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May 7, 2026

Ms. Elena Quiroz-Livanis
Interim Secretary
Maryland Higher Education Commission
217 East Redwood Street, Suite 2100
Baltimore, MD 21202

Dear Interim Secretary Quiroz-Livanis:

I am writing to request approval for a substantial modification to our Post-Baccalaureate Certificate of Professional Studies program to offer it a new location: the University System of Maryland at Southern Maryland Regional Higher Education Center. The proposal for the substantial modification is attached.

This proposal has undergone the appropriate internal university review and has my endorsement. I respectfully request your approval. This request is also being submitted concurrently to the Chancellor of the University System of Maryland.

Sincerely,

Darryll J. Pines
President
Glenn L. Martin Professor of Aerospace Engineering

DJP/mdc

cc: Candace Caraco, Associate Vice Chancellor
Jennifer King Rice, Senior Vice President and Provost
Samuel Graham, Jr. Dean, A. James Clark School of Engineering
Stephen Roth, Dean, The Graduate School

Office Use Only: PP#

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

Institution Submitting Proposal	University of Maryland, College Park

Each action below requires a separate proposal and cover sheet.

- ○ 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:	Payment Type:	Payment Amount:	Date Submitted:
○ Yes ◉ No	○ R*STARS # ○ Check #		

Department Proposing Program	A. James Clark School of Engineering
Degree Level and Degree Type	Post-Baccalaureate Certificate
Title of Proposed Program	Professional Studies (Development and Certification of Autonomous Systems)
Total Number of Credits	12
Suggested Codes	HEGIS: 499902 CIP: 30.9999
Program Modality	○ On-campus ○ Distance Education (fully online) ◉ Both
Program Resources	◉ Using Existing Resources ○ Requiring New Resources
Projected Implementation Date (must be 60 days from proposal submisison as per COMAR 13B.02.03.03)	◉ Fall ○ Spring ○ Summer Year: 2026
Provide Link to Most Recent Academic Catalog	URL: https://academiccatalog.umd.edu/
Preferred Contact for this Proposal	Name: Michael Colson Title: Senior Coordinator for Academic Programs Phone: 301-405-5626 Email: mcolson@umd.edu
President/Chief Executive	Type Name: Darryll J. Pines Signature: Darryll J. Pines Date: 5-7-2026
	Date of Approval/Endorsement by Governing Board:

Revised 4/2025

A. Centrality to the University's Mission and Planning Priorities

Description. This proposal from the University of Maryland, College Park (UMD) is for a substantial modification of our existing Post-Baccalaureate Certificate of Professional Studies (PBCPS) program (HEGIS: 499902; CIP: 30.9999) to allow an offering at an off-campus location, the University System of Maryland at Southern Maryland (USMSM) Regional Higher Education Center.

The Post-Baccalaureate Certificate of Professional Studies was established, along with the Master of Professional Studies, with approval from the University System of Maryland (USM) Board of Regents and the Maryland Higher Education Commission (MHEC) in 2005.

The PBCPS program specialization that we propose to offer at USMSM is titled Development and Certification of Autonomous Systems. This specialization was developed in response to a need identified by the US Navy to train personnel in the field known as the Development, Testing, Evaluation, Verification, and Validation (referred to as DTEVV) of autonomous systems. This program will fill a critical educational gap that was identified by the Office of Naval Research (ONR), and the Naval Air Warfare Center Aircraft Division (NAWCAD). ONR has funded the University of Maryland's MATRIX Lab through a STEM grant to establish the program. NAWCAD has helped develop the curriculum and has agreed to fund a minimum of 5 students per cohort.

UMD's MATRIX Lab is a high-tech research and education facility that serves industry, government, academia, and most importantly, the people of Southern Maryland. It maintains multiple affiliations and partnerships with the Department of Defense, including NAWCAD.

Note on program modality: The Post-Baccalaureate Certificate of Professional Studies is approved to be offered both in person and online as some specializations are offered using both modalities. This specialization will be offered in person.

Relation to Strategic Goals. The off-campus offering at USMSM aligns with our university mission statement, particularly the graduate education objective to "Expand professional graduate programs that are nationally recognized for excellence in their curricula, their contributions to the practice of the professions, and for their innovation and creativity."[1] The future of the transportation industry (especially aviation) is uncrewed, and ultimately autonomous. Specialists in the development and certification of autonomous systems must be trained to evaluate the risk associated with fielding these systems. In this field, current technology has outpaced the level of professional expertise, resulting in a massive knowledge gap when it comes to autonomous systems. The purpose of this program offering at USMSM is to address this gap with the current naval workforce in Southern Maryland.

