



Aminta H. Breaux, Ph.D.

President

Henry Administration Bldg., Ste. 2000
14000 Jericho Park Rd, Bowie, MD 20715

P 301-860-3555

F 301-860-3510

E president@bowiestate.edu

bowiestate.edu

March 5, 2025

Sanjay Rai, Ph.D.
Secretary of Higher Education
Maryland Higher Education Commission
6 North Liberty Street
Baltimore MD 21201

RE: New Academic Program Proposal – Bachelor of Science in Artificial Intelligence

Dear Secretary Rai:

Please find enclosed our proposal to offer the Bachelor of Science (B.S.) in Artificial Intelligence (HEGIS 079901/CIP 11.0102).

In support of our mission to empower a diverse population of students to reach their potential by providing innovative academic programs and transformational experiences as they prepare for careers, lifelong learning, and civic responsibility, this program seeks to make the burgeoning field of artificial intelligence (AI) more accessible to underserved populations and to create more inclusive pathways into the field. BSU's proposed program aims to address the lack of diversity and inclusion, while maximizing access to education by offering the program in dual modality to promote a holistic and coordinated approach to student success. The curriculum is enhanced by an interdisciplinary approach designed to create well-rounded students, and enhances our campus culture of diversity, inclusion, and civic engagement through corporate and government partnerships in STEM fields.

We eagerly await the Commission's consideration of this proposal and respectfully request your approval.

Sincerely,

Aminta H. Breaux, Ph.D.

Cc: Dr. Guy-Alain Amoussou, Provost and Vice President for Academic Affairs
Dr. Alison Wrynn, Senior Vice Chancellor
Dr. Candace Caraco, Associate Vice Chancellor
Dr. George Acquah, Dean, College of Arts and Sciences
Dr. Jacqueline Cade, Director of Institutional and Academic Programming
Ms. Gayle Fink, Office of Planning, Analysis and Accountability
Ms. Brandy Wilson, Registrar

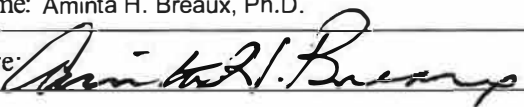


Cover Sheet for In-State Institutions
New Program or Substantial Modification to Existing Program

Institution Submitting Proposal	Bowie State University
---------------------------------	------------------------

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 Submitted: ☐ No	Payment ☒ R*STARS # JE235063 Type: ☐ Check #	Payment Amount: \$850	Date Submitted:
Department Proposing Program	Computer Science		
Degree Level and Degree Type	Bachelor of Science		
Title of Proposed Program	Artificial Intelligence		
Total Number of Credits	120		
Suggested Codes	HEGIS: 79901.00	CIP: 11.0102	
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: 2026		
Provide Link to Most Recent Academic Catalog	URL: https://catalog.bowiestate.edu/index.php?catoid=28		
Preferred Contact for this Proposal	Name: Dr. Jacqueline M. cade		
	Title: Director of Institutional and Academic Programming		
	Phone: (301) 860-3110		
	Email: jcade@bowiestate.edu		
President/Chief Executive	Type Name: Aminta H. Breaux, Ph.D.		
	Signature: 		Date: 3-7-25
	Date of Approval/Endorsement by Governing Board:		

Revised 1/2021



Bachelor of Science in Artificial Intelligence

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.**

Bowie State University (BSU) is a comprehensive university providing 21st-century learners with a strong foundation for success with a well-rounded academic experience, an inclusive environment, and hands-on learning opportunities. Building on its rich legacy as a training ground for teachers since 1865, the university is committed to providing access to high-quality education and cultivating emerging leaders who are prepared to succeed in a changing, global society. As part of BSU's mission to support the Maryland workforce, the accelerated BS & MS degree in Artificial Intelligence will help supply well-trained graduates to support this critical element of the state's economy.

The Department of Computer Science at Bowie State University proposes a new BS degree in Artificial Intelligence. The Association for Computing Machinery (ACM) defines artificial intelligence as the study of intelligence and its realization in computer systems. On the other hand, general computer science degree programs focus on the study of computers and computing, including their theoretical and algorithmic foundations, hardware and software, and their uses for processing information.

The program is unique because it prepares students for professional careers and advanced study by focusing on the symbolic inference, representation, and simulation by computers and software of human learning and reasoning processes and capabilities, and the computer modeling of human motor control and motion. The program includes instruction in computing theory, software design and development, data structures, algorithms, cybernetics, artificial intelligence theory and applications, mechatronics, robotic operating systems, natural language processing, machine learning, deep learning, cloud computing, parallel and distributed computing, robotic perception, and robotic motions. The program culminates in a capstone experience on an in-depth project that assesses students' ability to apply learned employable AI skills.

The proposal is aligned with BSU's mission to empower a diverse population of students to reach their potential by providing innovative academic programs and transformational experiences as they prepare for careers, lifelong learning, and civic responsibility. The addition of this program addresses the growing disparity in minority participation in the STEM

workforce at the state and national levels. With its proximity to the nation's capital and innumerable federal government contractors throughout the state and Washington, D.C./Maryland/Virginia region, BSU is strategically positioned to increase diversity in the STEM workforce.

The demand for professionals with expertise in artificial intelligence is proliferating. According to Lightcast online platform [1], the demand for bachelor's level occupations have increased in the most immediate term (2020-2021) and are expected to increase further in the near future. In the period 2020-2021, the occupation area grew 2.4 percent, per BLS. In the near future, 2021-2026, the occupation is expected to grow at 9.8 percent among master's level occupations. Within the study Maryland and Washington D.C. region, there were 148,355 unique job postings within the region earmarked for the bachelor's level. This number of job postings outpaces the number of completions in the region. In total, across all levels of study, there were 227,045 unique job postings, with over half at the bachelor's level.

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

The proposed Artificial Intelligence program contributes to the university's strategic goals (1, 2, 4 and 5) as follows:¹

Goal 1 - Achieve academic excellence supported by curricular and co-curricular experiences

The BS program in Artificial Intelligence contribute to the achievement of Bowie's FY 2019 – FY 2024 Racing to Excellence Strategic Plan, specifically Goal 1 Academic Excellence, Objective 1.1 High-demand, innovative academic programs.

Goal 2 - Promote a holistic and coordinated approach to student success

The Artificial Intelligence program consists of components from various disciplines and utilizes an approach designed to create a well-rounded student.

Goal 4 - Enhance our campus culture of diversity, inclusion, and civic engagement

According to *Diverse: Issues in Higher Education*, Bowie State University is among the top five universities in Maryland which graduates African Americans with bachelor's degrees in nursing, biology, and computer/information sciences. The university is committed to providing opportunities to traditionally underrepresented populations in STEM fields. The Artificial Intelligence program will empower "a diverse population of students to reach their potential, by providing innovative academic programs" and by supporting Maryland's workforce and economy. It further will allow Bowie State University to progress among other HBCUs to become one of the top-rated STEM institutions for higher learning.

Goal 5 - Ensure long-term viability of Bowie State University (BSU)

Due to the market demand for specialists in Artificial Intelligence, this new program will attract a large number of interested students that, in turn, will enhance the viability of BSU through

¹ <https://bowiestate.edu/about/administration-and-governance/office-of-the-president/reports/bsu-strategic-plan-fy19-fy24.pdf>

attracting a culturally diverse student body and engaging partners to address the critical needs of the Prince George's County and surrounding region.

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.)

The funding of the program will come from tuition and course fees for the first five years. The department will fund the programs through existing resources and budgets. Additional funding would be further supported through possible grants, partnerships, and research opportunities with related companies, organizations, agencies and the industries of artificial intelligence. The programs rely on existing Computer Science and Mathematics related courses and will require limited new expertise beyond current faculty resources. We intend to use existing courses from among the programs and will need to create new courses to support this program. The Department of Computer Science has existing relationships with government agencies and private industry. The plan is to enhance these partnerships and develop a pool of experts to bring real working experience to the class, and also provide extracurricular learning opportunities.

