



HARFORD

COMMUNITY COLLEGE

May 7, 2019

James D. Fielder, PhD
Maryland Higher Education Commission
6 N. Liberty Street, 10th Floor
Baltimore, MD 21201

RE: New Program Approval Request – Geospatial Technology, A.A.S.

Dear Dr. Fielder:

Harford Community College is proposing an Associate of Applied Sciences degree in Geospatial Technology (GST). The GST program offers a comprehensive array of geographic information systems (GIS), remote sensing, and global positioning systems with a curriculum that provides a foundation in geospatial technologies and information systems by following the geospatial technologies industry requirements of technicians.

The skill sets fostered and the goals promoted by the GST program closely relate to the mission pursued by HCC. In addition to promoting innovative ideas, life-long learning, and global awareness, the GST program also seeks to promote individual goal attainment, transfer, graduation as well as career and workforce development.

Payment in the amount of \$850 for MHEC approval has been included in the new program proposal arriving via U.S. mail. A copy of the payment is included in this electronic correspondence. Please contact Alison Amato at aamato@harford.edu or 443-412-2384 with any questions.

Sincerely,

Karen Hays, PhD
Interim Vice President for Academic Affairs



Cover Sheet for In-State Institutions
New Program or Substantial Modification to Existing Program

Institution Submitting Proposal: Harford Community College

Each action below requires a separate proposal and cover sheet.

- Radio button options for program types: New Academic Program, New Area of Concentration, New Degree Level Approval, New Stand-Alone Certificate, Off Campus Program, Substantial Change to a Degree Program, Substantial Change to an Area of Concentration, Substantial Change to a Certificate Program, Cooperative Degree Program, Offer Program at Regional Higher Education Center.

Payment Submitted: Yes/No, Payment Type: R*STARS/Check, Date Submitted: 05/08/2019

Department Proposing Program: Behavioral and Social Sciences
Degree Level and Degree Type: Associate of Applied Sciences - A.A.S.
Title of Proposed Program: Geospatial Technology
Total Number of Credits: 60
Suggested Codes: HEGIS: 2206.00, CIP: 45.0702
Program Modality: On-campus
Program Resources: Requiring New Resources
Projected Implementation Date: Fall, Year: 2019
Provide Link to Most Recent Academic Catalog: http://ww2.harford.edu/Catalog/

Preferred Contact for this Proposal: Name: Alison Amato, Title: Coordinator for Curriculum and Program Development, Phone: (443) 412-2384, Email: aamato@harford.edu

President/Chief Executive: Type Name: Dianna G. Phillips, Ph.D.
Signature: [Handwritten Signature] Date: 5.13.2019
Date of Approval/Endorsement by Governing Board: 6.11.19

Revised 6/13/18

GEOSPATIAL TECHNOLOGY PROGRAM, A.A.S.

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A. Centrality to Institutional Mission Statement and Planning Priorities

Program Description

The Associate of Applied Science in Geospatial Technology (GST) program at Harford Community College (HCC) provides students with the skills, knowledge and hands-on experience to pursue a career in geospatial technology. The GST Program offers a comprehensive array of geographic information systems (GIS), remote sensing, and global positioning systems. The skills and knowledge acquired from the GST Program can be applied in a variety of fields including, but not limited to education, public safety, local, state, and federal government, banking, health and human services, transportation, utilities, natural resources, business, manufacturing, and telecommunication to make informed data driven decisions by analyzing geospatial data.

The College's proposed GST program creates a career pathway as well as a transfer pathway to a baccalaureate degree in Geospatial Technology. The curriculum will provide a foundation in geospatial technologies and information systems by following the geospatial technologies industry requirements of technicians. Geospatial technicians should be proficient in data analysis, management, interpretation, acquisition, representation, and visualization. In addition to acquiring these proficiencies, students will gain real world experience through industry-based projects as well as internships.

Program in Relation to Strategic Plan and Institutional Priorities

The skill sets fostered and the goals promoted by the GST program closely relate to the mission pursued by HCC. In addition to promoting innovative ideas, life-long learning, and global awareness, the GST program also seeks to promote individual goal attainment, transfer, graduation as well as career and workforce development. Many of the goals pursued by the GST program align with the mission and goals advanced by HCC. Accordingly, "Harford Community College provides accessible, innovative, learner-centered educational opportunities. As an open-access institution, the College promotes graduation, transfer, individual goal attainment, and career and workforce development. The College fosters lifelong learning, global awareness, and social and cultural enrichment."¹

To "expand programming, events, and facilities that engage and enhance the community," the College's Strategic Plan² seeks to "provide for educational programs and workforce development training to meet the needs and interests of the community." The GST program and the skills it teaches can be strategically linked to certificate programs offered by HCC. Moreover, it is utilized by multiple entities within Harford County that warrant opportunities in internships for students, community-based projects, as well as employment.

¹ Harford Community College. *2018-2019 Credit Catalog*. N.D. Web. 24 September 2018

² "Goals and Strategies." Harford Community College. Harford Community College. N.D. Web. 24 September 2018

As for strategic linkages with existing certificate programs, the GST program can be easily linked to the Drone Technology Certificate or Unmanned Aerial Vehicle (UAV) / Drone Technology Certificate.³ The Economic Impact of Unmanned Aircraft Systems Integration in the United States report, published by the Association for Unmanned Vehicle Systems International, suggests that drone technology is gaining increasing popularity and as a result will contribute to economic growth across various sectors.⁴ Within the context of mapping, the GST program can tap into the growing utility of drones by building a skilled-based pathway with HCC's Drone Technology Certificate.

Regarding the utility of the GST Program within Harford County, two High Schools within Harford County, Joppatowne High School and North Harford High School, incorporate Geospatial Technology extensively into their curriculum. As such, the GST program offers an academic pathway for these high school students to continue their education in this area and a strong foundation to enter into articulation agreements with these High Schools upon program approval. In addition to expanding the GST program in terms of academic utility in the country, establishment of the GST program will strengthen potential internship opportunities with the Harford County Emergency Management, Harford County Department of Public Works, Town of Bel Air Planning Department, and other public sector entities in the region.

Program Funding and Institutional Commitment

The College is committed to providing administrative, financial and technical support for the proposed program for the first five years. The Behavioral and Social Science division has one regularly budgeted administrative assistant and the cost of instructional supplies and technical support are factored into the operating budget on an ongoing basis. Furthermore, the Division has created a new position, a Department Coordinator, responsible for supporting student completion rates and developing retention strategies, including consolidated block scheduling of courses, and dual enrollment.

B. Critical and Compelling Regional or Statewide Need as Identified in the State Plan

Demand and Need for the Program

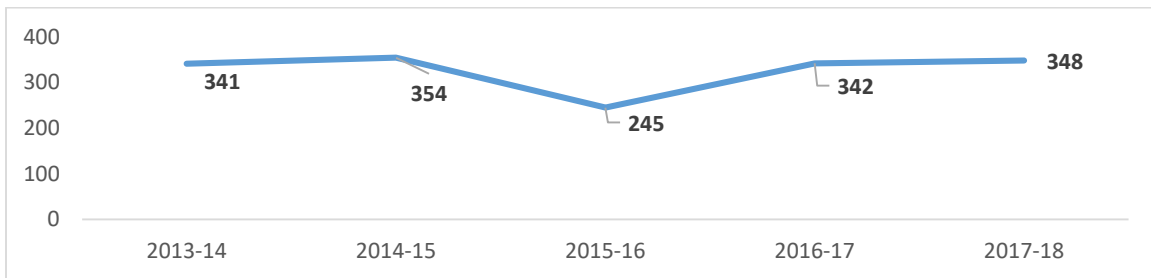
There is evidence of need for the GST program at HCC. Two high schools within Harford County have programs that utilize Geospatial Technology. One is a magnetic program in Agricultural Science at North Harford High School and the other is within the Homeland Security Emergency Preparedness (HSEP) program at Joppatowne High School. Eve Bour, HSEP/GIS Teacher from Joppatowne High School, and Greg Murrell, Agricultural Program coordinator at North Harford High School, are very excited to have a GST Program available to their students when they attend HCC.

³ HCC Drone Technology Certificate. <http://www.harford.edu/Academics/ibat/construction-manufacturing-and-industry/drone-technology-certificate.aspx>

⁴ Association for Unmanned Vehicle Systems International. The Economic Impact of Unmanned Aircraft Systems Integration in the United States, 2013.

