New Degree Program White Paper
Contact Person: Trevor Terrill
Degree name: Computer Engineering
Department:
College: Science, Engineering, and Technology

Please answer the following questions:
1. Does this degree program include stacked credentials? ___Yes ___X__No. If yes, indicate with an X all included credentials: ___Certificate ___Associates ___X_Baccalaureate ___Masters
2. How many new courses need to be developed for this program? ___14____
3. For the baccalaureate degree, how many credits of core courses are required? __89___ How many required elective credits? __6___ How many open elective credits? __0___ Counting 31 credits of GE courses, how many total credits are in this program? ___126____
4. If seeking external accreditation, please list organization(s) here ___ABET___________________________.

Program Description. Provide a brief description of the proposed program. If stacked credentials are included in the program, identify and describe each one. If one or more emphases are part of the program, identify and describe them.

Response:
-The proposed computer engineering degree is a bachelor’s level degree. As part of the coursework to fulfill the degree, students will also complete the minor in computer science. Computer engineering is a degree that includes elements of computer science, electrical engineering, software development, and mechanical engineering. Computer engineering emphasizes hardware integration with software or electrical systems. This field is relatively young, with roots originally in electrical engineering. However, computer engineering involves significantly more programming and hardware (sensors and actuators) than its electrical engineering counterpart. This degree is envisioned as a bridge between the mechanical engineering program (specifically mechatronics) and computer science. As part of the connection between these two majors, embedded systems is proposed as an emphasis of the program.

-Due to the amount of programming involved in computer engineering, the beginning coursework is very similar to computer science. As part of the normal coursework, students will earn a minor in computer science without any additional coursework. This minor is already in the catalog for DSU.

Strategic Alignment.
Cite specific examples of how this program aligns to the DSU strategic plan, mission, goals, and core themes. Include active learning-active life.

Response:
Several specific examples of how the proposed computer engineering program aligns with the above-mentioned items are:

-Strategic Plan Goal #2: Broaden and enhance academic programs to facilitate growth:
The computer engineering program broadens the academic offerings to students within the computing and engineering space. The creation of this program fulfills several of the desired outcomes within Goal #2, including increasing the number of Bachelor’s degrees awarded, increasing the number of offered Bachelor’s degrees, and adding programs in more areas of student interest. Additionally, computer engineering is a growing field, as indicated with the EAB market research study (discussed later).

-Strategic Plan Goal #1: Promote student success and increase retention and completion rates at all degree levels: The proposed computer engineering program will have very similar coursework to the computer science program in the first two years of coursework. This will improve retention and completion rates, as students
have more options within the computing space. A student can switch between these two programs with minimal additional coursework, promoting additional student flexibility and progress toward a degree.

-Active learning-active life: Similar to the mechanical engineering program at DSU, the courses within the computer engineering program will emphasize hands-on learning through labs and student projects. Additionally, students will participate in a senior-level design capstone course. Many programs within engineering focus on theoretical knowledge within the field. While appropriate theory will be taught, the focus of the computer engineering program will be hands-on and experiential learning.

**Comparison Benchmarks.** List a minimum of five universities whose similar programs were examined to inform the development of this proposal. State how this proposal compares in terms of required credits of core courses, electives, course content, etc. If there are similar programs in other departments at DSU, identify them and describe significant differences between the two.

**Response:**

- The five other computer engineering programs that were examined are: Utah Valley University, Weber State University, California Baptist University, Colorado Mesa University, and Utah State University. These colleges were selected based on university size, mission, proximity to DSU, and data available from the EAB research analysis. The table below summarizes the credit requirements. There were two programs that have significantly more technical elective credits than the other universities. In each of these programs, the majority of the technical electives were limited to a few core computer engineering topics, thereby ensuring students receive adequate coursework within computer engineering. The proposed program at DSU falls in line with the examined programs in regards to course requirements.

- As far as emphases within programs, two of the programs offered a combined Computer & Electrical Engineering degree. These programs focus more on electrical engineering topics and less on computer science. Alternatively, one program had a total of 24 required courses directly from the computer science program, with the overall emphasis on the degree more towards computer science.