The course projections will be revised annually based on current program enrollments and entering freshman interest in the program degrees or minors. Several new courses specific to artificial intelligence are anticipated within the first two to three years of degree rollout. The courses have all been developed and reviewed using existing faculty expertise.

Over time, program demand could necessitate additional full-time faculty. The need for new faculty will be evaluated by the administration based on sustained course needs within foundational courses, new course development needs, and critical expertise gaps. We will request the administration for new faculty as the need arises.

4. Provide a description of the institution's commitment to:
a. Ongoing administrative, financial, and technical support of the proposed program

BSU has demonstrated its unwavering commitment to technology-related programs. The university's policy is to support program growth by providing funds to hire new faculty, support the development of new courses, and provide additional library resources. The Artificial Intelligence program will receive similar support from the university administration. The University Administration has made a commitment to financially support this program.

BSU is part of 13-Million-dollar NSF HDR institute grant focusing on harnessing data and model revolution in the polar regions from 2022 to 2027. Computer Science department at BSU is also part of a 1.2 million dollars collaborative NSF Grant on Harnessing the Data Revolution (HDR) Data Science Corps (DSC) for creating and integrating data science corps to improve the quality of life in urban areas. Besides, BSU has also received 1 Million Dollar NSF grant on high-performance intelligent Data-Science Institute (HIDI) from 2021-2024.

The four computer labs located in the Thurgood Marshall Library support all technology-related classroom instruction and currently have sufficient capacity to simultaneously support most of the new courses proposed for the Artificial Intelligence program. The department has several labs technology-infused classrooms and labs for instruction and student use students use. In addition to these campus labs (described in greater detail below in Section K: Adequacy of Physical Facilities, Infrastructure and Instructional Equipment of this proposal), the university has also approved the acquisition of access to cloud-based laboratory resources, providing students with state-of-the-art computing resources. For research purposes BSU has acquired a \$445.5K Cray supercomputer called the Sphinx awarded through a grant from the Department of Defense U.S. Army Research Office. This machine is perfect for large-scale parallel and distributed computing and will be used for Artificial Intelligence research.

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

Given the established nature of the computer science degree programs, the proposed Artificial Intelligence degree will be able to handle the incremental resource needs by leveraging the existing curriculum and laboratory infrastructure. With each new year of the new degree offering, only those required for the initial student class will need to be added. Thus, only the classes that are needed for newly incoming students will be added to the class offerings in the first year of the program. In the second year, the first-year classes will be repeated, and second-year level courses will be added. This process will be repeated in the third and fourth year. This incremental increase in curricular offerings requires only a gradual increase in expenditure, to which the administration has committed. If at any point, after the full program launch, the university decides to discontinue the degree program, no new students will be admitted to the program. Therefore, enrolled students will be provided with the required classes to complete their degrees. The Department of Computer Science and BSU are committed to recruiting interested students and providing the necessary institutional support for them to succeed in this demanding and necessary major.

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**

Advancement in artificial intelligence is increasingly needed to develop techniques for the analysis and synthesis of systems that interact with an external world via perception, communication, and action, and that learn, make decisions and adapt in a changing environment. BSU faculty and students will have the opportunity to advance knowledge in the area of artificial intelligence. Faculty will advance knowledge through independent research and in collaboration with students while directing capstone projects and research seminar course projects. The research results may enhance the industry in addressing industrial pain-points for customer value creation, productivity improvement, cost reduction, site optimization, predictive analysis and insight discovery, etc.

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

As Maryland's oldest historically Black institution, Bowie State University has long served an underrepresented minority population. Understanding and respecting diversity is central to the university's goals of student success, academic excellence, and the long-term viability of the institution. The proposed Artificial Intelligence degree aims include the following:

- Helping to close the gap between Black or African American students who seek a STEM degree and those able to achieve this goal.
- Meeting the demand for additional STEM programs at HBCUs,
- Supporting other STEM programs on campus, and
- Increasing the number of minority artificial intelligence experts in a geographical area desperate to hire qualified graduates to populate the field.

Additionally, Bowie State University is compliant with all stipulations of Title VI, Title IX, and Section 504.

c. The need to strengthen and expand the capacity of historically black institutions to provide high quality and unique educational programs

According to a commissioned report from Education Dynamics, within the Greater Maryland region, across the entire population of those employed within the occupations related to AI/ML, the racial or ethnic background with the largest percentage of employees identify as White (51%) – and is higher than the percentage of those who complete a bachelor's degree who identify as white (45%). Those who are employed in the field and identify as Asian also outpace completions by 10 percent. Those who identify as Black African American are on par between employment and completion percentages (both at 13%). However, given that there is a gulf between the percentage of those who identify as Black or African American who complete a bachelor's degree in these AI/ML fields and overall bachelor's completions, this filters down to the employment figure in Table 1 – thus enrolling more who identify as Black or African American may have an employment impact.

Table 1: Greater Washington Region Employment

Race/Ethnicity	Percent Within Occupation Greater Maryland Region	Percent of Completions Within CIP Codes MD,DC,VA Bachelor's Level
	All Employed	
White	51%	45%
Black or African American	13%	13%
Asian	29%	19%
Hispanic or Latino	4%	7%
Two or More Races	2%	4%

Native Hawaiian or Other Pacific Islander	0%	0%
American Indian or Alaska Native	0%	0%
Other	--	12%

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

The 2022 Maryland State Plan for Postsecondary Education has three basic tenets Access, Success, and Innovation. The B.S. in Artificial Intelligence

Access: BSU provides opportunities for many underrepresented Maryland citizens to obtain a postsecondary education at an affordable cost. The Artificial Intelligence proposed program will provide an avenue for underrepresented students to enter the high demand field of data science. Aligned with Priority Three, our inclusive curriculum development process coupled with culturally responsive teaching, BSU's AI program is designed to be accessible to students from diverse backgrounds, including those in the underrepresented STEM field. This approach directly supports the state's goal of equitable access to higher education. A Bowie State University education is one of the most affordable in the state among public universities, yet we recognize that Priority One of Access is affordability of a Maryland postsecondary education. In concert with our commitment to ensure that students from diverse populations and underrepresented fields in STEM have access to a quality education, we realize that finances can create a burden for students and their families. The university offers scholarships and financial aid packages including private donor scholarship to make a BSU education more affordable.

Success: The B.S. in Artificial Intelligence demonstrates our continued commitment to quality postsecondary education and timely completion of the program as stated in Priorities Five and Six. As aforementioned, BSU aims to address equity gaps in STEM. We do this by engaging students early in research and experiential learning, and engaging partners in the classroom to deliver real world practical instruction to prepare them for graduate school and employment. Students entering the Artificial Intelligence program at BSU will have access to an affordable education, mentoring by a caring faculty, quality advising, and a nurturing environment which will help ensure their success in the Artificial Intelligence program.

The Computer Science department prepares students for leadership and innovation in the rapidly evolving fields of computing and technology. Grounded in a strong technical foundation, the program emphasizes critical thinking, problem-solving, and real-world application of computing principles across disciplines. In alignment with the university's mission to promote excellence and inclusivity, the program is also deeply committed to culturally responsive teaching as a core element of its strategic approach to student success. Faculty incorporate inclusive pedagogical strategies, culturally relevant problem sets, and collaborative projects that connect computing concepts to real-world issues affecting diverse communities to foster a more engaging and equitable learning environment where all students—particularly those from historically underrepresented backgrounds in STEM—can thrive.

This approach not only enhances retention and graduation rates but also prepares students to enter the tech workforce as socially conscious innovators and leaders. Through partnerships with industry, research opportunities, and a strong emphasis on ethical and inclusive computing, the program empowers students to apply their knowledge in ways that contribute to a more just and equitable digital future.

