units in one of the last three years. While success and persistence rates are relatively high in the program, the overall number of degrees and certificates awarded is slightly lower over the last three years. One big reason is the State Chancellor not approving our ADT (Associate Degree for Transfer) which forced many students to transfer without a degree.
- **Core Indicator 3: Persistence in Higher Education**
The Computer Science program has met the goal for Core Indicator 3 of having 87.92% of program students persisting in higher education (after earning at least 12 credits) every year for the last three years. Regular interaction with students and follow-up with any students who haven't registered for the following semester has helped keep persistence rates relatively high.
- **Core Indicator 4: Employment Rate**
The Computer Science program has met the goal for Core Indicator 4 of having 51.32% of program completers (those who did not transfer to another institution) in paid employment or an apprenticeship program every year for the last three years. The relationships program faculty have developed with the industry has helped students.
- **Core Indicator 5: Non-Traditional Student Participation Rate**
The Computer Science program has not met the goal for Core Indicator 5 of having a participation rate for students in non-traditional fields of 24% in any of the last three years. The participation rate for students in non-traditional fields for the GWC Computer Science program was scarce each year. The program has had a difficult time recruiting students beyond White and Asian males to the program. Many students have reservations for the computer field due to high demand for math background.
- **Core Indicator 6: Non-Traditional Student Completion Rate**
The Computer Science program has not met the goal for Core Indicator 6 of having a completion rate for students in non-traditional fields of 28% in any of the last three years. The success rates of non-traditional students has consistently been lower than those of White and Asian male students. This is partly due to other students not feeling capable to overcome the lack of math readiness. More work needs to be done to fully connect these students to the program even as they complete necessary remedial work.

Advisory Council Input: What type of inputs have your program received from your industry advisory council in the last three years?

At the time of writing this document there is no available input

SWOT ANALYSIS

Strengths:

- What does your program do well?
- What do you believe your students, potential employers, or transfer institutions see as your program's strengths?

Computer Science course offering matches both transfer requirements and industry demands for junior level software/game developers. The department teaching rigor is equipping students with solid, foundational knowledge and skills that are bound to make them successful both in the job place and with transferring to a university. Our strength is derived from a constant update and implement for the latest developments in the field of software and game development.

Weaknesses:

- In what areas does your program need to improve?
- What are your program's immediate needs?
- What limitations or barriers is your program experiencing?

We are currently experiencing an upward swing in terms of course offerings and budgetary support. An immediate area of improvement is for the variety of course offerings in addition to the core ones that the program was reduced to in the years past. A closely related need would be adding faculty support to match the increase in course offering. In absence of new full time faculty, any program growth would have to be supported by part time faculty which in itself is a limiting factor. Another limitation to growth is the equipment update turnaround. New technology requires new, more powerful equipment. This demand is imposed by the industry and cannot be satisfied by Computer Science department due to budgetary and procedural restrictions.

Opportunities

- What opportunities exist for your program?
- What trends are happening in the field or subject area that may allow your program to expand?
- What external funding opportunities are available for your program?
- What potential industry, high school, college/university or other external partnerships can be established or expanded to benefit your program?

Computer Science has a continuous stream of opportunities associated with the evolution of computing technology. Mobile application, virtual/augmented reality, robotics, networking, cybersecurity are just few of the areas in which Computer Science can grow.

External funding is one the priority items for Computer Science and remains to be explored as staff support becomes available.

Through Pathways Days program we already have established relationships with surrounding high schools. Since most of our students are transferring, the department is relying on counseling and articulation departments to keep us updated on any issues.

Computer Science department is in rebuild mode. Just recently one more full time faculty was added bringing the total to two. This is from downsizing from seven full time faculty to less than one in less than a decade. The effort is ongoing and it would take some time for industry partnerships to be developed. They will happen, and the department is planning for time when we can recommend students for internships and co-op work.

Threats/Challenges

- What challenges exist for your program?
- What budgetary constraints is your program facing?
- What kind of competitive disadvantages is your program facing?
- Are there upcoming changes to state and federal regulations that will impact your program? If so, please explain.

The most pressing challenge for Computer Science is to stay up to date with technology development. Even in a budgetary windfall, not all equipment and software can be brought up to date. The advantage is that computing advancement is an evolutionary process and we are right there, close to the leading edge with the course offering and equipment support. One competitive disadvantage is the size of Computer Science department at surrounding colleges. At this time we are not aware of any regulatory changes that would impact Computer Science program.