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of required credits</td>
<td>127</td>
<td>126</td>
<td>128</td>
</tr>
<tr>
<td>Required number of core credits:</td>
<td>61</td>
<td>45</td>
<td>77</td>
</tr>
<tr>
<td>Required technical elective credits</td>
<td>12</td>
<td>0</td>
<td>29</td>
</tr>
<tr>
<td>Required math and science credits*</td>
<td>34</td>
<td>31</td>
<td>39</td>
</tr>
<tr>
<td>Required general elective credits</td>
<td>20</td>
<td>15</td>
<td>23</td>
</tr>
</tbody>
</table>

* Some of the math and science credits fulfill general elective credits

- The closest programs to computer engineering within DSU are computer science and mechanical engineering. Computer science focuses on best-practice programming techniques, software development, cyber security, and fundamental computer algorithms. The primary focus of computer science is on software, and there is limited integration with hardware. Mechanical engineering covers some computer engineering topics, but also teaches mechanical design, thermal systems, materials science, system dynamics, etc. As such, the exposure to programming, circuits, and mechatronics is limited. Computer engineering provides an in-depth education in computer programming, circuits & electronics theory, and the integration of software and hardware systems. As such, computer engineering fills a void that currently exists within program offerings at DSU.

**Timeline (Stacked Credential Programs Only)** Describe the timeline and benchmarks that will be met as you add one credential at a time moving forward. Example: This program will start with a 12-credit institutional certificate that can be completed in two semesters. The first two courses have no prerequisites and are the prerequisites for the second two courses. Once we have a minimum of 20 students enrolled in the first two courses, we will add the associate’s degree. Or...This program will begin as an emphasis in the BS in Integrated Studies program. Once we have a minimum of 10 students per year working on this emphasis, we will establish
the certificate using four of the emphasis courses and begin marketing the associate’s degree that will lead to the baccalaureate degree.

**Response:**
- The first two years of the program are closely tied to computer science. By following the flowchart for computer engineering, it is anticipated that students will complete the computer science minor in the first two years of the program. The first two years also fulfill many of the required science and math requirements. This allows the computer engineering bachelor’s degree to be phased in with the first cohort of students. The first two years of the program will require an estimated 3 new computer engineering courses that are not offered by mechanical engineering, computer science, math, or science. The upper division courses will be developed and offered as students enter their upper division coursework within the program.

**Departmental Capacity for Program.** State the capacity that currently exists within the department to support this program in terms of faculty, space, equipment, etc. If building a stacked credential program, describe a tiered approach to build capacity such as identifying the crossover skills for this program you will include as necessary requirements in candidates as new faculty are hired for other programs in the department. If building a non-stacked credential program, briefly describe any new resources including faculty that will be needed in order to launch the program. Complete and attach Appendix D of the USHE form (Budget and Finance section).

**Response:**
- There are already established courses for approximately 80 of the required 126 credits. The additional 46 credits will need to be developed and taught by computer engineering faculty. It is anticipated that 2 full time faculty will be hired to offer the program and teach the associated computer engineering courses. Some of the subject matter is close enough to mechanical engineering and computer science that select courses could be taught by faculty in other programs, providing some flexibility in delivering the computer engineering courses.

- The proposed program requires two main spaces. The first is an electronics laboratory that houses student workstations with oscilloscopes, power supplies, and other electronic equipment. The mechanical engineering program currently has an electronics laboratory with sufficient capacity to accommodate the proposed program. The second space is a student computer lab. There is a space allocated in the new science, engineering, and technology building for this computer lab contingent on approval of the proposal.