Other potential students for this program are taking either Physical Geography, Human Geography or World Regional Geography courses at HCC. These students are introduced to Geospatial Technologies during these courses. Based on assessment of skills and knowledge, about 10% of students in these classes are familiar with geospatial technology. In addition to the existing skills and knowledge base among students, there has also been solid enrollment patterns in Physical Geography, Human Geography or World Geography over time. Accordingly, the total enrollment for these courses over the last five years is illustrated in Figure 1 below. Furthermore, students within our robust Environmental Science program are potential students in GST program as well.

Figure 1: Total Enrollment in Physical Geography, Human Geography, and World Regional Geography



There is a community need for geospatial technicians. Local engineering and environmental firms, local government, including Aberdeen Proving Grounds, utilize geospatial technologies. HCC has had several requests for interns with a geospatial background. Harford County Public Works recently requested the need for a GIS intern as well as Harford County Department of Emergency Services. In the past, we have had requests from the Town of Bel Air Planning Department as well as AECOM, an American multinational engineering firm and does government contract work.

According to O*NET⁵, occupations in the geospatial technology field have a good job outlook for both Maryland and Washington, D.C. over the next several years with an average growth rate between three and seven percent. Furthermore, the GST program also satisfies important components of the Maryland State Plan for Postsecondary Education. Specifically, the 2017-2021 Maryland State Plan for Post-Secondary Education⁶ has identified specific goals and strategies to reduce the amount of personal debt associated with college enrollments. The GST program supports the following goals and strategies:

Goal 2: “SUCCESS: Promote and implement practices and policies that will ensure student success.” The GST program offers two tracks for student success. Students who want to pursue their academic journey can complete the program and transfer to a four-year institution or enter directly into the workforce. In addition to preparing students to successfully pursue the academic or workforce track, the cost of obtaining a degree from a four-year institution is considerably reduced by completing the first two years of the GST program at HCC. As indicated by Table 1 below, and based on four-year institutions

⁵ Build your own Future with O*NET Online, 2018

⁶ Maryland Higher Education Commission. Increasing Student Success with Less Debt, 2017-2021 Maryland State Plan for Postsecondary Education, (2018)

with equivalent GST programs, students who complete the degree at HCC can save between \$5,204-\$17,615.76

Table 1: Price Comparison Between HCC and Four-Year Institutions

| Institution | Rate | Cost Per Credit Plus Fees 2018-2019 | Cost Per 30 Credits Plus Fees | Savings Over 2 Years By Going To HCC |
|---------------------------|--------------|-------------------------------------|-------------------------------|--------------------------------------|
| Harford Community College | In-County | \$154 | \$4,620 | Harford Community College |
| Salisbury University | In-State | \$327 | \$9,824 ⁷ | \$5,204 |
| Towson University | In-State | \$331 | \$9,940 ⁸ | \$5,320 |
| West Chester University | Out-of-State | \$927.41 | \$22,235.76 ⁹ | \$17,615.76 |

Strategy 6: “Improve the student experience by providing better options and services that are designed to facilitate prompt completion of degree requirements.” This strategy recommends the creation of “focused pathways” that demonstrate the “fastest way to obtain an associate degree by taking specific courses in a specific sequence.” The GST Program utilizes this pathway framework by identifying courses a student should take each semester, thereby reducing the time to degree completion. See Appendix A.

Strategy 7: “Enhance career advising and planning services and integrate them explicitly into academic advising and planning.” This strategy recommends opportunities for students to “explore a specific industry relevant to their academic program.” The GST Program provides students with an option to participate in an internship in either the private or public sectors. The internship will give students “practical experience” in a GST environment.

Strategy 8: “Develop new partnerships between colleges and businesses to support workforce development and improve workforce readiness.” Partnerships have been established with local municipalities near HCC, including the Town of Bel Air (Town Administrator, Police Department, Planning Department), City of Aberdeen (City Manager), Harford County Sheriff’s Office, and Harford County Government (Department of Public Works and Department of Planning and Zoning). Building on these partnerships, will help identify new partnerships across the region with local businesses. These partnerships with entities in the public and private sectors will offer another layer of internships opportunities for students. Moreover, these collaborative efforts across the public and private sectors

⁷ Tuition and Expenses <https://www.salisbury.edu/afford-college/tuition-and-fees.aspx> Accessed September 30, 2018

⁸ Tuition and expenses 2018 <https://www.towson.edu/admissions/tuition/> Accessed September 30, 2018

⁹ Tuition and fees 2018 <https://www.wcupa.edu/information/AFA/Fiscal/Bursar/newStudentsFallSpringUgrad.aspx> Accessed September 30, 2018

will create close linkages with the GST program and thus provide constant feedback that “could lead to improvements in curricula and programmatic outcomes.”

C. Quantifiable and Reliable Evidence and Documentation of Market Supply and Demand in the Region and State

Potential Industry Demands

Geospatial Technology is a multidisciplinary program, focusing on geographic information systems, global positioning systems, and remote sensing. Geospatial Technology provides a pathway for an advanced degree as well as employment. The multidisciplinary nature of Geospatial Technology means that GIS or Geospatial Technology is a multidisciplinary occupation.

According to The U.S. Department of Labor, Bureau of Labor Statistics (BLS), Geospatial careers fall under three categories, Cartographers and Photogrammetrists, Geographic Information Systems Technician as well as Mapping Technicians. Each of these categories represent potential industry demands and will be reviewed separately since each have distinct levels of education, training, and responsibilities. The following is a market analysis / survey breakdown of state and national employment trends, state and national wage information as well as education and training requirements for Cartographers and Photogrammetrists, Geographic Information Systems Mapping Technicians, and Geographers. Projected job growth is determined by comparing the occupation in question to the rate of all occupations.

Market Analysis and Market Surveys

Cartographers and Photogrammetrists: According to the U.S. Bureau of Labor Statistics, employment of Cartographers and Photogrammetrists workers is projected to *grow 19 percent* from 2016 to 2026, much faster than the average for all occupations. Growth will be driven by the increased use of maps in government planning. Because of the skills needed, Cartographers and Photogrammetrists typically hold a bachelor’s degree. Research regarding employment trends and supporting data in O*Netⁱ, a publication of the Bureau of Labor Statistics, reports Cartographers and Photogrammetrists have a “bright outlook,” meaning the occupations are expected to experience rapid growth in the next several years. ⁱⁱ

According to BLS, Cartographers and Photogrammetrists “collect, measure, and interpret geographic information in order to create and update maps and charts for regional planning, education, emergency response, and other purposes.”¹⁰ Table 2 below shows the Projected Annual Job Openings in the United States as well as Maryland, Pennsylvania and Virginia for Cartographers and Photogrammetrists.

¹⁰ “Summary Report for 15-1199.05 - Geographic Information Systems Technicians. Retrieved from O*Net online <https://www.onetonline.org/link/summary/15-1199.05> Accessed September 30, 2018

Table 2: Projected Annual Job Opening for Cartographers and Photogrammetrists in the United States and Maryland (2016 and 2026)

| Cartographers and Photogrammetrists | Employment | | Percent Change | Projected Annual Job Openings due to Growth |
|-------------------------------------|------------|--------|----------------|---|
| | 2016 | 2026 | | |
| United States ¹¹ | 12,600 | 15,000 | +19% | 1,200 |
| Maryland ¹² | 410 | 430 | +3% | 30 |
| Virginia ¹³ | 460 | 550 | +22% | 50 |
| Pennsylvania ¹⁴ | 230 | 260 | +14% | 20 |

Table 3 below shows the wage trends for Cartographers and Photogrammetrists across the United States, Maryland, and surrounding States. As illustrated by Table 3, Maryland has the highest income when compared to national wage rates as well as surrounding states.

