



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

Institution Submitting Proposal

Each action below requires a separate proposal and cover sheet.

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

Payment ☐ Yes Payment ☐ R*STARS #
Submitted: ☐ No Type: ☐ Check #0584591

Payment
Amount:

Date
Submitted:

Department Proposing Program

Degree Level and Degree Type

Title of Proposed Program

Total Number of Credits

Suggested Codes

HEGIS:

CIP:

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 submission as per COMAR 13B.02.03.03)

☐ Fall ☐ Spring ☐ Summer Year:

Provide Link to Most
Recent Academic Catalog

URL:

Preferred Contact for this Proposal

Name:

Title:

Phone:

Email:

President/Chief Executive

Type Name:

Signature:

Date: 5/15/2026

Date of Approval/Endorsement by Governing Board:

Revised 4/2025

ANNE ARUNDEL COMMUNITY COLLEGE

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Dr. Dawn Lindsay

President

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May 15, 2026

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

Dear Ms. Quiroz-Livanis:

Anne Arundel Community College is requesting approval to establish a new Area of Concentration in Astronomy/Physics within the Associate of Science (A.S.) Science Transfer program. A separate proposal has been submitted for approval of the new Associate of Science (A.S.) Science Transfer degree. Please see the attached proposal to support this request.

If you have any questions, please contact Dr. Tina Smith, Associate Vice President for Learning at Ksmith56@aacc.edu or (410) 777-2776.

We appreciate the Maryland Higher Education Commission's consideration of this request.

Sincerely,

A handwritten signature in black ink, appearing to read "D. Lindsay", is written over a horizontal line.

Dr. Dawn Lindsay
President

cc: Tanya Millner, Ed.D., Provost/Vice President for Learning
Tina Smith, Ph.D., Associate Vice President for Learning
Lance D. Bowen, Ph.D., Dean, School of Science, Technology & Education
Kirsten Casey, Ph.D., Assistant Dean, Science
Nanci Beier, M.A., Registrar
Tara Carew, M.B.A., M.Ed., Director, Financial Aid

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Astronomy/Physics Area of Concentration

A. Centrality to Institutional Mission and Planning Priorities:

1. **Provide a description of the program, including each area of concentration (if applicable), and how it relates to the institution's approved mission.**

Anne Arundel Community College's (AACC) Mission Statement: *"With learning as its central mission, Anne Arundel Community College responds to the needs of our diverse community by offering high quality, affordable, accessible and innovative lifelong learning opportunities."*¹

The Science Department at AACC is proposing a new Astronomy/Physics Area of Concentration (AOC) within the Associate of Science (A.S.) Science Transfer degree program. The Astronomy/Physics AOC offers students a rigorous introduction to the fundamental laws of nature and the structure of the universe. This AOC supports transfer into physics, astrophysics, engineering, and related disciplines, emphasizing both theoretical understanding and practical problem-solving. This new structure allows for greater flexibility in course selection, ensuring alignment with the diverse requirements of Maryland's four-year institutions and preparing students for careers in research, aerospace, data science, and education.

This AOC directly supports AACC's mission by expanding access to high quality, affordable, and innovative educational opportunities. It also promotes equity and inclusion by providing academic pathways that are clearly defined routes that reduce barriers and allow students from varied backgrounds and academic interests to achieve their goals. Additionally, the program fosters interdisciplinary collaboration and critical thinking, aligning with AACC's vision of transforming lives to create an engaged and inclusive society.

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

The A.S. Science Transfer degree program aligns with AACC's strategic plan, *AACC Forward 2030 (FY26–FY30)*,² which aims to advance the college as a dynamic, student-centered institution. The program supports *Goal 1: Be a Vibrant Resource for the Community* by creating clear academic and workforce pathways that meet regional economic needs. It fulfills *Goal 2: Provide Access for All* through affordable, flexible options that remove barriers and promote equity. To achieve *Goal 3: Ensure Academic Excellence*, the program offers evidence-based, rigorous curricula aligned with transfer and workforce requirements. By preparing students for advanced degrees and high-demand careers, *Goal 4: Driving Economic and Social Mobility*, is supported through enhanced long-term financial stability and community vitality. Finally, *Goal 5: Foster a Student-Centered Culture* is realized through targeted advising, STEM tutoring, and research opportunities that support retention and completion, ensuring a meaningful and achievable academic journey.

¹ <https://www.aacc.edu/about/mission-and-vision/>

² <https://www.aacc.edu/about/mission-and-vision/strategic-plan/>

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- 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 required in section L.**

All costs of the A.S. Science Transfer degree program will be funded through AACC's annual operating budget. This program will continue to be adequately funded for the first five years of implementation and will not require additional expenditures outside of those that are offset by tuition revenue from projected enrollment. More details are provided in Section L below.

- 4. Provide a description of the institution's commitment to:**

- a. ongoing administrative, financial, and technical support of the proposed program**

Anne Arundel Community College is committed to the ongoing administrative, financial, and technical support for the Astronomy/Physics AOC. This program has the necessary support at the departmental, divisional, and institutional levels to operate successfully. It will be implemented within the School of Science, Technology and Education, and the functional areas will be led by the Assistant Dean of Science, along with the Academic Chair. Current administrative staff will also provide support. Technical support, including remote, phone, and in-person modalities, will be provided by the onsite Technology Service Desk, through AACC's Information and Instructional Technology (IIT) division. The College's IDEA Lab provides support and maintenance of the College's learning management system (LMS).

