LOYOLA UNIVERSITY MARYLAND

— 1852 —

Office of Academic Affairs

February 15, 2025

Sanjay Rai, Ph.D.
Secretary of Higher Education
Maryland Higher Education Commission
217 East Redwood Street, Suite 2100
Baltimore, MD 21202

HEGIS: 210506
CIP: 43.0406

Dear Secretary Rai,

Loyola University Maryland enthusiastically submits a new program proposal for a B.S. in Forensic Science that builds upon our current forensics' programs, including a B.A. in Forensic Science and strong graduate programs. The new proposed program's emphasis on STEM electives and requirements builds on a liberal arts curriculum that weaves together natural and applied sciences, humanities, and social sciences, a distinctive and collaborative approach to forensic science. This expansion of Loyola's portfolio of forensic degree programs is designed to meet a trend in some professions that are increasingly requiring the B.S. degree as driven by accreditation.

The proposed interdisciplinary program was developed to provide forensic students who focus on forensic, natural, and applied science courses the ability to graduate with a Bachelor of Science degree. This will expand the job opportunities for graduates in fields that specifically require a Bachelor of Science degree. The proposed program was developed under the University's new strategic plan *Together We Rise* and directly meets the plan's initiative to grow health and STEM programs.

The proposal addresses the 2022 Maryland State Plan for Higher Education's goals and priorities and was approved by Loyola's Academic Senate and Loyola's Board of Trustees. The President approves this proposal, as made evident by his signature on the MHEC Cover Sheet. I approve the proposed program and submit it for your recommendation for implementation. Should the Commission have any questions about the proposals, please contact Mr. David Mack, Academic Program Development Specialist, at 410-617-2317 or dsmack@loyola.edu.

Sincerely,

Cheryl Moore-Thomas

Cheryl Moore-Thomas, Ph.D., NCC

Provost and Vice President for Academic Affairs

Cc: Francis Golom, Ph.D., Dean, Loyola College of Arts and Sciences
Mr. Matthew Power, President, Maryland Independent College and University Association
Dr. Angela Sherman, Vice President for Academic Affairs, Maryland Independent College and University Association

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

Institution Submitting Proposal	Loyola University Maryland

Each action below requires a separate proposal and cover sheet.

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

Payment Submitted: (●) Yes ( ) No Payment Type: ( ) R*STARS # (●) Check # 65497 Payment Amount: 850.00 Date Submitted: 2-15-25

Department Proposing Program	Forensic Science
Degree Level and Degree Type	Bachelor of Science
Title of Proposed Program	Forensic Science
Total Number of Credits	121 - 128
Suggested Codes	HEGIS: 210506.00 CIP: 43.0406
Program Modality	(●) On-campus ( ) Distance Education (fully online) ( ) Both
Program Resources	(●) Using Existing Resources ( ) Requiring New Resources
Projected Implementation Date (must be 60 days from proposal submisison as per COMAR 13B.02.03.03)	(●) Fall ( ) Spring ( ) Summer Year: 2025
Provide Link to Most Recent Academic Catalog	URL: https://catalogue.loyola.edu/
Preferred Contact for this Proposal	Name: David Mack Title: Program Development Specialist Phone: (410) 617-2317 Email: dsmack@loyola.edu
President/Chief Executive	Type Name: Terrence M. Sawyer, J.D. Signature: Terrence Sawyer (Feb 12, 2025 14:05 EST) Date: 02/12/2025
	Date of Approval/Endorsement by Governing Board:

Revised 1/2021

LOYOLA UNIVERSITY MARYAND

A DEGREE-GRANTING INSTITUTION AUTHORIZED TO OPERATE IN MARYLAND,
PROPOSAL FOR A SUBSTANTIAL MODIFICATION TO AN ACADEMIC DEGREE PROGRAM

BACHELOR OF SCIENCE IN FORENSIC SCIENCE

Submitted in accordance with state regulations found in COMAR 13B.02.03

On

February 15, 2025

Loyola College of Arts and Sciences

Loyola University Maryland
Bachelor of Science in Forensic Science
Executive Summary

Forensic Science has exploded in popularity over the last three decades with no signs of a slowdown in the foreseeable future. Loyola University Maryland has been responsive to increased student interest and heightened job growth in this discipline by creation of undergraduate and graduate degree programs that meet workforce needs of Maryland and the region. The university proposes a new Bachelor of Science in Forensic Science program. The degree program builds off Loyola's highly successful Bachelor of Arts degree in Forensic Science that was first implemented in 2018. In contrast to the current BA degree, students will concentrate their electives from existing forensic, natural, and applied science courses, and broaden their analytic training through coursework in chemistry and research. The new degree is in response to changing workforce requirements for forensic science and to expand the range of STEM careers that graduates may pursue, including those that contribute to Maryland's burgeoning biohealth industries.

The proposed new program is distinctive in the degree of interdisciplinarity woven into the curriculum. Students will have the opportunity to complete foundation courses from departments across three academic divisions, including the Natural and Applied Sciences, Humanities, and Social Sciences. Electives will be selected from seven Natural and Applied Science departments. Loyola provides a distinctive and collaborative approach to introduce students to forensic science. In fact, there are no Bachelor of Science in Forensic Science titled degrees offered in Maryland. While there are bachelor level programs that offer forensic content, that content is unique to their respective institution. Loyola currently offers the only bachelor's degree in Maryland titled forensic science. The lack of Bachelor of Science forensic science programs represents a major deficiency in the workforce pipeline for state, local, and federal agencies jobs that require a minimum of a Bachelor of Science degree for entry level positions. Loyola's new degree will not only address this deficiency, but also attract new students to the state and retain them in the region as many are expected to pursue careers in Maryland or seek graduate education at Loyola or other universities in the state.

The new degree program offers several key features that support Loyola's new strategic plan "Together We Rise" and Maryland's 2022 Strategic Plan for Postsecondary Education. The BS in Forensic Science builds on the success of Loyola's other forensic programs, and thus no new full-time faculty hires and only one new course are required to implement the degree; the curriculum allows flexibility for students to double major and/or explore minors, study abroad, and to easily schedule classes in a semester and thus graduate in a four-year trajectory; course work will include classes offered in ten departments across three academic divisions; writing, ethics and justice will be integrated throughout the curriculum; students will engage in a capstone that provides authentic experiences for application of knowledge and skills to real-world questions and problems; graduates will have expanded career opportunities by comparison to traditional curricula; and the degree will serve as a recruiting tool for the State of Maryland in that it will draw the attention of prospective students who otherwise would not consider Loyola or Maryland. Perhaps most importantly, graduates from the new degree program will gain skill sets that prepare them for multiple career paths within Maryland and across the United States, as well as prepare them for lifelong learning.

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.

   The proposed program leads to a Bachelor of Science degree in Forensic Science. The degree program is a slight modification of Loyola's highly successful Bachelor of Arts degree in Forensic Science that was first implemented in 2018. In contrast to the current BA degree, students will concentrate their electives from existing forensic, natural, and applied science courses. The coursework and degree title are essential for ensuring graduates are competitive for entry-level positions that require a "BS" degree, while still amenable to other career paths not directly linked to forensic science. In addition to developing a range of technical and specific skills to advance students' career options, this degree program will also enhance the broader development of students' skills in a manner consistent with Loyola's mission. The attributes of a forensic science professional are consistent with those of a Loyola graduate: excellent oral and written communication skills; intellectual curiosity; use of interdisciplinary approaches; critical thinking skills; commitment to life-long learning; and strong moral and ethical character. No matter what task assigned, a forensic investigator seeks only for truth. These attributes are the hallmarks of a Jesuit education, and all students pursuing a degree in forensic science would be required to develop and use these learning skills. The characteristics of this proposed interdisciplinary program also prepare graduates for both of Loyola's distinctive master's degrees in forensic science, and significantly contributes to the University's role as a leader in forensic education in the state and region.

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

   Loyola's new strategic plan, "Together We Rise", outlines several goals for enhancement of student preparation for lifetime contributions to the workplace and society. The plan specifically calls for weaving together vocational discernment and liberal arts education in undergraduate and graduate programs[1]. Loyola's Board of Trustees has encouraged the University to develop and implement new undergraduate and graduate programs that are consistent with the institution's Ignatian identity, while addressing one or more strategic goals. This proposal for a BS degree in Forensic Science addresses three focus areas of the strategic plan, including 1) enhancement of experiential learning through high impact reality experiences (Advance), 2) expansion of the footprint of STEM and graduate education (Grow), and 3) recognition as the leader in Forensic Science education in the region and among all Jesuit universities (Thrive). Desired outcomes mirror the success markers sought by Loyola for the strategic plan and include improved rankings and selectivity of our forensic programs, growth in undergraduate enrollments, and increased experiential learning and research opportunities for students. The new degree is derived from the existing BA in Forensic Science, which allows the additional benefits of 1) redeployment of several existing courses and faculty within the proposed curriculum, 2)

[1] Together We Rise, https://www.loyola.edu/about/mission-vision/strategic-plan/

development of only one introductory course and modification of two current courses to implement the curriculum, 3) and recruitment of prospective students to the undergraduate forensic science programs, who in turn, desire to enroll in one of the MS programs in Forensic Science.

The proposed program also aims to foster justice through the development of a curriculum that addresses both the strengths and weaknesses of forensic sciences and how this has impacted criminal justice in the United States. This approach has been a hallmark of the existing undergraduate and graduate degrees in the forensic science programs at Loyola. Students are presented with multiple viewpoints concerning forensic science and criminal justice in Baltimore and throughout the United States, and then are asked to participate in dialogue centered on ethics, social justice, policing reform, and reshaping of forensic science practices, analyses, and interpretations. The proposed program will serve as a cornerstone to strengthen and expand partnerships with external agencies, industries, and innovators focused on improving and reforming forensic science practices and policies. This approach to undergraduate education in forensic science is novel from other programs and will be attractive to a more diverse student population.

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.

   Implementation of the BS degree in forensic science will require limited new resources in terms of faculty, space, and budget. The proposed curriculum parallels the required courses in the BA in Forensic Science degree and the 5 forensic science elective courses are derived from 33 forensic, natural and applied science courses that currently serve as potential electives for the BA degree. The BS curriculum will have the added requirement of a year of general chemistry with lab, which will reduce the number of free electives from 12 to 10. The chair of Chemistry Department has indicated that the addition of forensic science majors will not be a burden to the current course offerings. One new foundation course, FO 102 Introduction to Forensic Investigations, will be added to replace SC 260 Introduction to Criminal Justice, which is currently required in the BA degree. Two foundation courses, FO 322 Forensic Ecological Evidence and FO 320 Serology of Animal and Human Body Fluids will be redesigned to provide guided or independent research experiences in the laboratory and field components. Since the courses are already taught in the BA program, there will be no need to hire additional instructors to cover these changes. Any other instructors needed will be hired on a per course basis during the first five years of the program. If the undergraduate program continues to grow, then new faculty and classroom space will be needed likely within 3-5 years.