Table 3: Wage Trends for Cartographers and Photogrammetrists in the United States and Selected States (2017)

| Location | Pay Period | 2017 | | | | |
|-----------------------------|------------|----------|----------|----------|----------|-----------|
| | | 10% | 25% | Median | 75% | 90% |
| United States ¹⁵ | Hourly | \$19.42 | \$24.18 | \$30.76 | \$39.08 | \$48.40 |
| | Yearly | \$40,390 | \$50,290 | \$63,990 | \$81,280 | \$100,670 |
| | Hourly | \$21.04 | \$25.97 | \$34.69 | \$47.17 | \$54.54 |

¹¹ "Occupational Employment Statistics" BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

¹² "Occupational Employment Statistics" Maryland." BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

¹³ "Occupational Employment Statistics" Virginia" BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

¹⁴ "Occupational Employment Statistics" Pennsylvania." BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

¹⁵ "Occupational Employment Statistics" BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

| Location | Pay Period | 2017 | | | | |
|----------------------------|------------|----------|----------|----------|----------|-----------|
| | | 10% | 25% | Median | 75% | 90% |
| Maryland ¹⁶ | Yearly | \$43,770 | \$54,020 | \$72,150 | \$98,110 | \$113,440 |
| Pennsylvania ¹⁷ | Hourly | \$18.45 | \$22.36 | \$27.65 | \$35.46 | \$45.24 |
| | Yearly | \$38,380 | \$46,520 | \$57,510 | \$73,760 | \$94,090 |
| Virginia ¹⁸ | Hourly | \$22.75 | \$28.49 | \$36.19 | \$46.44 | \$59.09 |
| | Yearly | \$47,320 | \$59,270 | \$75,270 | \$96,600 | \$122,910 |

Geographic Information Systems Technicians: Regarding Geographic Information Systems Technicians, O*Net summarizes the duties as follows: “assist scientists, technologists, or related professionals in building, maintaining, modifying, or using geographic information systems (GIS) databases. Such Technicians may also perform some custom application development or provide user support.”¹⁹

Based on the skills needed to become a Geographic Information Systems Technician, Tables 4 and 5 below compare national employment and wage trends for Geographic Information Systems Technicians to Maryland, Pennsylvania and Virginia. The projected growth for a Geographic Information Systems Technicians averages 5 to 9 percent.

Table 4: Employment Trends for Geographic Information Systems Technicians in the United States, District of Columbia, and Selected States (2016 and 2026)

| Geographic Information Systems Technicians | Employment | | Percent Change | Projected Annual Job Openings due to Growth |
|--|------------|---------|----------------|---|
| | 2016 | 2026 | | |
| United States ²⁰ | 287,200 | 313,800 | +9% | 22,400 |

¹⁶ “Occupational Employment Statistics” Maryland.”BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

¹⁷ “Occupational Employment Statistics” “Pennsylvania.”BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

¹⁸ “Occupational Employment Statistics” “Virginia.”BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

¹⁹ “Industry Profile.” Careeronestop.org. U.S. Department of Labor. 2018. Web September 30, 2018

²⁰ “Occupational Employment Statistics” BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

| Geographic Information Systems Technicians | Employment | | Percent Change | Projected Annual Job Openings due to Growth |
|--|------------|--------|----------------|---|
| | 2016 | 2026 | | |
| Maryland ²¹ | 14,460 | 14,780 | +2% | 950 |
| District of Columbia ²² | 17,420 | 18,720 | +7% | 1,320 |
| Virginia ²³ | 13,300 | 14,840 | +12% | 1,080 |
| Pennsylvania ²⁴ | 10,770 | 11,560 | +7% | 810 |

In addition to the promising employment trends for Geographic Information Systems Technicians, Table 5 shows the wages trends in Maryland are much higher when compared to the national wage rates.

Table 5: Wage Trends for Geographic Information Systems Technicians in the United States, District of Columbia, and Selected States (2017)

| Location | Pay Period | 2017 | | | | |
|-----------------------------|------------|----------|----------|-----------|-----------|-----------|
| | | 10% | 25% | Median | 75% | 90% |
| United States ²⁵ | Hourly | \$22.23 | \$31.40 | \$42.56 | \$54.89 | \$67.02 |
| | Yearly | \$46,240 | \$65,320 | \$88,510 | \$114,180 | \$139,390 |
| Maryland ²⁶ | Hourly | \$38.32 | \$46.00 | \$53.38 | \$59.25 | \$68.21 |
| | Yearly | \$79,710 | \$95,680 | \$111,030 | \$123,240 | \$141,890 |

²¹ "Occupational Employment Statistics" "Maryland." BLS.gov. U.S. Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

²² "Occupational Employment Statistics" "District of Columbia." BLS.gov. U.S. Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

²³ "Occupational Employment Statistics" "Virginia." BLS.gov. U.S. Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

²⁴ "Occupational Employment Statistics" "Pennsylvania." BLS.gov. U.S. Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

²⁵ "Occupational Employment Statistics" BLS.gov. U.S. Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

²⁶ "Occupational Employment Statistics" "Maryland." BLS.gov. U.S. Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

| Location | Pay Period | 2017 | | | | |
|------------------------------------|------------|----------|----------|-----------|-----------|-----------|
| | | 10% | 25% | Median | 75% | 90% |
| District of Columbia ²⁷ | Hourly | \$32.55 | \$43.98 | \$56.21 | \$68.08 | \$78.97 |
| | Yearly | \$67,700 | \$91,480 | \$116,920 | \$141,600 | \$164,250 |
| Pennsylvania ²⁸ | Hourly | \$22.76 | \$30.64 | \$41.14 | \$51.28 | \$61.98 |
| | Yearly | \$47,340 | \$63,730 | \$85,580 | \$106,660 | \$128,920 |
| Virginia ²⁹ | Hourly | \$32.83 | \$40.40 | \$50.13 | \$59.25 | \$70.01 |
| | Yearly | \$68,290 | \$84,030 | \$104,270 | \$123,240 | \$145,620 |

Mapping Technicians: Mapping Technicians perform a variety of duties including but not limited to updating maps to ensure accuracy, identifying errors and making corrections; produce maps; enter Global Positioning Systems (GPS) data in a GIS workstation; determine proper map elements of computerized maps such as scale, line sizes, and colors; and analyze aerial photographs.³⁰

Tables 6 and 7 compare the respective national employment and wage trends for Mapping Technicians in the United States, Maryland, District of Columbia, Pennsylvania and Virginia. According to the U.S Department of Labor Bureau of Labor Statistics, the job outlook for Mapping Technicians has a faster than average growth ranging from 6 to 11 percent.

²⁷ "Occupational Employment Statistics" "District of Columbia". BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

²⁸ "Occupational Employment Statistics" "Pennsylvania."BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

²⁹ "Occupational Employment Statistics" "Virginia."BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

³⁰ Details Report for17-3031.02 - Mapping Technicians

Table 6: Employment Trends for Mapping Technicians in the United States, District of Columbia, and Selected States (2016 and 2026)

| Mapping Technicians | Employment | | Percent Change | Projected Annual Job Openings due to Growth |
|-----------------------------|------------|---------|----------------|---|
| | 2016 | 2026 | | |
| United States ³¹ | 60,200 | 66,600 | +11% | 7,200 |
| Maryland ³² | 730 | 770 | +6% | 80 |
| District of Columbia | No Data | No Data | No Data | No Data |
| Virginia ³³ | 2,100 | 2,290 | +9% | 250 |
| Pennsylvania ³⁴ | 1,930 | 2,090 | +8% | 230 |

Finally, Table 7 below shows wage trends for Mapping Technicians. As with Geographic Information Systems Technicians, wages in Maryland are higher than the national wage rates and surrounding states.

Table 7: Wage Trends for Mapping Technicians in the United States, District of Columbia, and Selected States (2017)

| Location | Pay Period | 2017 | | | | |
|-----------------------------|------------|----------|----------|----------|----------|----------|
| | | 10% | 25% | Median | 75% | 90% |
| United States ³⁵ | Hourly | \$12.82 | \$16.15 | \$20.84 | \$27.40 | \$34.34 |
| | Yearly | \$26,670 | \$33,590 | \$43,340 | \$56,990 | \$71,440 |

³¹ "Occupational Employment Statistics" BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

³² "Occupational Employment Statistics" "Maryland."BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

³³ "Occupational Employment Statistics" "Virginia."BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

³⁴ "Occupational Employment Statistics" "Pennsylvania."BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

³⁵ "Occupational Employment Statistics" BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

| Location | Pay Period | 2017 | | | | |
|----------------------------|------------|----------|----------|----------|----------|----------|
| | | 10% | 25% | Median | 75% | 90% |
| Maryland ³⁶ | Hourly | \$14.40 | \$17.27 | \$22.19 | \$28.68 | \$34.87 |
| | Yearly | \$29,950 | \$35,920 | \$46,150 | \$59,660 | \$72,530 |
| District of Columbia | Hourly | No Data | No Data | No Data | No Data | No Data |
| | Yearly | No Data | No Data | No Data | No Data | No Data |
| Pennsylvania ³⁷ | Hourly | \$11.82 | \$16.27 | \$20.92 | \$56,990 | \$71,440 |
| | Yearly | \$24,580 | \$33,850 | \$43,520 | \$56,480 | \$68,180 |
| Virginia ³⁸ | Hourly | \$13.05 | \$15.67 | \$19.53 | \$25.92 | \$31.75 |
| | Yearly | \$27,150 | \$32,600 | \$40,620 | \$53,920 | \$66,040 |

Within the context of the market analysis / survey breakdown in terms of employment and wage trends, a keyword search for jobs on Indeed.com³⁹ generated several regional and statewide employment opportunities associated with “GIS technician.” Based on a search that included the State of Maryland and the surrounding metropolitan areas, the following lists job titles occurring most often per education requirements:

- GIS Technician
- Survey Technician
- CAD Technician
- Cartographer
- Geospatial Analyst (Journeyman)
- Apprentice – Geospatial Analyst
- Junior Cartographer/Geospatial Analyst

Industries for these job openings included: federal government, federal government contractors, local government, engineering companies, as well as higher education. The minimum degree requirement did vary from a high school diploma with two to three years of experience up to a bachelor’s degree.