- b. continuation of the program for a period of time sufficient to allow enrolled students to complete the program.**

Anne Arundel Community College is committed to providing all students an opportunity to complete their program of study. Students may elect to graduate from a program by meeting the curriculum requirements as outlined in the catalog in effect during their initial enrollment, ensuring stability and predictability in academic planning. This commitment reflects AACC's student-centered mission and institutional policy to safeguard degree completion for all learners.

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**

The Astronomy/Physics AOC will contribute to the advancement and evolution of knowledge in Maryland by preparing a diverse and skilled group of students for transfer into STEM-related programs at four-year institutions. Students will engage in a curriculum designed to foster critical thinking, analytical skills, and interdisciplinary collaboration. This approach ensures that graduates are well-equipped to contribute to scientific innovation, research, and problem-solving in a rapidly evolving global landscape. The program aligns with Maryland's strategic goals to strengthen its STEM workforce.

b. Societal needs, including expanding educational opportunities and choices for minority and educationally disadvantaged students at institutions of higher education.

As an open-enrollment institution, AACC serves as a primary access point to higher education for all students, including minority and educationally disadvantaged students in Anne Arundel County. As a low-cost option, the College is uniquely positioned to provide pathways for all students to pursue a wide variety of educational opportunities in STEM fields. In support of its mission, AACC has built a robust ecosystem for undergraduate research experiences across the sciences. This infrastructure includes faculty-mentored research projects, interdisciplinary collaborations, and partnerships with four-year institutions. These high-impact practices provide students with meaningful, hands-on learning opportunities that deepen their understanding of scientific inquiry and enhance their academic and professional preparation.

2. Provide evidence that the perceived need is consistent with the Maryland State Plan for Postsecondary Education.

The Astronomy/Physics AOC aligns strongly with the goals and priorities outlined in the *2022 Maryland State Plan for Postsecondary Education*, particularly in the areas of Access, Success, and Innovation.³

Access: This program expands affordable, high-quality STEM education to a diverse student population. As an open-enrollment institution, AACC provides clear, flexible transfer pathways through multiple concentrations helping all students, including underrepresented students, transition to Maryland's four-year institutions. This aligns with Priority 4, which focuses on improving systems that impact equitable access.

Success: Designed for rigorous academic preparation and structured transfer pathways, this program integrates faculty-mentored undergraduate research to enhance engagement, confidence, and readiness for advanced study. These practices support Priorities 5 and 6, ensuring high-quality education and reducing barriers to timely completion.

Innovation: With a modern, adaptable curriculum, this program responds to evolving STEM workforce needs. Its emphasis on research and interdisciplinary collaboration fosters creativity and problem-solving, advancing Priority 8 by promoting a culture of innovation beyond the classroom.

C. Quantifiable and Reliable Evidence and Documentation of Market Supply and 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 proposed A.S. Science Transfer degree program, with the Astronomy/Physics AOC, prepares students for transfer to four-year institutions and ultimately, to meet current and emerging

³ <https://mhec.maryland.gov/Pages/2021-2025-Maryland-State-Plan-for-Higher-Education.aspx>

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workforce needs in STEM-related fields. Potential industries include opportunities in aerospace, education, and data science. Entry-level roles are generally at the technician/assistant level or educators, with mid-level career growth achievable with experience or advanced degrees.⁴

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 to the Maryland Department of Labor, STEM fields are expected to grow by 10-15% from 2023-2033.⁵ This strong growth, combined with consistent job vacancies, confirms substantial educational and training needs over the next five years. These labor market insights support expansion of related academic programs such as the Astronomy/Physics AOC within the A.S. Science Transfer degree program to meet regional employment needs and align with state workforce goals. This concentration supports transfer into physics, astrophysics, engineering, education and related disciplines, emphasizing both theoretical understanding and practical problem solving. Anne Arundel County's proximity to federal research hubs and contractors in the region helps drive demand for skilled STEM professionals.

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.

Anticipated Vacancies from 2025–2030: According to the *Bureau of Labor Statistics (2024)*, 5,000 statewide openings are projected across the targeted fields. This figure confirms the need for robust transfer pathways to meet STEM educational and training demands (see table below).

Category	Key Occupations (SOC Codes)	5-Year Total Openings (2025–2030, Statewide)
Physics and Astronomy	Physicists/Astronomers (19-2012), Aerospace Engineers (17-2011)	1,500
Education and Science Communication	Secondary School Teachers, Science (25-2031), Science Writers (27-3043 subset)	3,500
		Total: 5,000

4. Provide data showing the current and projected supply of prospective graduates.

In FY25, 1,368 associate degrees were conferred at AACC across all disciplines, underscoring its role as a major contributor to regional talent development.⁶ This strong supply, combined with projected growth in STEM-intensive occupations, validates the need for expanded transfer pathways such as the new Astronomy/Physics AOC. This program will help meet workforce demand and support Maryland's strategic goals for access, success, and innovation. The Astronomy/Physics AOC is projected to produce more than 30 graduates over the next five years,

⁴ Maryland Department of Labor, *Maryland Long Term Occupational Projections 2023-2033*, [occupationalprojections.xlsx](#)

⁵*Ibid.*

⁶ AACC Institutional Research, 2025.

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based on enrollment trends in similar programs.