[1] University of Maryland, College Park Mission Statement. https://umd.edu/about/mission.

Funding. A grant from the Office of Naval Research will provide the initial resources for the program. Then it will be self-sustainable through collected tuition.

Institutional Commitment. The University of Maryland is fully committed to the success of this program offering at USMSM, which aligns with the institution's mission to advance public well-being through education, research, and service.

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

Need. The Naval Air Warfare Center Aircraft Division (NAWCAD) is located in Patuxent River, MD, about six miles from USMSM. NAWCAD's role in the U.S. Navy is stated as "Advancing capability and operational readiness for naval aviation and our warfighters."[2] University of Maryland faculty worked with NAWCAD strategic education staff to determine the educational needs regarding the development and certification of autonomous systems. NAWCAD's interest in developing the program has led to a commitment to fund a minimum of five students per cohort. Although NAWCAD will be the main source for students for the program, this is not intended to be a closed-site program. Other interested personnel at Patuxent River Naval Air Station may also be interested in the program.

State Plan. This off-campus offering aligns broadly with the 2022 *Maryland State Plan for Postsecondary Education,* specifically Priority 5, "Maintain the commitment to high-quality postsecondary education in Maryland," in particular, the Action Item to "Identify innovative fields of study." This program is designed to give students the skills required to evaluate autonomous aviation systems. Autonomous systems are not just critical for current military use, but also for the future of aviation. Autonomous technologies developed for military use will ultimately be adapted to civilian use, and this program will allow the state and Southern Maryland in particular to participate in this growing field.

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

At the national level, federal labor data confirm a strong and growing need for aerospace engineering professionals. According to the U.S. Bureau of Labor Statistics (BLS), employment of aerospace engineers is projected to grow 6% from 2024 to 2034—faster than the average for all occupations.[3] At the state level, Aerospace Engineering positions are also expected to rise by 6% in the Maryland Department of Labor's 2023-2033 Occupational Projections.[4]

[2] Naval Air Warfare Center Aircraft Division https://www.navair.navy.mil/nawcad/
[3] U.S. Bureau of Labor Statistics. Occupational Outlook Handbook. Aerospace Engineers. https://www.bls.gov/ooh/architecture-and-engineering/aerospace-engineers.htm
[4] Maryland Department of Labor. Maryland Long Term Occupational Projections (2023-2033). https://labor.maryland.gov/lmi/iandoproj/maryland.shtml

UMD's own marketing research shows strong and sustained demand for professionals in testing, evaluation, and autonomous systems. In Maryland, there were 1,815 unique job postings between April 2023 and October 2025, with a median advertised salary of $130,300, driven by major employers such as Johns Hopkins Applied Physics Laboratory, Boeing, and Leidos. Nationally, demand remains steady, with approximately 15,713 related positions and an average of 312 job postings per month. These roles require advanced technical skills in systems engineering, artificial intelligence, and verification and validation, yet the supply of specialized graduates is limited—only 24 post-baccalaureate certificate completions in a closely related field nationwide in 2024 across five institutions. This mismatch between strong employer demand and limited targeted training highlights a clear workforce gap that the proposed certificate program is designed to address.

D. Reasonableness of Program Duplication

UMD's Post-Baccalaureate Certificate of Professional Studies is an approved program on the Maryland state Academic Program Inventory. This PBCPS specialization is highly specialized and focuses on the needs of naval personnel for the development and certification of autonomous systems. There are no similar programs being offered at USMSM, and there are no post-baccalaureate certificate programs in the state that cover this same topic. The proposed program is therefore not duplicative but instead fills a clearly defined gap.

E. Relevance to Historically Black Institutions (HBIs)

No HBIs offer a similar certificate program. As such, offering the program at USMSM expands the range of high-demand educational opportunities available within the state without drawing resources or enrollment away from HBIs.

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

The proposed program was developed by UMD's A. James Clark School of Engineering, particularly its MATRIX Lab, which is located in Southern Maryland and focuses on autonomous technologies research. The program fits UMD's institutional identity, and does not impact the identities of any HBI.

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

Curricular Development. The proposed curriculum was developed by UMD faculty in conjunction with NAWCAD, and focuses on the field of study known as the Development, Testing, Evaluation, Verification, and Validation (DTEVV) of autonomous systems. This technical framework defines the primary field of study within the professional studies certificate program in Development and Certification of Autonomous Systems. The curriculum consists of four three-credit courses, starting with a course in the fundamentals of development, testing,

evaluation, verification, and validation (DTEVV), and then proceeding to specific courses in autonomy and artificial intelligence, computer vision principles, and robotics.