The Computer Science department ensures that students receive hands-on experience in their field, enhancing their practical skills and ensuring timely completion of academic programs making them employer ready. This initiative supports the state's priority to improve systems that prevent timely completion of academic programs. To ensure student success regardless of academic readiness, BSU offers a plethora of wraparound services and interventions, such as mentorship, tutoring, writing support, and career counseling, as well as health and counseling services, addressing the state's priority to provide more resources for student success.

Innovation: To support Priority Eight of the State Plan, students in the program are encouraged to pursue bold, creative solutions to complex problems, often through interdisciplinary and community-based projects that highlight the power of technology to drive social change. The department also promotes innovation through strong industry partnerships, cutting-edge research opportunities, and entrepreneurship support. Students in the Artificial Intelligence program at BSU will be involved with research projects with faculty mentors and industry partners. This exposure to research and cutting-edge techniques under the guidance of academic and industry experts will help develop the innovation techniques needed to become successful industry leaders.

Bowie State University's BS in Artificial Intelligence program exemplifies Maryland's commitment to student success in their pursuit of higher education, creating innovative programs in accessible environment. Through its inclusive curriculum, student support services, and industry partnerships, BSU is actively contributing to the state's strategic goals and preparing students for success in the evolving field of artificial intelligence. Efforts aim to prepare students for the growing demand for AI professionals and to increase diversity in the technology sector. Prospective students interested in AI-related fields may consider BSU's evolving programs in data science, analytics, and digital learning.

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.

Research by EducationDynamics identified potential industries for graduates of the BSU Artificial Intelligence Program by utilizing the Standard Occupational Classification (SOC) code in the fields related to the CIP codes. This analysis is conducted via the NCES/BLS crosswalk which correlates CIP codes and SOC codes. Additional data are provided by the LightCast data platform [1] operated by Economic Modeling, Inc. These industries include software development, manufacturing, healthcare, gaming, defense, cybersecurity, and tech industries among others. Job postings in these industries were seeking computer and information research scientist, computer and information systems managers, computer systems analysts, data scientists, information security analysts, management analysts, market research

analysts and marketing specialists, operations research analysts, software developers, software quality assurance analysts and testers, statisticians, and mathematical scientists. Graduates can expect to obtain mid-level positions.

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

The Education Dynamics research report indicated that, within the study region, there were 148,355 unique job postings within the region earmarked for the bachelor's level. The number of job postings is taken by "scraping" job boards to see which associated SOC code occupations require a bachelor's degree for employment. While this number of job postings outpaces the number of completions in the region, graduates will have to compete with those who come to the region from further flung areas. In total, across all levels of study, there were 227,045 unique job postings, with over half at the bachelor's level.

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.

To support the value of the Artificial Intelligence degree, an analysis of the job skills required by the referenced vacancies presented yields the following table.² Presented are the top hard skills for artificial intelligence related positions. Graduates of the proposed degree program at BSU will receive instruction with opportunities to practice and develop competency in those areas highlighted in the table.

² Data presented by Education Dynamics from a commissioned report.

Table 2: Job Postings

Skill	Frequency in Postings
Computer Science	54,222
Agile Methodology	36,893
Python (Programming Language)	27,786
Software Development	25,679
Java (Programming Language)	25,607
Amazon Web Services	25,530
Project Management	24,991
SQL (Programming Language)	24,650
Systems Engineering	22,620
Software Engineering	22,006
Automation	21,546
Linux	19,234
Data Analysis	17,581
JavaScript (Programming Language)	17,254
Scripting	16,016
Information Systems	15,240
DevOps	14,609
Cyber Security	14,514
Scrum (Software Development)	14,193
Microsoft Azure	13,912
Workflow Management	13,583
JIRA	13,026
Application Programming Interface (API)	12,989
Operating Systems	12,265
Business Process	11,864

According to the Education Dynamics research report, the SOC codes under investigation for bachelor's level occupations have increased in the most immediate term (2020-2021) and are expected to increase further in the near future. In the period 2020-2021, the occupation area grew 2.4 percent, per BLS. In the near future, 2021-2026, the occupation is expected to grow at 9.8 percent among master's level occupations. This is on par with future growth across all levels combined, with 9.9 percent growth. Note that bachelor's level growth is lower than graduate level growth (at only 11 percent).

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

Across all bachelor's level programs, regardless of format, institutions operating within the region saw an increase in the number of completions from 2012-2021 within the AI/ML CIP codes. Within these CIP codes, the highwatermark was in 2018 with 1,557 completions. The

completions figure in 2021 is the largest since that year. It is important to note that all completions were within the CIP code for Computer and Information Sciences, General. There were no reported completions in 2021 in Artificial Intelligence nor Data Analytics. Additionally, there were no reported bachelor's level completions in these two CIP codes in the 10 years prior (note that Data Analytics was introduced as a CIP code in 2020).

Table 3: Graduation Rates

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Percent Change 2012-2021
Number of Completions	710	753	835	1,052	1,094	1,227	1,557	1,133	1,117	1,205	70%

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.**

There are currently three (3) undergraduate AI programs available in Maryland:

Capitol Technology University offers the B.S. in Artificial Intelligence. The first of its kind in Maryland, the curriculum includes machine learning, neural networks, natural language processing, robotics, and AI ethics. Tuition per semester is \$13,175 (2024–2025), nearly four times the semester tuition at BSU. BSU's curriculum includes robotics, deep learning, cloud essentials, machine learning, and mechatronics.

University of Maryland Global Campus (UMGC) offers a fully online B.S. in Artificial Intelligence, scheduled to launch in Fall 2025. The program includes two tracks: AI Applications (focus on leveraging existing AI tools across various industries) and AI Developer (emphasizes building and implementing AI solutions). Curriculum includes Python, deep learning, generative AI, and AI ethics with an emphasis on real-world applications and industry tools with exposure to generative AI techniques, such as content creation and prompt engineering. The program is ideally suited for working professionals seeking flexible, remote learning options.

University of Baltimore offers the B.S. in Artificial Intelligence for IT Operations Analysis. □ This program emphasizes the application of AI techniques to IT operations, including system monitoring, automation, and predictive analytics. Courses cover machine learning, data analysis, and AI algorithms, with a focus on IT infrastructure, cloud computing, and network management with training in tools and platforms used for automating IT tasks and workflows. The program prepares students for careers as AI specialists in IT operations, system administrators, or IT automation engineers.

The table below summarizes the differences between the general computer and information sciences, artificial intelligence and robotics, and general data analytics programs based on the descriptions provided with the CIP codes. There are significant differences in their focus areas according to the descriptions given in the table.

Table 4: Descriptions of 3 programs

Title	CIP Code	Description
Computer and Information Sciences, General	11.0101	A general program that focuses on computing, computer science, and information science and systems. Such programs are undifferentiated as to title and content and are not to be confused with specific programs in computer science, information science, or related support services.
Artificial Intelligence and Robotics	11.0102	A program that focuses on the symbolic inference, representation, and simulation by computers and software of human learning and reasoning processes and capabilities, and the computer modeling of human motor control and motion. Includes instruction in computing theory, cybernetics, human factors, natural language processing, and applicable aspects of engineering, technology, and specific end-use applications.
Data Analytics, General	30.7101	A program that prepares individuals to apply data science to generate insights from data and identify and predict trends. Includes instruction in computer databases, computer programming, inference, machine learning, optimization, probability and stochastic models, statistics, strategy, uncertainty quantification, and visual analytics

2. Provide justification for the proposed program.

Artificial intelligence is rapidly changing the world, with applications in fields ranging from autonomous vehicles, fraud detection and medicine to personal assistants, epidemiology, industrial robots and smart appliances.

There is a great demand for artificial intelligence experts that will not be satisfied by tapping the traditional pool of students. Bowie State University serves a diverse demographic of marginalized groups and is uniquely poised to attract large numbers of minorities into the artificial intelligence field. The proposed Artificial Intelligence program at BSU is, therefore, timely and necessary.