D. Reasonableness of Program Duplication:

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.**

Anne Arundel Community College's new Astronomy/Physics AOC, within the A.S. Science Transfer degree program, is designed to meet Maryland's growing demand for STEM-educated graduates while addressing local student needs in Anne Arundel County. Although similar programs are offered at other community colleges in Maryland (see table below), their geographic distance limits accessibility for many students in AACC's service area. Community college students typically rely on local institutions due to transportation constraints, employment obligations, and the need for flexible scheduling. As a result, programs located outside the immediate area do not effectively meet the needs of these students. Additionally, Astronomy/Physics programs require substantial in-person engagement through laboratory instruction, observational experiences, and extended classroom contact hours. These hands-on components are not easily replicated through remote or hybrid delivery and make proximity to the institution especially important for student success.

School	Program Name	Degree
Allegany College of Maryland	Arts & Sciences Transfer, AOC in Physics	Associate
Carroll Community College	Physical Sciences, AOC in Physics	Associate
Cecil College	Secondary Education (AAT), AOC in Physics	Associate
Chesapeake College	Secondary Education (AAT), AOC in Physics	Associate
College of Southern Maryland	Physical Sciences, AOC in Physics	Associate
Community College of Baltimore County	Science, AOC in Physics	Associate
Hagerstown Community College	Arts & Sciences, AOC in Physics	Associate
Harford Community College	Secondary Education (AAT), AOC in Physics	Associate
Howard Community College	Secondary Education (AAT), AOC in Physics	Associate
Montgomery College	Science, AOC in Physics	Associate
Wor-Wic Community College	STEM, AOC in Physics	Associate

The AACC Astronomy/Physics concentration is consistent with established transfer pathways in the physical sciences. This is similar to programs across Maryland such as, Allegany College of Maryland (AOC in Physics), Carroll Community College (AOC in Physics), College of Southern Maryland (AOC in Physics), Hagerstown Community College (AOC in Physics), Montgomery College (AOC in Physics) and Wor-Wic Community College (AOC). These programs have broad physics preparation within Arts and Sciences, STEM, or Physical Science degrees and are designed to support transfer to four-year institutions. The Community College of Baltimore County offers an A.S. in Science, Physics AOC, designed to prepare students for transfer to a four-year university to

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complete a bachelor's degree in physics. AACC's proposed program similarly includes core coursework in physics, mathematics, and general education, reflecting statewide expectations for transfer alignment.

Cecil College, Chesapeake College, Harford Community College, and Howard Community College offer Associate of Arts in Teaching (A.A.T.) degrees in Secondary Education with Physics AOCs. These are similar in that they are transfer degrees. However, the A.A.T. degree programs are designed specifically to prepare students to become secondary physics teachers and to transfer directly into a teacher certification bachelor's program. AACC's proposed program is designed to be more flexible so that students choose courses based on their transfer goals.

Anne Arundel Community College's proposed concentration is distinguishable in both focus and delivery. Unlike many peer programs, AACC integrates astronomy coursework within the physics pathway, offering a more specialized curriculum that prepares students for transfer into astrophysics and related disciplines. At other institutions, physics is typically embedded within broader science frameworks and does not consistently include astronomy-specific or observational components. This distinction supports a unique academic area rather than duplicating existing offerings. AACC's program also integrates a robust undergraduate research ecosystem, another distinguishing feature.

The AACC Astronomy/Physics concentration aligns with MHEC expectations by supporting transfer readiness while remaining justified due to its specialized focus and its role in expanding equitable, local access to rigorous physical science education in AACC's service area.

2. Provide justification for the proposed program.

The A.S. Science Transfer degree program at AACC, with its Astronomy/Physics AOC, is a strategic response to student demand, institutional data, and Maryland's workforce and educational priorities. The program consolidates science focused pathways currently distributed across the Transfer Studies and Arts and Sciences degrees, into a cohesive, discipline aligned structure that improves transfer preparation, student outcomes, and program oversight.

Transfer Studies is AACC's largest academic pathway, enrolling approximately 2,500 students in 2024 (about 30% of total enrollment). Institutional advising and petition data indicate that roughly 40% of these students ultimately pursue science-related transfer goals but are enrolled in general programs due to limited discipline- specific- options.⁷ The A.S. Science Transfer degree consolidates these pathways, allowing AACC to better track and support cohorts in AOC's, including transfers to Maryland's HBIs.

The current Arts and Sciences Transfer structure treats each science area as a separate program with additional concentration specific requirements beyond general education, including mandated courses that often do not align with STEM transfer prerequisites at partner institutions. These misalignments contribute to approximately 150 substitution petitions annually. The new A.S. framework removes unnecessary rigidity while maintaining general education requirements,

⁷ AACC Institutional Research, 2025.

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aligning curricula with partner institutions through ARTSYS to ensure the transferability of 60 credits.

By consolidating science concentrations, administrative burdens are reduced, enabling more targeted assessment of student learning outcomes and more efficient use of institutional resources. Strategically, the program strengthens articulation, supports Maryland's demand for STEM professionals, advances equity through expanded access to high demand fields, and aligns with the *2022 Maryland State Plan for Postsecondary Education* by increasing completions in discipline specific majors and improving transfer outcomes statewide.

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

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

The proposed Astronomy/Physics AOC strengthens and expands the capacity of Maryland's HBIs to provide high quality STEM-related programs. By creating a robust transfer pipeline, fostering equitable access for underrepresented students, and aligning with HBI missions, this program enhances the ability of HBIs to meet Maryland's workforce demands and educational equity goals, without duplicating offerings.

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

1. Discuss the program's potential impact on the uniqueness and institutional identities and missions of HBIs.

This proposed program at AACC supports and strengthens the distinct missions and identities of Maryland's HBIs by serving as a complementary transfer pathway that prepares students for success without duplicating or diluting existing programs. By aligning coursework with HBI curricular expectations and transfer requirements, the program enhances the capacity of HBIs to advance equity, access, and excellence in STEM fields.