³⁶ “Occupational Employment Statistics” “Maryland.”BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

³⁷ “Occupational Employment Statistics” “Pennsylvania.”BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

³⁸ “Occupational Employment Statistics” “Virginia.”BLS.gov. U.S Department of Labor Bureau of Labor Statistics. Accessed September 30, 2018

³⁹ “Job Search.” *Indeed.com*. Indeed, Inc. 2019. Web January 11, 2019

In summary, the employment and wage analyses support the creation of a GST associate degree curriculum. Furthermore, the information provided in this section as well as sections A and B indicate that an associate degree in GST will prepare students for the workforce or a successful transfer to a four-year institution. HCC students with an associate degree in GST will acquire the necessary education, training, and skills to be competitive in the current and future job market in Geospatial Technologies and related professional areas.

Current and Project Supply of Prospective Graduates

Current student enrollment data from HCC suggests a strong interest in the geography curriculum. Based on the 2016-2017 and 2017-2018 averaged enrollment, 347 students completed at least three credits of geography at HCC. Projected enrollments, obtained from Harford County Public Schools (HCPS) Career and Technology Education,⁴⁰ suggest a promising outlook. In 2018, 250 students were enrolled in the Natural Resource and Agricultural Sciences (NRSA) Program with 20 students in the GIS pathway at North Harford High School. There are 123 students in the Homeland Security and Emergency Preparedness-HS Sciences which falls under the Human Resources Services and 10 students in the GIS pathway at Joppatowne High School. As mentioned, the GST Program creates a career a transfer pathway to a baccalaureate degree in Geography/GIS. Accordingly, a review of transfer institutions' with a Geography Program offering GIS as major or minor revealed the following: 1) Towson University⁴¹ averaged 78 students; 2) The University of Maryland College Park⁴² - averaged 127 students; and 3) the West Chester University⁴³ in West Chester, PA averaged 75 students.

D. Reasonableness of Program Duplication

Similar Programs

There is only one program in the State of Maryland that is similar to HCC's proposed program. The primary differences between the proposed GST Program and the Engineering Technology program offered by the Community College of Baltimore County are as follows:

- HCC's proposed program is an Associate of Applied Science with no concentration.
- HCC's program requires a variety of courses such as Physical Geography, Advanced Geospatial Information Systems, and Geospatial Project.
- HCC's associate degree allows students to go directly into the workforce or continue on to a baccalaureate degree program.

⁴⁰ "Harford County Public Schools CTE Enrollment- 2017". CTE Maryland. Maryland State Department of Education. Web. January 21, 2019 <http://www.mdctedata.org/dashboards/schoolprogram.php>

⁴¹ "Student Enrollment Data." Towson University-Office of Institutional Research. Towson University. Web. February 19, 2019 https://www.towson.edu/ir/documents/f_maj_hdct_dup_ug_coll.pdf

⁴² "Enrollments & Statistics." University of Maryland – IRP, University of Maryland. Web. February 19, 2019 <https://reports.umd.edu/reportHolder.html#NumberOfRegisteredMajors/NumberOfRegisteredMajorshttps://reports.umd.edu/reportHolder.html#NumberOfRegisteredMajors/NumberOfRegisteredMajors>

⁴³ "University Enrollment." West Chester University – Institutional Research. Web February 19, 2019 <https://www.wcupa.edu/viceProvost/institutionalResearch/universityEnrollment.aspx>

Table 8: Engineering Technology Program at the Community College of Baltimore County

| Institution | Program | Degree | Key Differences |
|---------------------------------------|------------------------|---|--|
| Community College of Baltimore County | Engineering Technology | Associate of Applied Science Engineering Technology (Geospatial Applications Concentration) ⁴⁴ , CIP 159999 HEGIS 530101 | CCBC offers a concentration in Geospatial Applications integrated with Engineering Technology. The curriculum focuses on engineering as well as geospatial applications. There are no articulation agreements associated with either degree. |

Both Salisbury University and Towson University offer bachelor programs in geography with a minor in GIS. In the neighboring state of Pennsylvania, West Chester University offers a BA degree in Geography with a track in Geographic Information Systems. Upon approval of this program possible articulation agreement with Salisbury University for 2-2-1 program ending in a M.S. in Geographic Information Systems Management will be discussed. Students would obtain an associate degree at HCC then complete two years for the B.S. degree in Geography with a GIS track and then complete one year of master level work to obtain a M.S. in Geographic Information Systems Management. There is also a possible articulation agreement with West Chester University, upon approval of this program.

E. Relevance to High-demand Program at Historically Black Institutions (HBIs)

Potential Program Impact on High Demand Programs at HBIs

The GST program will not impact high-demand programs at HBIs, as there are no Maryland HBI’s that offer comparable programs. Should a HBI develop a degree program compatible for transfer from HCC, the College would pursue that partnership opportunity.

F. Relevance to the Identity of Historically Black Institutions (HBIs)

Potential Program Impact on Identities and Missions of HBIs

The GST program will have no impact on the identities and missions of HBIs, as there are no Maryland HBI’s that offer comparable programs.

⁴⁴ Community College of Baltimore County, 2018

G. Adequacy of Curriculum Design, Program Modality, and Related Learning Outcomes

Program Establishment

The GST program was established in accordance with the College's Curriculum Manual.⁴⁵ Fundamental guidelines of establishing new program at HCC include assessment of data to support enrollment, consultation with other divisions, and analysis of course transferability to the College's top transfer institutions. In anticipation of this program, three new courses were developed and two course modifications were completed. The three new courses developed are GEOG 210: Remote Sensing and Global Positioning Systems, GEOG 220: Advanced Geospatial Information Systems, and GEOG 230: Geospatial Project. The two courses modified are GEOG 203: Fundamentals of Geospatial Technology and GEOG 204: Introduction to Geographic Information Systems. The approval process for the courses involved discussions by the Behavioral and Social Science division faculty, assessment by the Deans Group, review by the curriculum workgroup, and approval by the Vice President of Academic Affairs.

Educational objectives and Learning Outcomes (LOs)

The GST Program curriculum provides students with a foundation for a variety of careers in Geospatial Technology through experiential learning opportunities in the public and private sectors. The GST program also creates a transfer pathway to a bachelor degree in Geospatial Technology as well as the skills, knowledge and hands-on experience to pursue a career in geospatial technology.

Upon completion of the Geospatial Technology Program the students will:

1. Apply techniques and knowledge of GIS, GPS, and Remote Sensing.
2. Develop maps using GIS and remote sensing software to visualize geospatial data.
3. Apply principles of geospatial technology through experiential learning with real world data in a laboratory setting and classroom discussions.
4. Describe the design, management and implementation of a geospatial project.
5. Evaluate, generate, manage, acquire, and process geospatial information.
6. Demonstrate effective written and oral communication skills

Program Assessment

Assessment of student program learning outcomes will be accomplished throughout the core Geospatial Technology courses, including: Formative and summative assessments. Outcomes are collected and documented using a learning management system-integrated software. This software allows for program goal objectives as well as individual course learning outcomes. HCC recommends all course learning objectives be assessed every four years.

⁴⁵ Harford Community College. *Harford Community College Curriculum Manual, 2017 – 2018*. August 2017.

List of courses

CIS 102 Introduction to Information Sciences (3 Credits)

General Education: Interdisciplinary and Emerging Issues (GI)

This is a survey course of the characteristics, functions and applications of computers. It includes the concepts and principles of problem solving and computer programming. Emphasis is placed on microcomputers and application software packages, such as word processors, spreadsheets, and graphics. Course fee.