The U.S. Department of Education published “Charting a Course for Success: America’s Strategy for STEM Education” in December 2018 . The authors state, “The national benefits of a strong STEM foundation cannot be fully realized until all members of society have equitable access to STEM fields and employment” (p. 7). One of the three aspirational goals discussed in the document is to “increase diversity, equity, and inclusion in STEM and [to] provide all Americans with lifelong access to high-quality STEM education, especially those historically underserved and underrepresented in STEM fields and employment.” An analysis by the United Negro College Fund (UNCF) documents the disparity between degrees awarded to Black college students compared to the percentage who seek a STEM education. “Black and white students across the country intend to pursue STEM degrees at similar rates, but black students in any STEM field struggle to achieve comparable representation in degree attainment.”

The Artificial Intelligence program at Bowie State University will give students the in-depth knowledge to transform large amounts of data into actionable decisions. The program and its curriculum focus on how complex inputs can be used to make decisions or enhance human capabilities. The curriculum includes coursework in computing theory, software design and development, data structures, algorithms, cybernetics, artificial intelligence theory and applications, mechatronics, robotic operating systems, natural language processing, machine learning, deep learning, cloud computing, parallel and distributed computing, robotic perception, and robotic motions. The program culminates in a capstone experience on an in-depth project that assesses students' ability to apply learned employable AI skills.

When students graduate with a BS in AI from Bowie State University, they will have the expertise in artificial intelligence, machine learning, automated reasoning, and robotics that they will need to build the AI of tomorrow.

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 HBIs.

There is current no HBI offering the B.S. in Artificial Intelligence. As one of Maryland’s historically Black institutions, Bowie State serves an underrepresented minority population. Respect and understanding of diversity are central to its mission of advancing minority student achievement. The proposed Artificial Intelligence degree goals include helping to close the gap between Black or African American students who seek a postgraduate STEM degree and those able to achieve this goal. It will help meet the demand for additional STEM programs at HBCUs, support other STEM programs on campus, and increase the number of minority artificial intelligence experts in a geographical area desperate to hire qualified graduates to populate the field. Additionally, Bowie State University is compliant with all stipulations of Title VI, Title IX, and Section 504.

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.

While there is no HBI currently offering the B.S. in Artificial Intelligence, as Maryland's first historically Black public university, this program is mission-critical when considering STEM degrees, and serves to further promote BSU's identity in STEM and undergraduate research. Given the existing prominence of HBCUs graduating African Americans in science, technology, engineering, and math fields, these institutions must play a more prominent role in increasing the number of domestic STEM graduates with focused efforts toward supporting individuals from underrepresented minorities. BSU is committed to providing opportunities to traditionally underrepresented populations in STEM fields. BSU is located in the heart of one of the world's most influential technology hubs and surrounded by world-renowned government agencies, tech company headquarters, and key technology users in government, healthcare, defense, space, and professional services. The university is strategically positioned to affect an increased diversity in the STEM workforce.

Increasing the STEM opportunities for students at BSU helps fulfill the mission of the university, the needs of the state, and, most importantly, the needs of the student body to enter a field where they can earn a significant income in a stable and growing industry. The Artificial Intelligence degree will most certainly fulfill and enhance the identity of Bowie State University.

Adequacy of Curriculum Design, Program Modality, and Related Learning Outcomes (as outlined in COMAR 13B.02.03.10)

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

The Bowie State University computer science faculty and its Technical Advisory Board designed the Artificial Intelligence program. The development of this program was driven in part by the growing interest expressed by students in the computer science and math programs and inquiries by potential students who have a strong interest in artificial intelligence discipline.

Artificial intelligence is expanding swiftly into every aspect of the modern workplace and daily life. In response to our mission to diversify the STEM workforce, the faculty sought to meet the need as expressed by the multiple stakeholders of the department. The graduates of this program will boast the highest level of accreditation available for this and similar programs in the industry. The BSU program prepares students with the ability to contribute to any related industry or government position successfully. Of the 15 faculty members involved in developing the Artificial Intelligence curriculum, 14 have doctoral degrees in computer science or related fields. The academic strength of this faculty meets the Middle States Commission on Higher Education (MSCHE) requirements as rigorous and effective teachers, skilled in assessment, active in developing scholarship and participating in discipline-specific

organizations. Further, they meet the more stringent requirements of the ABET Commission regarding their academic credentials and ability to analyze and improve the program continuously.

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

Program Educational Goals:

Five years after completing the Artificial Intelligence BS program, students will be able to:

- a. Apply computing, mathematical, and statistical skills, practical tools, and techniques in artificial intelligence to solve real-world problems to facilitate successful careers in artificial intelligence and related fields.
- b. Facilitate professional communications in team environments, with colleagues and clients of varying backgrounds.
- c. Build career skills through graduate studies, continuing self-directed learning and professional development.

Student Outcomes:

After completing the Artificial Intelligence BS program, students will be able to:

1. Build expertise in artificial intelligence and robotics.
2. Implement techniques to transform large amounts of data into actionable decisions.
3. Display capability to utilize large-scale high-performance computing platforms.
4. Articulate machine learning and symbolic computation techniques.
5. Lead artificial intelligence and robotics projects with ethical and professional management skills.

3. Explain how the institution will:

- a. **provide for assessment of student achievement of learning outcomes in the program**
- b. **document student achievement of learning outcomes in the program**

Assessment involves one or more processes that identify, collect, and prepare data to evaluate the attainment of student outcomes. Effective assessment uses relevant direct, indirect, quantitative, and qualitative measures as appropriate to the outcome being measured. Appropriate sampling methods may be used as part of an assessment process. The faculty authors of the program developed educational objectives based upon the needs of the program's constituencies (students and employers of the graduates). The BSU Computer Science program is ABET-accredited. The same assessment approach will be used for the program. The student outcomes, as stated above, are ABET student outcomes.

Courses and curricula will be reviewed annually for effectiveness via course evaluations, course reviews, and assessments of student work, research, and projects that include senior capstones, senior seminar, student internship data. etc. An Assessment Committee will interpret assessment

data and make recommendations to the department. This evaluation will also feed strategic decisions on program improvement steps each year. Such incremental improvements will guide the continuous corrections required in a dynamic field such as artificial intelligence. And this will help maintain the relevance of the offering and assure continued value to the program's constituents.

Faculty members are evaluated on teaching performance by the students every semester. Peer faculty observations occur annually. The department chair also evaluates faculty performance against standards developed by the Faculty Evaluation Committee.

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

B.S. in AI will require the courses listed under years 1 - 4. Course and credit hours requirements for the Artificial Intelligence program are listed in the table below. Course descriptions are provided in Appendix A.

Required Courses for BS in AI: (57 credits)

Course #	Course Title	Credit Hours
COSC 173	Introduction to AI Concepts and Applications	4
COSC 112	Computer Science I	4
COSC 113	Computer Science II	4
COSC 208	Discrete Structures	3
COSC 214	Data Structures and Algorithms	4
COSC 279	Mechatronics	4
COSC 328	Applied Algorithms and Structures	3
COSC 379	Robotic Operating System	4
COSC 381	Cloud Essentials for Developers	3
COSC 473	Artificial Intelligence	3
COSC 474	Machine Learning and Discovery	3
COSC 476	Natural Language Processing	3
COSC 478	Deep Learning for Visual Recognition	3
COSC 479	Robotics	3
COSC 486	Parallel and Distributed Computing	3
COSC 480	Senior Capstone	3
COSC 495	Senior Seminar	3
Total Core Requirements		57

Artificial Intelligence BS Electives: (6 credits)

Select 2 of the following courses

Course #	Course Title	Credit Hours
COSC 274	Prompt Engineering	3
COSC 439	Big Data Systems	3
COSC 471	Social Network Analysis	3
COSC 477	Virtual Reality and its Principles	3
MATH 460	Numerical Analysis I	3
MATH 461	Numerical Analysis II	3
Artificial Intelligence BS Electives		6