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

   The proposed BS program will follow a similar administrative model as used for the current BA in Forensic Science. The forensic science program will be housed within the Forensic Science Department. The department chair will provide overall supervision of the program in terms of financial and personnel decisions. Day-to-day administration of the program will fall under the direction of the department chair. Oversight of programmatic and curricular

decisions will be provided by the department chair in consultation with the department's undergraduate curriculum committee. Technical support in terms of laboratory and field equipment and instructional opportunities will be provided by the department's Laboratory Manager.

Financial support of instructional initiatives for the BS degree will be made by Loyola College of Arts and Sciences and the Office of Academic Affairs via demonstrated need. A combined budget for the BA and BS degrees will be developed for the proposed new program following a typical three-year need-based model. Since the majority of students expected to enroll in the BS degree will come from the current BA program, only a modest increase in budgetary expenses should occur.

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:

   The proposed BS in Forensic Science will be a new award option (BS) associated with the BA degree currently offered by Loyola. The curricula of both programs will be similar for both degrees with the exception that the BS program will have additional requirements of 1) two semesters of general chemistry with lab, 2) completion of a research-based course, planned to be through a modification of existing courses, 3) addition of a new foundation course that will replace SC 260, and 4) all electives will be science courses. Those science courses are already on the approved list of electives for the BA degree program, which has been previously approved by MHEC. The BS degree in Forensic Science is being developed in response to changing workforce demands in Maryland and across the United States. For instance, some agencies in the United States are certified with a laboratory accreditation (ISO/IEC 17025) that specifies the type of degree required for specific entry level jobs (i.e., biology, trace evidence, seized drugs, toxicology, veterinary and wildlife). Without a BS degree in forensic science or one of the other natural sciences, Loyola graduates will not be hired for forensic science positions at Maryland State Police and several other local and federal agencies. A similar requirement is now expected for crime scene technician positions. Other agencies have or are considering elevating the degree requirements for entry level positions. The result is that currently, several talented students trained in Maryland cannot be hired for positions within the state. The same situation now exists for graduates originally from other states, especially in the mid-Atlantic region and along the west coast, seeking employment in their home states. The addition of a BS degree in Forensic Science at Loyola will increase the pipeline of talent applying for positions in forensic science and biohealth industries in Maryland, as well as augment the number of students applying for graduate programs in forensic science in the state.

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

   Maryland's 2022 strategic plan for postsecondary education encourages colleges to prioritize high-quality education (Priority 5), improve pathways to graduate in a timely manner (Priority 6) and to emphasize lifelong learning (Priority 7)[2]. This proposal for a BS

[2] https://dlslibrary.state.md.us/publications/Exec/MHEC/ED11-105(b)(3)(i)_2022.pdf

in Forensic Science details a plan to achieve elements of these three priorities. The proposed curriculum has an emphasis on natural and applied sciences but is also interdisciplinary, integrating coursework from forensic, natural and applied sciences, along with the social sciences and humanities. This approach will lead to the development of several learner, technical and professional skills essential for multiple STEM careers in Maryland. The curriculum is also flexible, permitting students from two-year programs, especially those emphasizing the natural sciences, to easily transfer into the new program. Importantly, transfer students should be able to graduate with a BS in Forensic Science from Loyola with only two additional years. In addition, any student in the program, including transfer students, will be eligible to apply for the accelerated programs for Loyola's Master of Science degrees in Forensic Pattern Analysis and Biological Forensics. Acceptance into the accelerated programs reduces the total time needed to complete the BS and MS degrees, thereby reducing the total cost of education for the students, and the cost for the master's degree is lower because graduates qualify for Loyola's double alumni discount and pay undergraduate tuition for graduate courses while in the accelerated program.

Promoting interest and literacy in STEM fields represents a national focus to overcome the STEM education crisis that exists in the United States[3]. Despite years of promoting educational reform in STEM fields and growth projections of more than 25% in science and engineering careers by 2027, STEM disciplines have not been attractive to many students. In fact, transformation efforts and increased spending in science and engineering have yielded the opposite outcomes: the number of high school and undergraduate students completing STEM curricula has continued to decline since 1997. Today, less than 60% of high school students initially pursuing a path in science, technology, mathematics or engineering are expected to pursue a STEM degree in post-secondary education, and fewer than 40% of those students will complete a college degree in a STEM discipline[4]. In Maryland, the STEM crisis has resulted in a workforce shortage for careers in the burgeoning biohealth industries, which includes those focused on forensic-related fields[5]. These trends can be overcome as evidenced by student interest in all things 'forensic.' At the high school level, forensic science has become one of the most demanded science courses in the Maryland public school systems[6], a phenomenon that has occurred throughout the United States. Consequently, these same students are seeking additional forensic opportunities when choosing colleges and universities for undergraduate and graduate study. By offering an interdisciplinary BS degree that complements the existing BA in Forensic Science, Loyola has the potential to become a preferred destination in the region for forensic education. More importantly, the new BS degree would help meet the workforce needs in forensic science and other disciplines throughout Maryland.

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.

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[3] https://www.whitehouse.gov/wp-content/uploads/2018/12/STEM-Education-Strategic-Plan-2018.pdf
[4] US Department of Education (2015).
[5] 2017 surveys conducted by Mid-Atlantic Biology Research and Career Network (http://www.loyola.edu/academics/biology/future/mabrc).
[6] Information obtained from a teacher focus group conducted by the Forensic Educators Committee, CFEX (2017).

Graduates from the proposed BS degree in Forensic Science will have immediate opportunities to apply for open positions in publicly funded and private forensic laboratories and private industry. Currently, there are 14 American Society of Crime Laboratory Directors (ASCLD) certified forensic laboratories in Maryland, each employing multiple crime scene investigators. Several federal agencies in the region employ multiple crime scene and criminal investigators, including the FBI, Homeland Security, Armed Forces Pathology Institute, CIA, ATF, US Secret Service, Treasury Department, US Postal Services, forensic units with the individual branches of US military, and several additional agencies associated with Washington, D.C., and the surrounding communities. Additionally, career opportunities exist with any private and government agency that performs background checks, as well as with numerous consulting firms engaged in forensic analysis associated with healthcare, identity fraud/personal identification, and criminal investigations domestically and abroad. Table 1 provides a list of broad career fields available to graduates of forensic science programs. Graduates from the proposed BS degree program will have immediate opportunity to pursue entry level positions in forensic laboratories, crime scene investigation, forensic and death investigations, and QA/QC, in addition to a wide range of related positions mentioned previously and associated with careers listed in Table 1. Alternatively, the degree may serve to launch graduates toward additional educational opportunities, especially in specialty areas of forensic sciences such as pattern analysis, biological forensics, forensic biology and crime scene investigation.

Table 1. Potential career fields for forensic science graduates

Law Enforcement	Policy Analysis
Forensic Laboratories	Social Statistics
Corrections	Allied Health
Rehabilitation	Social Work
Judiciary	Medicine
Forensic industries	Intelligence
Public Policy	Foreign Service
Research	BioHealth industries
Public Administration	Military
Government Research	Civil Service
Elected or Appointed Leadership	Non-Profit
Missing Persons Identification	Consultant
Academia	Cybersecurity, IT, Digital Forensics
Crime Scene Investigator or Technician	Forensic Medicine
Anthropology	Archaeology
Fraud analysis, Identity theft	Private investigator
Coroner/medical examiner	Medical or forensic pathology
Veterinary forensics/animal control/cruelty investigator	Wildlife forensics

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

   Presently there are over 400 state, municipal, county, and federal crime laboratories

operating in the United States[7], and an estimated 1000 government-funded forensic laboratories operating worldwide, minus China. The Bureau of Justice Statistics estimated over 13,000 full-time personnel were employed in publicly funded crime laboratories in the US as of 2009, representing a 28% increase from the previous census (2002). Another 7500 positions are available in medical examiner and coroner offices and over 1600 private companies perform forensic analysis or testing in the United States[8], providing a wide range of career opportunities for graduates with a BS degree in Forensic Science. A need for well-trained forensic scientists in the public, private, and academic sectors is expected to increase for the next several decades. In fact, forensic science positions are predicted to demonstrate the fastest growth in terms of total jobs from now until 2027 within the category of Life, Physical, and Social Science occupations, according to the Bureau of Labor Statistics[9]. Graduates with a forensic science degree are also prepared for work in a vast array of positions in biohealth industries. The BioHealth Capital region comprised of Maryland, Washington DC and northern Virginia is home to over 1300 companies dedicated to biotech, biopharma, agricultural technologies, and Health IT, including several with direct applications to forensic science. Industry positions also serve as excellent entry-level positions for quality control, project management, and other skill sets that are directly transferrable to forensic science laboratories.

Table 2. Market demand for graduates trained in forensic science and crime scene investigation

	Job Posting Source			
Job description	AAFS	ASCLD	IAI	Indeed*
Crime scene technician	0	0	2	50
Forensic scientist I	2	6	6	26
Latent prints examiner I	1	1	5	5
Forensic investigator	1	0	1	25
DNA analyst/serology	4	4	0	30
Pattern evidence examiner	3	0	3	57
Evidence control	1	2	2	224

Data collected on April 18, 2022. AAFS, American Academy of Forensic Sciences; ASCLD, American Society of Crime Laboratory Directors; IAI, International Association of Identification; Indeed, general job posting site. *Data from Indeed is for job openings within 100 miles of Baltimore, MD.

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.

   The Bureau of Labor Statistics indicates a fourteen percent increase between 2020 and 2030 in forensic science technicians in the United States as indicated in Table 3. Additionally, the Maryland Long Term Occupational Projections (Table 4) indicate a 26 % increase and Table 5 indicates a nearly nineteen percent increase in demand for forensic science technicians alone in Maryland.

[7] http://www.bjs.gov/index.cfm?ty=pbdetail&iid=4412.
[8] https://www.anab.org/
[9] https://www.bls.gov/opub/mlr/2015/article/occupational-employment-projections-to-2024.htm.

Table 3. Employment projections data for forensic science technicians, 2020-30 in the U.S.