CURRICULUM REVIEW

Course Outlines of Record: It is expected that all Course Outlines of Record (CORs) will be reviewed every three years. Starting in summer 2016, courses featured in the College Catalog will directly link to the courses' official CORs. It is crucial for all CORs to be reviewed to ensure their accuracy. Upon reviewing the courses in your disciplines through [CurricUNET](#), please provide a 3 year timeline of when all of the CORs under your disciplines will be reviewed. Please follow the table format below.

CORs needing review/ revision	Timeline to complete review	Person responsible
CS G101	October 2017	Smallwood, G.
CS G102	October 2017	Smallwood, G
CS G121	October 2017	Smallwood, G
CS G127	October 2016	Racataian, C.
CS G130	October 2017	Smallwood, G
CS G135	March 2017	Racataian, C
CS G145	October 2016	Racataian, C.
CS G147	March 2017	Smallwood, G
CS G148	March 2017	Smallwood, G
CS G149	March 2017	Smallwood, G
CS G150	March 2017	Smallwood, G
CS G153	October 2018	Racataian, C.
CS G154	October 2018	Racataian, C.
CS G167	March 2018	Smallwood, G
CS G168	March 2018	Smallwood, G
CS G170	March 2019	Smallwood, G
CS G171	March 2019	Smallwood, G
CS G175	October 2018	Racataian, C.
CS G176	October 2018	Smallwood, G
CS G177	October 2018	Smallwood, G
CS G178	March 2018	Smallwood, G
CS G179	March 2018	Smallwood, G
CS G185	October 2016	Racataian, C.
CS G189	March 2019	Racataian, C.
CS G193	March 2018	Racataian, C.
CS G194	March 2018	Racataian, C.
CS G195	October 2018	Racataian, C.
CS G196	October 2018	Racataian, C.
CS G198	March 2017	Racataian, C.
CS G242	March 2019	Racataian, C.
CS G262	Match 2019	Racataian, C.

C-ID Designation: In 2006, the Academic Senate for California Community Colleges developed the [Course Identification Numbering System \(C-ID\)](#). This system improves curricular consistency for courses throughout the state and provides many articulation/transfer benefits to our students. Many courses at Golden West College have been approved for C-ID alignment. Please review the list provided by Office of Research, Planning, and Institutional Effectiveness and discuss the following:

1. Does your department plan to submit more courses for C-ID designation? If yes, which ones? (These courses may or may not be part of an ADT. See C-ID.net for more information regarding courses, descriptors, and ADTs.)

The department will check regularly with the C-ID listing from the chancellor office and submit any further designations that might become available. At the present time, all C-ID designations have been approved.

Dual-listed courses: Review the list of dual listed courses in your area and complete the following chart.

Dual Listed Courses	Date of Faculty Discussion and Review	Recommendations
No dual listed courses in CS		

Curriculum Offering: Review the list of active courses in your programs that were offered and not offered in the last three years. Based on your review, what courses could you add, suspend, or retire to improve your overall program to ensure student success? (Data provided by ORPIE)

Course Name	Recommended Action (add/suspend/retire)
CS G185	Add
CS G127	Add
CS G171	Add
CS G135	Add
CS G171	Add
CS G193	Suspend
CS G194	Suspend
CS G177	Suspend

PROGRAM DATA AND ANALYSIS (Items in black font are provided by ORPIE)

SLO Assessments

List of courses with ongoing assessment

List of courses offered in the last 3 years that have not been assessed

Question:

- Looking at all assessments of your programs and courses, describe proposed plans for improvement.

Majority of courses with no assessment have been taught by part-time instructors. The department needs to improve communication with these instructors and provide them with assistance for proper and timely evaluation. Out of 31 active courses, 15 of them have not been offered during 2013-2015. Out of the 15 not offered, 5 will be added to the schedule for the next 3 years, and 3 courses will be suspended. The rest of 7 courses that were not offered will be considered for scheduling as soon as the full time faculty support improves. For the courses that are offered and have no assessment, we will compile a list with priority for evaluation during the next two terms. The list of courses will be distributed to all instructors in Computer Science, and reminders will be provided at appropriate times. The assessment provided indicated a good rate of success which is reflected also by the data indicating an average success rate of 67% for the past 3 years. One of the recurring areas of improvement is student poor time management. This is due to the fact that most of the sections are in the evening when students seemed to be less focused due to tiredness. Plans of improvement were highlighted by each individual instructor to overcome this issue and to improve the success rate overall.

Student Demographics (Headcount by Discipline)

- Gender
- Age
- Ethnicity
- Disability
- Economic Disadvantage
- Veteran
- Foster Youth

Comparison to GWC

Questions:

- How does your student population compare to GWC's general student population?
The Computer Science program serves mostly Asian, White and Hispanic predominantly males. The percentage of American Indian, Native Hawaiian/Pacific Islander, and African American students is much lower than the college average. For instance, only 31% of students in 2014-2015 were female, 0.1% were American Indian, 0.2% were Native Hawaiian/Pacific Islander, and 2% were African American.