Supporting Courses for Artificial Intelligence BS: (24 credits)

Course #	Course Title	Credit Hours
MATH 155	Probability and Statistics	3
MATH 225	Calculus I	4
MATH 226	Calculus II	4
MATH 228	Linear Algebra	3
ENGL 362	Technical Writing	3
Science	Two Science courses for science majors	7
Total Supporting Requirements		24

General Education Requirements and Institutional Requirements: (24 credits)

Course #	Course Title	Credit Hours
Institutional Requirements		6
FRSE 101	Freshman Seminar	3
HEED 102	Life and Health	3
English		6
ENGL 101	Expository Writing	3
ENGL 102	Argument and Research	3
Arts and Humanities (two different disciplines)		6
COMM 101	Oral Communications	3
Arts and Humanities Elective		3
Social Sciences		6
HIST 114 or HIST 115	African American History to 1865 African American History since 1865	3
Social Sciences Elective		3
Technology FULFILLED BY MAJOR		
Total General Education		24

Table 5: Program Requirements

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

The general education requirements for the Artificial Intelligence program will be met by students completing the following courses in the program curriculum, as prescribed in COMAR, Title 13B:

English Composition (6 semester hours)		
ENGL 101	Expository Writing	3 credits
ENGL 102	Argument and Research	3 credits
Arts and Humanities (6 semester hours)		
COMM 101	Oral Communication	3 credits
TBD	Arts and Humanities Elective	3 credits
Social Sciences (6 semester hours)		
HIST 114	African American History to 1865	3 credits

HIST 115	African American History Since 1865	3 credits
Free General Education Electives (9 semester hours)		

Note that Science (7-8 semester hours), Mathematics (3 semester hours), and Technology (3 semester hours) General Education Requirements are satisfied by taking the required courses in the degree curriculum. Free General Education Electives (9 semester hours) are usually satisfied by courses in the degree requirements area I (Technology category) and courses in the Science category of the degree plan. Additional Free General Education Electives, if needed, are chosen, with Department advisement, from designated General Education courses in any category.

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

None needed

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.

The department will develop, maintain, and publicly post clear, complete, and accurate information related to curriculum, course requirements, degree requirements, timing of course offerings, and technology requirements for the students. The Department of Computer Science will make this information available to current and potential students electronically. It will also post the information within the student and faculty areas of the computer science department on campus.

The new BS students will benefit from all of the existing support mechanisms in place to ensure students are fully engaged and aware of their path to success: providing detailed information including course sequencing examples, recommended hardware requirements, providing training on learning management systems, financial aid resources, and costs and payment policies at student orientation.

Students will be assigned to an advisor in the first semester of their first year. Students must meet with the advisor at least twice each year before course registration for the coming semester. Advisor work with students at those advising sessions to map out and continually revise a plan to complete the desired major within a timeline goal.

The Artificial Intelligence course syllabi will include detailed specifications of course requirements, goals, outcome objectives, and mode of professor-student interaction for effective learning.

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

The department will develop, maintain, and publicly post clear, complete, and accurate curriculum and course offerings information. The program will use the existing promotion mechanisms in the Department of Computer Science and the university. These include the graduate course catalog, departmental and university web pages, and marketing literature. Typically, coordinators provide the program study plan to potential students at admission events. Additionally, folders with information on the major will be available at open house events and scholarship meetings sponsored by Admissions.

More information is available online at <https://www.bowiestate.edu/academics/colleges/college-of-arts-and-sciences/departments/computer-science/>

Adequacy of Articulation

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

Bowie State has researched offerings at community colleges and did not identify an articulation partner for the B.S. in Artificial Intelligence. No community college in Maryland offers an associate degree in artificial intelligence.

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.

The department currently employs 15 faculty and staff members to support the extant degree offerings.

The table below catalogs the current full-time, tenure/tenure-track faculty members from the department who will support the launch of the Artificial Intelligence degree. Other part-time faculty are rotated each semester.

Name	Appointment Type & Rank	Terminal Degree	Field	Status	Courses to be taught
Dr. James Gil de Lamadrid	Tenured / Professor	Ph.D.-Univ of Minnesota	Computer Science	Full-time	All Computer Science courses

Ms. Patricia Hughes	Tenured / Asst Professor	MA-Univ of Wisconsin-Madison	Computer Science	Full-Time	Data Privacy and Ethics, Programming courses
Dr. Soo-Yeon Ji	Tenured / Assoc Professor	Ph.D.-Virginia Commonwealth Univ	Computer Science	Full-Time	All Data Science and Computer Science.
Dr. Darsana Josyula	Tenured / Professor	Ph.D.-Univ of Maryland-College Park	Computer Science	Full-Time	All Data Science and Computer Science.
Dr. Manohar Mareboyana	Tenured / Professor	Ph.D.-Indian Institute of Science	Computer Engineering	Full-Time	All Computer Science courses
Dr. Rosemary Shumba	Tenured / Professor, Chair	Ph.D.-Univ of Birmingham	Computer Science	Full-Time	All Computer Science courses
Dr. Seonho Choi	Tenured/Professor	Ph.D.- University of Maryland College Park	Computer Science	Full-Time	All Computer Science courses
Dr. Jie Yan	Tenured / Professor	Ph.D.- Harbin Institute of Technology	Computer Science	Full-Time	All Computer Science courses
Dr. Bo Yang	Tenured / Professor	Ph.D.-Pennsylvania State University	Computer Science	Full-Time	All Computer Science courses
Dr. Hoda El-Sayed	Tenured/Professor	D.Sc, The George Washington University	Computer Science	Full-time	All Data Science and Computer Science.
Dr. Vivek M Shandilya	Tenure-track / Assistant Professor	Ph.D.-University of Memphis	Computer Science	Full-Time	All Computer Science courses
Dr. Sreenivasan Ramasamy Ramamurthy	Tenure-track / Assistant Professor	Ph.D.-University of Maryland Baltimore County	Computer Science	Full-Time	All Computer Science courses
Dr. Avijoy Chakma	Tenure-track / Assistant Professor	Ph.D.-University of Maryland Baltimore County	Computer Science	Full-Time	All Computer Science courses
Dr. Md Kamruzzaman Sarker	Tenure-track / Assistant Professor	Ph.D.-Kansas State University	Computer Science	Full-Time	All Computer Science courses
Dr. Appolo Tankeh	Tenure-track / Assistant Professor	Ph.D.-Imperial College London	Electrical Engineering	Full-Time	All Computer Science courses

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**
- b. **The learning management system**
- c. **Evidence-based best practices for distance education, if distance education is offered.**

Bowie State University provides:

- Continuous training for faculty in all departments relative to the Blackboard learning management system.
- Teaching best practices (for both classroom and online courses).
- Other tools and techniques to support course delivery.

Additionally, the university supports faculty member involvement in discipline-specific professional memberships, which provide access to best practices in teaching subject matter, such as Artificial Intelligence. Faculty evaluations include how individual faculty members avail themselves of the available resources and implement improvements in their courses. Continuous faculty improvement also factors into ABET accreditation self-studies, providing additional incentive for all professors to remain engaged with their discipline and craft.

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.**

The Thurgood Marshall Library supports teaching and learning through a variety of materials and resources which can support a curriculum for Artificial Intelligence. The two most highly regarded resources pertinent to Artificial Intelligence coursework are: IEEE (Institute of Electrical and Electronics Engineers) and the ACM (Association of Computing Machinery). The Thurgood Marshall Library subscribes to both the **IEEE Xplore Digital Library** and **ACM Digital Library**. Both of these electronic databases include peer reviewed journal articles, conference proceedings, industry standards, products and services, interest groups, people of note, announcements of events, book reviews, forthcoming book announcements, and job announcements. Some of the top journal titles included in these databases are

- IEEE Transactions on Artificial Intelligence
- ACM Transactions on Intelligent Systems and Technology
- IEEE Communication Magazine
- Communications of the ACM
- Journal of Machine Learning Research
- Journal of Systems and Software
- Innovations in Systems and Software
- MIS Quarterly
- Information Systems

Elsevier's Science Direct is a third database that contains sciences including computer science, engineering, business management, and information systems. This database is helpful for the researcher and students for peer-reviewed sources, including journal articles, books, textbooks, handbooks, and reference works.