Faculty Oversight. The A. James Clark School of Engineering (Clark School) will provide oversight for the program. The MATRIX Lab is one of the Clark School's interdisciplinary research facilities. Donald Costello III, Director of Test and Evaluation of Autonomous Systems, will be the program director. He and other faculty affiliated with the MATRIX Lab will provide instruction for the program.

Educational Objectives and Learning Outcomes. The learning outcomes for the program are as follows:

1. Integrate engineering, computational, and analytical principles.
2. Design and implement rigorous DTEVV processes across the system lifecycle.
3. Evaluate risk and performance using quantitative and statistical techniques.
4. Develop, verify, and validate AI and autonomy-driven systems.
5. Critically assess ethical, human, and operational dimensions of emerging technologies.
6. Design and evaluate human–robotics teaming architectures.
7. Communicate technical findings with professional clarity and rigor.

Institutional assessment and documentation of learning outcomes. Please see Appendix A for information on learning outcomes assessment.

Course requirements. The program is 12 credits. A list of courses and descriptions is included in Appendix B.

Requirements		
Course Code	**Course Title**	**Credits**
ENTE401	Development, Test & Evaluation, Verification & Validation (DTEVV) Fundamentals	3
ENTE601	Autonomy and AI Fundamentals for the Development, Test & Evaluation, Verification & Validation (DTEVV) Workforce	3
ENTE602	Evaluation of Perception for Development, Test & Evaluation, Verification & Validation (DTEVV) of Autonomous Systems	3
ENTE603	Human Robotics Teaming in Development, Test & Evaluation, Verification and Validation (DTEVV) of Autonomous Systems	3
Total		**12**

General Education. Not applicable for our graduate programs.

Accreditation or Certification Requirements. The program will not require accreditation. The program is not intended to lead to any specific licensure or certification.

Other Institutions or Organizations. The offering unit is not planning to contract with another institution or non-collegiate organization in order to offer instruction for the program.

Student Support. The A. James Clark School of Engineering will provide administrative coordination for the program, in collaboration with the university's Extended Studies unit, which supports professional and continuing education. Students will be supported by the program director for academic guidance and advising. They will also have access to Graduate School counseling and the Counseling Center resources. The program director will be the first point of contact for students, while the Office of Extended Studies, which provides administrative services for a host of professional programs, will provide student and program services, such as admission support, scheduling, registration, billing and payment, graduation, and appeals. Students will see admission criteria, financial aid resources, costs, and complaint procedures on the Extended Studies program page. For technical aspects of the program, specific technological competence and equipment will be included in the admission criteria. Learning management information will also be included in these materials. UMD's MATRIX Lab is located on the USMSM campus. Consequently, students will be close to faculty and administrative support for the program.

Marketing and Admissions Information. Students will see marketing and admission criteria on the Extended Studies program page. Most information regarding direct marketing will be handled in coordination with NAWCAD.

H. Adequacy of Articulation

Not applicable for this graduate program.

I. Adequacy of Faculty Resources

Program faculty. Appendix C contains a list of faculty members who will teach in the program.

Faculty training. Faculty receive ongoing support and professional development in evidence-based teaching strategies, including instructional design for online learning, use of the university's learning management system (Canvas/ELMS), and best practices in assessment and student engagement. The Teaching and Learning Transformation Center and the Division of Information Technology at UMD provide training, instructional consultation, and media support to ensure high-quality delivery of in person and online coursework.

J. Adequacy of Library Resources

The University of Maryland Libraries assessment concluded that the Libraries are able to meet, with current resources, the curricular and research needs of the program.

K. Adequacy of Physical Facilities, Infrastructure, and Instructional Resources

The UMD MATRIX Lab is located within the SMART Building run by USMSM. This building is less than 5 years old and houses state-of-the-art facilities, infrastructure, and instructional equipment needed for the proposed program. Along with the program director, the Extended Studies unit provides administrative infrastructure. Course design and instruction costs will be covered by the ONR grant and tuition revenue will provide continued support for the program.

L. Adequacy of Financial Resources

Tables 1 and 2 contain the details of resources and expenditures.

Table 1 Resources:
The program will primarily be self-supported through tuition revenue. In addition to tuition revenue, the program benefits from external funding through an Office of Naval Research (ONR) grant, which provides $25,000 annually in Years 1 and 2. These funds support initial program development and startup costs, particularly curriculum development.