- **Based on the trend that you're seeing, what type of adjustments would you make to your program?**

Like other programs on campus, the Computer Science program has faced challenges in diversifying its student population. We will continue outreach to all students on campus to try and get more interested in computer science. We will also try to bring employers on campus for informational sessions to dispel some of the myths students may have about careers in computer related fields.

Program Enrollment (Filter by: Discipline, Session Type, Large Lecture Factor)

Enrollment at Census

Sections Offered (by CRN)

Fill Rate at Census

FTES/FTEF

Questions:

Consider sections offered, session type, and your current PT faculty pool as part of your analysis.

- What factors have contributed to your trends in enrollment, sections offered, and fill rate?

The overall enrollment rates for Computer Science courses has increased over the last three years (from 857 in 2012-2013 to 1093 in 2014-2015). This is somewhat consistent with the college as a whole, though the increase in Computer Science has been more pronounced.

- Based on your review of the data, should you increase, decrease, or keep the same number of sections offered?

Computer Science will increase the number of sections being offered. Courses that in the past were dropped from the schedule because of budget and faculty availability will be reintroduced in the next three years.

- How does your department average FTES/FTEF compare to college-wide average FTES/FTEF?

Computer Science average is at 39.1 which is higher than the GWC total of 35.8. These numbers support the higher enrollment that Computer Science program is experiencing.

Course Retention and Success

Overall

By Ethnicity, Age, Gender

By Large Lecture

By Session Type (Day, Evening, Hybrid, Online)

Questions:

- Looking at success rates for different demographic groups (age, gender, ethnicity), which groups are experiencing disproportionate impact (success rates for those groups are lower than the average success rates) in student success?

Overall retention and success rates in Computer Science courses is relatively high, though some student groups do have consistently lower success rates (the overall retention and success rates in 2014-2015 were 86.4% and 68.8%, respectively). The students who consistently have lower success rates are Hispanic students, and students with disabilities. The success rate for Hispanic students was 62%, compared with the overall success rate of 72%. Likewise, the success rate of students with disabilities

was 54.2%, compared with a success rate of students without disabilities of 69.4%.

- **If there are student groups experiencing disproportionate impact, what's your department's plan to address the disproportionate impact?**

Faculty will closely monitor student progress in each course and identify students early on in the semester who are falling behind. We will work with the counseling department to identify students with risk factors associated with failing a course so faculty can focus especially on those students. We will offer students at risk of failure extra academic support in the program. If we have sufficient resources, we would like to involve these at risk students with extracurricular activity groups of more advanced students to receive tutor/mentor support.

Degrees and Certificates

Number of degrees and certificates conferred in the last 6 years

Completers are defined

Questions:

- **Based on the number of degrees/certificates you are awarding, discuss any differences between your expectations and actual numbers.**

The number of degrees and certificates awarded in Computer Science has declined slightly over the last two years. The total number of certificates and degrees awarded in 2014-2015 was 4 (compared with 6 in 2013-2012 and 5 in 2012-2013). This low number is due to the overall movement of the program from no full time faculty to just one (1) since fall 2012 and two (2) since fall 2015. This is a reconstruction period when sections and courses are being offered for the first time in a decade. One other contributing factor is in the way scheduling of classes was conducted in the years past when one capstone course was not offered for 2 years. Thus, students were not able to obtain their certificate or degree. Another equally debilitating factor is the inability to obtain Computer Science ADT approval from the State Chancellor office. We were denied because of 2 extra units that are there because of Math and Physics courses that are 5 units each. Our hopes are high since we've seen the deciding agents relaxing the way units are counted for few other science disciplines. With the ADT approved, our certificate and degree numbers should increase considerably.

- **Please answer this question for programs that have fewer than 10 completers in the last 6 years: What strategies will you implement within your department to increase/attract completers or majors?**

While we have more than 10 completers in the Computer Science program each year, we still need to work to raise the overall completion rate. The

strategies mentioned above to increase student retention and success rates will help more students persist to graduation as well. We will have faculty do additional targeted outreach toward the end of the semester to students who have not yet registered for the following semester (if applicable) in order to try and get more students persisting from term to term.

Faculty Staffing

Percentage of courses taught by full-time versus part-time faculty

- **In recent years, what successes/challenges have you had in hiring and retaining qualified part-time faculty?**

Orange County is rich with computer programmers, but the challenge is in offering competitive compensations. Many part-time faculty would like to teach more than just one course which makes it hard to schedule when there are not enough sections being offered. For the time being, we are enjoying working with a solid, reliable pool of part-time instructors. However, looking ahead, we need to keep pursuing the possibility of more part-time instructors being added to the program.