Another resource for faculty to use to strengthen the library collection is a database entitled Choice Review Online, which includes the subject area for science and technology. Review categories are: Outstanding Academic Books, Essential Works, Reference Titles, and Recommended Websites. This publication enables faculty to make timely recommendations to the library for purchases and students to identify resources for their academic studies.

The library has a print book collection of 145,991 volumes, e-books 12,751, and media 4,241. The Thurgood Marshall Library is a member of the University of Maryland and Affiliated Institutions (USMAI), strengthening the resource base for all users. As a member of USMAI, Bowie students have borrowing privileges to the circulating collections of all 17 institutions. In addition to borrowing privileges, the Marshall Library also offers interlibrary loan (ILL). Materials not available within USMAI can be requested through interlibrary loan, a nationwide resource for library users.

Adequacy of Physical Facilities, Infrastructure, and Instructional Equipment (as outlined in COMAR 13B.02.03.13)

- 1. Provide an assurance that physical facilities, infrastructure and instruction equipment are adequate to initiate the program, particularly as related to spaces for classrooms, staff and faculty offices, and laboratories for studies in the technologies and sciences.**

The Computer Science Building opened to the BSU community in 2002 as a “state of the art” facility that houses instructional, laboratory, and research spaces for Computer Science and related disciplines. The laboratory space will serve the complete needs of Artificial Intelligence students. The computer science building includes sufficient flexibility in both classroom, office space, and laboratory space to accommodate the student body increases resulting from the launch of the Artificial Intelligence degree.

The computer resources are available to faculty members and students in the Computer Science Department at Bowie State University (BSU). These include 15 general-purpose computing labs and five research labs. The research labs are described in the project description. Each of the general-purpose labs has 10 to 20 computers. Ten of the labs have computers with 22-inch monitors of the following specification:

- Platform: Windows 10 (64bit), Memory: 16 GB,
- Processor: Intel Xeon CPU E5-1620 v3 @ 3.50GHz,
- Motherboard: Dell Inc. 0K240Y,
- Graphics: NVIDIA Quadro K620 2.0 GB,
- Audio: NVIDIA High Definition Audio, Realtek Audio,
- Optical: TSSTcorp DVD+-RW SH-216DB,
- Network: Intel Ethernet Connection I217-LM, and
- Hard Drive : 500GB

Another ten labs have computers with the following specification:

- Dell Precision Tower 5810,
- Platform: Windows 10 (64bit), Memory:16 GB,
- Processor: Intel Xeon CPU E5-1620 v3 @ 3.50GHz,
- Motherboard: Dell Inc. 0HHV7N,

- Graphics: AMD FirePro W2100 (FireGL V) Graphics Adapter 2.0 GB,
- Audio: AMD High Definition,
- Audio Device Realtek Audio,
- Optical: HL-DT-ST DVD+-RW GTA0N,
- Network: Intel Ethernet Connection I217-LM, and
- Hard Drive: 350GB

There are conference rooms where faculty and students meet to discuss research and make presentations when needed.

2. Provide assurance and any appropriate evidence that the institution will ensure students enrolled in and faculty teaching in distance education will have adequate access to:

- a. An institutional electronic mailing system, and**
- b. A learning management system that provides the necessary technological support for distance education**

Online students of the program will receive support comparable to that provided to residential students. All students will receive access to technology tools required to complete coursework and research, including university email support, LMS support, software development environment tools (compilers, editors, DBMS), and full access to the BSU IT help desk personnel.

The department has signed an agreement with TeleCommunications Systems to provide a cloud-based virtual lab environment and lab exercises accessible to online and residential students.

Adequacy of Financial Resources with Documentation (as outlined in COMAR 13B.02.03.14)

BSU demonstrates its commitment through budget reallocation and support from staff offices such as the library and IT department.

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 projects revenue for full-time-equivalent students and part-time equivalent students for the initial five-year period. The department estimates that 10-12 new students will be admitted in the first year, 18-20 the second year, increasing to a max of 40 and 50 full-time students in Years Four and Five, respectively. Part-time students are expected to be nominal. Graduates are expected by the fourth year.

TABLE 1: RESOURCES					
Resource Categories	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
1. Reallocated Funds ¹	0	0	0	0	0
2. Tuition/Fee Revenue ² (c+ g x 65%)	59,761	118,040	194,948	248,600	311,468
a. #Full-time Students	10	20	30	40	50
b. Annual Tuition/Fee ⁴	8,446	8,699	8,960	9,229	9,506
c. Annual Full-Time Revenue (a x b)	84,460	173,980	268,800	350,702	446,782
d. # Part-Time Students	1	1	2	2	2
e. Credit Hour Rate ⁵	374	381	389	397	405
f. Annual Credit Hours	20	20	40	40	40
g. Total Part-Time Revenue (d x e x f)	7,480	7,620	31,120	31,760	32,400
3. Grants, Contracts, & Other External Sources ³	0	0	0	0	0
4. Other Sources	0	0	0	0	0
TOTAL (Add 1 – 4)	59,761	118,040	194,948	248,600	311,468

1- Whenever reallocated funds are included among the resources available to new programs, the following information must be provided in a footnote: origin(s) of reallocated funds, impact of the reallocation on the existing academic program(s), and manner in which the reallocation is consistent with the institution's strategic plan.

2 -This value represents 65% of the projected total Tuition & Fee revenues for Full-Time & Part-Time students.

3- Whenever external funds are included among the resources, the following information must be provided in a footnote: source of the funding and alternative methods of funding the program after the cessation of external funding.

4 -Tuition Rate is based on the posted AY 2020.2021 In-state Tuition & Fees schedule with a 3% increase in the subsequent years, rounded up.

5- Credit Hour Rate is based on the posted AY 2020.2021 In-state Tuition & Fees Schedule with a 2% increase in the subsequent years.

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 expenditure category.

Table 2 describes projected expenditures. Although most of the faculty and support staff, instructional tools, and facilities are already in place in the Department of Computer Science, it is anticipated that the new proposed program will require an additional full-time faculty member, one adjunct faculty, and an assistant systems administrator. Additional costs for advertising and promotional materials are estimated at \$2,500/year.

TABLE 2: EXPENDITURES

Expenditure Categories	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
1. Total Faculty Expenses (b + c below)	92,249	94,094	95,975	97,895	99,852
a. # FTE	1	1	1	1	1
b. Total Salary ¹	69,360	70,747	72,162	73,605	75,077
c. Total Benefits ²	22,889	23,347	23,813	24,290	24,775
2. Total Assistant Systems Administrator Expenses (b + c below)	71,559	72,990	74,451	75,940	77,459
a. # FTE	1	1	1	1	1
b. Total Salary ³	53,804	54,880	55,978	57,098	58,240
c. Total Benefits ⁴	17,755	18,110	18,473	18,842	19,219
3. Total Adjunct Expenses (b + c below)	42,120	42,962	43,822	44,698	45,592
a. # FTE	1	1	1	1	1
b. Total Salary ⁵	39,000	39,780	40,576	41,387	42,215
c. Total Benefits ⁶	3,120	3,182	3,246	3,311	3,377
4. Equipment ⁷	10,000	0	0	10,000	0
5. Library	0	0	0	0	0
6. New or Renovated Space	0	0	0	0	0
7. Other Expenses	5,000	5,000	5,000	5,000	5,000
TOTAL (Add 1 – 7)	220,928	215,046	219,248	233,533	227,903

1-Average Salary for Assistant Professors in Computer Science for FY 2021 with a 2% increase in subsequent years.