**Documented Need for Program.** What is the rationale for bringing this program forward at this particular time? Validate the need with hard data from reliable sources. Include student demand, regional and national employment needs, economic trends that might add to a need for this program, new directions set forth from external accreditors, etc. (See Resources Packet)

**Response:**
- DSU requested a market research analysis from EAB to ascertain the employer demand for bachelor level computer engineering professionals. EAB analyzed both local and regional demand for computer engineers. The highlights from the report are:

  - Growth in computer engineering **degree completions** significantly outpaced mechanical engineering degree completions (136 percent vs 28 percent), indicating strong student interest in the field.
  - Growth in **regional** demand for bachelor’s-level computer engineering professionals outpaces growth in regional demand for all bachelor’s level professionals (9.6 percent vs 7 percent).
  - Growth in **local** demand for bachelor’s-level computer engineering professionals approximately matched growth for all bachelor’s level professionals (112 percent vs 127 percent)
  - Local employers most frequently seek computer engineering professionals with a bachelor’s degree (89%) compared to a master’s degree (10%) or doctoral degree (1%)

**Program Fit.** Describe the niche this program fills within the DSU academic portfolio and the contributions it makes beyond simply graduating its students. How might some of the courses accommodate non-majors of the program? Is there a certificate that students from other departments could complete to add depth to their own
degrees, etc.? Also describe the fit and uniqueness of this program relative to similar programs within other USHE institutions.

Response:
- As mentioned previously, the computer engineering program bridges a gap between computer science and mechanical engineering by focusing on the integration of hardware and software systems. While there is some overlap between each of these programs and computer engineering, each of the current programs on its own does not provide an in-depth education on circuit theory, embedded systems, mechatronics, and digital design. In accommodating non-majors in the program, select upper division courses will be cross-listed as technical electives for both mechanical engineering and computer science. This will expand the available technical electives for these students, thereby allowing students in other majors to better customize their experience.

- As the first two years of the computer engineering program are closely aligned with computer science, there are not any clear certificate programs other than those within the computer science space.

- There are other universities within Utah that offer computer engineering programs. The curriculum within computer engineering is not as universally standardized as other engineering programs (such as civil, mechanical, or electrical). Because of this, there is a variety of required and elective courses within each computer engineering program. The proposed program will emphasize embedded systems, as this area offers the clearest connection between mechanical engineering and computer science. Additionally, the EAB market research report highlighted highest earnings among computer hardware engineers (as opposed to computer engineers focused on software systems). Where appropriate, the courses will be synchronized with correlated courses at other USHE institutions.

Innovation. Describe innovative aspects of the program in terms of delivery mode, instructional design, scheduling, flexibility, removing traditional barriers, etc. (See Resources Packet)

Response
- By incorporating core courses directly from computer science and mechanical engineering, innovative teaching techniques will be automatically incorporated into those techniques. In addition, core computer engineering courses will be structured with labs, projects, and other high-impact experiences. The possibility of including a junior level course in the Dixie Design Day engineering showcase is also being explored.

Building University Capacity. Describe how the program will build university capacity in terms of research or creative opportunities, new markets, etc. for both faculty and students and the university as a whole.

Response:
- With the establishment of Innovation Plaza, the mechanical engineering program, and entrepreneurship programs at DSU, there has been a recent effort in innovation and entrepreneurship. The majority of invention ideas are a combination of mechanical and electrical/software components. Even primarily mechanical devices have basic electronics and user interfaces. As discussed above, computer engineering focuses on the connection between mechanical devices and software systems. By building a program in this area, the innovation capacity of the university will be increased in both faculty and students. As such, more sophisticated inventions can be developed and prototyped.

- With the introduction of masters of science degrees at DSU, the computer engineering program will expand the research capabilities of the university as a whole. Many theses, especially in STEM fields, require physical experiments, with appropriate data collection, processing, and visualization. Computer engineering provides necessary skills sets to build or modify experimental systems, incorporate sensing, and perform data analysis. The addition of faculty and students with capabilities to develop these experimental systems will improve the quality of research performed.
Appendix D: Projected Program Participation and Finance

Part I.
Project the number of students who will be attracted to the proposed program as well as increased expenses, if any. Include new faculty & staff as described in Appendix C.

<table>
<thead>
<tr>
<th>Three Year Projection: Program Participation and Department Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year Preceding Implementation</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td># of Majors in Department</td>
</tr>
<tr>
<td># of Majors in Proposed Program(s)</td>
</tr>
<tr>
<td># of Graduates from Department</td>
</tr>
<tr>
<td># Graduates in New Program(s)</td>
</tr>
</tbody>
</table>

### Department Financial Data

Project additional expenses associated with offering new program(s). Account for New Faculty as stated in Appendix C, "Faculty Projections."