Occupational Title	SOC Code	Employment, 2023	Projected Employment, 2033	Change, 2023-33	
				Percent	Numeric
Forensic science technicians	19-4092	18,600	21,200	14	2,500
SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program https://www.bls.gov/ooh/life-physical-and-social-science/forensic-science-technicians.htm#tab-6					

Table 4. Maryland Long Term Occupational Projections (2020 – 2030) - O*NET

Occupational Title	Employment, 2020	Projected Employment, 2030	Projected growth 2020-2030	Projected annual job openings 2020-2030
Forensic science technicians	430	540	26%	70
SOURCE: Projections Central 2020-2030 long-term projections. Sponsored by the U.S. Department of Labor				

Table 5. Maryland Long Term Occupational Projections (2020 – 2030) - MD Department of Labor

Occupation	Number of Openings			
	2020	2030	Change	Pct. Change
Forensic science technicians	441	524	83	18.82%
SOURCE: Maryland Department, Division of Workforce Development and Adult Learning, Office of Workforce Information and Performance https://www.dllr.state.md.us/lmi/iandoproj/maryland.shtml				

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

Since the inception of the forensic studies minor in 2011 at Loyola, student interest has steadily grown each year from an initial enrollment of 13 at the close of spring term 2012, to 85 students in April 2024.[10] Enrollments in the minor are now larger than all other Loyola College interdisciplinary minors. Equally impressive is the rapid growth of the BA degree in forensic science, which has grown to 174 majors in 6 years. The growth of Loyola's forensic programs reflects not only strong student interest, but also a growing reputation that the program meets the career and intellectual needs of participants. Table 5 provides enrollments for the forensic studies minor and forensic science major at Loyola since AY 2019-2020. Both programs have also served as sources of graduate students in the forensic pattern analysis and biological forensic MS programs.

Table 5. Enrollment data over the last 5 years for Loyola's forensic science/studies major and minor

Year	Forensic studies minor	Forensic science major (BA)	Total
2019-2020	73	29	102

[10] Data provided by the Loyola's Record Office 6/14/2024.

Year	Forensic studies minor	Forensic science major (BA)	Total
2020-2021	61	64	125
2021-2022	56	94	150
2022-2023	64	144	208
2023-2024	85	174	259

We believe that this growth trend will continue with high school students continuing to select Loyola's forensic programs, especially the BS and BA degrees for their undergraduate education. Loyola offers an accelerated option for both graduate programs, allowing students as early as junior year to apply for acceptance into either the MS in forensic pattern analysis or biological forensics. This shaves at least one semester from the graduate degree. The accelerated option has served as an effective recruiting tool for the BA in forensic science and is expected to be even more so for the proposed BS in forensic science.

Although we believe the proposed program has a unique curriculum by comparison to others offered in the state, we have included a table compiled from MHEC's degree trends website for programs offered in Maryland that are most similar to the proposed forensic science BS program.

Table 6. MHEC Degree Trends data

School Name	Degree Level	Program Name	CIP	2019	2020	2021	2022	2023
Towson University	Bachelors	FORENSIC CHEMISTRY	43.0406	15	16	15	23	18
University Baltimore	Bachelors	FORENSIC STUDIES	43.0406	23	25	15	13	11

Source: Maryland Higher Education Commission, Degree Trend Data https://data.mhec.state.md.us/macAux.asp#api

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.

   At present, no BS degrees in Forensic Science are conferred in Maryland. Loyola's program would be truly distinctive in its interdisciplinary foundation sequence and in the breadth of science electives available. The most similar program in the region is Loyola's BA in Forensic Science program. Towson University confers a BS in Forensic Chemistry that is focused on forensic DNA or forensic chemistry, both of which have significantly different curricular requirements dependent on FEPAC accreditation standards from Loyola's proposed BS in Forensic Science. University of Baltimore offers a BS in Forensic Studies that is focused on forensic investigations and does not require coursework in the natural sciences. Bowie State University offers a forensic science concentration within its Criminal Justice degree. The curriculum does require three semesters of chemistry (2

general chemistry and 1 organic) but no biology. Bowie's concentration in forensic science has a different curriculum that would not provide the same background for jobs as the proposed program, and only overlaps with Loyola's proposed new program in two required courses (i.e., general chemistry). Coppin State University offers a certificate in forensic investigations that does not overlap with Loyola's proposed BS degree.

Several community colleges in the Maryland, including Montgomery College and Prince George's Community College confer associate's degrees in forensic science. Loyola is working with PGCC and MC to develop articulations agreements for degree pathways transfer from the associate's degree to BA in Forensic Science. Similar articulation agreements will be developed for the BS program if approved, thereby providing career pathways for students across the state and helping to solidify the workforce pipeline in Maryland for forensic science and careers associated with biohealth industries.

Loyola's curriculum was developed in consultation with the forensic laboratory directors and crime scene supervisors at the Maryland State Police and Baltimore City Police. Courses in the BS program, with the exception of non-forensic courses, will be taught primarily by forensic experts in ecological evidence analysis, death investigation, person's identification, and crime scene investigation from the forensic units at the Maryland State Police and Baltimore City Police Departments, as well as by forensic practitioners in academia and the private sector.

2. Provide justification for the proposed program.

The BS degree in Forensic Science is being developed in response to changing workforce demands in Maryland and across the United States. For instance, some agencies in the United States are certified with a laboratory accreditation (ISO/IEC 17025) that specifies the type of degree required for entry level jobs. Without a BS degree in forensic science or one of the other natural sciences, Loyola graduates will not be hired for forensic science positions at Maryland State Police and several other local and federal agencies. A similar requirement is now expected for crime scene technician positions. Other agencies have or are considering elevating the degree requirements for entry level positions. The result is that currently, several talented students trained in Maryland cannot be hired for positions within the state. A same situation now exists for graduates originally from other states, especially in the mid-Atlantic region and along the west coast, seeking employment in their home states. The addition of a BS degree in Forensic Science at Loyola will increase the pipeline of talent applying for positions in forensic science and biohealth industries in Maryland, as well as augment the number of students applying for graduate programs in forensic science in the state.

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

Loyola's program should have no impact on HBIs since no HBI in Maryland offers a BS in Forensic Science.

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

   Loyola's proposed BS degree in Forensic Science program should have no impact on the uniqueness and institutional identities and missions of HBIs since no HBI in Maryland offers a BS degree in Forensic Science.

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

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

   The department chair engaged in conversations with the Chief of Forensic Science and Evidence Services at Baltimore City Police (BCP), the director of the forensic unit and the supervisor for Crime Scene Investigation at Maryland State Police regarding hiring needs and preparation of graduates for their respective agencies. The chair also attended an ASCLD meeting with lab directors and educators from around the United States that focused on perceived deficiencies in applicants and new hires in entry level positions in forensic laboratories and crime scene. These discussions centered on changes in requirements for entry level positions as well as technical skills that new hires are lacking or are not developed for casework. The chair also led Loyola's forensic science advisory board through a series of strategic planning exercises to consider near and future-term growth of the institution's forensic programs. The department chair conducted formal and informal surveys of current and past students, with about half of the current students enrolled in the BA degree in Forensic Science expressing interest in pursuing a BS program if available.

   Direct oversight of the program will be the purview of the department chair, who will work with members of the forensic science department to develop, implement, and assess the curriculum and various features of the program. The program will be housed in the department of forensic science.

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

   The Forensic Science major provides a framework for students to explore ideas, concepts, and technology addressing crime, homeland security, and growing threats to individuals, institutions, and nations through acts of terrorism and attacks on security. Concomitantly it provides a solid foundation in the natural sciences and applied through courses in forensic science, biology, chemistry, and physics, complemented by rigorous focus on biological and chemical concepts and analytical thinking through coursework in forensic science, biology, chemistry, computer science, engineering, mathematical sciences, physics, and statistics. Students will also experience and receive training in multi-disciplinary approaches to forensic science and studies; analyses applied to criminal and civil investigations; matters of administrative law; exploration of factors and events that influence individuals and groups to engage in criminal activity or commit acts of violence; and examination of issues that threaten national security and the tactics to counter such threats.

   The curricular path for the major encourages breadth of understanding, interdisciplinary

approaches, critical understanding, team skills, excellent communication skills, and deductive reasoning. Specifically, the major's curriculum will develop and promote skills needed for multiple career paths, including excellent oral and written communication skills, intellectual curiosity, use of interdisciplinary approaches, critical and analytical thinking skills, and commitment to life-long learning. Additionally, the program and its curriculum will emphasize the development of strong moral and ethical character in students.

University objectives for learning outcomes specifically supported by the Forensic Science major:

- Intellectual excellence
- Critical understanding
- Eloquentia Perfecta
- Leadership
- Promotion of justice

Curricular Outcomes specifically supported through the Forensic Science curriculum:

- Students will master current factual content, concepts, theoretical perspectives, and historical trends of different subfields of forensic science.
- Students will demonstrate proficiency in communicating effectively in a variety of formats, including verbal, written, and symbolic channels, relevant to forensic science investigation and research, and presentations in the judicial system.
- Students will develop an understanding of the moral and ethical issues surrounding crime, forensic investigation, and forensic science research.
- Students will demonstrate a clear understanding of major concepts and techniques used in subfields of forensic science based on their ability to read, interpret, and critically evaluate primary literature; design experiments or conduct independent investigation to test ideas and hypotheses; and interpret data through statistical and graphical packages.

A curricular map for the proposed bachelor's degree can be found in **Appendix A**.

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

The department chair will work with the department's undergraduate curriculum committee to develop an assessment plan and cycle for each student learning outcome. The goal is to implement assessment of all learning goals within the first five years of the program. Separate pre- and post-testing will also be performed with each cohort of students to assess the development of professional competencies relevant to biological forensics. Testing will primarily include factual and conceptual understanding, as well as technical proficiencies.

b) document student achievement of learning outcomes in the program

Student achievement of learning outcomes will be documented through Watermark based on the assessment cycle that will be established by the department chair and departmental undergraduate curriculum committee. Assessment will follow a similar plan as the current BA in Forensic Science program in which one program learning objective (PLO) per year is assessed, relying on artifacts from multiple required courses. All assessment measures for

each program learning objective, artifacts assessed, any form of analyses, assessment reports generated, and plans for follow-up will be posted online uploaded to Watermark.

Recommendations for curricular or course changes based on student achievement of specific PLOs will be discussed with the departmental undergraduate curriculum committee and instructors of the courses impacted prior to implementation.

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

   Students are considered to have met their graduation requirements when they have completed all degree requirements. Loyola degree requirements include successful completion of their program including any area of concentration, a minimum of 38 courses (3-,4- or 5-credit courses), diversity-justice course graduation requirements, satisfaction of Loyola's Core Curriculum, all totaling a minimum of 120 credits, while maintaining a minimum cumulative average of 2.00 in all Loyola courses. The residency requirement is satisfactory completion of at least 60 credits at Loyola University Maryland.