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.

This AOC was developed as part of the Academic Portfolio Review process at AACC, a multi-year initiative involving faculty and departmental leadership. The review focused on comprehensive data analysis related to courses, programs, and student success. Over the past two years, the Science faculty have engaged in extensive discussions about the proposed changes. Subject-matter experts were brought in to carefully evaluate the curriculum within each AOC. This AOC will be led by Deborah Levine, Ph.D., Department Chair and Associate Professor, Physical Science. She joined AACC in 2017 and received her Ph.D. in Astronomy from University of California, Los Angeles. The program consists of a team of faculty members who are experts in their respective disciplines. All full-time faculty at AACC hold at least a master's degree in their field, with many

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having earned a doctorate, ensuring a high level of academic expertise and instructional quality.

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

Upon successful completion of this program, students will be able to:

1. Analyze and solve problems by applying discipline-appropriate quantitative tools, concepts, and methods.
2. Investigate physical phenomena experimentally, using discipline-specific tools and methodology.
3. Apply discipline-specific lab safety rules.
4. Apply knowledge of discipline-specific fundamental concepts to explain experimental outcomes or real-world phenomena.
5. Collect, analyze, and interpret information based on scientific reasoning and discipline-specific concepts.

This program aligns with all the College's core competencies.

The assessment activities related to the above program outcomes may take diverse forms including, but not limited to, standardized assessments and faculty-developed evaluations, surveys, and evaluation of student work. The College believes that such input is vital to its responsibility to maintain quality instruction. Therefore, class time may be used at times for these activities, and it is expected that students will participate in the processes when asked.

3. Explain how the institution will:

a. provide for assessment of student achievement of learning outcomes in the program

Anne Arundel Community College is committed to ensuring that its students and graduates are among the best prepared citizens and workers of the world by offering high quality, affordable, and accessible learning opportunities while also continuing the institution's excellence, accountability, and continuous learning. To this end, practices and procedures are established to ensure faculty, staff and administrators systematically assess student learning outcomes at the course, program, and institution levels.

All AACC academic departments maintain assessment plans for their programs and courses that outline learning outcomes, curriculum mapping, assessments, and data collection cycles. Assessments to measure student learning take many forms including exams, research papers and other written assignments, class discussions, performances, and lab exercises. These assessment items are mapped to course-level and program-level learning outcomes. Measures of student learning are aggregated to the appropriate level (course, program, institution) to provide the basis for faculty discussions on curriculum, pedagogy, and assessment.

In addition to regular cycles of program-level learning outcomes assessment, all credit degree and certificate programs are reviewed on an annual basis for evidence of program retention and

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completion, success in program foundational courses, enrollment, and assessment practices. Program review also includes a review of program outcomes. The Science Department has established learning outcomes for all 100- and 200-level courses and has documented student achievement in these areas.

b. document student achievement of learning outcomes in the program

Departmental learning outcome assessment plans are submitted to and approved by AAAC's Director of Assessment and Instructional Innovation. Each AOC is reviewed on a regular 2-year cycle, and all data and reports are tracked and housed in that office.

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

The Astronomy/Physics AOC requires the following courses:

Astronomy/Physics AOC Requirements: 16 Credits

- MAT 192 Calculus and Analytic Geometry 2 (4 credit hours)
- MAT 201 Calculus and Analytic Geometry 3 (4 credit hours)
- MAT 212 Differential Equations (4 credit hours)
- PHY 213 General Physics 3 (4 credit hours)

Astronomy/Physics AOC Electives: 8 Credits

Choose from the following courses:

- AST 112 Stars and Stellar Systems (4 credit hours)
- CHE 111 General Chemistry 1 (4 credit hours)
- CHE 112 General Chemistry 2 (4 credit hours)
- MAT 202 Linear Algebra (4 credit hours)
- SCI 101 Introduction to Research (1 credit hour)
- SCI 201 Research Experience (2 credit hours)
- SCI 202 Research Communication (1 credit hour)

In addition, students take the following 36 General Education credits:

English Composition: 6 credits

ENG 101 Academic Writing and Research 1 (3 credit hours)

ENG 102 Academic Writing and Research 2 (3 credit hours)

Arts and Humanities: 6 credits

One of the courses must be chosen from the following:

COM 101, COM 110, COM 111, COM 116, COM 141, DAN 100, MUS 100, THA 111, ASL or a World Language at the 111, 112 or 211 level.

Biological and Physical Sciences: 8 credits

PHY 211 General Physics 1 (4 credit hours)

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PHY 212 General Physics 2 (4 credit hours)

Mathematics: 4 credits

MAT 191 Calculus and Analytic Geometry 1 (4 credit hours)

Social and Behavioral Sciences: 6 credits

Students must take two Social and Behavioral Sciences courses from two different disciplines. One course should be used to satisfy the Diversity course requirement.

Additional General Education requirements: 6 Credits

Wellness (3 credit hours) and Technology (3 credit hours)

Course Descriptions:

AST 112 - Stars and Stellar Systems

Learn about the universe beyond our solar system. Explore topics including the nature of stars and their evolution, galaxies and quasars, the universe as a whole and the possibility of life elsewhere in the Universe.

CHE 111 - General Chemistry 1

Study atomic theory and periodic relationships, chemical bonding, gases, liquids and solids, stoichiometry, kinetic-molecular theory, solutions, oxidation-reduction, reactions of molecules and ions and nuclear chemistry. Laboratory work includes basic techniques and principles as well as quantitative measurements by titration, calorimetry and stoichiometry.

