December 13, 2019

James D. Fielder, Jr., Ph.D.
Secretary of Higher Education
Maryland Higher Education Commission
6 North Liberty Street
Baltimore, MD 21201

Dear Dr. Fielder,

The purpose of this letter is to submit two new academic program proposals for an Associate of Applied Science degree in Small Unmanned Aircraft Systems and a Lower Division Certificate in sUAS Pilot Safety at Carroll Community College. These proposed degree and certificate programs will be the only programs in the State of Maryland with a unique focus on safe sUAS operation for aerial video production and the collection and processing of aerial and geospatial data, and we are therefore seeking Statewide Program Designations.

The complete proposals accompany this cover letter. Thank you in advance for the Commission's consideration of these new programs.

If there are questions regarding the program or materials, please direct them to Dr. Melody Moore, Associate Vice President for Program Development and Partnerships, memoore@carrollcc.edu or 410-386-8412.

Sincerely,

Dr. Rosalie V. Mince
Vice President of Academic and Student Affairs

cc: Dr. Melody Moore
    Mr. Scott Gore

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

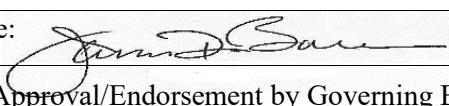| Institution Submitting Proposal	Carroll Community College

Each <u>action</u> below requires a separate proposal and cover sheet.

⊙ New Academic Program	O Substantial Change to a Degree Program
O New Area of Concentration	O Substantial Change to an Area of Concentration
O New Degree Level Approval	O Substantial Change to a Certificate Program
O New Stand-Alone Certificate	O Cooperative Degree Program
O Off Campus Program	O Offer Program at Regional Higher Education Center

Payment Submitted: ⊙ Yes O No	Payment Type: O R*STARS O Check	Date Submitted: November 13, 2019

Department Proposing Program	Academic Affairs
Degree Level and Degree Type	Associate of Applied Science (A.A.S.)
Title of Proposed Program	Small Unmanned Aircraft Systems
Total Number of Credits	60
Suggested Codes	HEGIS: CIP: 49.0102
Program Modality	O On-campus O Distance Education (fully online) ⊙ Both
Program Resources	⊙ Using Existing Resources O Requiring New Resources
Projected Implementation Date	⊙ Fall O Spring O Summer Year: 2020
Provide Link to Most Recent Academic Catalog	https://www.carrollcc.edu/uploadedFiles/CarrollCCedu/Content/PDF/Credit_Publications/Catalog/2019-2020%20College%20Catalog.pdf
Preferred Contact for this Proposal	Name: Melody L. Moore
	Title: Associate Vice President for Program Development and Partnerships
	Phone: (410) 386-8412
	Email: memoore@carrollcc.edu
President/Chief Executive	Type Name: James Ball
	Signature: Date:
	Date of Approval/Endorsement by Governing Board:

Revised 6/13/18

Small Unmanned Aircraft Systems (Drones) A.A.S.
Carroll Community College

A. Centrality to institutional mission statement and planning priorities:

1. Provide a description of the program, including the degree to be awarded, each area of specialization/concentration (if applicable), purpose or objective, and how it relates to the institution's approved mission.

Carroll Community College (CCC) is proposing a new Associate of Applied Science (A.A.S.) degree in Small Unmanned Aircraft Systems (sUAS). The program is intended for prepare individuals for an exciting career related to Small Unmanned Aircraft Systems. It will provide students with both the theoretical knowledge and practical skill necessary to safely operate, analyze data, and maintain small unmanned aircraft system within the guidelines of the National Airspace System.

The program will prepare students for employment or advancement in careers such as sUAS Pilot, Data Analyst, Drone Data Specialist, sUAS (Drone) Manager and Drone Technician. The coursework applies this emerging technology across a broad spectrum of industrial applications, including construction, energy, utilities, agriculture, infrastructure, mining, public safety, surveying, mapping, real estate, photography and videography.

The coursework focuses on safe sUAS operation for aerial video production, the collection and processing of aerial and geospatial data, as well as piloting and flight requirements. As part of this program, students will prepare to earn their FAA Remote Pilot in Command Certificate. Some coursework may require fieldwork and flight laboratories.

The program is intended for students who plan to enter the workforce immediately after completing the program. However, there are many different routes that students can take after finishing their associate's degree. Whether they want to enter the workforce right away or continue into higher education, they will be well-equipped with foundational knowledge to help them succeed.

Carroll Community College is a public, open admission, associate-degree-granting college serving Carroll County, MD with baccalaureate preparation programs, career education, workforce and business development, and personal and cultural enrichment opportunities. As a vibrant, learner-centered community, the College engages students as active learners, prepares them for an increasingly diverse and changing world, and encourages their lifelong learning.

The College mission is to provide "accessible, high-quality educational opportunities to advance careers, enrich lives, and strengthen the community" it serves. This mission is conveyed through seven College goals, two of which are expressly addressed by the proposed Associate of Applied Science degree program in *Small Unmanned Aircraft Systems (sUAS).* Those two are:

Goal 1: Provide associate degree programs, career, and credentialing preparation, job skill enhancement, continuing professional education, and career resources and support to strengthen the regional workforce.

Goal 3: Delivers training and essential services to businesses and entrepreneurs, and creates and sustains strategic community partnerships to support business and economic development.

Through engaging lab, field, and classroom activities, the College strives to provide students with the current knowledge and skills necessary to prepare them for their educational and career goals. The courses in the program will expose students to the fundamentals of the subject on a general level, and give them the opportunity to specialize should they decide to transfer. They will come to understand analysis, design, and troubleshooting, using a variety of instructional modes such as technology, investigation, and interpretation of data, oral and written communication, information literacy, problem-solving, and critical thinking skills.

2. Explain how the proposed program supports the institution's strategic goals and provide evidence that affirms it is an institutional priority.

The A.A.S. degree in Small Unmanned Aircraft Systems directly supports two of the College's strategic goals in its *FY2019 Strategic Initiatives* (Carroll Community College, 2018).

Goal II: Enrollment Development **–** Respond to community and student needs through resourcefulness in instructional programming, course delivery and scheduling, student services, and effective communications.

The new program in Small Unmanned Aircraft Systems is expected to generate new enrollment for the College. Carroll is currently developing ways to expand enrollment through new scheduling options such as more evening courses, online courses, and hybrid courses and is also considering full-time programs all day on Fridays and a Weekend College program. Services, processes, and procedures are being revised to ensure that non-traditional students feel welcome and not encumbered by paperwork.

Goal III: Economic and Community Development – Support Carroll County business, workforce, and community development through career programs, customized training, and strategic alliances.

This program is being developed in response to local and regional workforce needs. The main underlying mission of community colleges is to serve their communities. The College makes it a priority to meet local workforce needs by the development of long-term relationships with industry partners. Success comes from taking great care to listen to the needs of industry partners on multiple levels—individual students, businesses, the economy—locally, regionally, and nationally. It is through these connections that it was determined that the College needed to develop an A.A.S. degree program in Small Unmanned Aircraft Systems to supply the area workforce.

3. Provide a brief narrative of how the proposed program will be adequately funded for at least the first five years of program implementation. (Additional related information is noted in section L).

The sUAS program has existed at the College for approximately two years as a Continuing Education (non-credit) program. The program has been funded through tuition revenue and support from the College Foundation. The College has a fleet of drones the will be used for both the credit and non-credit programs. Future expenses (new drones, cameras, software, etc.) will be shared by the credit and non-credit programs.