   The proposed Bachelor of Science in Forensic Science is composed of five foundation courses shared with our current BA in Forensic Science, a capstone requirement which is recommended to be a research experience, two semesters of introductory biology (BL 150/151 & BL 152/153) and chemistry (CH 101/105 & CH 102/106) with lab, statistics (ST 210 or ST 265), an introductory course in psychology (PY 101) and sociology (SC 100), and five forensic electives from forensic, natural or applied sciences. In addition to the university core requirements, the degree has 10 free electives. The latter provides flexibility to take additional coursework associated with a specific career pathway, such as organic chemistry, biochemistry and physics, for students' intent on pursuing forensic biology, bloodstain pattern analysis, or bullet trajectory analysis, or to double major or add a minor. The program requires 121 - 128 credits based on student program elective choice.

Forensic Science, BS (See Appendix B: Program Advising Worksheet for B.S. in Forensic Science)

Required Courses

- FO 101 – Introduction to Forensic Science with Lab
- FO 102 – Introduction to Forensic Investigation with Lab
- FO 320 – Forensic Serology of Animal and Human Body Fluids *or*
- FO 322 – Forensic Ecological Evidence
- PY 202 – Psychopathology
- WR 325 - Professional Writing *or*
- WR 326 - Technical Writing
- Forensic Science Capstone – FO 498 Forensic Science Research, FO 497 Forensic Science Internship, or FO 499 Forensic Science Independent Study

Natural Science Core Courses

- BL 150 - Foundations of Biology I *and*
- BL 151 - Foundations of Biology I Lab

- BL 152 - Foundations of Biology II *and*
- BL 153 - Foundations of Biology II Lab
- CH 101 – General Chemistry I *and*
- CH 105 – General Chemistry I Lab
- CH 102 – General Chemistry II *and*
- CH 106 – General Chemistry II Lab
- ST 210 - Introduction to Statistics *or*
- ST 265 - Biostatistics

Social Science Core Courses

- PY 101 - Introductory Psychology
- SC 100 - Introduction to Sociology

Forensic Science Electives

Select 5 courses from 32 courses offered by Natural and Applied academic departments

- BL 281 - General Genetics
- BL 322 - Synthetic Biology with Lab
- BL 341 - Molecular Genetics with Lab
- BL 431 - Biochemistry I *and*
- BL 433 - Biochemistry Lab I
- BL 432 - Biochemistry II *and*
- BL 434 - Biochemistry Lab II
- CH 201 - Quantitative Analysis
- CH 410 - Instrumental Methods *and*
- CH 411 - Instrumental Methods Lab
- CH 431 - Biochemistry I *and*
- CH 433 - Biochemistry Lab I
- CH 432 - Biochemistry II *and*
- CH 434 - Biochemistry Lab II
- CS 115 - Cyber Security and Digital Forensics
- CS 151 - Computer Science through Programming
- CS 212 - Object-Oriented Data Structures
- CS 312 - Object-Oriented Software Design
- FO 230 - Introduction to Criminalistics
- FO 300 - Crime Scene Investigation
- FO 319 – Supporting 21st C Policing with Forensic Evidence
- FO 330 - Biological and Forensic Science Quality Assurance
- FO 350 – Forensic Pattern Evidence
- FO 351 - Forensic Entomology with Lab
- FO 376 – Digital and Forensic Imaging

- FO 377 - Death Investigation
- FO 385 - Introduction to Firearms and Toolmarks Analysis
- FO 390 – Topics in Forensic Science
- FO 404 – Victimology of Violent Crimes
- FO 406 – Investigations in Violent Crimes
- FO 415 – Forensic Anthropology
- FO 452 – Forensic Science Errors and Wrongful Convictions
- FO 481 – Cold Case Investigation
- FO 482 – Advanced Cold Case Investigation
- MA 251 - Calculus I
- MA 252 - Calculus II
- PH 383 - Physics of Medicine and the Human Body
- PH 384 - Waves and the Physics of Medicine

Typical Program

A typical program of study is as follows:

First Year

Fall Term

- BL 150 - Foundations of Biology I *and*
- BL 151 - Foundations of Biology I Lab
- PY 101 - Introductory Psychology
- SC 100 - Introduction to Sociology
- WR 100 - Effective Writing
- Language Core

Spring Term

- BL 152 - Foundations of Biology II *and*
- BL 153 - Foundations of Biology II Lab
- HS 100 - Encountering the Past
- PY 202 - Psychopathology
- ST 210 - Introduction to Statistics *or*
- ST 265 - Biostatistics
- Elective

Sophomore Year

Fall Term

- FO 101 - Introduction to Forensic Science with Lab
- CH 101 – General Chemistry I *and*
- CH 105 – General Chemistry Lab I
- EN 101 - The Art of Reading
- PL 201 - Foundations of Philosophy *or*
- TH 201 - Theology Matters
- Elective

Spring Term

- FO 102 – Introduction to Forensic Investigation with Lab
- PL 201 - Foundations of Philosophy *or*
- TH 201 - Theology Matters
- CH 102 – General Chemistry II *and*
- CH 106 – General Chemistry II lab
- EN 200-Level or HS 200-Level Course
- Fine Arts Core *or*
- Elective

Junior Year

Fall Term

- FO 322 -Forensic Ecological Evidence or
- Forensic Science Elective+
- Forensic Science Elective+
- PL 200-Level or TH 200-Level Course
- Elective
- Elective

Spring Term

- WR 326 - Technical Writing
- FO 320 – Forensic Serology of Animal and Human Body Fluids or
- Forensic Science Elective+
- Elective
- Elective
- Elective

Senior Year

Fall Term

- Ethics Core

- Forensic Science Elective+
- Forensic Science Capstone* *or*
- Elective
- Elective

Spring Term

- Forensic Science Elective+
- Forensic Science Capstone* *or*
- Elective
- Forensic Science Elective+ *or*
- Elective

Course Descriptions

BL 150 – Principles of Biology I (3.00 cr.) *Corequisite BL 151.* An examination of the molecular and cellular basis of life, specifically how cell structure determines cell function, thereby enabling cells to adapt to their environment. Topics include chemical bonding, macromolecules, genome structure, cell structure and replication, metabolism and cellular energetics, cellular homeostasis, and cell communication. *Fulfills the natural science core requirement.*

BL 151 – Principles of Biology I Lab (1.00 cr.) *Corequisite BL 150.* An introduction to laboratory work at the cellular and molecular level, in which students demonstrate the ability to use the scientific method, design of experiments, perform laboratory techniques such as pipetting and microscopy, express and interpret data in graphs and tables, perform scientific calculations and statistics, and work in diverse teams.

BL 152 – Principles of Biology II (3.00 cr.) *Prerequisite BL 150, BL 151. Corequisite BL 153.* An introduction to organismal structure and function, including how and why cells are organized into tissues, organs, and organ systems, transmission and expression of genetic information, the role of positive and negative feedback in maintaining homeostasis, and how organisms use different strategies to solve problems such as reproduction, repair and regeneration, response to the environment, transport of materials, and control via cellular communication.

BL 153 – Principles of Biology II Lab (1.00 cr.) *Corequisite BL 152.* A continued introduction to laboratory work at the organismal level, in which students demonstrate proper dissection techniques, express and interpret data in graphs and tables, perform scientific calculations and statistics, design, conduct, and adapt experiments and protocols, and work in diverse teams.

BL 281- General Genetics (3.00 cr.) An introduction to genetics focused on principles of classical, molecular, and population genetics.

BL 322 - Synthetic Biology with Lab (5.00 cr.) *Prerequisite BL 153, BL 154.* Examines the emerging field of synthetic biology, focusing on the design of biological devices and organisms. Topics include gene structure and regulation; genome organization; synthesis of whole genomes; genetic circuits; and the practical applications of synthetic biology in the creation of biofuels, production of pharmaceuticals, and development of vaccines. The laboratory employs bioinformatic tools to analyze DNA sequences and design genes, as well as bioengineering techniques to construct a portion of a genome. *IFS*

BL 341 - Molecular Genetics with Lab (5.00 cr.) *Prerequisite BL 153, BL 154.* Students are introduced to the basic principles of molecular genetics and how studies in molecular genetics have advanced fields such as genetic engineering. Topics include structure and function of nucleic acids and proteins; gene expression and regulation in prokaryotic and eukaryotic organisms; and the nature of mutations and cancer. Examines some of the genetic tools used to analyze genes. The laboratory emphasizes basic and advanced techniques of DNA, RNA, and protein manipulation. Students also learn to use computer software to access gene databases and analyze gene sequences. *IFS*

BL 431 - Biochemistry Lab I (3.00 cr.) *General principles of biochemistry including studies of the macromolecules (carbohydrates, lipids, proteins and nucleic acids), enzyme kinetics and reaction mechanisms, and intermediary metabolism. Same course as CH 431.*

BL 432 - Biochemistry Lab II (3.00 cr.) Examines select topics in biochemistry, focusing on how life processes are regulated by the interactions between molecules. Topics vary and may include energy metabolism (oxidative phosphorylation, photosynthesis, and glycogen metabolism); signal transduction cascades; amino acid and lipid metabolism; enzyme reaction mechanisms; and protein synthesis. Students lead discussions and/or make oral presentations. *Same course as CH 432.*

BL 433 - Biochemistry Lab (1.00 cr.) Designed to supplement and reinforce concepts covered in the lecture course and introduce students to the techniques of the modern biochemistry laboratory. Experiments include computer visualization of biomolecules, enzyme kinetics, chromatography, and electrophoresis. *Same course as CH 433.*

BL 434 - Biochemistry Lab (1.00 cr.) Modern experimental biochemistry focusing on techniques for the purification, characterization, and analysis of proteins. *Same course as CH 434.*

CH 101 – General Chemistry I (3.00 cr.) *Corequisite CH 105.* Basic atomic structure, periodic table, chemical equations, gases, liquids, solids, electrolysis, properties of elements and compounds, rates and mechanisms of reactions.

CH 102 – General Chemistry II (3.00 cr.) *Corequisite CH 106*. A continuation of CH 101.

CH 105 - General Chemistry Lab I (1.00 cr.) *Corequisite CH 101*. An introduction to the laboratory study of the physical and chemical properties of matter; the principles and applications of gravimetric, volumetric chemical, and qualitative analysis.

CH 106 – General Chemistry Lab II (1.00 cr.) *Corequisite CH 102*. A continuation of CH 105.