CHE 112 - General Chemistry 2

Study the fundamental principles and quantitative aspects of chemical equilibrium, acid-base chemistry and acid-base equilibria, solubility equilibria, thermodynamics, electrochemistry, kinetics, basic concepts in nuclear chemistry and an introduction to organic chemistry nomenclature and structure. Laboratory work applies theoretical principles presented in the lecture and includes data collection and analysis, basic laboratory techniques and use of chemical instrumentation; use of chemical literature and databases, use of a laboratory notebook to record data and results, methods of qualitative analysis, and written communication of results and conclusions in the form of lab reports.

ENG 101 Academic Writing and Research 1

Learn critical writing, reading, and thinking strategies. Write multiple essays, culminating in an instructor-guided research paper. Analyze a variety of texts and identify their cultural, historical, and social contexts. Develop foundational information literacy, academic research, and documentation skills.

ENG 102 Academic Writing and Research 2

Develop advanced critical writing, reading, and thinking skills. Compose analytical and argumentative essays, culminating in the production of an independent, extensive, multiple-source, fully documented research paper. Analyze a variety of texts through close reading and explore their cultural, historical, and social contexts. Learn advanced research techniques, including formulation of research questions, identification of multiple audiences, analysis of rhetorical situations, and ethical research tactics.

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MAT 191 - Calculus and Analytic Geometry 1

Find limits, derivatives and integrals of functions. Apply these concepts to explicit, implicit, algebraic, trigonometric and transcendental functions, using derivatives to analyze graphs and to model real situations.

MAT 192 - Calculus and Analytic Geometry 2

Learn numerical and analytical techniques for integration and apply these techniques to solve problems involving definite integrals. Other topics include solving separable differentiable equations, extending the concepts of calculus to polar and parametric forms, using Taylor polynomials to approximate functions, and determining the convergence or divergence of improper integrals, infinite sequences and infinite series.

MAT 201 - Calculus and Analytic Geometry 3 (4 credit hours)

Extend the ideas of limits, differentiation and integration to two or more dimensions. Study vectors and vector functions, partial differentiation, gradients, directional derivatives and tangent planes, optimization, Lagrange multipliers, iterated integration, line and surface integrals, and the classical theorems of Green, Gauss and Stokes.

MAT 202 - Linear Algebra

Study vector spaces and linear transformations on finite-dimensional vector spaces. Topics include linear systems, matrices, determinants, inner product spaces and eigen values.

MAT 212 - Differential Equations

Analyze and solve ordinary differential equations of various types: separable, exact, linear equations of all orders and systems of linear equations. Master techniques including integrating factors, undetermined coefficients, the Wronskian, variation of parameters, reduction of order, power series, Laplace transforms and numerical approximations. Solve systems of linear equations using operator methods, numerical approximations and matrix methods. Apply these techniques to various applications including trajectories, mixing, growth, decay, vibrating springs, electric circuits and resonance. Use a mathematical software system as an integral and substantial part of the course.

PHY 211 - General Physics 1

Discover the fundamental concepts and methods of physics as a basis for further study in science and engineering. Study the classical principles and their application to calculus-based mathematical analysis of physical problems. Analyze topics including mechanics (kinematics, laws of motion, force, momentum, and energy) and basic fluid theory.

PHY-212 General Physics 2

Examine the topics of thermodynamics, electrostatics, and direct current circuit theory while expanding on the theory from PHY 211 demonstrating these topics application to the calculus-based mathematical analysis of physical problems.

PHY 213 - General Physics 3

Continue the study of physics and its application to the calculus-based mathematical analysis of physical problems. Analyze topics including magnetism, electrodynamics and Maxwell's equations, alternating current circuit theory and applications, optics, quantum mechanics, and

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special relativity.

SCI 101 - Introduction to Research

Investigate the process of conducting research, from initial literature reviews to project outline and data collection. Engage in a variety of research projects at AACC and during field trips to local research facilities in the Chesapeake region's diverse habitats, using a wide range of scientific tools and technologies. Design a research project to conduct with a faculty mentor at AACC.

SCI 201 - Research Experience

Design and conduct an original research project with the guidance of a faculty mentor. Operate a variety of discipline-specific equipment and learn research methods and techniques. Search databases to find existing work in the relevant field and determine how the research project adds to the body of knowledge. Enhance oral presentation skills by presenting research findings to faculty and peers and develop a plan to present findings to a broader audience through publications or conferences.

SCI 202 - Research Communication

Explore the process of research communication to a diverse audience with a focus on scientific journal articles and presentations at scientific conferences. Critique existing articles and presentations to refine your own list of best practices for research communication. Examine research results to write, edit, and submit a scientific journal article for publication. Design a research presentation to present during the course or at a regional conference in your field.

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

Please refer to Section 4 above which outlines the General Education requirements.

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

Not applicable.

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

Not applicable.

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.

Anne Arundel Community College ensures students receive clear, complete, and timely information regarding curriculum, course and degree requirements, faculty student interaction, technology expectations, equipment needs, learning management systems, academic support services, financial aid, and costs and payment policies. Program information is published in the

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College catalog and on the College website, both accessible to all students and regularly reviewed and updated by the Science Department in coordination with Academic Affairs.