The program operates on a rolling basis, with all four courses offered annually. Students enroll part-time and may complete courses in flexible sequence over approximately two years.

1. Item 1 shows no reallocated funds because the off-campus offering is supported by student tuition.
2. The program will consist of part-time students only. The annual tuition rate is provided for informational purposes only.
3. The program is designed to serve approximately 10-20 part-time students annually, each enrolling in 6 credit hours per year. The resource table (Table 1) reflects the minimum number of students expected, 10.
4. The tuition rate will be $1,350 per credit with an assumed annual increase of 3%.
5. Item 3 shows $25,000 from the Office of Naval Research (ONR) grant for the first two years. These funds support initial program development and startup costs, particularly curriculum development.
6. Other than the grant, no other external sources of funding are assumed.

Table 2 Expenditures:

Program expenditures are organized into personnel, operational, and other expense categories, all of which are consistent with the program's scope and delivery model. Additional notes are as follows:

1. The program will offer four 3-credit courses per year, resulting in a total annual instructional cost of $40,000 in salaries, with fringe benefits calculated at 30.7%,

bringing total faculty costs to $52,280 in Year 1. These costs increase modestly over time to reflect standard salary adjustments at 3%.

2. Administrative costs include part-time support for program coordination, advising, and marketing. These functions are supported at approximately 0.10 FTE, with total salary and fringe costs beginning at $13,690 in Year 1 and increasing slightly over time.
3. Minimal equipment costs ($500 annually) are included to support instructional needs. Facilities expenditures, primarily associated with room usage at the UMD MATRIX Lab, are estimated at $2,500 annually. No major capital investments or renovations are required, as the program utilizes existing facilities and infrastructure.
4. Other expenses include fees for Extended Studies and A. James Clark School of Engineering administrative support, marketing, general operating expenses, and one-time curriculum development costs ($25,000 annually in Years 1 and 2).

M. Adequacy of Program Evaluation

This professional studies program and its offering at USMSM will be evaluated through a combination of institutional program review processes and ongoing assessment of student learning outcomes. The program will participate in the University of Maryland's established cycle for periodic review of academic units, which examines program quality, student outcomes, and alignment with institutional goals.

Student learning outcomes will be assessed on a regular basis through course-embedded assessments aligned with the program's stated learning objectives. Faculty will review assessment results to identify areas for improvement and to ensure that the curriculum continues to meet professional and academic standards.

In addition, the program will utilize student course evaluations and feedback mechanisms to monitor instructional quality and student satisfaction. These data will be reviewed by program faculty and administrators and used to inform continuous improvement of curriculum, instruction, and student support services.

These processes are conducted in accordance with established University of Maryland policies and procedures, including the Policy on Periodic Review of Academic Units (http://www.president.umd.edu/policies/2014-i-600a.html), the campus-wide Learning Outcomes Assessment cycle (https://irpa.umd.edu/Assessment/loa_overview.html), and the Policy on Periodic Evaluation of Faculty Performance (http://www.president.umd.edu/policies/2014-ii-120a.html).

N. Consistency with Minority Student Achievement Goals

The program supports Maryland's minority student achievement goals by expanding access to high-quality, workforce-aligned graduate education in engineering and autonomous systems. The program's location makes it more accessible to working professionals and students who may not be able to attend programs on the main campus because of their military responsibilities. The program benefits from the NAWCAD partnership, as employer-supported enrollment pathways provide opportunities for a broader and more diverse population of students, including those from underrepresented groups, to participate in advanced technical training. The program's focus on applied, career-oriented skills in high-demand fields such as artificial intelligence, robotics, and systems engineering aligns with state goals to improve minority student access, retention, and success in STEM disciplines.

O. Relationship to Low Productivity Programs Identified by the Commission

N/A

P. Adequacy of Distance Education Programs

The proposed program will be in-person, but for the online components of the coursework, UMD maintains an Enterprise Learning Management System (ELMS). ELMS is a Web-based platform for sharing course content, tracking assignments and grades, and enabling virtual collaboration and interaction.