CH 201 - Quantitative Analysis (4.00 cr.) *Prerequisite CH 102.* An investigation into techniques used to determine chemical composition. Includes application of statistical analysis to chemical systems and emphasizes chemical equilibrium. Provides a foundation for advanced level courses in physical chemistry, instrumental analysis, and laboratory techniques. *Lecture/Laboratory. IFS*

CH 410 - Instrumental Methods (3.00 cr.) *Prerequisite CH 201, CH 311, CH 315. Corequisite: CH 411.* Principles and applications of analytical instrumentation. An introduction to spectroscopic, chromatographic, and electrochemical techniques. *IFS*

CH 411 - Instrumental Methods Lab (1.00 cr.) *Prerequisite CH 201, CH 311, CH 315. Corequisite: CH 410.* Covers principles and applications of some spectroscopic and chromatographic techniques. Applications of chemometrics. *IFS*

CH 431 - Biochemistry I (3.00 cr.) *Prerequisite CH 302, CH 308. Corequisite: CH 433.* General principles of biochemistry including studies of the macromolecules (carbohydrates, lipids, proteins and nucleic acids), enzyme kinetics and reaction mechanisms, and intermediary metabolism. *Same course as BL 431. IFS*

CH 432 - Biochemistry II (3.00 cr.) An examination of select topics in biochemistry, focusing on how life processes are regulated by the interactions between molecules. Topics vary and may include energy metabolism (oxidative phosphorylation, photosynthesis, and glycogen metabolism); signal transduction cascades; amino acid and lipid metabolism; enzyme reaction mechanisms; and protein synthesis. Students lead discussions and/or make oral presentations. *Same course as BL 432.*

CH 433 - Biochemistry Lab I (1.00 cr.) *Corequisite CH 431.* Designed to supplement and reinforce concepts covered in the lecture course and introduce students to the techniques of the modern biochemistry laboratory. Experiments include computer visualization of biomolecules, enzyme kinetics, chromatography, and electrophoresis. *Same course as BL 433. IFS*

CH 434 - Biochemistry Lab II (1.00 cr.) Modern experimental biochemistry focusing on techniques for the purification, characterization, and analysis of proteins. *Same course as BL 434.*

CS 115 - Cyber Security and Digital Forensics (3.00 cr.) An introduction to computer science with an emphasis on techniques and procedures for investigating digital material in conjunction with criminal investigations. Includes the recovery of digital files, network monitoring, and the operation and detection of malware. Students also get hands-on experience with data analysis and organization using spreadsheets and databases. *IFS*

CS 151 – Computer Science Through Programming (4.00 cr.) Introduces students to problem solving with the fundamentals of programming, enabling them to decompose complex problems into elementary steps for effective implementation in a modern programming language. Students work with numeric and textual data, procedural programming with conditionals and loops, basic linear data structures, and on testing their solutions. Problems may draw on topics in computer security, data encoding, graphics, games, financial analysis, physical models, and others. Provides a general survey of some of the major areas of computer science, such as digital logic, software engineering, computer graphics, artificial intelligence, theory of computation, object-oriented programming, and ethical and societal issues in computing.

CS 212 – Object-Oriented Data Structures (4.00 cr.) Students learn to program in a high level object-oriented language, with emphasis on data storage and manipulation. Students should have previous experience in programming but do not need experience in an object-oriented language. Students learn essential object-oriented concepts including object, class, message, method, inheritance, and polymorphism. They also learn the analysis of algorithms to determine if a program is correct and efficient. They apply the object-oriented and analysis concepts to data structures such as stacks, queues, priority queues, maps, and trees, as well as algorithms such as sorting and searching.

CS 312 – Object-Oriented Software Design (4.00 cr.) A continuation of CS 212. Students learn how to design and implement flexible, reusable, and maintainable object-oriented programs. The course fosters a deeper understanding of object-oriented programming, including generics, abstract classes, interfaces, inheritance and delegation, and object-oriented analysis and design. Students apply techniques learned to the analysis, design, and implementation of advanced data structures such as heaps and balanced trees, and the advanced algorithms they support.

FO 101 - Introduction to Forensic Science with lab (4.00 cr.) *Restricted to students majoring and minoring in forensic science or written permission of the department chair.* An introduction to the field of forensic science and its application in the world today. Topics include crime scene investigation, DNA analysis, questioned documents, forensic psychology, and toxicology. Lab topics include fingerprint and shoe print analysis, crime scene investigation, blood typing, and use of DNA in criminal investigation.

FO 102 – Introduction to Forensic Investigation with lab (4.00 cr.) *Restricted to students majoring in forensic science or written permission of the department chair.* The course expands on ideas and concepts in criminalistics, justice, and ethics from FO 101, while introducing the application of the scientific method to forensic science research and investigation, topics in criminal profiling, victimology, and criminal justice in the context of forensic investigations.

FO 230 - Introduction to Criminalistics (3.00 cr.) An introduction to the problems and techniques of scientific examination of forensic physical evidence with emphasis on documentation and interpretation of physical patterns. Emphasis is placed on the theoretical bases of methods of comparison and their influence on scientific interpretation of evidence. Topics include scientific photography, imprints, impressions, tool marks, gunshot residue, cordage and textile examinations. Laboratory exercises include forensic photography, analysis of fingerprints, hair, gunshot residue, and footwear outsole patterns.

FO 284 - Forensic Chemistry (3.00 cr). An examination of the fundamental issues, concepts, and methodologies associated with forensic chemical analysis of physical and trace evidence. Topics will include drug analysis, toxicology, explosives analysis, arson, firearms and tool marks, and latent prints.

FO 300 - Crime Scene Investigation (4.00 cr.) An introduction to the basic procedures and practices used in crime scene investigation including documentation and processing, methods for recovery and processing of physical and trace evidence, and procedures for establishing chain of custody and continuity of evidence. Legal and ethical requirements associated with crime scene processing will also be examined. Some field trips may be required.

FO 320 – Forensic Serology of Animal and Human Body Fluids (4.00 cr.) Introduces the basic concepts of forensic serology as it applies to the collection, preservation, and testing of biological evidence in the form of body fluids. Lectures and laboratories examine concepts and techniques related to the collection and analysis from humans as well as in veterinary and wildlife forensic investigations. *Closed to students who have taken FO 322, FO 356, BL 355, or BL 356.*

FO 322 – Forensic Ecological Evidence (4.00 cr.) Introduces biological and ecological evidence associated with crime scenes, especially evidence associated with violent crimes and death investigations. Lectures and laboratories examine concepts and techniques used for the collection and analysis of anthropological, biological, botanical, entomological, and microbial physical and trace evidence commonly discovered during crime scene investigations. *Closed to students who have taken FO 320, FO 356, BL 355, or BL 356.*

FO 330 - Biological and Forensic Science Laboratory Quality Control and Assurance (4.00 cr.) Introduction to theory and practice of quality assurance to include quality control/assurance, management, and application of statics, as applied in bioscience industry and forensic laboratory environments. Standards associated with ALCOA, ASCLD-LAB and ISO accreditation and professional certification procedures are emphasized.

FO 350 - Forensic Pattern Evidence (4.00 cr.) An examination of topics and techniques used in firearms and toolmarks analysis, shoe print and tire tread analysis, and bloodstains pattern evidence. Techniques associated with the evaluation of question documents will also be discussed.

FO 351 - Forensic Entomology w/lab (5.00 cr.) Forensic entomology is the application of basic and applied principles of insect biology and the collection of entomological data in such a manner that it can be used as evidence in criminal investigations to aid in resolving legal issues that are either criminal or civil in nature. Lectures explore the use of insects in the science of forensic entomology and its impact on death scene investigation, neglect, or abuse; contamination of food products and other marketable goods; and subsequent litigation. Laboratories focus on techniques associated with death scene investigation, particularly in the collection and identification of arthropods found on a corpse. *Some field trips may be associated with the*

laboratory portion of the course.

FO 376 – Digital and Forensic Imaging (4.00 cr.) Explores forensic imaging through discussions and laboratory and field work associated with 2D imaging and enhancement, 360 imaging done at crime scenes, 3D imaging and printing, visual evidence enhancement, witness reproduction, and medical imaging. The course includes discussions of application of forensic imaging as well as the regulation and ethical consideration of the associated methodology.

FO 377 – Death investigation (3.00 cr.) An examination of the procedures for conducting investigations of various types of human death and the investigator's role throughout the investigative process. Discussions will focus on the manner of death, including, homicide, suicide, accidental, natural, and undetermined, including examples of each and investigative characteristics.

FO 385 – Introduction to Firearms and toolmark analysis (3.00 cr.) A foundational course for the forensic examination of firearms and toolmark evidence. Firearm and ammunition development are explored, along with class and individual characteristics and identification criteria. Instrumentation, serial number restoration, and other manufacturer-related markings are also addressed. *Some field trips may be required.*

FO 390 - Topics in Forensic Science (3.00 cr.) Select topics in forensic science are examined to increase the breadth and depth of understanding of a given subject. May include student presentations depending on topic.

FO 404 – Victimology of Violent Crimes (3.00 cr.) An examination of the issues related to victims of violent crimes, including measurement of victimization, the impact on victims, discussions of typology of victims, and analysis of the victim-offender relationship. The course will examine the role of victimology in investigations of violent crimes, specifically within the context of forensic victimology and investigative profiling that require an in-depth, holistic understanding of the victim's life, their relationships with friends and family, etc.

FO 406 – Investigations in Violent Crimes (3.00 cr.) Investigations of Violent Crimes (3.00 cr.): Examination of the concepts, techniques, and methodologies used to investigate violent crimes, including sexual assault, aggravated assault, and homicides. Topics will include identification and analysis of physical and trace evidence, interviewing witnesses and suspects, and understanding of victimology and suspectology in the context of violent crimes.

FO 415 – Forensic Anthropology (4.00 cr.) An introduction to the basic knowledge of human anatomy and osteology, including human remains recovery and laboratory processes that are required of a forensic anthropologist, especially for person's identification.

FO 452 – Forensic Science Errors and Wrongful Convictions (3.00 cr.) Performs reviews of cases associated with wrongful convictions and elucidates causative factors related to scientific validity, testimony standards, laboratory management, professional development, system issues, and legal professionals and frameworks. Students learn to analyze common factors across forensic disciplines and jurisdictions, perform root cause analyses, and develop systemic reforms.

FO 481- Cold Case Investigations (3.00 cr.) A capstone experience focused on investigations of cold homicide cases. The class examines some high-profile cold cases as means to learn the methodologies and techniques used during investigations. Each student spends the term on a real cold case for investigation, culminating in an investigative and a victimology report.