4. Provide a description of the institution's commitment to:
   a. ongoing administrative, financial, and technical support of the proposed program
   b. continuation of the program for a period of time sufficient to allow enrolled students to complete the program

> The program will be housed in the Applied and Theatre Arts Division (name change pending) and the Division Chair is Scott Gore. Through the Division, administrative and financial support for the program will be provided. Technical support will be provided by the College's Network and Technology Services Department.
>
> If in the future, a decision is made to discontinue the A.A.S. in Small Unmanned Aircraft Systems degree program, a teach-out plan will be developed and executed to ensure that all students in the program will have the opportunity to obtain all courses needed to complete the program.

B. Critical and compelling regional or statewide need as identified in the State Plan:

1. Demonstrate demand and need for the program in terms of meeting present and future needs of the region and the State in general based on one or more of the following:
   a. the need for the advancement and evolution of knowledge
   b. societal needs, including expanding educational opportunities and choices for minority and educationally disadvantaged students at institutions of higher education
   c. the need to strengthen and expand the capacity of historically black institutions to provide high quality and unique educational programs

> By 2023, the FAA predicts that the commercial drone market will consist of 835,000 aircraft, three times the number in 2018. Demand for certified pilots will also grow significantly, offering a wide variety of jobs as well as opportunities for students to start their own businesses in this rapidly evolving field. As quoted from the recent FAA Aerospace Forecast 2018-2038 "Remote pilot certifications (RPCs) are set to experience tremendous growth following the growth trends of the non-model sUAS sector. Starting from the base of 73,673 RPCs in 2017, non-model activities may require over 300,000 new remote pilots in 5 years, providing tremendous opportunities for growth in employment associated with commercial activities of the UAS. Potential for RPs may enhance even more if larger UAS are used in commercial activities and urban air mobility becomes a reality in the near future."
>
> The Association of Unmanned Vehicle Systems International (AUVSI) estimates that by 2025 drone technology will have an economic impact of $82 billion, and more than 100,000 new drone related jobs will be created. In Maryland, the economic impact is estimated at greater than $2 billion, creating more than 2,500 new jobs (Jenkins & Vasigh, 2013).
>
> As a community college, Carroll subscribes to the "open door" admissions standard. Open admissions refer to colleges offering admittance to all students as long as they have completed high school or passed the GED. It is meant to provide access and remove barriers to higher education, particularly for individuals from disadvantaged or underprivileged backgrounds. The result is that many students enroll who are not prepared to take on college-level work. For those students who choose programs such as the proposed Small Unmanned Aircraft Systems A.A.S. program, which require high levels of technical knowledge, the barriers can seem insurmountable.

In response, Carroll offers remedial classes, academic assistance, and support services to help them succeed. The faculty, staff, and administrators are committed to creating a student-centered campus where chances of success are equitable for every student, where every student feels valued, and where students achieve their goals.

2. Provide evidence that the perceived need is consistent with the 2017-2021 Maryland State Plan for Postsecondary Education.
    a. Statewide Plan Goal #1: Student Access
    b. Statewide Plan Goal #2: Student Success
    c. Statewide Plan Goal #3: Innovation in Higher Education

The proposed program is well aligned with the 2017-2021 Maryland State Plan for Postsecondary Education (Maryland, 2017). The Associate of Applied Science degree in Small Unmanned Aircraft Systems is intended to prepare highly trained students for work in organizations where they can contribute to the needs of society. The long-term success of the College's academic programs attests to the quality and effectiveness of its programs.

Through robust online course offerings, students can undertake course-related activities at a time and location most convenient to them, allowing students to participate in and to complete their program even if their work schedules do not permit regular class attendance, thus supporting Goal 1, "Access: Ensure equitable access to affordable and quality postsecondary education for all Maryland residents."

Similarly, the proposed program is consistent with Goal 3, "Innovation: Foster innovation in all aspects of Maryland higher education to improve access and student success," which articulates Maryland's aspiration to be "a national leader in the exploration, development, and implementation of creative and diverse education and training opportunities that will align with state goals, increase student engagement, and improve learning outcomes…" By leveraging technology in innovative ways to make the College's offerings more accessible and interactive, candidates can pursue "anytime, anywhere" learning opportunities.

The proposed program is also consistent with Goal 2, "Success: Completion of a credential such as a licensure or certification, sub-degree certificate, or degree." Due to dedicated advisors, milestone advising, retention alert software, an initiative that reaches out to non-completers to get them back in school and to completion, and the collaboration between faculty and the student services staff, Carroll Community College has one of the highest completion rates nationally.

Data from the Student Tracker Postsecondary Completions Institutional Benchmark Reports, prepared and distributed by the National Student Clearinghouse Research Center, regarding the percent of first-time, degree-seeking fall cohorts completing degree or certificate programs within six years of entry, indicates that of the 2011 cohort, Carroll had a 59.0% completion rate for all students compared to the national rate of 37.5%. For just full-time students, or the same cohort, Carroll's rate was 80.0% compared to 55.5% nationally.

C. Quantifiable & reliable evidence and documentation of market supply & demand in the region and State:

1. Describe potential industry or industries, employment opportunities, and expected level of entry (*ex. mid-level management*) for graduates of the proposed program.

The Association for Unmanned Vehicle Systems International's (AUVSI) 2013 report on *The Economic Impact of Unmanned Aircraft Systems Integration in the United States* projected that UAS and sUAS primary markets, civil and commercial, would be public safety and agriculture (Jenkins & Vasigh, 2013). These two remain significant, while other applications are emerging (e.g., utilities, construction) that may prove as compelling. UAS and sUAS public and commercial applications grow by the day, and as the regulatory environment matures over time, will drive the growth of the industry. The applications will bring dramatic safety, efficiency and knowledge benefits to government and private business. Examples of existing and anticipated application are shown below.

- Agricultural monitoring
- Arial imaging/mapping
- Construction
- Disaster management and recovery
- Environmental monitoring
- Freight transport
- Insurance
- Law enforcement
- Manufacturing
- News and entertainment
- Oil and gas exploration
- Telecommunication
- Thermal infrared power line surveys
- Utilities
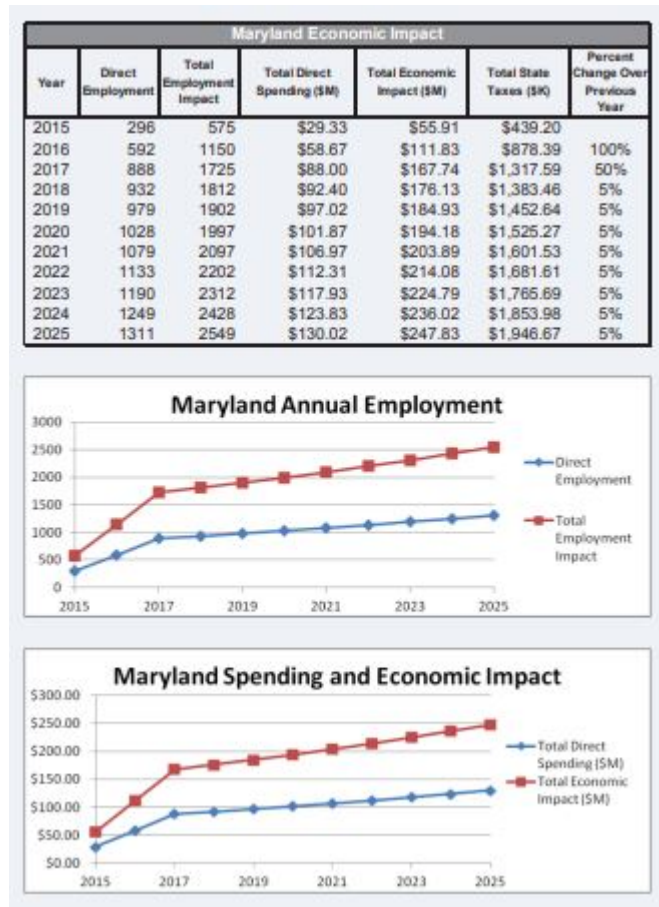- Weather monitoring
- Wild fire mapping

In the same 2013 AUVSI report, it was projected that more than 100,000 new jobs related to unmanned aircraft will be available by 2025. Of those jobs, 34,000 alone will be in manufacturing with the remaining 70,000 spread out in the sectors mentioned above. Maryland is expected to have 2,500 new jobs in the UAS and sUAS field by 2025.