CIS 118 Introduction to Microsoft Access (3 Credits)

This course provides an introduction to databases, including database design, creation, joining, tables, forms, reports, labels and queries. The student solves a variety of business problems using database products to design and create database files, locate and edit data, organize and display data, and modify and expand a database. Prerequisite: CIS 102 or permission of instructor. Course fee.

CMST 101, Speech Fundamentals (3 credits)

General Education: Interdisciplinary and Emerging Issues (GI) Students develop skills in this performance-based course of public communication concepts and techniques, including audience analysis, topic selection and research, organization of speech materials, delivery skills, and critical evaluation of speeches.

ENG 101, English Composition (3 credits)

General Education: English Composition (GE) This course is designed to develop mature writing skills in the essay form, including the documented essay. Through writing a series of essays in a variety of modes, such as argumentative essay, the process analysis, the research paper, and the summary analysis, students achieve proficiency in presenting and supporting their own ideas and incorporating the ideas of others into their essays. Prerequisites: ENG 012, ENG 018, ENG 060 or a qualifying score on the writing assessment.

GEOG 203, Map Interpretation (3 credits)

This course introduces maps as effective tools to record and communicate spatial information. Emphasis is on map scale and measurement, referencing systems, map types, and new geo-techniques. Topics include earth geometry, geodetic survey, map projections, location and land partitioning systems, map measurement, symbolization, (3D) terrain representation and contour interpretation, thematic maps, and cartogram maps. Geographic exercises requiring geo-technologies, digital cartography, remote sensing, image interpretation, geographic information, global positioning, and interactive internet mapping are discussed. Prerequisite or Co-requisite: GEOG 101 Prerequisites: MATH 023 or MATH 026 or appropriate Accuplacer score.

GEOG 204 Introduction to Geographic Information Systems (4 credits)

This course is an introduction to Geographic Information Systems (GIS), a tool for integrating and analyzing spatial data to visualize relationships, seek explanations and develop solutions to problems. Practical applications of geographic information systems (GIS) are emphasized. The laboratory provides hands-on experience with GIS software and data collection methods. Prerequisites: GEOG 101, GEOG 203.

GEOG 210, Principles of Remote Sensing and Global Positioning Systems (3 Credits)

Introduction to the acquisition, interpretation and mapping of aerial and satellite images. Students will also learn to use Global Positioning Systems (GPS) in the field, apply error correction of GPS data, and build Geospatial Information Systems using GPS technology. This course meets for 30 lecture hours and 30 laboratory hours. Prerequisite: GEOG 204 grade of "C" or higher.

GEOG 220, Advanced Geospatial Information Systems (3 Credits)

This course builds upon the concepts introduced in GEOG 204. Students will learn in-depth spatial data handling, modeling, and analysis using ArcGIS software. This course meets for 30 lecture hours and 30 laboratory hours. Prerequisite: GEOG 204 grade of "C" or higher.

GEOG 230, Geospatial Project (4 credits)

This is a capstone course in which students will gain real world experience in the development, management, and implementation of a geospatial project. The project will be used to resolve geospatial problems in the public and private sectors, and/or in academia. This class meets for 30 lecture hours and 60 laboratory hours. Prerequisite: GEOG 220 grade of "C" or higher.

MATH 101 College Algebra (3 Credits)

General Education: Mathematics (GM): This course presents linear, quadratic, logarithmic, polynomial and inverse functions. Additional topics include linear systems and inequalities, complex numbers, and piecewise-defined functions. Emphasis is placed on solving application problems related to business and social sciences. Prerequisites: A qualifying score on the math assessment or Math 026.

MATH 216, Introduction to Statistics (4 credits)

General Education: Mathematics (GM): This course provides the student with the fundamental concepts and methods of statistical analysis. Course topics: measures of central tendency and variation, graphical representation of data, least squares regression, correlation, probability distributions, sampling techniques, parameter estimation, and hypothesis testing. Technology and statistical literacy will be integrated throughout the course. Prerequisite: qualifying score on the math assessment or MATH 023, MATH 026 or MATH 027.

CIS 111C Programming Language (4 Credits)

This course in computer programming uses the C language. The student learns to define, solve, code, enter, test, debug and document programming problems. Prerequisite: CIS 102 or permission of the instructor. Corequisite: CIS 115. Course fee.

CIS 115 Fundamentals of Programming (3 Credits)

This course is designed to develop problem-solving skills in relation to designing computer programs. The student examines and uses program development techniques by developing hierarchy charts, flowcharts and pseudocode to solve common programming problems. This course is a co-requisite for programming languages classes. It is strongly recommended that students complete CIS 115 prior to taking a programming language.

CIS 229 Python Programming Language (4 Credits)

This course in computer programming uses the Python language, which is a general purpose, object-oriented programming language, ideal for rapid prototype development, scripting, and cross-language software development. The student learns how to define, solve, code, test, and document programming problems using Python. Prerequisites: CIS 102 or permission of the instructor. Course fee.

CADD 101 Introduction to CADD (3 Credits)

The content of the basic course includes learning CADD commands and working with the user-interface. File maintenance and plotting are used to create two-dimensional design models in a CADD environment using AutoCAD software. Course includes 30 lecture hours and 30 lab hours per semester. Course fee.

CMST 106 Business & Professional Speech (3 Credits)

This course is designed to teach skills necessary for effective oral presentations in business and professional settings. Students present a variety of presentational forms including those for meetings, informative and persuasive speeches, and technical presentations. All activities are designed to provide maximum opportunity for practical application of skills learned.

[General Education Requirements](#)

The following recommended sequence of course completion demonstrates how General Education requirements will be met and maps courses to the GST Program.

Table 9: General Education Requirements in Relation to the GST Program

| Course (Credit) (General Education ⁴⁶ or HCC Graduation Requirement) | Program LOs |
|--|----------------|
| Semester 1 | |
| ENG 101, English Composition (3) (GE) | 4, 6 |
| CIS 102, Introduction to Information Science | 2, 5 |
| MATH 101, College Algebra (GM) | 1, 2, 5 |
| GEOG 101, Physical Geography (GB) | 1, 2, 6 |
| GEOG 203, Fundamental of Geospatial Technology | 1,2,3,4,5,6 |
| Semester 2 | |
| CMST 101, Speech Fundamentals (3) (GI) | 4,6 |
| CIS 118, Introduction to Microsoft Access | 2,3,4,5 |
| MATH 216, Introduction to Statistics (GE) | 2,5 |
| GEOG 204, Introduction to Geographic Information Systems | 1,2,3,4,5,6 |
| PE Elective (1) (PE ⁴⁷) | 6 |
| Semester 3 | |
| ENG 209, Technical Writing | 4, 6 |
| GEOG 210, Remote Sensing and Global Positioning Systems | 1,2,3,4,5,6 |
| GEOG 220, Advanced Geospatial Information Systems | 1,2,3,4,5,6 |
| Arts and Humanities Elective (GH ⁴⁸) | 6 |
| Program Elective | 5,6 |
| Semester 4 | |
| GEOG 230, Geospatial Project | 1,2,3,4,5,6 |
| Biology/Physical Lab Elective (GL) | 6 |
| Program Elective | 1,5,6 |

Assurance and Evidence

Following a 2017 comprehensive review of business processes, HCC has begun implementation of projects designed to enhance the student experience. Improvements to workflow will provide students with clear, complete, and timely information. For example, the adoption of catalog management software that integrates with both the current Enterprise Resource Planning (ERP) solution and the degree-auditing and tracking tool will provide students with transparent, real time information regarding curriculum, course and degree requirements.

HCC regards faculty interactions with the student body as paramount to academic success. All full-time faculty maintain at least five reasonably distributed office hours per week when the faculty member's

All students must meet specific General Education requirements within their associate degree programs. To be eligible for the Associate of Applied Science (AAS) degree, students must complete a minimum of 60 credits of college-level work. Of the 60 credits, 28-36 credits must fulfill the College's General Education requirements.

⁴⁷ Harford Community College requires students to earn at least 1 credit in Physical Education for graduation from all degree programs.

⁴⁸ To be eligible for an associate degree, new and readmitted students must complete one 3-credit diversity course.

courses are in session. Office hours are posted in the syllabus, on office doors and in the learning management system. Additionally, each GST student will be assigned a faculty advisor to develop goals and objectives for the purpose of internship placement.