FO 482 – Advanced Cold Case Investigations (3.00 cr.) Focuses on advanced techniques and concepts in investigations of cold homicide cases. The class works as a team to investigate a real cold case lead by cold case investigators. Students are taught how to examine case files including how to organize the information, to initiate a cold case investigation, and to search for old and new leads. Field trips may be included to investigate potential leads in the case. *Generally completed during senior year.*

FO 497 – Forensic Science Internship (3.00 cr.) A capstone experience in forensic science in which a student may arrange an internship in a professional setting (e.g., forensic laboratory, law enforcement agency, criminal justice services, attorney's office) to engage in an in-depth exploration of a topic associated with forensic or criminal investigation, criminal justice/criminology, law, or forensic psychology. Minimum expectation is 150 hours. A journal and reflection paper are required. *Generally completed during senior year; students should secure a faculty sponsor and obtain the approval of the department chair by the end of junior year. Written or electronic permission of a sponsoring faculty member.*

FO 498 – Forensic Science Research (3.00 cr.) A capstone experience in forensic science in which a student may engage in an in-depth exploration of a topic associated with forensic or criminal investigation, criminal justice/criminology, law, or forensic psychology through research with a sponsor/mentor (on or off campus). A preliminary paper outlining the nature and scope of the problem, experimental procedures, and associated literature and a final research paper are required. *Generally completed during senior year; students should secure a faculty sponsor and obtain the approval of the department chair by the end of junior year. Written or electronic permission of a sponsoring faculty member.*

FO 499 – Forensic Science Independent Study (3.00 cr.) A capstone experience in forensic science in which a student may engage in an in-depth exploration of a topic associated with forensic or criminal investigation, criminal justice/criminology, law, or forensic psychology through an independent study. Projects are expected to involve extensive literature reviews and independent, new analysis. A preliminary research proposal that delineates the topic and plan for investigation and a thesis paper are required. *Generally completed during senior year; students should secure a faculty sponsor and obtain the approval of the department chair by the end of junior year. Written or electronic permission of a sponsoring faculty member.*

MA 251 - Calculus I (4.00 cr.) *Prerequisite: MA 109 or a score of 56 or better on Part II of the Math Placement Test or one year of high school calculus.* A rigorous approach to Calculus for all majors. Topics include limits, definition, interpretation, and applications of the derivative; differentiation rules; antiderivatives; definition of definite and indefinite integrals; and the Fundamental Theorem of Calculus.

MA 252 - Calculus II (4.00 cr.) *Prerequisite: At least a C- or better in MA 251.* A continuation of MA 251. Techniques and applications of integration; improper integrals; parametric equations and polar coordinates; sequences and series. *IFS*

PH 383 - Physics of Medicine and the Human Body (3.00 cr.) *Prerequisite: PH 101 or PH 201.* Expands on introductory physics courses through the study of mechanics, fluids, and sound as they are applied to the human body. Examples include biomechanics, metabolism, cardiovascular system, lungs, and alveoli, and hearing. Modern medical instrumentation is covered, particularly MRI, PET, and the gamma camera. Hands-on activities are included. *A field trip may be required. IFS*

PH 384 - Waves and the Physics of Medicine (3.00 cr.) *Prerequisite: PH 102 or PH 202.* Expands on introductory physics courses through the study of geometric optics, interaction of light with tissue, nuclear physics, and ultrasound, as they are applied to modern medical instrumentation. Examples include fiber optics, CT, gamma camera, PET, MRI, and ultrasound imaging. Hands-on activities are included. *One field trip may be required. IFS*

PY 101 - Introductory Psychology (3.00 cr.) Surveys the multifaceted aspects of both the science and practice of psychology. Biological, cognitive, and social bases of behavior and mental processes are explored, as are the key features and importance of critical thinking skills and solid psychological research.

PY 202 – Psychopathology (3.00 cr.) *Prerequisite: PY 101.* A study of abnormal behavior, cognition, and affect. The definition of abnormality is explored, as well as the concept of what constitutes a mental disorder. Classification of abnormality and theories regarding the development of disorders are discussed. Current research findings concerning specific mental disorders, ethical issues, and cultural diversity are explored.

SC 100 – Introduction to Sociology (3.00 cr.) Students learn the fundamentals of sociological inquiry both as a social science focused on the study of human organization, and as an art of critiquing various modalities of human organization. This course introduces students to the history of the discipline, primary theories of social order and social change, and the methods used by sociologists to answer salient sociological questions. Focused as it is on primary challenges facing the social world, this class provides an opportunity for students to develop an appreciation for history, philosophy, politics, economics, and the liberal arts in general, while learning to think scientifically and systematically about the social world, and the social construction of the individual within the social world.

ST 210 - Introduction to Statistics (3.00 cr.) *Prerequisite: MA 109 or a score of 48 or better on Part II of the Math Placement Test or one year of high school calculus.* A non-calculus-based course covering descriptive statistics; regression model fitting; probability; normal, binomial, and sampling distributions; estimation; and hypothesis testing.

ST 265 – Biostatistics (3.00 cr.) *Prerequisite: MA 109 or a score of 48 or better on Part II of the Math Placement Test or one year of high school calculus.* A non-calculus-based course covering descriptive statistics, regression model fitting, probability, distributions, estimation, and hypothesis testing. Applications are geared toward research and data analysis in biology and medicine.

WR 325 - Professional Writing (3.00 cr.) Prepares students interested in business, the humanities, and STEM fields for writing in the workplace. Using workplace technology, such as the Microsoft Office Suite, students produce memos, résumés, cover letters, reports, proposals, and presentations. These projects require students to consider the purpose, audience, and context of professional settings when writing on the job. Students also learn how to use text and visuals together in order to create clear and persuasive documents. For team projects, students collaborate with clients or community partners to develop experiential skills. During the semester, students deliver presentations to refine public speaking skills.

WR 326 - Technical Writing (3.00 cr.) Helps students prepare for jobs that require detailed technical writing. Using industry-standard technology, such as Adobe Creative Suite and social media, students produce standard workplace documents, as well as instructions and technical descriptions, and legal documents. Students learn about project management, workplace ethics, and research methods for usability testing and user experience (UX) projects. Students collaborate in teams with clients or community partners to develop high-impact, visually dynamic documents such as grant proposals, websites, and multimedia applications. During the semester, students deliver presentations to refine public speaking skills.

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

   The university has 15 core or general education requirements of all majors. Two of core classes may also fulfill the University's diversity education requirements. Coursework in the proposed BS degree in Forensic Science fulfills 5 of the core class requirements: two social science courses and three natural and applied core classes. In addition, FO 101 Introduction to Forensic Science is a designated diversity course. The remaining core classes should be easily completed during the 4-year degree path as shown in section G4 under 'Typical Program.'

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

No specialized accreditation is required for the program.

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

   The proposal does not include contracting with another institution or non-collegiate organization.

8. Provide assurance and any appropriate evidence that the proposed program will provide students 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.

   All program requirements, including pre-requisites, curriculum, administration, financial aid, and any other relevant information will be maintained on the program's website and in the undergraduate catalogue. The department chair and academic advisors will be responsible for ensuring that the webpage remains current and that students are informed of any changes. Individual course requirements will be clearly delineated on syllabi, as well as in catalogue descriptions prior to registration. The department chair and academic advisors will also be available to discuss program/course requirements and university services during office hours or by appointment.

   Loyola provides support services that include an Office of Technology Services, Counseling Center, Disability and Accessibility Services, Financial Aid Office, the Loyola-Notre Dame Library, a National Fellowships Office, The Study, the Writing Center, and many other support services to assist students for success. Loyola's Office of Undergraduate Admissions maintains a website that provides the tuition and fee and total costs for attendance at the university.

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 proposed BS program in Forensic Science will be marketed using a variety of approaches developed by the Office of Undergraduate Admissions and Marketing and Communications. These same approaches have led to successful recruiting for the current BA in Forensic Science at Loyola that is one of the fastest growing programs on campus.

   Loyola University Maryland has a dedicated Office of Marketing and Communications. Loyola endorses and adheres to ethical principles and codes of conduct published by various national organizations. These include the Public Relations Society of America (PRSA) Code of Ethics, the National Association for College Admission Counseling (NACAC) Statement of Principles of Good Practice, the National Association of Student Financial Aid Administrators (NASFAA) Statement of Ethical Principles and Code of Conduct for Institutional Financial Aid Professionals, American Association of Collegiate Registrars and Admissions Officers (AACRAO) Professional Practices and Ethical Standards, the NAFSA: Association of International Educators Statement of Ethical Principles, and the Association for Institutional Research (AIR) Code of Ethics, which are followed by the Office of Marketing and Communications, the Admission Office, the Office of Financial Aid, the Records and Admissions Offices, the Office of International Programs,

and the Office of Institutional Research, respectively. Furthermore, the institution provides clear and accurate program information on the University's website.

Loyola's Enrollment Management team will be sent all the relevant information for the program and works closely with academic departments and the Academic Advising and Support Center to ensure that advertised information is clear and accurate. The academic department's website will be a major resource for students. At Loyola, all websites are maintained by the individual departments. This helps to ensure that content is accurate and relevant for anyone who visits a department website.

H. Adequacy of Articulation

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

No formal articulations have been developed with partner institutions at this time.

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 faulty member will teach (in this program).

   The faculty assembled to teach in the proposed BS in Forensic Science already contribute to our highly successful BA program in Forensic Science and many also teach in one or both MS degree programs in the Forensic Science Department. Each has significant experience teaching undergraduates and/or graduate students at Loyola and other institutions in Maryland. Twenty-one of the twenty-six faculty are full-time professors or instructors at Loyola, twenty have PhDs, and all of the faculty have a terminal degree in their fields. Nine of the faculty have experience as forensic practitioners, forensic consultants, and/or worked in law enforcement.

