

PROGRAM MODIFICATION PROPOSAL FORM

Name of Institution: Francis Marion University

Briefly state the nature of the proposed modification:

The Chemistry department is proposing to add a new concentration to the basic chemistry major. The forensic science option in chemistry offers students a basic chemistry major that includes courses from the criminal justice curriculum for work in forensic fields including SLED and/or advanced degrees in forensic science.

Current Name of Program: B.S. in Chemistry with Environmental Science option, ACS-certified major in chemistry.

Proposed Name of Program: B.S. CHEMISTRY – Forensic Science Option in Chemistry

Program Designation:

- | | |
|---|--|
| <input type="checkbox"/> Associate's Degree | <input type="checkbox"/> Master's Degree |
| <input checked="" type="checkbox"/> Bachelor's Degree: 4 Year | <input type="checkbox"/> Specialist |
| <input type="checkbox"/> Bachelor's Degree: 5 Year | <input type="checkbox"/> Doctoral Degree: Research/Scholarship (e.g., Ph.D. and DMA) |
| <input type="checkbox"/> Doctoral Degree: Professional Practice (e.g., Ed.D., D.N.P., J.D., Pharm.D., and M.D.) | |

Does the program currently qualify for supplemental Palmetto Fellows and LIFE Scholarship awards?

- Yes
 No

If No, should the program be considered for supplemental Palmetto Fellows and LIFE Scholarship awards?

- Yes
 No

Proposed Date of Implementation: August 2020

CIP Code: 40.0501

Current delivery site(s) and modes: Francis Marion University campus (Site Code: 50301); Traditional/face-to-face

Proposed delivery site(s) and modes: Francis Marion University campus (Site Code: 50301); Traditional/face-to-face

Program Contact Information:

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Institutional Approvals and Dates of Approval:

Departmental Approval November 20, 2019

Academic Affairs Committee Approval January 23, 2020

Faculty Senate Approval February 4, 2020

FMU Faculty Approval February 11, 2020

Provost Approval February 11, 2020

President Approval February 11, 2020

Background Information

The new forensic science option in chemistry offers students a basic chemistry major that includes courses from the criminal justice curriculum for work in forensic fields including SLED and/or advanced degrees in forensic science. This forensic option requires the completion of general education courses and the requirements for the basic chemistry major along with selected criminal justice courses from sociology and political science focusing on areas such as criminology, social deviance, violence, alcohol and drugs, judicial processes, and policing. As part of the mission statement reads, "Topics and concepts on the fundamental laws of nature that govern the physical universe and on the methods of scientific inquiry used to investigate and develop those laws are the foundations of course content." This methodology includes the area where science and law intersect; forensics. The aim of this new track is to ensure that students who complete it will be technically competent, proficient in scientific principles, and knowledgeable about societal and institutional criminal justice settings. It is intended for undergraduate students with a strong career interest in forensic science. By offering this additional option for students in chemistry, our department hopes to increase enrollment and retention (Strategic Plan, Objective VII) and develop formal job placement relationships with local business, governmental and public organizations (Objective X).

Assessment of Need

A substantial number of chemistry and biology majors are interested in forensic/criminal justice careers after graduation from FMU, and this option aids students in being prepared for that field. Forensic science and crime scene investigation (CSI) has become increasingly more popular in the past decade. By offering a related degree program in that area, we will be able to meet the demand of this growing need.

Transfer and Articulation

There are no special articulation agreements for the modified proposed program.

Description of the Program

Projected Enrollment						
Year	Fall Headcount		Spring Headcount		Summer Headcount	
	New	Total	New	Total	New	Total
2020-2021	0	39	0	39		
2021-2022	2	41	2	41		
2022-2023	3	44	3	44		
2023-2024	5	49	5	49		

Enrollment Projections are based on observation of enrollment trends over the last 5 years in Chemistry. The projected first year (new) students should enter program in 2021-2022 with anticipated graduation in four (4) years. As seen in projected enrollment figures, between 5-10 new students overall are expected to enter this program within the next four - five years.