The use of technology is at the core of Geospatial Technology. With technology quickly becoming a primary means with which people communicate and receive information, the BSS Division firmly believes that students will benefit from skill proficiency well beyond college completion. The GST lab will have 20 computers with dual monitors, a wide format printer, a table top scanner, two GEO 7X Trimble GPS units, and 10 iPads.

All HCC courses are required to use the Learning Management Systems (LMS) to provide links to academic support services, financial aid resources, and college policies regarding tuition costs and payment regardless of instructional delivery mode.

HCC's Office of Communications generates promotional materials for academic programs that are used in advertising, recruiting, and admission. Office of Communications staff work closely with staff in Academic Affairs and Student Affairs & Institutional Effectiveness to ensure the accuracy of promotional materials. An annual review process of program brochures has been established to coincide with the release of each academic catalog, as well as a line of communication for any programmatic changes that may occur outside of the annual review cycle.

H. Adequacy of Articulation

The Associate of Applied Science in Geospatial Technology is designed to transfer to comparable bachelor degree programs offered at other institutions. Upon program approval, HCC will seek articulation agreements with Salisbury University, Towson University, and West Chester University.

I. Adequacy of Faculty Resources

HCC employs highly qualified faculty in all disciplines. Additionally, through the Center for Excellence in Teaching and Learning (CETL), the College offers comprehensive professional development and training for all who are engaged in the teaching and learning process at HCC. CETL is intentionally designed to be a hub both digitally and physically for innovation, collaboration, and learning transformation through a variety of events and resources in order to:

- Create faculty teaching and learning communities of practice;
- Celebrate innovation in instruction and scholarship;
- Offer on-going basic and advanced learning management system training;
- Provide resources, facilities and technology to foster experimentation; and
- Offer opportunities for faculty to gain additional knowledge and hone skills related to technology and pedagogy.

Full-time faculty have graduate degrees in Geographic Information Science, geography and experiences in a variety of settings.

The following identifies faculty engaged in this program:

Tamara Biegas, Ph.D.

Assistant Professor of Geography (Full-Time)
AS, Schoolcraft College
BS, Eastern Michigan University
MS, Eastern Michigan University
Ph.D. Texas State University

GEOG 101 Physical Geography
GEOG 203 Fundamental of Geospatial Technology
GEOG 204 Introduction to GIS
GEOG 210 Remote Sensing and Global Positioning Systems
GEOG 220 Advanced GIS
GEOG 230 Geospatial Project

Jessica Adams

Assistant Professor of Mathematics (Full-Time)
B.S., University of Delaware
M.S., Johns Hopkins University
M.S., Notre Dame of MD University
MATH 216 - Introduction to Statistics

John Bray

Assistant Professor of Mathematics (Full-Time)
B.S., University of Scranton
M.S., Pennsylvania State University
MATH 216 - Introduction to Statistics

Michele Catterton

Assistant Professor of Mathematics (Full-Time)
B.S., Towson University
M.S., McDaniel College
MATH 216 - Introduction to Statistics

Cynthia Gribbin

Resident Faculty, Communication Studies (Full-time)
B.A., University of Maryland, College Park
M.A., Notre Dame of Maryland University

CMST 101 – Speech Fundamentals

Linda Heil

Associate Professor of Communication Studies (Full-time)

B.S., Towson University

M.S., Towson University

G.C.E.R.T., University of Maryland-University College

CMST 101 – Speech Fundamentals

General Education Humanities

Chris Jones

Professor of Mathematics (Full-Time)

B.S., Towson University

M.S., Towson University

MATH 216 - Introduction to Statistics

Dorothy Miller

Professor of English (Full-Time)

B.S., Bloomsburg University of Pennsylvania

M.A., Johns Hopkins University

M.Ed., Bloomsburg University of Pennsylvania

Ed.D., Columbia University

ENG 101- English Composition

Susan Muaddi Darraj

Associate Professor of English (Full-Time)

B.A., Rutgers State University of New Jersey

M.A., Rutgers State University of New Jersey

ENG 101- English Composition

General Education Humanities

Carol Mueller

Assistant Professor of Mathematics (Full-Time)

C.E.R.T., Capella University

A.A., College of DuPage

B.Ed., University Arkansas Fayetteville

M.Ed., University Arkansas Fayetteville

Ph.D., University Arkansas Fayetteville

MATH 216 - Introduction to Statistics

Terry Surasky

Assistant Professor of Mathematics (Full-Time)

B.S., Towson University

M.Ed., Loyola University Maryland

MATH 216 - Introduction to Statistics

Scott West

Assistant Professor of English (Full-Time)

A.A., Harford Community College

B.A., Goucher College

M.A., Morgan State University

M.F.A., University of Baltimore

ENG 101- English Composition

ENG 209 Technical writing

Steve Johnson

Assistant Professor of Computer Aided Design (Full-Time)

BS, University of Maryland College Park

MS, University of Maryland College Park

CADD 101- Introduction to CAD

Abigail Chapin

Assistant Professor of Computer Information Systems (Full-Time)

B.S., University Maryland College Park

B.S., University Maryland College Park

M.S., University of Virginia-Main

CIS 102 Introduction to Information Systems

Mark Dencler

Assistant Professor of Computer Information Systems (Full-Time)

B.S., Towson University

M.S., Towson University

CIS 111 C Programming Language

CIS 115 Fundamentals of Programming Language

CIS 229 Python Programming Language

Jerome Brown

Assistant Professor of Computer Information Systems (Full-Time)

B.S., Lincoln University-PA

M.S., University of Maryland College Park

CIS 102 Introduction to Information Science

CIS 115 Fundamentals of Programming Language

J. Adequacy of Library Resources

The HCC Library is a 25,734 square foot facility located centrally on campus. It is open seven days per week for student access. The library's website provides 24-hour free access to the catalog, databases, subject guides, tutorials and other resources. Borrowing privileges are available for all students, as well as county residents 18 years or older. The library focuses its collection on a mixture of print, electronic, and video resources to meet the informational and curricular needs of the HCC community. The Library has several hundred Geospatial Technology print and/or electronic books, many of which will support the courses for the program. Students have access to full-text journal, magazine and newspaper articles through the College's subscription databases. Streaming video collections are available through two databases, Films on Demand and Alexander Street Press. Students have access to unlimited resources through the Inter-Library Loan Service, which can deliver titles from almost any academic library in the country.

K. Adequacy of Physical Facilities, Infrastructure and Instructional Equipment

Physical resources at HCC offer sufficient space and learning technology to support education. The 352-acre campus has a physical plant of 21 buildings including a performing arts center, an observatory, a 3,000-seat arena and athletic center and six classroom buildings.

Students enrolled in the program have access to the HCC Learning Center for tutoring services in math, science, writing, study skills and test taking skills. Additionally, the Test and Assessment Center, Academic Advising and Transfer Services, and Career Services are all resources of the college that may be utilized episodically for individual or groups of students.

All faculty and credit-earning students are provided with an institutional e-mail account that integrates with the learning management system. Open-access, comprehensive student support for the learning management system is provided in module format and includes "how to" video and print tutorials, an eLearning Help Desk, links to student services, and tips for success in an online learning environment. Faculty are assigned an eLearning point-of-contact for technical support, a learning management system "trouble-shoot" guide, and access to Help Desk dedicated line.

Computing and Technology Services (CTS) at HCC provide technology support for desktop, laptop and tablet devices provided by the college, classroom computers and instructional technology such as Smart boards, LCD projectors, and DVDs. Wireless access is available throughout the HCC campus. Open-access computer labs located in the library offers a wide selection of computer software and applications for student use, including multimedia production and digital editing capabilities. A resource help desk, staffed by eLearning personnel, is located in this area specifically for student help with online resources.

Currently, Geospatial courses are taught in a shared computer lab with 16 computers which includes the instructor station. The latest GIS software (ArcGIS 10.5) is installed. This software license allows HCC to install ArcGIS onto any computer on campus so as long as it is being for teaching and research purposes. Remote sensing software (ERDAS Imagine 16.0) is also installed in this computer lab. The lab also

includes an HP designjet Z5600 wide format printer. Additional hardware includes eight iPads and two GEO 7x Trimble GPS Units.

Beginning, Spring 2020 there will be a dedicated computer lab for Geospatial courses located in Fallston Hall. Fallston Hall is being renovated beginning January 2019 through December 2019. This lab will include 21 workstations with 27" monitors as well as a server. In addition, there will be a tabletop scanner, tabletop printer, engineering light table, HP wide format printer, and a storage cabinet.