Accuracy is maintained through AACC's integrated curriculum and catalog management system, which requires review and approval by content managers and the College catalog editor in partnership with Strategic Communications. Upon approval, the A.S. Science Transfer degree program, and its AOCs, will be clearly presented, including requirements, course formats, technological competencies, equipment expectations, and use of the Canvas LMS. Students receive course specific information through syllabi at the start of each term. The College provides comprehensive academic support services and financial aid services, with information on tuition and fees available online.

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.

Anne Arundel Community College ensures the accuracy of program presentations in advertising, recruiting and admissions materials by using procedural processes through a connected curriculum/catalog software system where content managers and the College catalog editor review and update in partnership with Strategic Communications. The College's homepage has links to six major headings, two of which directly apply to college majors and credit courses (earn a degree, certificate or college credits, and earn college credits while in high school). The main page for each heading has relevant advertising, recruiting and admissions information. In addition, across the top of every page are direct links to Programs & Courses, Apply & Register, Costs & Paying for College, Resources for Students, Campus Life & Activities, and About Us.

H. Adequacy of Articulation (as outlined in COMAR 13B.02.03.19)

1. If applicable, discuss how the program supports articulation with programs at partner institutions. Provide all relevant articulation agreements. More information for Articulation Agreements may be found here.

The A.S. Science Transfer degree program at AACC, with its Astronomy/ Physics AOC, is designed to enhance student outcomes by streamlining transfer success and supporting timely completion of four-year degrees at partner institutions across Maryland, including HBIs such as Bowie State University, Coppin State University, Morgan State University, and UMES. The program's flexible, concentration-based structure allows students to tailor their academic pathways to meet specific prerequisite and general education requirements of similar STEM majors statewide, reducing barriers such as credit loss or the need for additional coursework post-transfer, which can delay degree completion.

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 the proposed program.

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Faculty Resources				
Name	Terminal Degree	Academic Title	Status	Courses
Jason Barbour	Ph.D., University of Virginia	Full Professor	Full-time	CHE 111, CHE 111LB, PHY 211, PHY 211LB, PHY 212, SCI 101, SCI 201, SCI 202
Robert Carp	M.A., University of California	Full Professor	Full-time	CHE 111, CHE 111LB, CHE 112, CHE 112LB, SCI 101, SCI 201, SCI 202
Eric Fons	M.S., University of Florida	Associate Professor	Full-time	PHY 211, PHY 212, PHY 213, SCI 101, SCI 201, SCI 202
Deborah Levine	Ph.D., University of California Los Angeles	Associate Professor & Academic Chair, Physical Sciences	Full-time	AST 112, PHY 211, SCI 101, SCI 201, SCI 202
Maureen Sherer	M.Ed., Johns Hopkins University	Full Professor	Full-time	CHE 111, CHE 111LB, CHE 112, CHE 112LB, SCI 101, SCI 201, SCI 202
Shyamala Sivalingam	Ph.D., Bharathidasan University	Associate Professor	Full-time	CHE 111, CHE 111LB, CHE 112, CHE 112LB, SCI 101, SCI 201, SCI 202
Lynn Tracey	Ph.D., University of Delaware	Full Professor	Full-time	CHE 111, CHE 111LB, CHE 112, CHE 112LB, SCI 101, SCI 201, SCI 202
Elizabeth Ward	M.S., University of West Virginia	Instructional Specialist	Full-time	CHE 111, CHE 111LB, CHE 112, CHE 112LB
Andrew Yolleck	M.Ed., Rutgers University	Assistant Professor	Full-time	PHY 211, PHY 211LB, SCI 101, SCI 201, SCI 202
Mary R. Gregory	M.S., Bowling Green State University	Adjunct Professor	Part-time	AST-112
Marcio B. Melendez	Ph.D., Catholic University	Adjunct Professor	Part-time	AST-112LB
John J. Miller	M.Ed., University of Illinois at Chicago	Adjunct Professor	Part-time	PHY-211, PHY-211LB
Brian Mills	M.S., Walden University	Adjunct Professor	Part-time	AST-112LB
John J. Schiller	M.S., Syracuse University	Adjunct Professor	Part-time	PHY-211
Jeffrey Feuer	Ph.D., University of Rhode Island	Associate Professor	Full-time	MAT-192, MAT-212
MaryEllen Kassebaum	Ph.D., Montana State University	Professor	Full-time	MAT-192, MAT-201, MAT-202

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Faculty Resources				
Name	Terminal Degree	Academic Title	Status	Courses
Monica Leid	M.S., Boston University M.S., University of Maryland, Baltimore County	Associate Professor	Full-time	MAT-192
Thao-Nhi Luu	M.S., University of California, Riverside	Associate Professor	Full-time	MAT-202
James Messenger	M.S., Florida State University	Associate Professor	Full-time	MAT-192, MAT-201
Michael Wright	M.A., University of Montana	Assistant Professor	Full-time	MAT-192, MAT-212

2. Demonstrate how the institution will provide ongoing pedagogy training for faculty in evidenced-based best practices, including training in:

a. Pedagogy that meets the needs of the students

Anne Arundel Community College's faculty professional development is designed to deepen understanding of student-centered, evidence-based teaching practices that enhance learning outcomes for a diverse student population, including underrepresented and first-generation students in STEM fields. Training is delivered through multiple formats, including face-to-face workshops, online and hybrid courses, department-specific mini-workshops, and signature series programs aligned with the Division of Learning's priorities. These opportunities, facilitated by internal faculty experts and external consultants, are part of the faculty's required professional development plans.

b. The learning management system

Anne Arundel Community College utilizes Canvas LMS for all courses, including face-to-face, hybrid, and online modalities. All full- and part-time faculty teaching or developing online/hybrid courses must complete Online Focus and Online Focus-Applied training prior to course delivery. Online Focus equips faculty with best practices in online pedagogy, course design, facilitation, and technology integration, emphasizing clear navigation, explicit instructions, accessibility, and assessments that promote higher-order thinking. Online Focus-Applied enables faculty to build or refine online/hybrid courses using institutional quality standards, such as those informed by the Quality Course Action Review (Q-CAR) framework. Faculty teaching face-to-face courses receive separate Canvas LMS training tailored to in-person instruction, ensuring all program faculty are proficient in leveraging Canvas to support student engagement and learning. These training courses are regularly updated to reflect technological advancements and student feedback, ensuring alignment with best practices.

c. Evidenced-based best practices for distance education if distance education is offered.