#### EXPENSES – nature of additional costs required for proposed program(s)
List salary benefits for additional faculty/staff each year the positions will be filled. For example, if hiring faculty in year 2, include expense in years 2 and 3. List one-time operating expenses only in the year expended.

<table>
<thead>
<tr>
<th>EXPENSES</th>
<th>Year Preceding Implementation (Base Budget)</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel (Faculty &amp; Staff Salary &amp; Benefits)</td>
<td>$142,621</td>
<td>$216,000</td>
<td>$216,000</td>
<td>$216,000</td>
</tr>
<tr>
<td>Operating Expenses (equipment, travel, resources)</td>
<td>$102,528</td>
<td>$45,000</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL PROGRAM COSTS</td>
<td></td>
<td>$261,000</td>
<td>$221,000</td>
<td>$221,000</td>
</tr>
<tr>
<td>TOTAL EXPENSES</td>
<td>$245,149</td>
<td>$506,149</td>
<td>$466,149</td>
<td>$466,149</td>
</tr>
</tbody>
</table>

### FUNDING – source of funding to cover additional costs generated by proposed program(s)
Describe internal reallocation using Narrative 1 on the following page. Describe new sources of funding using Narrative 2.

<table>
<thead>
<tr>
<th>FUNDING</th>
<th>Year Preceding Implementation (Base Budget)</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Reallocation</td>
<td>$101,832</td>
<td>$84,150</td>
<td>$62,150</td>
<td>$62,150</td>
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<tr>
<td>Special Legislative Appropriation</td>
<td>$60,000</td>
<td>$108,000</td>
<td>$108,000</td>
<td>$108,000</td>
</tr>
<tr>
<td>Grants and Contracts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special Fees</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuition</td>
<td>$83,317</td>
<td>$68,850</td>
<td>$50,850</td>
<td>$50,850</td>
</tr>
<tr>
<td>Differential Tuition (requires Regents approval)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROPOSED PROGRAM FUNDING</td>
<td></td>
<td>$261,000</td>
<td>$221,000</td>
<td>$221,000</td>
</tr>
<tr>
<td>TOTAL DEPARTMENT FUNDING</td>
<td>$245,149</td>
<td>$506,149</td>
<td>$466,149</td>
<td>$466,149</td>
</tr>
<tr>
<td>Difference</td>
<td>Funding - Expense</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>
Part II: Expense explanation

Expense Narrative

Describe expenses associated with the proposed program.

We anticipate hiring two full-time tenure track faculty in year one. In fiscal year 2019, DSU received $375,000 in Engineering Initiative funds, $108,000 of the funds have been set aside to fund two computer engineering faculty positions.

One-time funds of $40,000 will be needed in year one for computer lab equipment which will consist of 30 workstations with appropriate software.

Ongoing operating budget of $5,000 for marketing, recruiting and supplies for the program.

Part III: Describe funding sources

Revenue Narrative 1

Describe what internal reallocations, if applicable, are available and any impact to existing programs or services.

DSU plans to fund this program through institutional funds, Engineering Initiative funds, and new tuition revenue. Space has been allocated for labs and offices in the new Science, Engineering & Technology building.

The rows in the Funding section of Appendix D are the defined as follows:

- Appropriation is designated as ongoing money allocated by the institution as faculty, advisor, and admin budget lines.
- Special Appropriation is Engineering Initiative money being allocated specifically to Computer Engineering faculty.

Revenue Narrative 2

Describe new funding sources and plans to acquire the funds.

DSU will apply for additional Engineering Initiative money as it becomes available.
DATA SNAPSHOT

Employer Demand for Bachelor’s-Level Computer Engineering Professionals

Analysis of Local and Regional Employer Demand and Competitor Programs
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1) Research Methodology

Project Challenge

Leadership at Dixie State University approached the Forum as they evaluated the market viability of a bachelor's in computer engineering program. Through a combination of quantitative data analytics and secondary research, the Forum sought to assess local and regional market demand for bachelor's-level computer engineering professionals.