2-Average Benefits for Assistant Professors in Computer Science for FY 2021 is 33% of salary with a 1% increase in subsequent years.

3-Average Salary for Assistant Systems Administrator in FY 2021 with a 2% increase in subsequent years.

4-Average Benefits for Assistant Systems Administrator in FY 2021 is 33% with a 1% increase in subsequent years.

5-Average Salary for Adjunct Faculty (\$6,500 per course x 6 courses) in FY 2021 with a 2% increase in subsequent years.

6- Average Benefits for Adjunct Faculty in FY 2021 is 8% with a 1% increase in subsequent years.

7-Equipment is the cost for (2-3) computers on a three-year replacement cycle.

Table 2: Expenditure

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.

Faculty evaluation will follow BSU guidelines for all faculty members, including evaluation input from students, administrators and departmental personnel, per COMAR 13b.02.03.15. In addition, faculty evaluations will include the following:

- Evaluation of faculty qualifications and how they are adequate to cover all the curricular areas of the Artificial Intelligence program—this will include the size, specialization, credentials, and experience of the faculty;
- Analysis of faculty workload; and
- Professional development opportunities for each faculty member.

Evaluation of student learning outcomes will be based on assessment of the stated ABET outcomes using the continuous improvement processes.

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 evaluation of the program educational objectives will follow the same process currently used for the BS in Computer Science. Evaluation of the program's educational effectiveness will include

- Ensuring that the program educational objectives are aligned to the BSU mission.
- Ensuring that the program educational objectives align to the needs of the constituencies.
- Following a documented process and timeline to review the program educational objectives.
- Analyzing how the program's requirements and its associated prerequisite structure support the attainment of student outcomes.
- Analysis of program criteria describing how the program meets the specific requirements for the Data Science field as it evolves.
- Analysis of class size on achievement of learning outcomes.

Evaluation of student retention and student achievement will follow established BSU policy used by all departments. The courses, the program's effectiveness, enrollment, retention and graduation rates, students, instructors, and staff satisfaction will be evaluated using student, faculty, and staff surveys and program committee reviews on a regular basis.

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.

As Maryland's first historically Black institution, Bowie State University is committed to providing high quality higher education to African Americans and other underrepresented minorities. The goals established in the University's Racing to Excellence FY 2019 – FY 2024 Strategic Plan, support student achievement and long-term viability of the institution and align with the goals in the *2017-2021 State Plan for Postsecondary Education: Student Success with Less Debt*. Specifically, Bowie continues to:

- Support educational opportunity for Marylanders (Success, Strategy 4)
- Engage in a continuous improvement process to ensure that institutional policies and practices support student success (Success, Strategy 5)
- Provide alternative modalities, new programs and pedagogies and streamlined student and academic support services to facilitate timely degree completion (Success, Strategy 6) (Innovation, Strategy 9)
- Integrate high impact practices into the student experience, including career advising and planning into internship experiences (Success, Strategy 7)
- Partner with business, government and other institutions to support workforce development and graduate readiness (Innovation, Strategy 8) and
- Expand support for grant participation and research (Innovation, Strategy 10).

Bowie State faculty, staff, students, and administrators are engaging in change management strategies and embracing experimentation so that we can better meet the holistic needs of our students (Innovation, Strategy 11).

Bowie State University has a long-standing core commitment to diversity; it values and celebrates diversity in all its forms. The university community believes that its educational environment is enriched by the diversity of individuals, groups, and cultures that come together in a spirit of learning. As the university aspires to even greater racial diversity, it fully embraces the global definition of diversity that acknowledges and recognizes differences and advances knowledge about race, gender, ethnicity, national origin, political persuasion, culture, sexual orientation, religion, age, and disability. The University creates positive interactions and cultural awareness among students, faculty, and staff through infusing global diversity awareness in the curriculum, expanding co-curricular programming that promotes diversity awareness, and maintaining a campus climate that respects and values diversity.

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.**

This new program has no relationship with a low productivity program identified by the Commission.

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.**

The university has the resources to offer a quality distance education program. It utilizes the state-of-the-art Blackboard system as well as cloud-based, virtual laboratories. All departmental faculty are trained in offering distance learning education courses.

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

The institution has met the nine guidelines as required by the Council of Regional Accrediting Commissions (C-RAC)

APPENDIX A – COURSE DESCRIPTIONS & SAMPLE PROGRAM PLAN

Required Artificial Intelligence BS Core Courses

COSC 107 - Introduction to AI Concepts and Applications (4 credits)

This course surveys the latest AI applications across diverse domains, its historical development and the ethical considerations shaping its deployment. Through practical projects and immersive laboratory exercises in robot process automation, machine learning, natural language processing and robotics, this course provides a firsthand experience in harnessing AI to address multifaceted challenges spanning various disciplines.

COSC 112 - Computer Science I (4 credits)

This course is a study of the formal syntax and semantics of a programming language. Topics include expressions, assignments, declarations, control structures, arrays, data abstractions, subprograms, user interfaces, error handling, end of file handling, and string handling. Aspects of Software Engineering include top-down design, structured programming, and style in programming conducted in a block-structured language, such as Pascal, C, or C++. Ethical and social issues include information privacy, data reliability, data security, wiretapping, encryption, and ergonomics. This course may be used to satisfy the General Education Requirement in the Technology category.

COSC 113 - Computer Science II (4 credits)

Prerequisite(s): COSC 112. Prerequisite or taken concurrently: MATH 141 or MATH 150.

This course explores the design and analysis of large-scale systems of programs. Topics include testing, debugging, documentation, recursion, dynamic storage allocation, LIFO stacks, FIFO queues, trees, linked lists, routed I/O to multiple files, protecting software and other intellectual property, computer crimes, and constitutional and related issues. This course may be used to satisfy the General Education Requirement in the Technology category.

COSC 279 - Introduction to Mechatronics (3 credits)

Prerequisite(s): COSC 112 and COSC 107.

This course covers the fundamentals of mechatronics and introduces topics such as sensors, transducers, mechanical and electrical actuation systems, communications systems, closed-loop controllers, digital data representation and software-based manipulation to control electromechanical devices.

COSC 208: Discrete Structures (3 credits)

Prerequisite(s): COSC 113 or COSC 190 and either MATH 141 or MATH 150.

This course explores the definitions and implementations of basic data structures such as stacks, queues, linked lists, binary trees, etc.; internal searching and sorting algorithms; and garbage collection algorithms. Design of sort and search algorithms and introductory analysis associated with the basic data structures, as well as recursive algorithms, are discussed.

COSC 214: Data Structures & Algorithms (3 credits)

Prerequisite(s): COSC 113 or COSC 190

This course explores the definitions and implementations of basic data structures such as stacks, queues, linked lists, binary trees, etc.; internal searching and sorting algorithms; and garbage

collection algorithms. Design of sort and search algorithms and introductory analysis associated with the basic data structures, as well as recursive algorithms, are discussed.

COSC 379: Robotic Operating System (4 credits)

Prerequisite: COSC 113 and COSC 279.

This course explores UNIX, Linux, and Robotic operating systems. Topics such as programming in a UNIX environment, shell scripting, and Robotic Operating Systems (ROS) will be covered in this course. This course will provide theoretical knowledge and practical experience to create robotic applications using ROS and APIs and to test those applications by simulating them in a virtual environment.

COSC 328 - Applied Algorithms and Structures (3 credits)

Prerequisite: COSC 214.

This course covers techniques for designing and analyzing algorithms and structures in the context of computer application development. Topics such as running-time analysis, backtracking, greedy search, divide-and-conquer, dynamic programming, computational intractability and gradient descent will be studied.

COSC 381 - Cloud Essentials for Developer (3 credits)

Prerequisite(s): COSC 112.