Table 9. Faculty

Faculty	Degree	Appointment	Status	Course(s)
Birget Albrecht – Chair, Chemistry	PhD Physical Chemistry	Associate Professor	Full-time	CH 101, CH 102, CH 105, CH 106
Tatiana Anderson – Crime Scene Investigator, Baltimore City Police	MS Forensic Science	Instructor	Per course	FO 300, FO 385
Richard Auer - Statistics	PhD Applied Statistics	Assistant Professor	Full-time	ST 210, ST 265

Brian Barr - Biochemistry	PhD Biochemistry	Associate Professor	Full-time	BL/CH 431, BL/CH 432, BL/CH 433, BL/CH 434
Adrian Black – Director, Office of Public Safety	EdD	Instructor	Per course	FO 319
Maren Blohm – Biology, Plant Physiology	PhD Plant Science	Professor	Full-time	BL 152, BL 153, BL 281
Hoang Bui – Computer Science	PhD Computer Science and Engineering	Associate Professor	Full-time	CS 151, CS 212
Tiffany Curtis – Writing	PhD Writing	Professor	Full- time	WR 325, WR 326
Elizabeth Dahl - Chemistry	PhD Earth System Science	Associate Professor	Full-time	CH 201, CH 410, CH 411
Marion Davidson – Forensic Anthropology, Decision Science	MS Biological Anthropology	Teaching Professor	Full-time	FO 101, FO 322, FO 390, FO 415
Rana DellaRocco – Chief, Forensic Services, Baltimore City Police	MS Forensic Science	Instructor	Per course	FO 230
Jon Fried – Graduate Director, FPA	MS Forensic Science	Teaching Professor	Full-time	FO 330, FO 350, FO 351, FO 404, FO 406
Courtney Hastings – Organic Chemistry	PhD Organic Chemistry	Associate Professor	Full-time	CH 101, CH 102, CH 105, CH 106
Armina Kazi – Molecular Biology/Cancer Biology	PhD Molecular Biology	Associate Professor	Full-time	BL 150, BL 151, BL 152, BL 153, BL 341
Aleezay Khaliq – Sociology	PhD in Public Sociology	Assistant Teaching Professor	Full-time	SOC 100
Diane Lawder – Forensic Scientist Advanced (Trace Evidence/Questioned Documents), Maryland State Police	MS Criminal Justice	Instructor	Per course	FO 376, FO 377

Mary Lowe – Physics, Fluid Dynamics	PhD Physics	Professor	Full-time	PH 383, PH 384
John Morgan – Private consultant, Department of Justice	PhD Mechanical Engineering	Instructor	Per course	FO 452,
Theresa Nguyen - Biochemistry	PhD Biochemistry and Molecular Biology	Associate Professor	Full-time	BL/CH 431, BL/CH 432, BL/CH 433, BL/CH 434
Megan Olsen - Computer Science	PhD Computer Science	Professor	Full-time	CS 151, CS 212, CS 312
David Rivers – Chair, Forensic Science	PhD Entomology	Professor	Full-time	FO 351, FO 481, FO 482, FO 497, FO 498, FO 499
Lisa Scheifele – Chair, Biology	PhD Bioinformatics	Associate Professor	Full-time	BL 150, BL 151, BL 281, BL 322
Andrew Schoeffield – Biology, Microbiology	PhD Medical Microbiology	Associate Professor	Full-time	BL 150, BL 151, BL 152, BL 153
Jijuan Tao - Mathematics	PhD Mathematics	Professor	Full-time	MA 251, MA 252
Amanda Thomas – Psychology	PhD Clinical Psychology	Professor	Full-time	PY 202
Alan Thoms-Chelsey – Graduate Director, Biological Forensics	PhD Physiology	Teaching Professor	Full-time	FO 101, FO 322, FO 390, FO 497, FO 499

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

Loyola currently offers two formal university-wide teaching enhancement workshops each year for all faculty, as well as numerous less formal pedagogical opportunities throughout the year. Several workshop sessions are dedicated to pedagogical training for faculty and instructors, including discussions of best practices for promoting student learning. In 2018 Loyola established Teaching Fellows who act as learning communities to research, incorporate, and disseminate best practices. Cohorts of teaching fellows have been formed for high-impact teaching practices, equity and inclusion, and digital teaching and learning. The

department chair is also on the editorial board for the Journal of Forensic Science Education (https://jfse-ojs-ttamu.tdl.org/jfse/index.php/jfse/index) and the European Journal of Educational Research. The chair will direct faculty in BS program to the journals and specific articles relevant to Loyola's program and students. In addition, the professional and technical writing courses offer service-learning optional projects, which are a recognized high-impact practice pedagogy.

b) The learning management system

Loyola uses the Moodle learning management system and has a fully staffed technology center. Support includes a help line for faculty, several Moodle specialists, and Moodle training workshops to help faculty use Moodle effectively. The institution also provides an Office of Digital Teaching & Learning that provides additional support and training, including support and training for face-to-face courses that supplement learning with digitally enhanced supports.

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

The program is not a distance education program; however, one course (FO 452) will be taught on-line. All Loyola courses are designed to meet university requirements and expectations. This includes any course taught through a distance education modality. Instructors of this course and any future distance learning class will be informed of pedagogical workshops, webinars and/or other venues for continuing education in best practices in evidence-based instruction. As with any mode of instruction, instructors will be expected to stay current in their field and appropriate teaching practices.

Additionally, Loyola's Office of Digital Teaching and Learning's instructional designers are available to collaborate in the development of on-line classes. Loyola follows Quality Assurance Standards for Online Education Programs including adhering to C-RAC guidelines.

J. Adequacy of Library Resources (as outlined in COMAR 13B.02.03.12).

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

Definition of the Program:

The Forensic Science Bachelor of Science program will utilize an interdisciplinary curriculum and all proposed courses in the major are currently offered as part of the Forensic Science major or Chemistry major. Loyola Notre Dame Library currently supports the Bachelor of Arts in Forensic Science, Master of Science in Forensic Pattern Analysis, and Master of Science in Biological Forensics programs. Because of this, the new degree will require no new resources. The degree prepares graduates for both of Loyola's distinctive master's degrees in forensic science and significantly contributes to the University's role as a leader in forensic education in the state and region.

Technology Support

LNDL offers a wide variety of technology that would support the instruction of the program, including virtual reality, 3D printers, a recording studio, visualization wall with touch screen capacity, video editing software, 360 cameras, laser cutter, and a large format printer. This technology has several potential uses. Possible uses for this technology include using VR to explore crime scenes, utilizing the Viz Wall for large scale projection of fingerprint or ballistic patterns, or 3D printing objects for analysis.

Research & Instruction Support

The Research and Instruction unit offers online and face-to-face scheduled consultations and assistance via 24/7 chat, the Help Desk, phone, and e-mail to support the research needs of these students. Because this is an undergraduate program and students will likely be unfamiliar with the Library, the Research and Instruction librarians can collaborate with faculty to develop just-in-time research instruction. Additionally, existing library tutorials can be embedded into the learning management system to orient students to general Library services and resources.
Adequacy of Physical Facilities, Infrastructure and Instructional Equipment (as outlined in COMAR 13B.02.03.13)

K. Adequacy of Physical Facilities, Infrastructure and Instructional Equipment

(as outlined in COMAR 13B.02.03.13)

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

   If the program is to be implemented within existing institutional resources, include a supportive statement by the President for adequate equipment and facilities to meet the program's needs.

   All the resources required for the program already exist. The curriculum is a modification of the existing BA in Forensic Science program that Loyola implemented in 2018. All the courses outlined in this proposal already exist and have been taught multiple times. Loyola currently possesses the necessary classroom and laboratory space to accommodate these existing courses, and the appropriate instructional resources, as well as faculty offices that are already in place.

   The only new resource request is for a full-time program assistant for the department of forensic science. At present, the only administrative position in the department is the Director of Program Operations, who has primary responsibilities for the two Masters of Science programs. The department chair has taken on all the functions of the program assistant. Space already exists for a desk for the program assistant in Newman 105.

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

      Students are provided with an electronic mailing system and other technologies

listed above in section G8. The institution has several computer labs and utilizes Moodle as the learning management platform.

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

Only one course, FO 452 will rely on distance learning as the primary mode of instruction. All students enrolled in the course will have access to communications through the Inside Loyola portal. Similarly, the course will be delivered through the Moodle system, to which all Loyola faculty and students have access. In addition, the Office of Technology Services provides technical support for all students with email accounts and use of Moodle. The Office of Digital Technology provides separate support for distance education courses to all students enrolled in an on-line course.

K. 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.

Narrative Rationale - Tuition and Fee Revenue
FTE growth is projected conservatively based on Loyola University Maryland enrolled undergraduates and market demand. Anticipated revenue outpaces expenses after the first year of the program.

Please see the table below for more details.

TABLE 1: PROGRAM 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)	$219,900	$540,336	$938,859	$1,474,956	$2,034,560
a. Number of F/T Students	10	24	41	63	85
b. Annual Tuition/Fee Rate	$21,990	$22,514	$22,899	$23,412	$23,936
c. Total F/T Revenue (a x b)	$219,900	$540,336	$938,859	$1,474,956	$2,034,560
d. Number of P/T Students	0	0	0	0	0
e. Credit Hour Rate	0	0	0	0	0
f. Annual Credit Hour Rate	0	0	0	0	0
g. Total P/T Revenue (d x e x f)	0	0	0	0	0
3. Grants, Contracts & Other External Sources	0	0	0	0	0
4. Other Sources (-Scholarship & Discounts)	0	0	0	0	0
TOTAL (Add 1-4)	$219,900	$540,336	$938,859	$1,474,956	$2,034,560
Notes:					
2.a Number of students based on current enrollment in the BA program and interest determined by undergraduate admission and program surveys.					
2.b. Tuition rate is based on expected 3% tuition increase per year.					
2.c. Anticipated revenue outpaces expenses each year of the program					

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.

Narrative Rationale – Program Expenditures

Loyola College has the existing faculty expertise, personnel, and instructional space to add this program to its academic offerings. Moderate new expenditures will be necessary during implementation and the first year of the program, but overall, projected revenue exceeds projected expenses after the first year of the program.

TABLE 2: PROGRAM EXPENDITURES:					
Expenditure Categories	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1. Faculty (b + c below)	$0	$9,689	$55,971	$167,698	$193,821
a. Number of FTE	0.000	0.250	0.875	2.250	2.500
b. Total Salary	$0	$9,000	$45,397	$131,623	$151,610
c. Total Benefits	$0	$689	$10,574	$36,075	$42,211
2. Admin. Staff (b + c below)	$0	$0	$0	$0	$0
a. Number of 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	$53,374	$55,129	$56,783
a. Number of FTE		0	1	1.0	1
b. Total Salary		0	40,950	42,180	43,445
c. Total Benefits		0	12,424	12,949	13,338
4. Technical Support and Equipment	$4,000	$9,600	$16,400	$25,200	$34,000
5. Library	$0	$0	$0	$0	$0
6. New or Renovated Space	$0	$0	$0	$0	$0
7. Other Expenses	$3,500	$8,400	$14,350	$22,050	$29,750
TOTAL (Add 1 – 7)	**$7,500**	**$27,689**	**$140,095**	**$270,077**	**$314,353**

Notes:

1a. Per course faculty: Year 1: 6 credits at $4,500/3-credits. Year 2-5: Number of per course faculty increases to accommodate more students. In Years 3-5 rate increase to $4,700/3-credits, using historical increases.
Teaching Faculty to support major: One added in Year 4.
Teaching Faculty in support of Core due to larger enrollment: 0.5FTE in Year 3, increasing to 1.0 FTE in Year 5. Salaries benchmarked to CUPA. Salaries increase 3%/year.
1b. Per course faculty benefit is FICA only, while Teaching faculty have a benefit rate of 30.34% in Years 1-3 and 30.70% in Years 4-5.
3b. 3% annual increase in salary is included. This is Loyola's recent historical increase.
3c. Current fringe benefits, including FICA, is 30.34%. That value was used for Year 3. As has occurred in recent years, this value slowly increases. In Year 4 and 5, in anticipation of such slow increase, 30.70% was used.