Supportive statement by the President

It is the position of Dr. Dianna Phillips, President of HCC, that existing library resources, physical facilities, infrastructure and instructional equipment will more than adequately support the GST program.

L. Adequacy of Financial Resources with Documentation

Table 10: Resources

| Resource Categories | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|--|----------|----------|----------|----------|----------|
| 1. Reallocated Funds | 0 | 0 | 0 | 0 | 0 |
| 2. Tuition/Fee Revenue (c + g below) | \$43,248 | \$51,588 | \$59,928 | \$69,042 | \$73,212 |
| a. Number of F/T Students | 10 | 12 | 14 | 16 | 17 |
| b. Annual Tuition/Fee Rate ⁴⁹ | \$4170 | \$4170 | \$4170 | \$4170 | \$4170 |
| c. Total F/T Revenue (a x b) | \$41,700 | \$50,040 | \$58,380 | \$66,720 | \$70,890 |
| d. Number of P/T Students ⁵⁰ | 2 | 2 | 2 | 3 | 3 |
| e. Credit Hour Rate | \$129 | \$129 | \$129 | \$129 | \$129 |
| f. Annual Credit Hour Rate ⁵¹ | 6 | 6 | 6 | 6 | 6 |
| g. Total P/T Revenue (d x e x f) | \$1548 | \$1548 | \$1548 | \$2322 | \$2322 |

⁴⁹ \$129/credit x 30 credits=\$3870 + average of \$300 in course fees

⁵⁰ The number of part-time students varies from year to year. Majority of students are part-time. In FY15 and FY 16, HCC averages 1956 full time students and 5771 part-time students. Although most students will be full time, there will probably be a couple students whole are going to back to school part-time

⁵¹ Numbers are based on the average part-time student taking 6 credits a semester.

| Resource Categories | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|----------|----------|----------|----------|----------|
| 3. Grants, Contracts & Other External Sources | \$0 | \$0 | \$0 | \$0 | \$0 |
| 4. Other Sources Consolidated Service Fee ⁵² | \$9288 | \$10,836 | \$12,384 | \$14,706 | \$15,480 |
| TOTAL (Add 1 – 4) | \$52,536 | \$62,424 | \$72,312 | \$83,748 | \$88,692 |

Table 11: Expenditures

| Expenditure Categories | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---------------------------------|----------|----------|----------|----------|----------|
| 1. Faculty (b + c below) | \$50,600 | \$51,012 | \$52,032 | \$53,073 | \$54,134 |
| a. # FTE ⁵³ | 1 | 1 | 1 | 1 | 1 |
| b. Total Salary ⁵⁴ | \$50,600 | \$51,012 | \$52,032 | \$53,073 | \$54,134 |
| c. Total Benefits ⁵⁵ | \$0 | \$0 | \$0 | \$0 | \$0 |
| 2. Admin. Staff (b + c below) | \$0 | \$0 | \$0 | \$0 | \$0 |
| a. # FTE ⁵⁶ | 0 | 0 | 0 | 0 | 0 |
| b. Total Salary | \$0 | \$0 | \$0 | \$0 | \$0 |
| c. Total Benefits | \$0 | \$0 | \$0 | \$0 | \$0 |
| 3. Support Staff (b + c below) | 0 | 0 | 0 | 0 | 0 |
| a. # FTE ⁵⁷ | 0 | 0 | 0 | 0 | 0 |
| b. Total Salary | \$0 | \$0 | \$0 | \$0 | \$0 |
| c. Total Benefits | \$0 | \$0 | \$0 | \$0 | \$0 |
| 4. Equipment ⁵⁸ | \$59,742 | \$0 | \$0 | \$0 | \$0 |

⁵² \$25.80/credit x 30 credits = \$744 x number of students

⁵³ The expenditures listed reflect the number of FT Faculty needed to meet the program's 27 credits of GEOG. FT Faculty at Harford Community College are required to teach 30 credit hours per academic year. GST will be implemented with existing faculty resources.

⁵⁴ Salaries are forecasted to increase at 2% each year.

⁵⁵ The benefits include family medical insurance, family dental insurance, family vision insurance, long term disability and life insurance. Most employees at HCC have family insurance policies so that was the rate factored in. HCC pays 85% of the premium for medical, dental and vision.

⁵⁶ GST will be implemented with existing administrative staff resources.

⁵⁷ GST will be implemented with existing support staff resources.

⁵⁸ A new lab is being created during the first year

| Expenditure Categories | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---------------------------------|-----------|----------|----------|----------|----------|
| 5. Library ⁵⁹ | \$0 | \$0 | \$0 | \$0 | \$0 |
| 6. New or Renovated Space | \$0 | \$0 | \$0 | \$0 | \$0 |
| 7. Other Expenses ⁶⁰ | \$0 | \$0 | \$0 | \$0 | \$0 |
| TOTAL (Add 1 – 7) | \$110,342 | \$51,012 | \$52,032 | \$53,073 | \$54,134 |

M. Adequacy of Provisions for Evaluation of Program

Course Evaluation Procedure

Faculty are evaluated annually by the division dean using the following core components: instruction observations, syllabus, final examinations, assessment instruments or strategies used to evaluate course objectives and academic outcomes, data reports and written critiques of student surveys of instruction, participation records of college assignments, professional development activities, and college and community service activities.

Institutional Assessment of Program Effectiveness

HCC has a systematic plan for evaluation of all degree programs and courses that will be applied to the Community Health Promotion program. The College supports the review of curriculum as a significant component of an overall educational effectiveness plan. Program reviews lead to program and course improvements that are based on sustained information gathering and analysis and provide insight for needed resources and ensure superior educational programs that meet student and community needs. Program reviews assess how well the program has achieved its objectives and suggests potential approaches to enhance this effort and address and fulfill accreditation requirements as prescribed by Middle States.

The program evaluation process includes faculty and staff within and outside of the program, students, advisory board members, representatives from resource areas in the college, and other communities of interest. This clearly defined program review process provides a consistent framework for evaluating a program's educational effectiveness and includes the use of a comprehensive data management system to systematically collect and report student learning outcome assessments and collaboration with the Office of Institutional Research, Planning, and Effectiveness for data regarding student retention and completion, faculty and student satisfaction, and program cost-effectiveness. All programs and their options/tracks, including A.A.S. (career), certificate, A.A. /A.S. (transfer) degree programs, and programs

⁵⁹ Library resources are budgeted in the operating budget on an ongoing basis.

⁶⁰ Expenses such as professional development, travel, memberships, office supplies, communications, data processing, and equipment maintenance are budgeted in the operating budget on an ongoing basis.

such as General Education, Information Literacy and Distance Learning are evaluated every three to five years on a planned cycle.

N. Consistency with the State's Minority Student Achievement Goals

Minority Student Needs

HCC has a history of promoting diversity and creating an environment that is open and inclusive for students, visitors, and employees. HCC embraces differences, respects intellectual and academic freedom, promotes critical discourse, and encourages socio-cultural and global awareness.

HCC has developed strategies to address the eradication of the attainment gap including implementation of the My College Success Network (MCSN) and Soar2Success (S2S). Established in July 2014, these programs are a network of services, events, staff and faculty geared toward empowering and supporting African American students.

In 2018, HCC joined Achieving the Dream (ATD), a network dedicated to improving student success, with a particular focus on academic goal attainment, personal growth, and economic opportunity for low-income students and students of color.

O. Relationship to Low Productivity Programs Identified by the Commission

This proposed program is not directly related to an identified low productivity program.

P. Adequacy of Distance Education Programs

Affirmation of Institutional Distance Education Eligibility and C-RAC Guidelines

HCC is an approved institution of the National Council for State Authorization Reciprocity Agreement (NC-SARA). As a NC-SARA institution, HCC is approved to offer distance learning courses to students who reside in other NC-SARA approved states. At this point in time, HCC is unable to admit students from California and Massachusetts, as the two are not participating members of NC-SARA.

HCC does comply with C-RAC guidelines for the Evaluation of Distance Education. The College's eLearning Department and the Distance Learning Committee (DLC) ensure online learning offered by HCC aligns with the College's mission to provide accessible, innovative, and learner-centered education as a means to promote individual goal attainment, as well as career and workforce development. Both the DLC and eLearning have worked together to develop a formal Quality Matters review for courses as

well as an internal review process for all new and existing online classes at HCC to ensure a high quality and rigorous educational experience for all online students.