While it may be possible to enter the sUAS field with a high school diploma and experience, the majority of those who are employed as drone pilots have a postsecondary certificate or associate's degree and an FAA Part 107 Remote Pilot Certification.

Typically individuals start out with low level positions such as shooting photos for realtors, hotel and resort ads, or weddings. Starting pay is generally around $35,000 per year. The most lucrative jobs require an extremely good pilot. For instance, power-line inspections, aerial reconnaissance and surveillance, delivery and disaster relief, and so on. Earnings can get as high as $200,000 in these advanced jobs.

2. Present data and analysis projecting market demand and the availability of openings in a job market to be served by the new program.

According the *FAA Aerospace Forecast-Fiscal Years 2019-2039* "Starting from the base of 116,027 RPs in 2018, non-model activities may require almost 350,000 RPs in 5 years, a three-fold increase, providing tremendous opportunities for growth in employment associated with commercial activities of UAS. Potential for RPs may enhance even more if larger UAS are used in commercial activities and urban air mobility becomes a reality in the near future" (United States, 2019). Please see the charts below from *The Economic Impact of Unmanned Aircraft Systems Integration in the United States*, on the economic impact and employment in Unmanned Aircraft Systems in Maryland (Jenkins & Vasigh, 2013).

Maryland Economic Impact

Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	296	575	$29.33	$55.91	$439.20	
2016	592	1150	$58.67	$111.83	$878.39	100%
2017	888	1725	$88.00	$167.74	$1,317.59	50%
2018	932	1812	$92.40	$176.13	$1,383.46	5%
2019	979	1902	$97.02	$184.93	$1,452.64	5%
2020	1028	1997	$101.87	$194.18	$1,525.27	5%
2021	1079	2097	$106.97	$203.89	$1,601.53	5%
2022	1133	2202	$112.31	$214.08	$1,681.61	5%
2023	1190	2312	$117.93	$224.79	$1,765.69	5%
2024	1249	2428	$123.83	$236.02	$1,853.98	5%
2025	1311	2549	$130.02	$247.83	$1,946.67	5%

Maryland Annual Employment

Maryland Spending and Economic Impact

3. Discuss and provide evidence of market surveys that clearly provide quantifiable and reliable data on the educational and training needs and the anticipated number of vacancies expected over the next 5 years.

According to Embry-Riddle Aeronautical University's *ERAU-Worldwide Unmanned System Related Career Opportunities: 2018*, the following represent the number of available unmanned systems related positions in 2018 advertised across the U.S. in 2018 at varying salary levels and associated with specific categories
- <$50,000 (1,215)

- $50,000-$69,999 (964)
- $70,000-$89,999 (1,318)
- $90,000-$109,999 (1,707)
- $110,000-$129,999 (1,076)
- $130,000+ (530)

(Terwillinger, 2018)

As mentioned above, the FAA predicts that the demand for certified pilots will also grow significantly in the next 5 years, with the potential for 300,000 new remote pilot jobs. Potential for RPs may enhance even more if larger UAS are used in commercial activities and urban air mobility becomes a reality in the near future.

Engineering skills are desired, with an emphasis on guidance and control, communication, and autonomous behavior are in demand.   In addition, operational skills in unmanned systems are a must.

4. Data showing the current and projected supply of prospective graduates.

The increase in the use of drones commercially is estimated to boom by more than 6,000 percent by the end of the decade according to Levin & Litvan (2014). *Next in Tech* (2017) has also reported that the global market for commercial uses of drone technology, currently estimated at about $2 billion, will grow to around $127 billion by the year 2020. The state of Maryland, according to *UAS and Maryland: Opportunity and accountability: A report connected to the Unmanned Aircraft Systems Research, Development, Regulation and Privacy Act of 2015,* wants to be a leader in this field. The State is encouraging industry and government to participate actively in developing the regulations that will allow this industry to explode. The report notes that there will be a move from engineers in this job category to unmanned systems educated individuals who have the hands-on experience desired.

Data on the current and projected supply of graduates could not located because the field is so new. However, the information identifying the current and future demand speaks to the need for higher education based training in this field.

The field is in its infancy in terms of its application outside the military. There are currently 2,500 non-cleared governmental jobs in Unmanned and Autonomous Systems available on Indeed.com. This number does not account for other for-profit job sites, recruiting agencies, and private employment sites. The current job market is significantly short of the expected demand due to the current regulations. However, industry experts expect that supportive regulations will allow the market to explode with opportunities for careers in the field. Carroll Community College intends to respond proactively to the expected need with the proposed A.A.S. in Small Unmanned Aircraft Systems. Our students will be well positioned to respond to all Maryland initiatives in this field.

D. **Reasonableness of program duplication** (search by CIP or HEGIS codes or check other institution's websites)**:**

1. Identify similar programs in the State and/or same geographical area. Discuss similarities and differences between the proposed program and others in the same degree to be awarded.

A search of the Maryland Higher Education Commission program inventory database for CIP Codes 47.0609 – Mechanic and Repair Technologies/Technicians and 49.0102 –Airline/Commercial? Professional Pilot and Flight, indicates that there is only two related programs at the community college level (associate degree or certificate) l in the State. Having the program at Carroll will not over-saturate the field particularly since the two existing programs focus on different aspects of the industry.

Institution	Program Title	Award	Taxonomy
Community College of Baltimore County (CCBC)	Professional Pilot – Unmanned Aircraft Systems	Associate Degree	530202
Hagerstown Community College (HCC)	Unmanned Aerial Systems Technician	Lower Division Certificate	

CCBC currently offers a Professional Pilot-Unmanned Aircraft Systems, Associate of Applied Science with 47 program credits that relate primarily to manned aviation with the exception of two courses, Unmanned Aircraft Operations and Unmanned Aircraft Systems Flight Training. The proposed Carroll program has 13 courses dedicated to the topic of Unmanned Aircraft Systems while expanding on UAS pilot training as well as training students to manipulate the images and data captured by the drone. The proposed program also seeks to expand on building the student knowledge so that they can successfully implement and manage an enterprise drone program.

HCC is in the process of having their Unmanned Aerial Systems Technician Certificate program approved by MHEC. Students in this program will learn the operation, mechanics, data processing, maintenance, and regulations that pertain to unmanned systems.   Although the program will cover some of the same topics as the Carroll program, the distance between the two institutions (approximately 50 miles) eliminates direct competition.

At the state university level, the University of Maryland – Eastern Shore offers a bachelor's program in Aviation Science and Capital Technology University offers a bachelor's, master's, and doctorate in Unmanned Systems.

A unique aspect of Carroll's proposed program is the way in which the degree program has leveraged the success of the initial non-credit drone training program. The non-credit program continues to be highly successful in training entry level drone pilots. The degree program has developed courses that allow for seat sharing with non-credit in order to train our student so they can pilot a drone to the same standards. The program will allow students to log substantially more flight time and work with data and management skills.

2. Provide justification for the proposed program.

Unmanned aerial systems (UAS), use is really taking off. Although the technology has existed since the first World War, the past decade has brought us to an unprecedented precipice of a UAS commercial application boom within the world of aviation.

The Goldman Sachs Group (n.d.), the leading global investment banking, securities and investment management firm, along with numerous other industry leaders, is predicting that opportunities in the

unmanned industry are about to boom; and the industry is going to need a lot of well-trained professionals to meet an imminent demand for pilots.