Curriculum

In developing this curriculum, we looked at student interest and our existing curriculum to see if it was possible to create student opportunities for study that would benefit both the institution and the student body utilizing our current offerings. This way we would be able to maximize student opportunity without creating a resource burden on the institution. Forensic science is a very popular field of study, and an investigation of our current curriculum showed us that we already have in place the majority of the tools needed to provide students with this course of study. All of the courses listed in the curriculum below, except for Chemistry 204 noted under “New Courses,” already exist in our course offerings. By creating and offering Chemistry 204, Essential Forensic Chemistry, we are giving students the base knowledge and perspective within the discipline to apply to the existing courses in the various disciplines.

Curriculum Changes

Courses Eliminated from Program	Courses Added to Program	Core Courses Modified
None	Chemistry 204 (Essential Forensic Chemistry)	None

New Courses

CHEM 204 Essential Forensic Chemistry: Understanding the Evidence (4:3-3) This course aims to explain the scientific principles and techniques behind the work of crime scene investigators (CSIs) and will be illustrated with various case studies. Topics will include crime scene investigation procedures and principles, collection and physical evaluation of evidence, fingerprint classification, blood analysis and much more. Labs will focus on method analysis of crime scenes. Current trends in forensic chemistry addressing scientific, technological, and societal effects will be explored. This course emphasizes the importance of investigation and the legal process through accurately questioning, hypothesizing, analyzing data, concluding, and communicating. Additionally, scientific processes will be applied in focused lab activities.

Curriculum Sheet

BS in Chemistry-Forensic Science Option	120-122 Hours
General Education Requirements (48-49 Hours)	
English 101 (or English 101E/L)	3 or 4 Hours
English 102	3 Hours
Speech Communication 101	3 Hours
Political Science 101 or 103	3 Hours
Political Science 230	3 Hours
Sociology 201	3 Hours
Literature	3 Hours
History	3 Hours
Art 101, Music 101, or Theater 101	3 Hours
Humanities Elective	3 Hours
Math 132 or 137	3 Hours
Math 134	3 Hours

Biology 105/107, 115	4 Hours
Biology 106/108	4 Hours
Chemistry 101	4 Hours
Chemistry Requirements (34-35 hours)	
Chemistry 102 General Chemistry II: Intro to Inorganic Chemistry	4 Hours
Chemistry 201 Organic Chemistry I	4 Hours
Chemistry 202 Organic Chemistry II	4 Hours
Chemistry 203 Analytical Chemistry I: Quantitative Analysis	4 Hours
Chemistry 301 Physical Chemistry I	4 Hours
Chemistry 303 Analytical Chemistry II: Instrumental Analysis	4 Hours
Chemistry 499 Chemistry Senior Capstone	1 Hours
Chemistry at or above 300:	3 or 4 Hours
302 Physical Chemistry II (4 Hours)	
313 Environmental Chemistry (4 Hours)	
402 Inorganic Chemistry (3 Hours)	
405 Advanced Organic Chemistry (3 Hours)	
407 Introduction to Polymer Science (3 Hours)	
408 Biochemistry II (3)	
Electives (Recommended from Chemistry, Sociology or Political Science)	6 Hours
Forensic Science curriculum (38 Hours)	
Chemistry 404 Biochemistry I	3 Hours
Chemistry 497 Special Studies	1 Hours
Chemistry 204 Essential Forensic Chemistry	4 Hours
Sociology 341 Criminology	3 Hours
Sociology	3 Hours
342 Social Deviance	
343 Juvenile Delinquency	
344 Violence in Society	
347 Alcohol, Drugs, and Society	
Political Science	3 Hours
206 Introduction to the Law	
330 Perspectives on Policing	
331 Administration of Justice	
Physics 201 Technical Physics II	4 Hours
Physics 202 Technical Physics III	4 Hours
Math 201 Calculus I	3 Hours
Math 202 Calculus II	3 Hours
Math 203 Calculus III	3 Hours
Biology 205 Human Anatomy	4 Hours