Table 1: Resources

Resources Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1.Reallocated Funds					
2. Tuition/Fee Revenue (c+g below)	$81,000	$83,430	$85,933	$88,511	$91,166
a. #FT Students	0	0	0	0	0
b. Annual Tuition/Fee Rate	$8,780	$9,043	$9,315	$9,594	$9,882
c. Annual FT Revenue (a x b)	$0	$0	$0	$0	$0
d. # PT Students	10	10	10	10	10
e. Credit Hour Rate	$1,350	$1,391	$1,432	$1,475	$1,519
f. Annual Credit Hours	6	6	6	6	6
g. Total Part Time Revenue (d x e x f)	$81,000	$83,430	$85,933	$88,511	$91,166
3. Grants, Contracts, & Other External Sources	$25,000	$25,000	0	0	0
4. Other Sources	0	0	0	0	0
TOTAL (Add 1 - 4)	$106,000	$108,430	$85,933	$88,511	$91,166

Table 2: Expenditures

Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b+c below)	$52,280	$53,848	$55,464	$57,128	$58,842
a. #FTE	0.40	0.40	0.40	0.40	0.40
b. Total Salary	$40,000	$41,200	$42,436	$43,709	$45,020
c. Total Benefits	$12,280	$12,648	$13,028	$13,419	$13,821
2. Admin. Staff (b+c below)	$13,690	$13,964	$14,243	$14,528	$14,818
a. #FTE	0.1	0.1	0.1	0.1	0.1
b. Total Salary	$10,000	$10,200	$10,404	$10,612	$10,824
c. Total Benefits	$3,690	$3,764	$3,839	$3,916	$3,994
3. Total Support Staff (b+c below)	$0	$0	$0	$0	$0
a. #FTE	0.0	0.0	0.0	0.0	0.0
b. Total Salary	$0	$0	$0	$0	$0
c. Total Benefits	$0	$0	$0	$0	$0
4. Graduate Assistants (b+c)	$0	$0	$0	$0	$0
a. #FTE	0	0	0	0	0
b. Stipend	$0	$0	$0	$0	$0
c. Tuition Remission	$0	$0	$0	$0	$0
d. Benefits	$0	$0	$0	$0	$0
5. Equipment	$500	$500	$500	$500	$500
6. Library	$0	$0	$0	$0	$0
7. New or Renovated Space	$2,500	$2,500	$2,500	$2,500	$2,500
8. Other Expenses	$38,530	$38,835	$14,149	$14,472	$14,806
TOTAL (Add 1 - 8)	$105,000	$107,147	$84,356	$86,628	$88,966

Appendix A: Learning Outcomes Assessment

By the completion of the certificate program, students will be able to:

1. Integrate Engineering, Computational, and Analytical Principles:
Apply advanced engineering, scientific, and mathematical frameworks to diagnose, model, and solve complex problems in the development, test & evaluation, verification, & validation (DTEVV) of autonomous systems.

Assessment Methods: In class exercises, design exercises, and comprehensive applied project based learning activities.

2. Design and Implement Rigorous DTEVV Processes Across the System Lifecycle:
Plan, execute, and document DTEVV activities that ensure system safety, performance, and reliability across design, testing, and operational phases.

Assessment Methods: In class exercises, laboratory exercises, project based learning activities, and case-based scenario analysis.

3. Evaluate Risk and Performance Using Quantitative and Statistical Techniques:
Employ statistical analysis and modeling tools to quantify system risk, evaluate experimental data, and inform decision-making in DTEVV contexts.

Assessment Methods: In class exercises, project based learning activities, quantitative assessments, and simulation-based evaluations.

4. Develop, Verify, and Validate AI and Autonomy-Driven Systems:
Design and test control algorithms, perception systems, and autonomous decision frameworks using formal verification methods and reinforcement learning approaches.

Assessment Methods: Laboratory exercises, simulation demonstrations, project based learning activities, and system validation reports.

5. Critically Assess Ethical, Human, and Operational Dimensions of Emerging Technologies:
Analyze ethical challenges, trust dynamics, and human–machine interactions to ensure responsible development and deployment of autonomous and AI-enabled systems.

Assessment Methods: Written assignments, literature review, and in class exercises

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6. Design and Evaluate Human–Robotics Teaming Architectures:

Integrate mission autonomy, human–computer interaction, and simulation systems into cohesive architectures that enhance human–robot collaboration and system performance.

Assessment Methods: Project-based learning activities, and in class exercises

7. Communicate Technical Findings with Professional Clarity and Rigor
Produce and present high-quality technical documentation and oral presentations that effectively communicate system design decisions, validation results, and recommendations to technical and non-technical stakeholders.

Assessment Methods: Oral presentations, written assignments, in class exercises, and project-based learning activities.