EAB's market research function provides insights which guide strategic programmatic decisions at member institutions. The Forum combines qualitative and quantitative data to help administrators identify opportunities for new program development, assess job market trends, and align curriculum with employer and student demand.

EAB reports rely primarily on labor market data from Emsi Analyst and Alumni Insight tools (description below). Reports occasionally use data from the United States Census Bureau and United States Bureau of Labor Statistics data to explore occupation and job trends. Market research reports may also incorporate Integrated Postsecondary Education Data System (IPEDS) data to assess student enrollment, demographics, and completion rates across competitor programs.

Methodology and Definitions

Methodology: Unless stated otherwise, this report includes data from online job postings from January 1, 2018 to December 31, 2018. The Forum analyzed demand over time, frequently sought skills, and advertised earnings for professionals in computer engineering professions.

Definitions: “Local” refers to counties entirely or partially contained within a 50-mile radius of Dixie State University.

“Region” and “regional” refer to Utah, Nevada, and the following California counties:

- San Bernardino,
- San Diego, and
- Riverside.

Emsi Analyst™ and Emsi Alumni Insight™

EAB’s Partner for Comprehensive Labor Market Data

This report includes data made available through EAB’s partnership with Emsi (Economic Modeling Specialists International), a labor market analytics firm serving higher education, economic development, and industry leaders in the U.S., Canada and the United Kingdom.

Emsi curates and maintains the most comprehensive labor market data sets available for academic program planning, providing real-time job posting data, workforce and alumni outcomes data, and traditional government sources of data. Under this partnership, EAB may use Emsi's proprietary Analyst™ and Alumni Insight™ tools to answer member questions about employer demand, the competitive landscape, in-demand skills, postings versus actual hires, and skills gaps between job postings and professionals in the workforce. The Emsi tools also provide EAB with in-depth access to unsuppressed, zip-code-level government data for occupations, industries, programs, and demographics. For more complete descriptions of the Emsi tools, visit:

- [https://www.economicmodeling.com/alumni-insight/](https://www.economicmodeling.com/alumni-insight/)
To learn more about Emsi and its software and services, please contact Bob Hieronymus, Vice President of Business Development at bob.hieronymus@economicmodeling.com or (208) 883-3500.

**Project Sources**

The Forum consulted the following sources for this report:

- EAB’s internal and online research libraries ([eab.com](http://eab.com))
- The United States Bureau of Labor Statistics (BLS) ([bls.gov](http://bls.gov))
- The National Center for Education Statistics ([nces.ed.gov](http://nces.ed.gov))
- Profiled program websites:
  - Alfred State College of Technology at the State University of New York: [Bachelor of Science in Computer Engineering Technology](http://eab.com)
  - California Baptist University: [Bachelor of Science in Electrical and Computer Engineering](http://eab.com)
  - Chapman University: [Bachelor of Science in Software Engineering](http://eab.com)
  - Pennsylvania College of Technology: [Bachelor of Science in Electronics and Computer Engineering Technology](http://eab.com)
  - Point Loma Nazarene University: [Bachelor of Science in Computer Science: Software Engineering](http://eab.com)
  - Utah Valley University: [Bachelor Science in Computer Engineering](http://eab.com)

**Profiled Institutions**

The Forum profiled institutions with bachelor’s-level computer engineering programs representative of Dixie State University’s proposed degree. The Forum profiled programs via secondary research at the following institutions:

### A Guide to Institutions Profiled in this Brief

<table>
<thead>
<tr>
<th>Institution</th>
<th>Location</th>
<th>Approximate Institutional Enrollment (Undergraduate/Total)</th>
<th>Carnegie Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfred State College of Technology at the State University of New York</td>
<td>Northeast</td>
<td>10,000 / 30,000</td>
<td>Baccalaureate/Associate’s Colleges: Mixed Baccalaureate/Associates</td>
</tr>
<tr>
<td>California Baptist University</td>
<td>Pacific West</td>
<td>7,000 / 9,000</td>
<td>Master’s Colleges and Universities: Larger Programs</td>
</tr>
<tr>
<td>Chapman University</td>
<td>Pacific West</td>
<td>6,500 / 8,500</td>
<td>Master’s Colleges and Universities: Larger Programs</td>
</tr>
<tr>
<td>Pennsylvania College of Technology</td>
<td>Mid-Atlantic</td>
<td>5,500 / 5,500</td>
<td>Baccalaureate/Associate’s Colleges: Mixed Baccalaureate/Associates</td>
</tr>
<tr>
<td>Point Loma Nazarene University</td>
<td>Pacific West</td>
<td>3,000 / 4,000</td>
<td>Master’s Colleges and Universities: Larger Programs</td>
</tr>
<tr>
<td>Utah Valley University</td>
<td>Mountain West</td>
<td>34,500 / 35,000</td>
<td>Master’s Colleges and Universities: Larger Programs</td>
</tr>
</tbody>
</table>

1) National Center for Education Statistics
2) Executive Overview

Growth in computer engineering degree completions regionally outpaces growth in mechanical engineering completions. Between 2013 and 2017, bachelor’s-level computer engineering degree completions increased 136 percent (i.e., from 189 to 446 degree completions). During the same time period, bachelor’s-level mechanical engineering degree completions increased 28 percent (i.e., from 881 to 1,129 degree completions).

Consider offering experiential learning opportunities, such as internships, capstone projects, or field experiences, to align with curriculum of competitor programs. Five of six profiled programs advertise experiential learning opportunities for enrolled students to complete, generally during their junior or senior year of the program. To enhance student learning opportunities and compete with established programs, administrators at Dixie State University should consider offering experiential options, such as the cross-cultural opportunities available at California Baptist University, or the internships available at Utah Valley University.

Highlight high median hourly earnings of common occupations in program marketing materials to appeal to outcomes-oriented students. Each of the four occupations most commonly posted for computer engineering professionals regionally exhibit median hourly earnings greater than the regional median. Administrators at Dixie State University should highlight this advantage when marketing the proposed program to appeal to students. Students respond to marketing which highlights relevant local and regional career opportunities made available through program enrollment and completion.

Confer a combination of software and programming language skills to prepare graduates to meet local employer demand. Over the last 12 months, local employers frequently seek computer engineering candidates with software and programming skills (e.g., 'Information systems,' 'Python'). Among relevant job postings, ‘SQL’ represents the most commonly requested programming language skill, appearing in 21 percent of openings (i.e., 114 of 553 postings). Program curriculum should prepare graduates to meet local employer demand by prioritizing these high-demand skills.
3) Employer Demand

Demand over Time

Regional Demand for Bachelor’s-Level Computer Engineering Professionals Outpaces Regional Demand for All Bachelor’s-Level Professionals

Regional employer demand for bachelor’s-level computer engineering professionals rose 126 percent between September 2016 and December 2018 (i.e., from 952 to 2,156 postings). Across the region, employer demand for all bachelor’s-level professionals increased 113 percent between September 2016 and December 2018 (i.e., from 48,380 to 103,149 postings). Both regional and local employer demand for bachelor’s-level computer engineering professionals increased at an average rate of three percent per month between September 2016 and December 2018.

Local employer demand for bachelor’s-level computer engineering professionals increased 112 percent between September 2016 and December 2018 (i.e., job postings increased from 86 to 182). In comparison, local employer demand for all bachelor’s-level professionals grew 127 percent over the same time period (i.e., from 6,596 to 14,953 job postings).

The Bureau of Labor Statistics (BLS) expects the nationwide employment of “computer hardware engineers” to increase five and a half percent between 2016 and 2026, less quickly than the seven percent average growth projected across all occupations over the same time period. However, projected regional employment growth for “computer hardware engineers” exceeds the national average growth rate of employment for all professionals (i.e., 9.6 percent increased 2019 and 2028).

Demand over Time for Bachelor’s-Level Computer Engineering Professionals

September 2016-December 2018, Local and Regional Data

As requested by leadership at Dixie State University, the Forum analyzed this growth with changes in demand for comparative professional in electrical and software engineering. During the same time period, regional demand for bachelor’s-level electrical engineering and software engineering professionals increased 182 percent and 206 percent, respectively.