Blackboard is used as the College's LMS. All full and part-time faculty are provided Blackboard course sites for each of their courses and are required to complete Blackboard basic training or demonstrate competency through a "Blackboard Veterans" quiz developed internally. In addition to the required training, course syllabi, contact information, and college closing information must be included on all course sites. To further facilitate student success in online learning environments, the DLC developed and implemented common nomenclatures for online course menus to standardize terminology used in courses across campus. An "Online Readiness Check" was also developed as a tool to assess the readiness of students interested in enrolling in online courses.

eLearning also provides professional development training that focuses on enhancing online instruction for all faculty throughout the year. Workshops and training sessions range in level and content in order to adequately provide faculty with relevant information and experiences, as well as facilitate continual growth in online instruction.

Appendix A: Harford Community College Catalog Page

ASSOCIATE OF APPLIED SCIENCE DEGREE

2019-2020

Geospatial Technology Program

Award: Associate of Applied Science Degree

No. of credits required: 60

For more information: Dr. *Tamara Biegas* or *Admissions*, 443-412-2109

PROGRAM DESCRIPTION

The Geospatial Technology Program provides students with the skills, knowledge and hands-on experience to pursue a career in geospatial technology. The Geospatial Technology Program offers a comprehensive array of Geographic Information Systems, Remote Sensing, and Global Positioning Systems. Geospatial Technology can be applied in a variety of fields including, but not limited to Education, Public Safety, Local, State, and Federal Government, Banking, Health and Human Services, Transportation, Utilities, Natural Resources, Business, Manufacturing, and Telecommunication to make informed data driven decisions by analyzing geospatial data.

PROGRAM GOALS

1. Apply techniques and knowledge of Geospatial Information Systems (GIS), Global Positioning Systems, and Remote Sensing.
2. Develop maps using GIS and remote sensing software to visualize geospatial data.
3. Apply principles of geospatial technology through experiential learning with real world data in a laboratory setting and classroom discussions.
4. Describe the design, management and implementation of a geospatial project.
5. Evaluate, generate, manage, acquire, and process geospatial information.
6. Demonstrate effective written and oral communication skills

* PROGRAM ELECTIVES

(Choose 10 credits)

| | | |
|----------|---------------------------------------|---|
| CADD 101 | Introduction to CAD | 3 |
| CIS 111 | C Programming Language | 4 |
| CIS 115 | Fundamentals of Programming Language | 3 |
| CIS 229 | Python Programming | 4 |
| CMST 106 | Business and Professional Speech | 3 |
| GEOG 102 | Human Geography | 3 |
| GEOG 103 | World Regional Geography | 3 |
| ENV 111 | Introduction to Environmental Science | 3 |
| ENV 112 | Environmental Science Lab | 1 |
| MATH 203 | Calculus I | 4 |
| GEOG 283 | Internship in Geospatial Technology | 3 |

DEGREE REQUIREMENTS

Recommended Course Sequence

| First Semester | | Credits |
|-----------------------|--|-----------|
| ENG 101 | English Composition (GE) | 3 |
| CIS 102 | Introduction to Information Science | 3 |
| MATH 101 | College Algebra (GM) | 3 |
| GEOG 203 | Fundamentals of Geospatial Technology | 3 |
| GEOG 101 | Physical Geography (GB) | 3 |
| Semester Total | | 15 |
| Second Semester | | Credits |
| CMST 101 | Speech Fundamentals (GI) | 3 |
| CIS 118 | Introduction to Microsoft Access | 3 |
| MATH 216 | Introduction to Statistics (GM) | 4 |
| GEOG 204 | Introduction to Geographic Information Systems | 4 |
| | PE Elective | 1 |
| Semester Total | | 15 |
| Third Semester | | Credits |
| ENG 209 | Technical Writing | 3 |
| GEOG 210 | Remote Sensing and Global Positioning Systems | 3 |
| GEOG 220 | Advanced Geospatial Information Systems | 3 |
| | Arts/Humanities Elective (GH) | 3 |
| | Program Elective | 3 |
| Semester Total | | 15 |
| Fourth Semester | | Credits |
| GEOG 230 | Geospatial Project | 4 |
| | Biology/Physical Lab Elective (GL) | 4 |
| | Program Electives | 7 |
| Semester Total | | 15 |

Note: The following codes identify courses which satisfy the General Education Degree Requirements:

- GB** Behavioral/Social Science+
- GE** English Composition
- GH** Arts/Humanities+
- GI** Interdisciplinary and Emerging Issues
- GL** Biological/Physical Laboratory Science
- GM** Mathematics
- GS** Biological/Physical Science

TO SATISFY THE DIVERSITY REQUIREMENT: Associate degree students must complete one 3-credit diversity course **D**. It is recommended that students select one of the 3-credit **GB**, **GH**, **GI** course electives from those that also appear on the approved list of diversity course graduation requirements.

*If you plan on transferring to a four-year institution, please see an academic advisor or program coordinator for Geospatial Technology.

Appendix B: Best Practices for HCC Online Courses

Faculty Presence

Faculty should have an active presence that encourages student involvement in the online course environment. Courses that adhere to this practice will typically include several of the following:

- Expectations of availability and turn-around time are clear
- There is evidence that instructors will regularly engage with students in various course activities.
- Faculty intends to provide frequent and substantial feedback
- A personable faculty introduction is included
- A welcome is clearly visible upon first logging into the course

Start-Up Information & Navigation

Course navigation guidance, including start-up information, is readily available. The course is well organized and easy to navigate. Courses that adhere to this practice will typically include several of the following:

- A location, clearly evident upon logging into the course, labeled “start here,” includes information the student should view prior to starting the course selected by the instructor such as welcome letter, syllabus, instructor information, student expectations/tips for success, etc.
- The syllabus is complete and easy to access
- Navigation is clear, simple, and user friendly
- The course schedule is summarized in one location
- Organization and sequencing of the course content is logical and clear
- Required instructional materials are easily located
- Links to other parts of the course and external sources are accurate and up to date
- FAQs or help for technological issues are available

Content

Instructional rigor is equal to that of a face-to-face course. It is delivered to address different learning styles and reinforced through various tools. Courses that adhere to this practice will typically include several of the following:

- Instructional content should include more than one of the following: readings, online lectures, videos, simulations, case studies, games, discussion forums, study guides, practice problems, pretests, homework, etc.
- Activities promoting a sense of engagement and community are included, such as scavenger hunt, ice breakers, collaborative exercises, discussion boards, etc.
- The pace of the course is appropriate to the course content and level
- Clear information and instructions are provided regarding the access of required course materials
- Appropriate media supports course content and adds interest
- Any materials which are not required are clearly marked as optional
- Written material is professional and uses language appropriate to the course topic and level
- Copyright ownership is followed and clearly documented

- All course components are visually and functionally consistent with each other

Active Learning

The course provides a variety of opportunities for interaction that support active learning. Courses that adhere to this practice will typically include several of the following:

- The course includes activities which provide opportunities for students to interact with the teacher, with each other, and with the content
- Activities are included which do not have a single right answer
- Challenging tasks are presented
- Sample cases and assignments are used as a template
- Expectations for student participation in the course activities are clear
- Activities and assessments encourage students to apply, analyze and evaluate course content
- Students are encouraged to create new understandings as demonstrated on course assessments
- Students have input to the learning environment, for example, due dates, assessment formats, course content, etc.

Assessment

Various forms of assessment occur throughout the course, in accordance with the HCC attendance policy, and measures student achievement of Student Learning Objectives and/or competencies.

Courses that adhere to this practice will typically include several of the following:

- Forms of assessment should include more than one of the following: quizzes, papers, discussions, self-checks, projects, tests & exams, presentations, case studies, labs, skill assessments, etc.
- Assessments clearly align with Student Learning Objectives
- Instructions, student expectations, and grading standards are clearly stated, this may include the provision of sample assignments
- The course grading policy and grading calculations are stated clearly
- The gradebook is visible to students and there are clear instructions on how students can access their grades and feedback, preferably using the Blackboard Grade Center
- The gradebook is current

Accessibility

Course design reflects a commitment to accessibility and usability throughout the course. Courses that adhere to this practice should include the following:

- Course content is in compliance with the Americans with Disabilities Act
- The course design facilitates readability (e.g., color, font, use of white space, length, background, etc.)
- Necessary technology is easily obtainable
- Course media is easy to view and operate
- Technology used in the course supports achievement of the Student Learning Objectives
- Hardware and software requirements are clearly stated and students are given information about downloading necessary software

- Information directing students to methods of accessing institutional support services; including technology, accessibility, and academic support is included
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