For the program's distance education components, AACC provides comprehensive training in evidence-based best practices to ensure high quality online and hybrid course delivery. Faculty content developers collaborate with AACC's instructional designers to create courses adhering to institutional standards, informed by frameworks like Q-CAR and the Online Learning Consortium's Scorecard. Trainings, presentations, demonstrations, and model courses emphasize strategies for

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effective communication, student engagement, and higher-order thinking in virtual environments. Key areas of focus include clear course navigation, accessible content, explicit instructions, and appropriate assessments. Lectures for all didactic courses are hosted on Canvas, ensuring consistent access. The College's commitment to regular training updates ensures faculty stay current with emerging distance education trends, supporting students expected to take online/hybrid courses.

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.**

AACC's Andrew G. Truxal Library maintains a robust collection of online and physical resources that address all aspects of science education. There are no additional needs from the library beyond those that are already supporting existing programs.

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 instructional 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.**

Anne Arundel Community College affirms that its physical facilities, infrastructure, and instructional equipment are fully adequate to initiate this program. It will be implemented using existing institutional resources and has the full support of the President and Board of Trustees. AACC has made sustained investments in modern, discipline specific facilities that support instruction across the sciences. Biology and health programs are housed in the Health and Life Sciences Building, which opened in 2021. This three-story facility includes advanced laboratories, a fully equipped greenhouse, a plant tissue culture lab, and dedicated undergraduate research spaces that support hands-on learning essential for transfer preparation in STEM fields.

Physical Science disciplines are supported by the Dragun Science Building, which is currently undergoing a comprehensive renovation scheduled for completion in 2028. During the renovation, Physical Science courses are delivered in fully equipped laboratory spaces in the Center for Applied Learning and Technology (CALT), ensuring uninterrupted instruction. All instructional spaces meet or exceed current industry and safety standards for STEM and health education. AACC provides dedicated office space for full-time and adjunct faculty. These offices are equipped with appropriate technology and connectivity to support instruction, advising, and collaboration. Laboratories are equipped with discipline specific instrumentation and technology, supported by ongoing institutional investment in STEM equipment maintenance and upgrades, ensuring instructional resources remain current and sufficient to support projected program enrollment.

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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

Anne Arundel Community College provides all students and faculty with access to an institutional Microsoft Outlook email system, integrated with Microsoft 365. This system supports secure communication for academic purposes, including course updates, advising, and collaboration. Students receive email accounts upon enrollment, accessible via single sign-on (SSO) through AACC's MyAACC portal, with technical support from IIT. Faculty utilize Outlook for course-related communication and to coordinate with the IDEA Lab, ensuring seamless interaction in online/hybrid courses.

b. A learning management system that provides the necessary technological support for distance education

Anne Arundel Community College's Canvas LMS supports all program courses. Canvas provides a robust platform for delivering lectures, assessments, and interactive content. The IDEA Lab ensures courses meet Q-CAR standards, with clear navigation, accessible materials, and aligned assessments. Faculty complete mandatory Online Focus and Online Focus-Applied training to design and teach online/hybrid courses, while students access Canvas with 24/7 technical support. The College's infrastructure supports high-speed internet and cloud-based Canvas hosting.

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 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	Year 2	Year 3	Year 4	Year 5
1. Reallocated Funds	0	0	0	0	0
2. Tuition/Fee Revenue (c + g below)	139,712	147,246	154,972	162,890	166,250
a. Number of F/T Students	8	8	8	9	9
b. Annual Tuition/Fee Rate	4,366	4,462	4,558	4,654	4,750
c. Total F/T Revenue (a x b)	34,928	35,696	36,464	41,886	42,750
d. Number of P/T Students	24	25	26	26	26
e. Credit Hour Rate	136	139	142	145	148
f. Annual Credit Hour Rate	32	32	32	32	32
g. Total P/T Revenue (d x e x f)	104,784	111,550	118,508	121,004	123,500
3. Grants, Contracts & Other External Sources	0	0	0	0	0
4. Other Sources	0	0	0	0	0

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TOTAL (Add 1 – 4)	139,712	147,246	154,972	162,890	166,250
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1. Reallocated Funds: None
2. Tuition and Fee Revenue: Tuition & Fees are estimated to increase by 2% each year.
3. Grants and Contracts: None
4. Other Sources: None

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

TABLE 2 - EXPENDITURES					
Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (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
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	0	0	0	0	0
5. Library	0	0	0	0	0
6. New or Renovated Space	0	0	0	0	0
7. Other Expenses	3,520	3,630	3,740	3,850	3,850
TOTAL (Add 1 – 7)	3,520	3,630	3,740	3,850	3,850

1. Faculty Funds: All courses required for the proposed degree program will be taught by existing full-time and part-time faculty. There are no new faculty resources required.
2. Admin. Staff Funds: None
3. Supportive Staff Funds: None
4. Equipment: None
5. Library: None
6. New or Renovated Spaces: None
7. Other Expenses: Funding for lab supplies.