As technology improves and the government works to create regulations, there will be few areas in which the use of unmanned aircraft will not be initiated, considering a task can often be performed more efficiently and effectively than with a manned aircraft.

Here are some facts:
- The unmanned drone market is expected to reach $127 billion by 2020
- By 2020, it is projected that 7.8 million consumers will be demanding drones, producing $3.3. billion in revenue
- 100,000 new jobs will be created by 2025
- Starting salaries can be as high as $85,000 for remote pilots

E. Relevance to high demand programs at Historically Black Institutions (HBIs) (do not put N/A as a response)**:**

1. Discuss the program's potential impact on the implementation or maintenance of high-demand programs at HBI's.

The proposed A.A.S. in Small Unmanned Aircraft Systems degree program will not have an impact on the development and continuance of high demand programs at HBI's. Maryland's HBIs include Bowie State University, Coppin State University, Morgan State University, and the University of Maryland - Eastern Shore. None offer associate degree programs and only one, University of Maryland – Eastern Shore, has a related bachelor degree program.

F. Relevance to the identity of Historically Black Institutions (HBIs) (do not put N/A as a response)**:**

1. Address any potential collaboration between an HBCU and the proposing institution. Refer to the articulation of the proposed program into undergraduates program as an HBCU, or the development of joint or dual degrees.

At this time, no collaborative agreements exist between Carroll and the HBCUs in the region. However, should this program be approved, Carroll will contact University of Maryland – Eastern Shore to look into the possibility of articulation.

G. Adequacy of curriculum design, program modality, and related learning outcomes (as outlined in COMAR 13B.02.03.10):

1. Describe how the proposed program was established, and also describe the faculty who will oversee the program.

The curriculum for this program was designed by Carroll faculty and advisors with years of experience in the curriculum development and small unmanned aerial systems.

Luisa Winters, a consultant and adjunct instructor at the College, is the project lead on the development of the program. She also is a private pilot, has a Remote Pilot certificate from the FAA, and has several other certifications related to the operation of sUAS.

Chet Andes, Coordinator of Information Technology and Workforce Development in the College's Continuing Education and Training division, leads the non-credit sUAS program. He has a Remote Pilot certificate from the FAA.

Scott Gore, Division Chair of Fine and Performing Arts at the College, has the administrative experience needed to develop an academic program, has experience with digital imaging and data interpretation, and is currently working on a FAA Remote Pilot certification.

2. Describe educational objectives and learning outcomes appropriate to the rigor, breadth, and (modality) of the program.

Upon completion of the Associate of Applied Science degree in Small Unmanned Aircraft Systems, students will be able to:
1. Demonstrate how to safely and legally fly multi-rotor and fixed wing drones in a variety of commercial sUAS missions in both simulated and actual conditions.
2. Interpret a variety of regulations, policy and procedures.
3. Operate sUAS systems to include aircraft platforms, control stations, hardware, software and firmware.
4. Use remote sensing equipment and cameras to collect data and analyze results.
5. Determine the requirements of sUAS mission planning across a number of industry sectors.

Student Learning Outcomes Assessment is a deliberate, systematic, and collaborative process driven by the College's commitment to improving student learning. It is a purposeful course of action that defines student accomplishments in terms of expected learning outcomes and core competencies. Actual student achievement is measured using established internal standards and external benchmarks. The assessment process is learning-centered and accumulates data from numerous sources to determine what students know, what skills they possess, how they conceptualize, and how they will continue to learn. The overall goal of assessment is to create a quality learning environment under ideal conditions through the use of best practices that inspire creativity, innovation, and critical thinking.

3. Explain how the institution will:
   a. provide for the assessment of student achievement of learning outcomes in the program
   b. document student achievement of learning outcomes in the program

Student Learning Outcomes Assessment is an ongoing component of the instructional process. All members of the institution share responsibility for student learning. Continuous improvement of learning is a collaborative enterprise upon which the success of instruction depends. The results of assessments are never used in a punitive manner toward students, faculty, or staff. The data collected during the assessment process is used to provide feedback to students and faculty, reinforcing and improving educational practices that facilitate learning.

The Small Unmanned Aircraft Systems Associate of Applied Science degree program will be evaluated at the course and program level on an annual basis. Resource allocation is driven by the needs

addressed in the assessment process.

Each program at the College is required to assess one or two of its student learning goals yearly. In addition, each program is subject to a comprehensive review every five years. Data from these processes are used for program improvement.

4. Provide a list of courses with the title, semester credit hours and course descriptions, along with a description of program requirements.

See Appendix A for program course and credit requirements and Appendix B for course descriptions. There are no special admission requirements for the program.

5. Discuss how general education requirements will be met, if applicable.

As an Associate of Applied Science degree program, students will be required to complete a minimum of 28 credits in General Education courses. At Carroll Community College, the purpose of the General Education Program is to provide all students with skills and knowledge necessary to be informed, productive citizens in a diverse and changing world. Students who enroll in a degree program at Carroll must complete a core of General Education courses specified by their program of study. The course distribution is intended to ensure that students have met the General Education Learning Goals. Each course requires students to integrate skills and knowledge gained from academic and life experiences in a signature assignment.

The following are the General Education learning goals:
1) Communicate ideas in written, oral, and other modes as appropriate to a situation and audience.
2) Apply quantitative and scientific reasoning skills relevant to a field of study.
3) Employ various thinking strategies to develop well-reasoned judgments.
4) Evaluate sources of information for accuracy, relevance, and reliability.
5) Use technology tools to manage, integrate, and evaluate digital information.
6) Explore issues through creative, interdisciplinary, and innovative approaches.
7) Cultivate intellectual and ethical practices that promote the wellness of self, community, and environment.
8) Identify their roles as global citizens in a multicultural country and world.

6. Identify any specialized accreditation or graduate certification requirements for this program and its students.

There are no specialized accreditation or graduate certification requirements for this program. Students who complete this program will receive an A.A.S. in Small Unmanned Aircraft Systems from Carroll.

7. If contracting with another institution or non-collegiate organization, provide a copy of the written contract.

At this time, there are no agreements with other educational institutions or non-collegiate organizations.

8. Provide assurance and any appropriate evidence that the proposed program will provide students with clear, complete, and timely information on the curriculum, course and degree requirements, nature of faculty/student interaction, assumptions about technology competence and skills, technical equipment requirements, learning management system, availability of academic support services and financial aid resources, and costs and payment policies.

The College will provide similar resources to students in the Small Unmanned Aircraft Systems program as are provided for other programs. Information regarding curriculum, course, and degree requirements, including a suggested course sequence that demonstrates how the program can be completed in two years, is provided via the College website and the Carroll Community College Catalog and the Student Academic Planning tool, WebAdvisor, which requires a secure login and is individualized for each program and each student. Information about the learning management system (Blackboard), the availability of academic support services and financial aid resources, and costs and payment policies are found on various pages within the Carroll website.

9. Provide assurance and any appropriate evidence that advertising, recruiting, and admissions materials will clearly and accurately represent the proposed program and the services available.

The Carroll Community College homepage links to seven major sections, two of which (Apply & Register and Programs & Courses) contain advertising, recruiting and admissions information. The information available includes, but is not limited to, admissions criteria and deadlines, financial aid information, tuition, and other information of interest to prospective students and their families. In addition, each program of study has its own page to provide students with and overview of the program, the program goals, the curriculum, and faculty information. The Office of Academic Affairs works closely with the Offices of Admissions and Enrollment Development and Planning, Marketing, and Assessment to develop and maintain clear and accurate program-specific marketing materials.

H. Adequacy of Articulation

1. If applicable, discuss how the program supports articulation with programs at partner institutions. Provide all relevant articulation agreements.