M. Adequacy of Provisions for Evaluation of Program (as outlined in COMAR 13B.02.03.15).

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

Loyola University Maryland utilizes several mechanisms for evaluating courses, including student course evaluation, faculty peer evaluations, and faculty annual updates. The latter require faculty to perform self-evaluation of courses and teaching effectiveness, and to provide evidence of achieving student learner outcomes. In turn, all of these assessment vehicles are evaluated by department chair and dean.

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.

Program level assessment will be performed using assessment plans developed specifically for the BS degree in Forensic Science. Assessment will rely on establishing a timeline for assessment of each program learner outcome identified in Appendix A. Direct evidence of student learning will be collected by the department chair and the department's undergraduate curriculum committee, along with the measures used for assessment and samples of student work. The results of the assessment will be used for continual improvement of the program. All assessment measures, assessment cycle, artifacts used for assessment, including student achievement of the program learning outcomes, and any reports will be maintained in the centralized software system used by Loyola for program level assessment. Institutional evaluation will occur in accordance with the University's and Middle State's accreditation timelines. The cost-effectiveness of the program will be reviewed annually by the dean using data generated by the University's budget model and graduate program-specific budget models.

Each department at Loyola is required to submit an annual report, which includes progress towards previous year's goals and a complete assessment report. The reports are evaluated by the dean's office annually, and the dean meets with the chair each year to discuss departmental progress. Programs also engage in academic program review on a seven- year cycle at Loyola.

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.

Loyola University Maryland has a strategic focus on enhancing equity and inclusion for the university community. The University is committed, through its mission and core values, to creating a community that embraces and celebrates the inherent value and dignity of each person. The strategic plan goal to enhance equity and inclusion guides faculty and administrators' work toward promoting inclusive academic excellence. Specifically, teaching practices identified by AAC&U as highly impactful for the success of all students are being incorporated more fully in academic and cocurricular programs across the University. The provost has invested in related professional development by funding cohorts of faculty fellows to explore, employ, disseminate, and support high-impact

teaching strategies. Faculty Fellows for High-Impact Practices (HIPs) are represented in all three schools, including the School of Arts and Sciences. Following a similar model, a cohort for Equity & Inclusion Fellows and a cohort for Digital Teaching and Learning has been established.

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.

   The proposed program is not a low productivity program.

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.

   Loyola University Maryland is approved to offer distance education and abides by C-RAC Guidelines, but this concentration is not a distance education.

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 proposed program is not a distance education program but does offer a few courses through distance education.

   The development of online courses at Loyola University Maryland is based on industry best practices as well as institution-specific quality benchmarks and Loyola abides by C-RAC Guidelines.

   The Office of Digital Teaching & Learning, composed of instructional designers and multimedia technicians, is charged with ensuring the highest quality standards in online teaching and learning. In this way, Loyola University Maryland's online course design, development, and delivery frameworks are consistent with, while also extending beyond, the recommendations of and standards set forth by the industry leading standards-based frameworks of Quality Matters and the Online Learning Consortium Quality Scorecard, while also incorporating the Community of Inquiry framework to further define and inform measures of quality.

Appendix A. Forensic Science curriculum map

Forensic Science curriculum map

Institutional learning aim	*Program learning aim*	*Course(s)*
Excellence in a discipline, including understanding of the relationship between one's discipline and other disciplines; understanding the interconnectedness of all knowledge	Students will master current factual content, concepts, theoretical perspectives, and historical trends of different subfields of forensic science.	FO 101, FO 102, FO 230, FO 300, FO 319, FO 322, FO 351, FO 377, FO 415, FO 450, FO 452, FO 481, FO 497, FO 498, FO 499
Demonstrate the ability to use speech and writing effectively, logically, gracefully, persuasively, and responsibly	Students will demonstrate proficiency in communicating effectively in a variety of formats, including verbal, written, and symbolic channels, relevant to forensic investigation, criminology, and presentations in the judicial system.	FO 101, FO 102, FO 230, FO 300, FO 319, FO 322, FO 351, FO 377, FO 415, FO 450, FO 452, FO 481, FO 497, FO 498, FO 499, WR 325, WR 326
Critical understanding of and competence in a broad range of communications media		
Ability to use mathematical concepts and procedures competently, and to evaluate claims made in numeric terms		
An appreciation of the great moral issues of our time: the sanctity of human life, poverty, racism, genocide, war and peace, religious tolerance and intolerance, the defense of human rights, and the environmental impact of human activity	Students will develop an understanding of the moral and ethical issues surrounding crime and forensic investigation.	FO 101, FO 102, FO 230, FO 300, FO 319, FO 322, FO 351, FO 377, FO 415, FO 450, FO 452, FO 481, PY 202, WR 325, WR 326
Ability to analyze and solve problems using appropriate tools	Students will demonstrate a clear understanding of major concepts and techniques used in subfields of forensic science based on their ability to read, interpret, and critically evaluate primary literature; design experiments or conduct independent investigation to test ideas and hypotheses; and interpret data through statistical and graphical packages.	FO 101, FO 102, FO 230, FO 300, FO 319, FO 322, FO 351, FO 377, FO 415, FO 450, FO 452, FO 481, FO 497, FO 498, FO 499, PY 202, WR 325, WR 326

Appendix B: Program Advising Worksheet for B.S. in Forensic Science

Program Requirements for Proposed **Forensic Science** (B.S.)	
Courses	**Credits**
Liberal Arts Core	
1. WR 100 Effective Writing	3
2. History 100 Encountering the Past	3
3. EN 101 The Art of Reading	3
4. History 200 Level ***OR*** English 200 Level	3
5. World Language Intermediate II Level (104 level)*	3
6. PY 101 Introductory Psychology ***	3
7. SC 100 Introduction to Sociology ***	3
8. Fine Arts (AH109. AH110, AH111, DR250, DR251, DR252, MU201, MU202, MU203, MU204, PT270, SA224 or SA227)	3
9. ST 110 *or* ST 210 *or* ST 265 ***	3
10. BL 150 Foundations of Biology I (3 cr.) with *** BL 151 Foundations of Biology I Lab (1 cr.)	4
11. BL 152 Foundations of Biology II (3cr.) with *** BL 153 Foundations of Biology II Lab (1 cr.)	4
12. PL 201 Foundations of Philosophy	3
13. TH 201 Theology Matters	3
14. PL 202 – 299 ***OR*** TH 202 – 299	3
15. Ethics: PL 300 – 319 (**If student took TH 202 – 299 for #14**) TH 300 – 319 (**If student took PL 202 – 299 for #14**)	3
Diversity and Justice Course**	
Diversity and Justice Course**	
Program Core Courses	
16. FO 101 Introduction to Forensic Science with Lab	4
17. FO 102 Introduction to Forensic Investigation with Lab	4
18. FO 320 Forensic Serology of Animal & Human Body Fluids ***OR*** FO 322 Forensic Ecological Evidence	4
19. PY 202 Psychopathology	3
20. WR 325 Professional Writing ***OR*** WR 326 Technical Writing	3
21. Forensic Science Capstone – FO 498 Forensic Science Research or	3

FO 497 Forensic Science Internship, or FO 499 Forensic Science Independent Study	
Natural Science Core Courses	
BL 150 - Foundations of Biology I and BL 151 - Foundations of Biology I Lab	Counts toward Loyola Core and Major requirements
BL 152 - Foundations of Biology II and BL 153 - Foundations of Biology II Lab	Counts toward Loyola Core and Major requirements
22. CH 101 – General Chemistry I and CH 105 – General Chemistry I Lab	4
23. CH 102 – General Chemistry II and CH 106 – General Chemistry II Lab	4
ST 210 - Introduction to Statistics or ST 265 - Biostatistics	Counts toward Loyola Core and Major requirements
Social Science Core Courses	
PY 101 - Introductory Psychology	Counts toward Loyola Core and Major requirements
SC 100 - Introduction to Sociology	Counts toward Loyola Core and Major requirements
Forensic Science Electives *(Select 5 courses from 32 courses offered by Natural and Applied academic departments)*	
24. Forensic Science Electives	3-5
25. Forensic Science Electives	3-5
26. Forensic Science Electives	3-4
27. Forensic Science Electives	3-4
28. Forensic Science Electives	3-4
29. Free Elective	3
30. Free Elective	3
31. Free Elective	3
32. Free Elective	3

33. Free Elective	3
34. Free Elective	3
35. Free Elective	3
36. Free Elective	3
37. Free Elective	3
38. Free Elective	3

List of Forensic Science Electives

BL 281 - General Genetics	3
BL 322 - Synthetic Biology with Lab	5
BL 341 - Molecular Genetics with Lab	5
BL 431 - Biochemistry I *and* BL 433 - Biochemistry Lab I	4
BL 432 - Biochemistry II *and* BL 434 - Biochemistry Lab II	4
CH 201 - Quantitative Analysis	4
CH 410 - Instrumental Methods *and* CH 411 - Instrumental Methods Lab	4
CH 431 - Biochemistry I *and* CH 433 - Biochemistry Lab I	4
CH 432 - Biochemistry II *and* CH 434 - Biochemistry Lab II	4
CS 115 - Cyber Security and Digital Forensics	3
CS 151 - Computer Science through Programming	4
CS 212 - Object-Oriented Data Structures	4
CS 312 - Object-Oriented Software Design	4
FO 230 - Introduction to Criminalistics	3
FO 300 - Crime Scene Investigation	4
FO 319 – Supporting 21st C Policing with Forensic Evidence	3
FO 330 - Biological and Forensic Science Quality Assurance	3
FO 350 – Forensic Pattern Evidence	3
FO 351 - Forensic Entomology with Lab	4
FO 376 – Digital and Forensic Imaging	4
FO 377 - Death Investigation	3
FO 385 - Introduction to Firearms and Toolmarks Analysis	3
FO 390 – Topics in Forensic Science	3
FO 404 – Victimology of Violent Crimes	3
FO 406 – Investigations in Violent Crimes	3
FO 415 – Forensic Anthropology	4
FO 452 – Forensic Science Errors and Wrongful Convictions	3
FO 481 – Cold Case Investigation	3
MA 251 - Calculus I	4
PH 383 - Physics of Medicine and the Human Body	3
PH 384 - Waves and the Physics of Medicine	3

*Students who place higher than the 104 level on Loyola's foreign language placement exam may be exempt from the foreign language core requirement, pending confirmation from Loyola's Modern Language department after a proctored on-site placement exam. Those students will need to complete 1 additional free elective in lieu of the foreign language core.

**The Diversity and Justice course requirements may simultaneously fulfill a Core, Major, Minor or Elective requirement. The Diversity and Justice courses and the Diversity courses may be taught in any discipline and will focus on domestic diversity, global diversity, or justice awareness. The Diversity-Justice and Diversity requirements must be taken at Loyola.

*** Required courses for the major that also meet Loyola Core requirements.