Cloud Essentials for Developers presents cloud computing concepts and technologies. Topics include cloud fundamentals, infrastructure, architecture, deployment models, security, compute services, storage services, network services, and cost.

COSC 473 - Artificial Intelligence (3 credits)

Prerequisite(s): COSC 214.

This course is an introduction to basic concepts and techniques of artificial intelligence. Topics include: knowledge representation, search strategies, fuzzy and probabilistic reasoning, and theorem proving. Applications of AI languages and the design and construction of Expert Systems are discussed.

COSC 474 - Machine Learning (3 credits)

Prerequisite(s): COSC 214.

Artificial intelligence techniques for knowledge acquisition by computers. Fundamental problems in machine learning and discovery. Systems that learn from examples, analogies, and solved problems. Systems that discover numerical laws and qualitative relationships. Projects centering on implementation and evaluation.

COSC 486 - Parallel and Distributed Computing (3 credits)

Prerequisite(s): COSC 428.

This course covers a broad range of topics related to parallel and distributed computing. The course introduces the foundations of parallel computing, including parallel architectures, parallel and distributed programming paradigms, parallel algorithm designs, cloud computing. Data Centers, Clouds, Edge, and Cluster Computing. Performance analyses and evaluation of parallel and distributed systems. Shared memory and distributed systems programming with introduction to OpenMP and message passing.

COSC 495 - Senior Seminar In Cosc (3 credits)

Prerequisite(s): ENGL 361 or 362 and a minimum of one 400-level COSC course.

Students research topics of interest including issues on professional ethics and responsibilities (ACM Code of Ethics and Computer Ethics). Written reports and presentations of complete projects are required.

COSC 480 - Senior Capstone (3 credits)

Prerequisite(s): COSC 350, COSC 354, COSC 414.

This is a capstone course that integrates and applies knowledge and skills acquired in earlier course work. The emphasis is on solving problems that require concepts from more than one core computer science area. Selected problems integrating the topics covered in these courses will be formulated, discussed, and solutions developed. Local and global impacts of computing solutions on individuals, organizations and society are also covered. Only SENIORS are allowed to enroll in the course.

COSC 476 - Natural Language Processing (3 credits)

Prerequisite(s): COSC 474.

Natural Language Processing is an advanced course for students familiar with machine learning fundamentals that covers a broad range of topics including finite-state methods; context-free and extended context-free models of syntax; parsing and semantics interpretation; n-gram and Hidden Markov models; part-of speech tagging; coreference resolution; discourse structure; and natural language applications such as machine translation, automatic summarization, sentiment analysis and question answering.

COSC 478 - Deep Learning for Visual Recognition (3 credits)

Prerequisite(s): COSC 474.

This course focuses on the use of deep learning techniques for computer vision problems. Students learn how to apply convolutional neural networks, recurrent neural networks, generative models, deep reinforcement learning and graph neural networks to solve visual recognition problems.

COSC 479 - Robotics (3 credits)

Prerequisite(s): COSC 279 and COSC 379.

This course will cover theoretical and algorithmic principles behind robotic systems. The course will provide hands-on experience through project-based assignments with lightweight rovers and drones. Sample topics include: feedback control; motion planning; state estimation, localization, and mapping; computer vision and learning.

Artificial Intelligence Electives

COSC 274 - Prompt Engineering (3 credits)

Prerequisite(s): COSC 113.

This course provides the theoretical understanding and hands-on experience necessary to utilize state-of-the-art generative AI models and tools effectively. It briefly discusses generative AI models, such as large language and vision models before delving into prompting, different

patterns of prompting, logical chaining of prompts, fact-checking, and limitations of generative AI models.

COSC 439: Big Data Systems (3 credits)

Prerequisite(s): COSC 381, MATH 155.

The course details the process for planning big data analysis solutions that include cloud computing and machine learning concepts and terminology relevant to big data analytics, and specific cloud services for collecting, processing, analyzing, and presenting data. Big Data Analytics and Applications further includes the application of machine learning services to resolve problems from different domains and technologies for handling big data such as Hadoop ecosystem, Spark, and SparkML libraries. Big data related concepts such as complexity, distributed systems, parallel computing, and high-performance computing also are covered. A series of data analytics labs complement the taught concepts.

COSC 471: Social Network Analysis (3 credits)

Prerequisite(s): COSC 214.

This course provides the concepts and techniques related to social network analysis including network structure, graph, network measures, network clustering, centrality, network visualization, and topic modeling.

COSC 477: Virtual Reality and its Principles (3 credits)

Prerequisite(s): COSC 113 or concurrent registration ; or consent of Instructor.

This course introduces students to Virtual Reality (VR) hardware and software. it provides an opportunity for them to apply this knowledge to applications for education and games. This course applies cutting-edge virtual reality technology currently available in academia and industry. Students will design, model, and script the VR environment by developing a complete VR application as a group project.

MATH 460: Numerical Analysis I (3 credits)

Prerequisite(s): MATH 228, MATH 232, MATH 252 and MATH 300.

Elements of the theory and application of numerical analysis using computers; solution of linear and nonlinear systems of equations; computation of eigenvalues and eigenvectors; basic approximation theory; interpolation techniques; numerical quadrature; solution of ordinary and partial differential equations. Extensive use of graphing calculator/computer should be expected.

MATH 461: Numerical Analysis II (3 credits)

Prerequisite(s): MATH 228, MATH 232, MATH 252 and MATH 300.

Elements of the theory and application of numerical analysis using computers; solution of linear and nonlinear systems of equations; computation of eigenvalues and eigenvectors; basic approximation theory; interpolation techniques; numerical quadrature; solution of ordinary and partial differential equations will be discussed. Extensive use of graphing calculator/computer should be expected.

BS in Artificial Intelligence – FOUR-YEAR PROGRAM

First Year

First Semester	Credits	Second Semester	Credits
COSC107 - Introduction to AI Concepts and Applications	4	COSC 112 - Computer Science I	4
ENGL 101 - Expository Writing	3	ENGL 102 - Argument and Research	3
MATH 225 - Calculus I	4	MATH 226 - Calculus II	4
FRSE 101 - Freshman Seminar	3	COMM 101 - Oral Communication	3
<i>Total:</i>	14	<i>Total :</i>	14

Second Year

First Semester	Credits	Second Semester	Credits
COSC 113 - Computer Science II	4	COSC 214 - Data Structures and Algorithms	4
COSC 279 – Mechatronics	4	HIST 114 - African American History to 1865 or HIST 115 - African American History Since 1865	3
MATH 155 - Introduction Probability & Statistics	3	COSC 208 - Discrete Structures	3
Science Elective	4	Science Elective	3
		Health and Wellness Elective	3
<i>Total:</i>	15	<i>Total :</i>	16

Third Year

First Semester	Credits	Second Semester	Credits
COSC 379 - Robotic Operating System	4	COSC 328 Applied Algorithms and Structures	3
ENGL 362 - Technical Writing for Computer Science and Computer Technology	3	Free Elective	3
MATH 228 - Linear Algebra	3	Free Elective	3
Free Elective	3	COSC 381 - Cloud Essentials for Developers	3
Social/Behavioral Science Elective	3	Arts and Humanities Elective	3
<i>Total:</i>	16	<i>Total :</i>	15

Fourth Year

First Semester	Credits	Second Semester	Credits
COSC 495 - Senior Seminar	3	COSC 480 - Senior Capstone	3
COSC 473 - Artificial Intelligence	3	COSC 479 Robotics	3
COSC 474 - Machine Learning and Discovery	3	COSC 478 - Deep Learning for Visual Recognition	3
COSC 486 - Parallel and Distributed Computing	3	COSC 476 - Natural Language Processing	3
CS/AI Elective	3	CS/AI Elective	3

<i>Total:</i>	15	<i>Total :</i>	15
---------------	----	----------------	----

References

1. Lightcast Online Platform

<https://lightcast.io/>