There are no public institutions in Maryland that offer a baccalaureate degree in Unmanned Aircraft Systems. The only related program is at the University of Maryland Eastern Shore, which offers a Baccalaureate degree in Aviation with concentrations in Professional Pilot, Aviation Management, Aviation Electronics, and Aviation Software. A private college, Capital Technology University, offers bachelor's, master's, and doctorate degree in Unmanned Systems, but the cost, $833 per credit hour, makes enrollment prohibitive.

The closest public baccalaureate programs to Carroll in Unmanned Aircraft Systems are in Virginia and Ohio. Liberty University in Lynchburg, Virginia, 245 miles away, offers a Bachelor of Science in Aeronautics with an Unmanned Aerial Systems Cognate. Kent State University, in Kent, Ohio, 326 miles away, offers a minor in Unmanned Aircraft Systems.

After program approval from MHEC, Carroll will contact the above referenced institutions to see if articulation and transfer agreements can be developed.

I. **Adequacy of faculty resources (as outlined in COMAR 13B.02.03.11)**:

1. Provide a brief narrative demonstrating the quality of program faculty. Include a summary list of faculty with appointment type, terminal degree title and field, academic title/rank, status (full-time, part-time, adjunct) and the course(s) each faculty member will teach (in this program).

> The FAA does not currently require any specific training or credentials for a teacher or faculty member providing small unmanned aircraft instruction. However, the College plans to require faculty members to have both demonstrated proficiency in operating any sUAS that may be used in the class and has in his or her possession at least one active FAA pilot certification.
>
> Scott Gore, who is the program director, is currently working on a FAA Remote Pilot certification. His current expertise is in digital imaging and interpreting data, so he will be teaching the courses related to that area in the program while working on his certification and flight experience. In the meanwhile, Luisa Winters, who has her FAA Remote Pilot certification and years of flight experience, will be teaching the courses relating to sUAS flight.

Name	Jason Scott Gore
Appointment Type	12 month
Terminal Degree Title and Field	Master of Fine Arts in Graphic Design Towson University 2005
Certifications/Other	Certified Solidworks Associate 2018 Certified Solidworks Professional 2018
Academic Title/Rank	Professor
Status (full-time, part-time, adjunct)	Full-time
Teaching Experience	Professor, Carroll Community College, 2019 Associate Professor, Carroll Community College, 2005-2019 Adjunct, Towson University, 2003-2006 Instructor, New Horizons Technical Institute, 2002-2004 Instructor, Bradley Academy for the Visual Arts, 1997-2002 Adjunct, York College of Pennsylvania, 1997-1999
Other Experience	Division Chairperson, Fine & Performing Arts, Carroll Community College, 2007-2019 Coordinator of the Entrepreneurship in the Arts, Carroll Community College, 2010-2014 Program Director, Computer Graphics, 2005-2007 Program Director, Multimedia Design, Bradley Academy for the Visual Arts, 1999-2002 Freelance Graphic Designer & Corporate Training Consultant, Gore Studios, 1995-2019 Partner, Digital Archival Printing, S&S Printing, Inc., 1999-2001 Senior News Broadcast Designer, WPMT-FOX 43, 1994-1997
Course(s) to be Taught in Program	CGR 130 Introduction to Digital Video Editing SUAS 103 sUAS Foundations SUAS 104 sUAS Applications SUAS 202 sUAS Aerial Mapping and Modeling

SUAS 204 sUAS Personnel
SUAS 205 Safety Management
SUAS 230 Drone Cinematography

Name	Luisa Winters
Appointment Type	Part-time
Terminal Degree Title and Field	Bachelors in Music
	Johns Hopkins University
	1987
Certifications/Other	FAA Remote Pilot
	Part-time Instructor, Donovan Olsen
	UAS Instructor – Air National Guard, Defense Media Activity, National Association of Broadcasters, Amananet, Carroll Community College 2016-2019
	Adobe Instructor (Certified Training Centers), 1991-2019
	FAA Advanced Ground School Instructor (AGI), 2018
	USI Safety Certificate, 2018
	USI Small UAS Safety Certificate
	Infrared Training Center Certified Electrical Thermographer, Level 1, 2017
	FAA Remote Pilot, 2016
	SGS Safety Certificate, 2016
	FAA Private Pilot, 2015
	Adobe Master Instructor, 2012
	Adobe Instructor (ACI), 1999
Academic Title/Rank	Instructor
Status (full-time, part-time, adjunct)	Part-time
Teaching Experience	Adjunct, Carroll Community College, 2018-2019
	Adjunct, Anne Arundel Community College, 1993-1999
	Professor, Salisbury State University, 1989-1991
Other Experience	Video Production (Producing, Directing, Writing, Shooting, Editing), 1983-2019
Course(s) to be Taught in Program	SUAS 101 Drone Technology 1
	SUAS 102 Drone Technology 2
	SUAS 105 sUAS Policy, Regulations, and Procedures
	SUAS 200 Data Analysis
	SUAS 206 sUAS Mission Planning and Management
	SUAS 207 sUAS Flight and Maintenance
	SUAS 270 Capstone in sUAS Technology

2. Demonstrate how the institution will provide ongoing pedagogy training for faculty in evidence-based best practices, including training in:
   a. pedagogy that meets the needs of the students
   b. the learning management system
   c. evidenced-based best practices for distance education, if distance education is offered

Training in pedagogy that meets the needs of students is provided yearly through the use of Teaching Squares, mentoring, faculty coaching, and faculty workshops and supported by evidence-based best practices.   Training for those new to the College's learning management system, Blackboard, is offered through open drop-in workshops every week. The College supports faculty attendance at related regional and national conferences.

J.   **Adequacy of library resources (as outlined in COMAR 13B.02.03.12):**

1.   Describe the library resources available and/or the measures to be taken to ensure resources are adequate to support the proposed program. If the program is to be implemented within existing institutional resources, include a supportive statement by the President for library resources to meet the program's needs.

The Small Unmanned Aircraft Systems program is supported by the Carroll Community College Library and Media Center, which purchases print and electronic reference sources, DVDs, and books, subscribes to periodical database and streaming media services, and provides other resources to facilitate student research and learning in the subject area of sUAS. An assigned librarian serves as the divisional liaison and coordinates material purchasing and collection development with full and part-time faculty depending upon departmental and class learning outcomes.

K.   **Adequacy of physical facilities, infrastructure and instructional equipment (as outlined in COMAR 13B.02.03.13):**

1.   Provide an assurance that physical facilities, infrastructure, and instruction equipment are adequate to initiate the program, particularly as related to spaces for classrooms, staff and faculty offices, and laboratories for studies in the technologies and sciences. If the program is to be implemented within existing institutional resources, include a supportive statement by the President for adequate equipment and facilities to meet the program's needs.

Carroll Community College is strategically located in Class G airspace which allows for drone training without the need for special accommodations such as a waiver or flight in controlled airspace. Some flight training can also take place in the gym, should inclement weather pose a problem with outdoor flight. All related software, such as Pix4D is available for student use during the program either installed in a computer lab or on the class iPads that interface with the drones. Currently Carroll has a small fleet of drones that are utilized through the non-credit training program, but will also be shared with the credit degree program. The College owns and operates the following platforms: 4-DJI Mavic Pro, 2-Parrot Mambos, 1-Tello, 1-DJI Inspire 1, 1-DJI Mavic Pro 2 with a Sentera Camera (NDVI), 1-Parrot Disco (fixed-wing). Additionally, the program is currently equipped with all of the necessary chargers, batteries and accessories to support the program.

Current physical facilities and infrastructure at Carroll are adequate to offer the new degree program without the need for additional resources. Classrooms are equipped with the latest and updated instructional equipment which includes computers and audio/visual devices including projectors. Carroll's Information Technology department supports this equipment with software updates and any maintenance or repairs necessary to maintain quality instruction.