- **Based on your department discussion, what do you see as your ideal number of full-time faculty to promote student success?**

We currently have two full-time faculty. While we have been able to make this work, having 2 additional full-time faculty would be ideal (especially if we expand the program to include a new mini-certificate for web development). In talking with the President Wes Bryan about the needs of Computer Science program, he seemed favorable to the idea of hiring new full-time faculty within the next cycle.

PROGRAM PLANNING

Based on your analysis of previous program review and current data:

- **What does your program want to accomplish in the next three years?**
 - a. Increase and diversify program enrollment
 - b. Expand partnerships with software/video games businesses in the region
 - c. For the next three years, Computer Science plans for a complete overhaul of the Video Game Degree and Certificate.
 - d. We will try to find concrete answers and guidance from local and state administration for the ADT to get approved.
 - e. We will add one mini-certificate that students can complete in 2 semesters while working on either transfer or Associate Degree.
 - f. Computer Science will continue to stay on the cutting edge of technology advancement with the addition of equipment and extracurricular support for students in areas of Virtual Reality (VR), robotics, web development, and cybersecurity. Computer Science Club will be involved in some of these activities as well as outreach events.

- **What areas does your program plan to improve?**
 - a. Recruit more non-traditional students to the Computer Science program
 - b. Increase overall certificate/degree completion rates
 - c. Increase transfer rates to UC/CSU agriculture programs so more GWC program graduates go on to earn their bachelor's degrees.
 - d. One immediate improvement which is already in the works is the area of collaboration with Digital Media and Digital Arts to support and develop new certificates.
 - e. As the full time faculty support increases, we plan to have action meeting for immediate improvement and long term strategic development.
- **What specific actions will you take to improve upon those areas?**
The specific strategies for making these improvements will include:
 - a. Do outreach on campus focused on females and underrepresented minority students (hosting informational sessions to dispel myths about careers in software and video game development)
 - b. For the collaboration improvement, we plan to work with Digital Media to offer back-end courses for a web design certificate. Also, we are working together to furnish a lab with state of the art computers that are needed both for video game development and digital art rendering.
 - c. In terms of action meetings within the discipline, we plan to have formal and informal gatherings to discuss matters at hand. One such meeting took place at the end of March when we invited one of the vendors to present their product for CS G130. At the meeting, faculty from CBA were also invited to participate.
 - d. Work with Cal State Poly Pomona/Long Beach on articulation agreement; have informational sessions with representatives from other UC/CSU agriculture management programs to encourage more students to transfer after earning their associate's degree
- **How will you assess whether your program has accomplished those goals?**
The best measurement would be in student success like the following:
 - a. Comparing enrollment of female students and underrepresented minority students in three years to the level today (and to the target participation rate set in the VTEA core indicators)
 - b. Comparing retention and success rates, year-to-year persistence rates, and completion rates in three years to the level today (and to the target persistence and completion rates set in the VTEA core indicators)
 - c. Comparing the number and percentage of Computer Science students who successfully transfer to a four-year institution in three years to the level today

Certificate approval and lab furnishings completion will be a direct tangible way to measure success in these areas.

RESOURCE ALLOCATION

In order to accomplish those goals, what resources do you need? You will need to fill out the resource request forms and include them with your Program Review Report.

- Staffing:
 - We request the addition of two (2) full time faculty to support the development of Computer Science program.
 - One faculty is needed immediately to support the strong enrollment the program is experiencing across all courses. Also with the addition of the new mini-certificate, more courses and sections are going to be added to the program.
 - A second faculty is needed to focus on CS G130 (Survey of Computer Science/Information Technology). This course is in high demand campus wide. As more sections are being added it needs to be closely monitored in terms of curriculum, SLO assessment, scheduling, textbook updates and changes, software support, and any other issues might arise.
- Facilities:
 - We need one more computer room that can support extracurricular activity: Virtual Reality (VR), robotics, web development, and cybersecurity. We request HUM 210D for this purpose.
- Technology:
 - There is continuous need for licensing for video game engine software.
- Equipment
 - The three computer labs in Humanities building (HUM 210, 211, and 212) require a complete overhaul for the outdated computers. New cables and electrical connections will have to be established beyond the existing ones. Also the lab in Digital Media building needs immediate attention since our video game courses will use it.
- Funding for Professional Development
 - Funding for 2 national conferences in video game and software development.
 - Funding for 4 local conferences in areas of video game, software development, web development, and cybersecurity.