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3) Bureau of Labor Statistics
4) Emsi Analyst™
Confer Software and Programming Skills Through Program Curriculum to Prepare Students to Meet Employer Demand

Leadership at Dixie State University should highlight the in-demand skills conferred by the proposed program when marketing to prospective students. Administrators should emphasize programming and software skills in the curriculum of a prospective program to align with high local employer demand for these skills. Programming and software skills (e.g., ‘Java,’ ‘Amazon Web Services’) account for 17 of the top 20 skills local employers seek in bachelor’s-level computer engineering professionals. Among relevant job postings, ‘SQL’ represents the most commonly requested programming language skill, appearing in 21 percent of openings (i.e., 114 of 553 postings). Local employers also seek bachelor’s-level computer engineering professionals with hardware and firmware skills. ‘Systems engineering’ represents the fourth-most frequently sought skill by local employers in relevant postings.

**Top Skills for Bachelor’s-Level Computer Engineering Professionals**
*January 2018 - December 2018, Local Data*

553 job postings

- Computer engineering: 184
- Information systems: 143
- Operating systems: 128
- Systems engineering: 118
- Linux: 114
- Java: 97
- Electrical engineering: 96
- Software development: 91
- Software engineering: 91
- C++: 80
- C Sharp: 77
- Python: 72
- C: 60
- Information technology*: 60
- Unix: 59
- Agile software development: 57
- Amazon Web Services: 56
- JavaScript: 52
- Scripting: 52

Minimum Advertised Education

Local Employers Most Frequently Seek Computer Engineering Professionals with a Bachelor’s-Level Degree and Zero to Three Years of Work Experience

While local employers post 553 openings for bachelor’s-level computer engineering professionals in 2018, employers post only 64 job openings over the same period seeking master’s-level computer engineering professionals. Additionally, local employers post nine jobs for individuals with a professional degree or a Ph.D. in computer engineering. Forty-six job postings did not specify an educational attainment level.

In 2018, local employers seek computer engineering professionals with zero to three years of professional experience in 35 percent of relevant postings (i.e., 199 of 553 job postings). Local employers seek professionals with four to seven and over eight years of professional experience in 21 percent of relevant postings (i.e., 114 of 553 job postings).
years of experience in 33 percent and four percent of job postings, respectively (i.e., 188 and 20 job postings of 553 total postings, respectively). The BLS reports 46.4 percent of “computer hardware engineers” hold a bachelor’s degree as their highest level of educational attainment.\\(^6\)

**Minimum Advertised Education Qualifications for Computer Engineering Professionals**

*January 2018-December 2018, Local Data*\\(^7\)

n=626 job postings, 46 unspecified

- 89% Bachelor’s-level
- 10% Master’s-level
- 1% Doctoral-level

**Work Experience for Bachelor’s-Level Computer Engineering Professionals**

*January 2018-December 2018, Local Data*\\(^8\)

n=553 job postings

- 46% 4 to 7 years
- 49% 0 to 3 years
- 5% 8+ years

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6) Bureau of Labor Statistics
7) Emsi Analyst™
8) Emsi Analyst™
Computer Hardware Engineers Earn the Highest Salaries Among Commonly Posted Computer Engineering Professions

Students completing Dixie State University’s proposed computer engineering program can expect to receive the highest earnings by finding employment as “computer hardware engineers,” “computer and information research scientists,” or “software developers, systems.” Regionally “computer hardware engineers” report median hourly earnings of $55.57 per hour, slightly higher than the national median for “computer hardware engineers” (i.e., $55.35 per hour). Median hourly earnings for each of the five most common occupations held by regional computer engineering professionals exceed the regional median hourly earnings across all occupations (i.e., $22.47).9

Advertised Median Hourly Earnings for Relevant Occupations in which Regional Employers Frequently Seek Bachelor’s Level Computer Engineering Professionals

January 2018-December 2018, Regional Data10

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Advertised Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Hardware Engineers</td>
<td>$55.57</td>
</tr>
<tr>
<td>Computer and Information Research Scientists</td>
<td>$53.13</td>
</tr>
<tr>
<td>Software Developers, Systems</td>
<td>$51.51</td>
</tr>
<tr>
<td>Software Developers, Applications</td>
<td>$48.21</td>
</tr>
<tr>
<td>Electronics Engineers</td>
<td>$47.43</td>
</tr>
</tbody>
</table>

The occupations included in this graph represent the five most common occupations in which computer engineering professionals possess employment at the regional level.