Computers are available for student, faculty and staff use in classrooms, computer labs, and the library. Free printing and wireless internet access can be found in all those locations.

The Testing Center is available to instructors for students with disability accommodation needs.

The advising staff provides course information that will assist students interested in pursuing the study of Small Unmanned Aircraft Systems.

The College complies with the American with Disabilities Act and has the necessary infrastructure and instructional equipment for ADA accommodations. The Office of Student Support Services provides the evaluations for ADA accommodations.

2. Provide assurance and any appropriate evidence that the institution will ensure students enrolled in and faculty teaching in distance education will have adequate access to:
   a. an institutional electronic mailing system, and
   b. a learning management system that provides the necessary technical support for distance education

Carroll Community College faculty receive an employee e-mail address and access to the College e-mail system on their first day of employment. Students receive a student e-mail address upon enrollment. Students receive access instructions at the e-mail address listed on their application. Students are requested to activate their College e-mail account immediately and must use that e-mail address for all College correspondence. Once activated, this is also the only e-mail address that the College will use to contact students. Students are asked to check their Carroll e-mail, even when classes are not in session.

To facilitate learning, all credit-courses use Blackboard (Bb), Carroll's learning management system. Blackboard sites support easy access to course materials, interactions with the instructor and other students, course grades, and much more. Students are automatically enrolled into Blackboard course sites. Faculty members are given Blackboard assess and training within their first week of employment. At a minimum, faculty members are required to use Blackboard to post their syllabus, faculty contact information, and announcements and course communications. In addition, the grade book within Blackboard must be used to provide students with a reasonable understanding of the status of their grades through the duration of the course.

L. Adequacy of financial resources with documentation (as outlined in COMAR 13B.02.03.14):

1. Complete Table 1: Resources and Narrative Rationale. Provide finance data for the first five years of the program implementation. Enter figures into each cell and provide a total for each year. Also, provide a narrative rationale for each resource category. If resources have been or will be reallocated to support the proposed program, briefly discuss the sources of those funds.

TABLE 1: RESOURCES:					
Resource Categories	**Year 1** **2020-2021**	**Year 2** **2021-2022**	**Year 3** **2022-2023**	**Year 4** **2023-2024**	**Year 5** **2024-2025**
1. Reallocated Funds	0	0	0	0	0
2. Tuition/Fee Revenue (c + g below)	$100,700	$129,880	$160,625	$192,980	$226,990
a. Number of F/T Students	13	16	19	22	25
b. Annual Tuition/Fee Rate	$5,960	$6,115	$6,275	$6,440	$6,610
c. Total F/T Revenue (a x b)	$77,480	$97,840	$119,225	$141,680	$165,250
d. Number of P/T Students	9	12	15	18	21
e. Credit Hour Rate	$172	$178	$184	$190	$196
f. Annual Credit Hour Rate	15	15	15	15	15
g. Total P/T Revenue (d x e x f)	$23,220	$32,040	$41,400	$51,300	$61,740
3. Grants, Contracts & Other External Sources	0	0	0	0	0
4. Other Sources	$77,798	$68,534	$43,351	$14,710	0
TOTAL (Add 1 – 4)	$178,498	$198,414	$203,976	$207,690	$226,990

Narrative for Table 1: Resources
1. <u>Reallocated Funds</u>: Carroll Community College does not anticipate any need to reallocate funds from any other area to support this program.
2. <u>Tuition and Fee Revenue</u>: The cost of both full-time and per-credit tuition is subject to a 3% increase each year.
3. <u>Grants and Contracts</u>: Not applicable.
4. <u>Other Sources</u>: The College Foundation will help support the program for the first four years.

2. Complete Table 2: Program expenditures and Narrative Rationale. Provide finance data for the first five years of the program implementation. Enter figures into each cell and provide a total for each year. Also, provide a narrative rationale for each expenditure category.

Expenditure Categories	Year 1 2020-2021	Year 2 2021-2022	Year 3 2022-2023	Year 4 2023-2024	Year 5 2024-2025
TABLE 2: EXPENDITURES:					
1. Faculty (b + c below)	$81,949	$84,407	$86,938	$89,545	$92,232
a. # FTE	1	1	1	1	1
b. Total Salary	$60,703	$62,524	$64,899	$66,330	$68,320
c. Total Benefits	$21,246	$21,883	$22,539	$23,215	$23,912
2. Admin. Staff (b + c below)	0	0	0	0	0
a. # FTE	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	0	0	0	0	0
b. Total Salary	0	0	0	0	0
c. Total Benefits	0	0	0	0	0
4. Equipment	$1,600	$16,600	$16,600	$16,600	$7,600
5. Library	$1,000	$1,000	$1,000	$1,000	$1,000
6. New or Renovated Space	0	0	0	0	0
7. Other Expenses	$12,000	$12,000	$12,000	$11,000	$11,000
TOTAL (Add 1 – 7)	$178,498	$198,414	$203,976	$207,690	$204,064

Narrative for Table 2: Expenditures
1. Faculty (#FTE, Salary, and Benefits):
   The College has already committed to adding one full-time faculty member by the time the program begins in fall 2020.
2. Administrative Staff:
   No additional administrative staff is expected in the first five years of the program.
3. Support Staff:

No additional support staff is expected in the first five years of the program.

4. Equipment:
Equipment includes Pix4D software, drones, drone support, replacement equipment, and additional payloads.

5. Library:
The current library loan mechanism and the electronic retrieval methods will be used for the program. New library holdings related to Small Unmanned Aircraft Systems will be added each year for the first five years of the program.

6. New or Renovated Space:
No new or renovated space needs are expected in the first five years of the program

7. Other Expenses:
Includes USI sUAS Safety Certification and USI Visual Line of Sight. Marketing and faculty development expenses are expected in the first five years of the program.

M. Adequacy of provisions for evaluation of program (as outlined in COMAR 13B.02.03.15):

1. Discuss procedures for evaluating courses, faculty and student learning outcomes.

> Students in the Small Unmanned Aircraft Systems A.A.S. program will be required to demonstrate their competency with regard to the stated learning outcomes for each course and the program. This will be achieved through various deliverables, which include projects, written quizzes and exams, exercises, written assignments, and oral presentations.
>
> Courses and faculty will be evaluated based on how effective they cover the stated learning goals, as well as through the parameters outlined in the student evaluation process.
>
> The College has a rigorous course and program assessment process. Data from these course and program assessments are collected and analyzed to improve courses and to ensure program learning outcomes are met.

2. Explain how the institution will evaluate the proposed program's educational effectiveness, including assessments of student learning outcomes, student retention, student and faculty satisfaction, and cost-effectiveness.

> At the program level, the Program Director and faculty conduct and document an annual assessment report of select goals that are chosen and responded to on a yearly basis. In addition, as part of the quality improvement process, a comprehensive program review is conducted once every five years. The purpose of the review is to evaluate the effectiveness of the academic program through the evaluation of curriculum, faculty, student enrollment and retention, and student learning goals. Each program has an advisory board consisting of professionals in the field to assist in the construction and analysis of program review data. The information collected is used to determine many things, including cost-effectiveness and program viability. The review process ensures that the following are reflected in the document:
>
> a) the mission of the College and how the needs of the community are met
> b) student performance
> c) transferability and /or workforce applicability
> d) curriculum strengths and weakness

e) adequacy of resources to support the program

The Vice President of Academic and Student Affairs, along with the Student Learning Improvement Committee, the General Education Committee, and the Program Review Committee coordinate these processes.

N. Consistency with the State's minority student achievement goals (**as outlined in COMAR 13B.02.03.05 and in the State Plan for Postsecondary Education):**

1. Discuss how the proposed program addresses minority student access & success, and the institution's cultural diversity goals and initiatives.