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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.

All courses and faculty at AACC are evaluated by students using the online Student Opinion Forms (SOFs) at the conclusion of each semester. These forms have standard Likert questions with opportunities for anecdotal feedback. Students are also given the opportunity to leave comments. All faculty are evaluated each academic year based on the college's evaluation form which includes a review of SOF data. This data is also reviewed and evaluated during the faculty promotion and tenure processes. In addition to soliciting student input for faculty and course evaluation, faculty colleagues conduct classroom visitations and peer evaluations in the second and fifth year of employment and at any time of consideration for promotion or tenure for full-time faculty. Adjunct faculty are evaluated by a peer or supervisor in the first year of employment and every three years thereafter and/or at the time of consideration of promotion.

Student learning outcomes are assessed by evaluating data collected via the Canvas LMS data collection tool. Data will be collected from several assessment sources, including essays, exams, and quizzes. Faculty will compare achievement levels with the current set of student learning outcomes to determine the utility and effectiveness of the learning outcomes. This procedure leaves open the possibility of future adjustment to ensure that these outcomes drive optimal classroom instruction and yield useful data.

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.

The College has an established Office of Assessment and Instructional Innovation. The Director of this office meets regularly with a faculty-run subcommittee on Learning Outcomes Assessment, a subcommittee of the Teaching and Learning Committee. The mission of the subcommittee on Learning Outcomes Assessment is to guide and oversee program-level outcomes assessments throughout the College. The Office of Assessment and Instructional Innovation provides tools to the College's various programs to assist in regular program assessment, including a Program/Department Assessment Report and a Curriculum Mapping Template to ensure alignment of course objectives and outcomes with department and/or program outcomes, as well as college-level core competencies.

Anne Arundel Community College's Educational Policies Committee (EPC) is designed to evaluate the addition or modification of new programs, and deletion of existing programs. The EPC makes recommendations to the Academic Forum/Council of the College since it is charged with evaluating existing and proposed curricula and courses so that they support educational objectives and policies and comply with established requirements from accrediting and other approving agencies. This proposed program was reviewed and approved by EPC, the Academic Forum/Council, as well as the College's Board of Trustees.

The College conducts regular evaluations of degree programs with respect to enrollment, retention, curriculum relevancy, and outcomes assessment. All programs undergo a

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comprehensive review on a staggered 4-year cycle. The template includes metrics in the areas of program continuation and completion, course success, headcount and program outcomes assessment. As applicable, national exam pass rates are also evaluated during this process. The entire package is reviewed by the Program Chair/Director, Assistant Dean, Director of Assessment and Instructional Innovation, Dean, Associate Vice President for Learning & Academic Affairs, and the Provost/Vice President for Learning. The purpose of this program review is to share program successes and address program needs.

As indicated above, student satisfaction with courses and instruction is assessed for each course and instructor each semester through the collection of feedback from SOFs. Students can assess and comment on the course content, delivery, and instruction. This information is also used for faculty evaluation and considerations for promotion and tenure.

N. Consistency with the State's Minority Student Achievement Goals (as outlined in COMAR 13B.02.03.05).

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

Anne Arundel Community College has embedded a strong commitment to open access and meaningful engagement across all aspects of its mission and strategic initiatives. The College's guiding philosophy, articulated through its mission to deliver high quality, affordable, and innovative lifelong learning opportunities, supports an institutional culture where every student can fully participate in and benefit from the proposed program. Central to AACC's mission is a student-centered approach that removes barriers to participation. This is reflected in strategic efforts to keep tuition rates low, expand financial aid, and ensure access to essential resources such as emergency support funding and food assistance. These measures help reduce the financial pressures that often hinder student success and enable broader engagement across income levels and life stages.

The College holds itself accountable through robust data tracking and strategic indicators. Metrics such as credit and noncredit enrollment, completion and transfer rates, scholarship distribution, and student employment outcomes are carefully monitored to evaluate participation trends and inform continuous improvements.

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.

Not applicable.

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P. Adequacy of Distance Education Programs (as outlined in COMAR 13B.02.03.22)

1. Provide affirmation and any appropriate evidence that the institution is eligible to provide Distance Education.

Anne Arundel Community College has been approved by Middle States Commission on Higher Education (MSCHE) to offer degrees and certificate programs for which students could meet 50% or more of their requirements by taking distance education courses. The College utilizes the Canvas LMS to provide online lectures to students. In addition, the College has distance education classrooms equipped with cameras and audio to share lectures with students.

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

Anne Arundel Community College complies with C-RAC guidelines for distance education through policies and practices aligned with MSCHE standards such as:

- Student Identity Verification: All online and hybrid courses use AACC's SSO and Canvas LMS authentication to verify student identity.
- Regular and Substantive Interaction: Faculty are required to maintain meaningful engagement through scheduled virtual meetings, discussion boards, and timely feedback, consistent with federal and C-RAC expectations.
- Faculty Qualifications and Training: Instructors teaching online courses complete mandatory training programs covering best practices in online pedagogy, accessibility, and course design.
- Student Support Services: Distance learners have full access to advising, tutoring, library resources, technology support, and counseling services through multiple modalities (online, phone, and in-person).
- Assessment and Quality Assurance: All online courses undergo systematic review for learning outcomes and instructional quality, using frameworks such as Q-CAR and AACC's internal assessment processes.