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Program Learning Outcomes to Course Alignment Matrix

Introduced (I): Students first encounter foundational concepts or skills related to the outcome.
Reinforced (R): Students apply the concepts in structured contexts with guided practice and feedback.
Mastered (M): Students demonstrate independent and proficient performance of the outcome through complex, authentic tasks.

Program Learning Outcome (PLO)	ENTE 401	ENTE 601	ENTE 602	ENTE 603
1. Integrate engineering, computational, and analytical principles	I	R	R	M
2. Design and implement rigorous DTEVV processes across the system lifecycle	I	R	R	M
3. Evaluate risk and performance using quantitative and statistical techniques	I	R	R	M
4. Develop, verify, and validate AI and autonomy-driven systems	—	I	R	M
5. Critically assess ethical, human, and operational dimensions of emerging technologies	I	R	R	M
6. Design and evaluate human–robotics teaming architectures	—	—	R	M
7. Communicate Technical Findings with Professional Clarity and Rigor	I	R	R	M
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Appendix B: Course Descriptions

ENTE401 Development, Test & Evaluation, Verification & Validation (DTEVV) Fundamentals (3 Credits)

This course provides a basic understanding of the Development, Test & Evaluation, Verification & Validation (DTEVV) process used to produce new aviation systems. While the course will mainly focus on DTEVV of aviation platforms/systems, the basics taught can be applied to any domain. The course will provide students with: the history and development of DTEVV; basic DTEVV concepts and ways to approach DTEVV; issues relating to various forms of DTEVV (i.e., Contractor, Government, Developmental, and Operational); common tools used in the test and evaluation community; the role of DTEVV during a systems lifecycle; and the engineering rigor that is applied to DTEVV to properly assess risk prior to fielding. This course will provide a solid foundation to join the DTEVV community upon completion.

ENTE601 Autonomy and AI Fundamentals for the Development, Test & Evaluation, Verification & Validation (DTEVV) Workforce (3 Credits)

The future of transportation is uncrewed and ultimately autonomous. Before these systems can be fielded, they will need to go through a risk mitigation and acceptance process that is managed by professionals in and out of the government. This course is designed to give the students the skills required to evaluate autonomous aviation systems during this Development, Test & Evaluation, Verification and Validation (DTEVV) process. The course will cover the basic concepts and challenges faced by the DTEVV community when evaluating systems that contain Autonomous/AI functionality. It will examine control methods that are used by the DTEVV community. The course will provide practical experience in evaluating these systems through formal methods analysis, reinforcement learning, and programming to perform perception tasks required within the DTEVV community. This course will give the student a solid understanding and the skills needed to perform DTEVV on autonomous/AI systems in aviation.

ENTE602 Evaluation of Perception for Development, Test & Evaluation, Verification & Validation (DTEVV) of Autonomous Systems (3 Credits)

Provides a comprehensive and rigorous introduction to computer vision principles and their application in the Development, Test & Evaluation, and Verification & Validation (DTEVV) of autonomous systems. Students will explore the entire computer vision pipeline, from the physics of image formation to the implementation and validation of state-of-the-art deep learning models. The course is grounded in the theoretical foundations of machine learning and deep learning, while also emphasizing the practical challenges of building robust and reliable systems. A significant portion of the course will be dedicated to hands-on labs and a final project where students will develop, train, and rigorously evaluate a computer vision model for an object tracking task, simulating real-world DTEVV scenarios by analyzing performance against both nominal and disturbed data.

ENTE603 Human Robotics Teaming in Development, Test & Evaluation, Verification and Validation (DTEVV) of Autonomous Systems (3 Credits)

Human Teaming with Robotic Systems is slowly becoming a reality in multiple industries. As more of these systems deploy, a broad question arises about how to complete the Development, Test & Evaluation, Verification & Validation (DTEVV) process for these systems. This course will address this broader question by asking students to develop a simulated Human Robotics System to gain an intuitive understanding of how these systems work. Furthermore, we will use the developed Human Robotic System to illustrate the usage of different algorithmic DTEVV techniques. The outcome of this course is a broader understanding of the challenges of testing Human Robotics Teaming from a variety of different perspectives (e.g. Developer, Tester, Safety Engineer).

Appendix C: Faculty Information

The following faculty member will provide instruction for the program, although additional faculty may be hired as the program develops.

Name	Highest Degree Earned and Institution	Academic Field	UMD Title	Courses Taught
Donald Costello	PhD, University of Maryland, College Park	Mechanical Engineering	Associate Research Professor (full-time)	ENTE401, ENTE601, ENTE602, and ENTE603