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7) Bureau of Labor Statistics
8) Emsi Analyst™
Consider Offering Experiences Outside of the Classroom to Enhance Student Learning and Match Competitor Offerings

Leadership at Dixie State University should consider offering a field experience or internship as part of a bachelor’s-level computer engineering degree program. Five of six profiled institutions offer opportunities for bachelor’s-level computer engineering students to complete an internship or field experience as part of their degree program. At Point Loma Nazarene University, students select from several experimental options, such as internships in information technology, service learning in computer science, or a student-designed and led honors project. California Baptist University advertises the program’s cross-cultural experience as offering a global context to engineering work.

Provide opportunities for students to customize their degree (e.g., Point Loma Nazarene University’s honor’s project). At Chapman University, students consult with advisors to select electives groupings tailored toward individual academic interests and professional goals (e.g., “machine learning,” “artificial intelligence”). Profiled programs use concentrations to create structured learning tracts, while specializations offered by Chapman University are student-designed. Alfred State College of Technology at the State University of New York also offers students the chance to select preferred electives (e.g., “Networking and Security” or “R for Computational Science”).

**Characteristics of Profiled Bachelor’s-Level Computer Engineering Programs**

- Regional Institution

<table>
<thead>
<tr>
<th>Institution</th>
<th>Program Name</th>
<th>Modality</th>
<th>Selected Courses Imparting In-Demand Skills</th>
<th>Experiential Learning Opportunities</th>
<th>Concentrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfred State College of Technology at the State University of New York</td>
<td>Bachelor of Science in Computer Engineering Technology</td>
<td>In-person</td>
<td>Major elective titles not available</td>
<td>Not advertised</td>
<td>Not advertised</td>
</tr>
<tr>
<td>California Baptist University</td>
<td>Bachelor of Science in Electrical and Computer Engineering</td>
<td>In-person</td>
<td>• C++ • Data acquisition, design, and visualization</td>
<td>• Internship between Junior and Senior year • Required cross-cultural experience</td>
<td>Minors available</td>
</tr>
<tr>
<td>Chapman University</td>
<td>Bachelor of Science in Software Engineering</td>
<td>In-person</td>
<td>• Digital Logic Design • iOS/Android Application Development • Data Science • Compiler Construction</td>
<td>• Software Engineering Capstone Project</td>
<td>Students consult with advisors to select elective groupings geared towards individual academic and professional goals.</td>
</tr>
</tbody>
</table>
Growth of Computer Engineering Degree Completions Outpaces Growth of Mechanical Engineering Completions

All regional institutions report fewer bachelor’s-level degree completions in computer engineering than in mechanical engineering in each year 2013 through 2017. However, growth among bachelor’s-level degree completions from computer engineering programs exceeds bachelor’s-level completions from mechanical engineering programs. Reported bachelor’s-level computer engineering degree completions grew 136 percent between 2013 and 2017 (i.e., degree completions increased from 189 to 446). Bachelor’s-level mechanical engineering degree completions increased only 28 percent over the same time period (i.e., from 881 to 1,129 completions).

### Relevant Bachelor’s-Level Degree Completions

*National Center for Education Statistics, Regional Data*

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Computer Engineering</td>
<td>189</td>
<td>261</td>
<td>308</td>
<td>369</td>
<td>446</td>
<td>136%</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>881</td>
<td>863</td>
<td>971</td>
<td>1,046</td>
<td>1,129</td>
<td>28%</td>
</tr>
<tr>
<td>Total</td>
<td>1,070</td>
<td>1,124</td>
<td>1,279</td>
<td>1,415</td>
<td>1,575</td>
<td>47%</td>
</tr>
</tbody>
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