Carroll Community College is committed to the recruitment and retention of minority students and will expand its services and policies to include the Small Unmanned Aircraft Systems program students. The College employs broad recruitment efforts to attract a racially diverse student body and support them with the services they need to be retained and successful. The entire staff supports the College goal of providing a "safe learning environment that models respect, acceptance, inclusion, and empathy towards diverse ways of thinking and being." Statements of non-discrimination are included in College publications and will appear in any marketing pieces for the programs.

O. Relationship to low productivity programs identified by the Commission:

1. If the proposed program is directly related to an identified low productivity program, discuss how the fiscal resources (including faculty, administration, library resources, and general operating expenses) may be redistributed to this program.

Currently, there are no low-productivity programs at the College from which resources can be redirected.

P. Adequacy of Distance Education Programs (as outlined in COMAR13B.02.03.22)

1. Provide affirmation and any appropriate evidence that the institution is eligible to provide distance education.

In January 2018, the Middle States Commission on Higher Education confirmed that Carroll Community College had completed the review process and was approved to offer academic programs for which 50 percent or more of the degree or academic program will be offered through an alternative method of delivery without additional approvals. Notification of such was sent to the Maryland Higher Education Commission on April 27, 2018.

2. Provide assurance and any appropriate evidence that the institution complies with the C-RAC guidelines, particularly as it relates to the proposed program.

The College follows the C-RAC guidelines to assure comparable national standards for interstate offering of postsecondary distance education courses and programs.

REFERENCES

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APPENDICES

Small Unmanned Aircraft Systems (Drones)
Associate of Applied Science
Program Course and Credit Requirements

Prepare for an exciting career as a Commercial Drone Pilot. This program provides students with both the theoretical knowledge and practical skill necessary to safely operate a small-unmanned aircraft system (sUAS) within the National Airspace System.

This Associate of Applied Science degree in Small Unmanned Aircraft Systems prepares students for employment or advancement in careers such as sUAS Pilot, Data Analyst, Drone Data Specialist, sUAS (Drone) Manager and Drone Technician. The coursework applies this emerging technology across a broad spectrum of industrial applications, including construction, energy, utilities, agriculture, infrastructure, mining, public safety, surveying, mapping, real estate, photography and videography.

The coursework focuses on safe sUAS operation for aerial video production, the collection and processing of aerial and geospatial data, as well as piloting and flight requirements. As part of this program, students will prepare to earn their FAA Remote Pilot in Command Certificate. Some coursework may require fieldwork and flight laboratories.

Degree Requirements/Recommended course sequence:

Course Prefix and Number	Course Title	Credits
ENGL 101	College Writing **ENGLISH COMPOSITION**	3
📖	**MATHEMATICS**	3-5
SUAS 101	Drone Technology 1 (7 Weeks)	3
SUAS 102	Drone Technology 2(7 Weeks)	3
CGR 130	Digital Video (Fall Only)	3
SUAS 103	sUAS Foundations(7 Weeks) (Spring Only)	3
SUAS 104	sUAS Applications (7 Weeks) (Spring Only)	3
SUAS 105	sUAS Policy, Regulations, and Procedures (Spring Only)	3
SUAS 230	Drone Cinematography (Spring Only)	3
📖	**BIOLOGICAL AND PHYSICAL SCIENCES** - GEOSC-201, Meteorology Is Recommended	3-4
📖	**SOCIAL AND BEHAVIORAL SCIENCES**	3
📖	**ARTS AND HUMANITIES**	3
SUAS 204	sUAS Personnel (Fall Only)	3
SUAS 205	Safety Management (Fall Only)	3
SUAS 206	sUAS Mission Planning & Management (Fall Only)	3
*📖	**GENERAL EDUCATION ELECTIVE - GENERAL EDUCATION DIVERSITY**	3
SUAS 200	sUAS Data Analysis	3
SUAS 202	sUAS Aerial Mapping and Modeling (Spring Only)	3
SUAS 207	sUAS Flight and Maintenance (Spring Only)	3
SUAS 270	Capstone in sUAS Technology	3
	Total Credits	*60*

Diversity requirement: take an Arts and Humanities or Social and Behavioral Sciences course designated with the ⚲ (bicycle) insignia.

Program Goals
Upon successful completion of the program, students will be able to:
1. Demonstrate how to safely and legally fly multi-rotor and fixed wing drones in a variety of commercial sUAS missions in both simulated and actual conditions.
2. Interpret a variety of regulations, policy and procedures.
3. Operate sUAS systems to include aircraft platforms, control stations, hardware, software and firmware.
4. Use remote sensing equipment and cameras to collect data and analyze results.
5. Determine the requirements of sUAS mission planning across a number of industry sectors.

Small Unmanned Aircraft Systems (Drones)
Associate of Applied Science
Course Descriptions

General Education Courses

ENGL-101: College Writing 1   **3 credits**

College Writing develops critical reading, thinking, and writing skills for the purpose of exploring ideas and issues relevant in a participatory society. Students will use an inquiry-based writing process to engage in ethical public discourse by developing sound perspectives that are supported by evidence, identifying and addressing bias, and considering the needs and interests of different audiences. Students will compile Part 1 of a writing portfolio that will be evaluated as the final examination. A grade of C or higher is required to meet General Education requirements for graduation, to transfer the course to a 4-year institution, or to enroll in any class for which ENGL-101 is a prerequisite. Prerequisite: eligibility for ENGL-101. Three hours lecture each week. Three credits. Three billable hours. & GENERAL EDUCATION

ARTS AND HUMANITIES   **3 Credits**

Students may choose from the following courses:

ART 125 Art Appreciation 🚲	HIST 102 Western Civilization 2
ART 135 Art of the Western World, Prehistoric-1300	HIST- 105 History of U.S. to 1876
ART 136 Art of the Western World, 1300-Present	HIST 106 History of U.S. from 1876
COMM 105 Introduction to Speech Communication	MUSIC 101 Music Appreciation
COMM 120 Introduction to Film 🚲	MUSIC 102 The History of Rock and Roll
ENGL 102 Writing About Literature 🚲	MUSIC 103 History of Classical Music
ENGL 211 Introduction to American Literature	MUSIC 104 World Music 🚲
ENGL 212 Contemporary World Literature	MUSIC 105 Fundamentals of Music
ENGL 225 Classical Mythology	MUSIC 106 History of Jazz
ENGL 240 British Literature since 1798 🚲	MUSIC 110 Theory of Music 1
FPA 101 Introduction to the Arts	PHIL 101 Introduction to Philosophy
FREN 100 Elementary French 1	PHIL 105 Ethics
FREN 102 Elementary French 2	PHIL 120 World Philosophy 🚲
FREN 201 Intermediate French 1 🚲	PHIL 130 Introduction to World Religions 🚲
FREN 202 Intermediate French 2 🚲	SPAN 100 Elementary Spanish 1
GERM 100 Elementary German 1	SPAN 102 Elementary Spanish 2
GERM 102 Elementary German 2	SPAN 201 Intermediate Spanish 1 🚲
GERM 201 Intermediate German 1 🚲	SPAN 202 Intermediate Spanish 2 🚲
GERM 202 Intermediate German 2 🚲	THTR 101 Theatre Appreciation
HIST 101 Western Civilization 1	THTR 110 Acting for Non-Majors

BIOLOGICAL AND PHYSICAL SCIENCES   **3-4 Credits**

Students may choose from the following courses:

BIOL 100 General Biology	GEOSC 103 Environmental Sustainability (no lab)
BIOL 101 Fundamentals of Biology 1	GEOSC 105 Introduction to Oceanography
BIOL 102 Fundamentals of Biology 2	GEOSC 110 Physical Geography
BIOL 105 Human Biology	GEOSC 121 Physical Geology
BIOL 107 Introduction to Evolution (no lab)	GEOSC 123 Historical Geology
BIOL 108 Introduction to Marine Biology	GEOSC 201 Meteorology
BIOL 210 Human Anatomy and Physiology 1	PHSC 100 General Physical Science
CHEM 101 Introductory Chemistry	PHYS 101 Fundamentals of Physics 1
CHEM 105 Principles of General Chemistry 1	PHYS 111 Physics 1 for Scientists and Engineers
GEOSC 100 Introduction to Earth and Space Science	PHYS 212 Physics 2 for Scientists and Engineers

MATHEMATICS   3-5 Credits
Students may choose from the following courses:
MATH 111 Fund. of Geometry and Measurement   MATH 130 Precalculus I & II
MATH 115 Introduction to Statistical Methods   MATH 132 Applied Calculus MATH-135 Calculus of a
MATH 121 Introduction to College Mathematics   Single Variable 1
MATH 123 Precalculus, I (College Algebra and Trig)

SOCIAL AND BEHAVIORAL SCIENCES   3 Credits
Students may choose from the following courses:
ANTH 101 Introduction to Cultural Anthropology ⚘   GEOG 201 Regional Geog. and Global Awareness ⚘
CRIM 101 Introduction to Criminal Justice System   PSLS 100 American Government
CRIM 105 Criminology   PSYC 101 General Psychology
ECON 100 Principles of Micro Economics   PSYC 211 Human Development through the Life Span
ECON 102 Principles of Macro Economics   SOC 101 Introduction to Sociology ⚘
ENGR 100 Introduction to Engineering   SOC 110 Social Problems ⚘
GEOG 105 Human Geography ⚘   SOC 115 Diversity in the U.S.

Core Requirements
CGR 130   Introduction to Digital Video Editing   3 credits
Digital Video will acquaint students with the equipment and software associated with digital video production. Emphasis will be placed on production planning, execution, and editing techniques. In addition, students will capture images and real time video. Prerequisite: exemption/completion of ENG-001. Two hours lecture and two hours laboratory each week. Three credits. Three billable hours. Offered Fall term only.

SUAS 101   Drone Technology 1   3 credits
Review Small Unmanned Aircraft Systems (SUAS) and a diverse range of drones used in industry and business. Identify basic controls for flying a drone in controlled and outdoor settings. Explore best practices and issues related to drone flight. Prepare for the Aeronautical Knowledge Test required to obtain the FAA Remote Pilot Certificate. Certification is not guaranteed. Prerequisite: exemption/completion of ENGL-001 and MAT-095. Three hours lecture each week. Three credits. Three billable hours. Offered Spring, Summer, and Fall terms.

SUAS 102   Drone Technology 2   3 credits
Develop core skills in drone operation and maneuvering, pre-flight planning, and image and data collection. Explore advantages and unique perspective of aerial photos, along with basics of video and photo editing and manipulation. Use drones and various software packages to create maps and 3D models. Prepare for USI's Visual Line of Sight Certification. Certification is not guaranteed. Prerequisite: SUAS-101. Three hours lecture each week. Three credits. Three billable hours. Offered Spring, Summer, and Fall terms.

SUAS 103   sUAS Foundations   3 credits
Identify the capabilities and limitations of UAS technology, including hardware and software. Explain the wide-ranging concerns related to UAS integration into national airspace. Prerequisite: SUAS-102. Three hours lecture each week. Three credits. Three billable hours. Offered Spring Only.

SUAS 104   sUAS Applications   3 credits
Explain how remote pilots apply UAS technology for commercial, scientific, and governmental purposes while respecting both physical and regulatory limitations. Summarize ways that unmanned aircraft are used to accomplish a variety of tasks in complex environments. Explore professionalism and ethics for remote pilots. Prerequisite/Corequisite: SUAS-103. Three hours lecture each week. Three credits. Three billable hours. Offered Spring term only.

SUAS 105   sUAS Policy, Regulations, and Procedures   3 credits
Explore the limitations and requirements of Federal Aviation Administration (FAA) regulations as they relate to commercial drone operation in the National Airspace System (NAS). Investigate state, local and organizational standards related to drone use, privacy, and emerging topics. Explore best practices in Standard Operating Procedures (SOPs). Prerequisite: SUAS-102. Three hours lecture each week. Three credits. Three billable hours. Offered Spring term only.

SUAS 200   sUAS Data Analysis   3 credits
Explain accepted methods of capturing and analyzing drone data for various industries and purposes. Evaluate objectives and conditions that impact payload and drone platform decisions. Execute a flight plan. Engage in the analysis of various data sets. Prerequisite/Corequisite: SUAS-102. Three hours lecture each week. Three credits. Three billable hours. Offered Spring term only.

SUAS 202   sUAS Aerial Mapping and Modeling   3 credits
Use Small Unmanned Aerial Systems to create maps and models. Plan advanced missions; program autonomous flights; capture data. Import data sets into industry standard software; analyze data; create client deliverables, such as 2D or 3D models, reports, videos, etc., for a number of industry sectors. Prepare for industry standard software certification. Certification is not guaranteed. Prerequisite: SUAS-102. Three hours lecture each week. Three credits. Three billable hours. Offered Spring term only.

SUAS 204   sUAS Personnel   3 credits
Explore decision-making bias, stress, and methods for safely identifying and mitigating risk while making time-critical decisions. Identify limits and skills used by professional remote pilots to trap and mitigate mistakes. Analyze techniques that detect and stop errors during day-to-day remote pilot tasks. Prerequisite: SUAS-104. Three hours lecture each week. Three credits. Three billable hours. Offered Fall term only.

SUAS 205   Safety Management   3 credits
Investigate the management system and culture at the heart of the traditional aviation industry. Analyze processes and tools for capturing and mitigating risk in unmanned operations. Evaluate continuous improvement programs as they relate to unmanned operations. Develop appropriate attitudes and behaviors for aviation safety. Prerequisite/Corequisite: SUAS-204. Three hours lecture each week. Three credits. Three billable hours. Offered Fall term only.

SUAS 206   sUAS Mission Planning and Management   3 credits
Recognize the value of pre-production in the successful completion of safe and accurate sUAS missions. Learn techniques to plan, select equipment, mitigate risk, and establish Standard Operating Procedures (SOPs). Manage resources throughout the implementation of an enterprise drone mission. Prerequisite: SUAS-105. Three hours lecture each week. Three credits. Three billable hours. Offered Fall term only.

SUAS 207   sUAS Flight and Maintenance   3 credits
Fly fixed-wing aircraft and industrial drones. Explore advanced flight maneuvers including demonstration of controls and safety while in flight. Design and develop maintenance plans and logs for sUAS components such as propellers, motors, and batteries. Perform minor repairs including the design and creation of a field repair kit. Prerequisite: sUAS-205. Three hours lecture each week. Three credits. Three billable hours. Offered Spring term only.

SUAS 230   Drone Cinematography   3 credits
Utilize a variety of techniques to capture cinematic shots in various formats and color spaces while flying a drone. Configure drones and cameras for optimal video and photo acquisition. Produce high quality aerial productions that tell an intended story. Prerequisite: CGR-130. Three hours lecture each week. Three credits. Three billable hours. Offered Spring term only.

SUAS 270   Capstone in sUAS Technology   3 credits

Assemble a portfolio of work that includes an independent, comprehensive, industry-specific project and presentation. Explore participation in the sUAS industry. This capstone course is designed for students pursuing the Associate of Applied Science (AAS) degree in Small Unmanned Aircraft Systems. Prerequisite: should be taken during the last semester prior to graduation from the sUAS program. Three hours lecture each week. Three credits. Three billable hours. Offered Spring and Fall terms.