Curriculum by Year					
Course Name	Credit Hours	Course Name	Credit Hours	Course Name	Credit Hours
Year 1					
Fall		Spring		Summer	
Math 132(Trig) or 137 (Pre-Calc)	3	Math 134 (Stats)	3		
Chem 101 (General) & Lab	4	Chem 102 (General) & Lab	4		
Eng 101 (101E/L)	3/4	Eng 102	3		
Social Science (Pol. Sci. 101/103)	3	Humanities (Art, Music, Hist. etc.)	3		
Communications (Speech 101)	3	Biology 105 & 115 or 107	4		
Total Semester Hours	16/17	Total Semester Hours	17	Total Semester Hours	
Year 2					
Fall		Spring		Summer	
Math 201 (Calc I)	3	Math 202 (Calc II)	3		
Chem 201 (Organic) & Lab	4	Chem 202 (Organic) & Lab	4		
Biology 106 or 108	4	Physics 201 & Lab	4		
Humanities (Art, Music, Hist. etc.)	3	Humanities (Literature)	3		
Humanities (History)	3	Social Science (Soc. 201)	3		
Total Semester Hours	17	Total Semester Hours	17	Total Semester Hours	

Course Name	Credit Hours	Course Name	Credit Hours	Course Name	Credit Hours
Year 3					
Fall		Spring		Summer	
Chem 203 (Quant) & Lab	4	Political Science 230	3		
Chem 301 (PChem I) & Lab	4	Chem 303 (Instrumental) & Lab	4		
Physics 202 & Lab	4	Biology 205 & Lab	4		
Math 203 (Calc III)	3	Soc. 341 (Criminology)	3		
Total Semester Hours	15	Total Semester Hours	14	Total Semester Hours	
Year 4					
Fall		Spring		Summer	
Soc. (Crime and Deviance)	3	Chem 300 or 400 level	3/4		
Political Science 206, 330, or 331	3	Chem 499 (Capstone)	1		
Chem 404 (Biochem I)	3	Chem 497 (Forensic Research)	1		
Elective	3	Essential Forensic Chem 204	4		
		Elective	3		
Total Semester Hours	12	Total Semester Hours	12/13	Total Semester Hours	
Year 5					
Fall		Spring		Summer	
Total Semester Hours	60/61	Total Semester Hours	60/61	Total Semester Hours	

Similar Programs in South Carolina offered by Public and Independent Institutions

Identify the similar programs offered and describe the similarities and differences for each program.

Program Name and Designation	Total Credit Hours	Institution	Similarities	Differences
Forensic Science Concentration in Chemistry, B.S.	120	University of South Carolina Upstate	Basic chemistry major with criminal justice courses	Our program at FMU offers a forensic chemistry course (Chem 204) as well as a forensic research course (Chem 497) in addition to criminal justice courses

Faculty

We are utilizing primarily existing courses and faculty to support the new track, so no new faculty are needed.

Resources

Library Resources:

There are no new library resources needed for this modification. The library provides adequate resources to support Chemistry and Forensic Science. The bulk of our titles are available electronically via various databases.

E-JOURNALS

There are 3,742 e-journal titles available via Ebsco Discovery Search for chemistry and 292 e-journal titles for forensic science.

E-BOOKS

We have six e-book collections that contain works pertaining to chemistry and forensic science. A breakdown is provided below:

ProQuest Ebook Central: 59,148 titles for chemistry; 20,524 for forensic science

Credo Reference eBook Collection: 34,840 titles on chemistry; 1,183 on forensic science

Ebsco eBook collection: 3,505 on chemistry, 226 on forensic science

Gale Virtual Reference Library: 205 titles on chemistry; 603 on forensic science

Science Direct ebooks: 1,158 on chemistry; 25 on forensic science

Springer ebooks: 6,935 on chemistry; 226 on forensic science

Our other database subscriptions that support chemistry or forensic science include:

ACS | American Chemical Society Journal

Applied Science & Technology

JSTOR

Project Muse

Academic Search Complete

Credo Reference

Gale Reference Sources

Science Direct

Science Reference Center

PRINT MATERIAL

The library currently has 3,828 print titles for chemistry and 12 print titles for forensic science.

Lastly, PASCAL Delivers is a rapid book-delivery service provided by the Partnership Among South Carolina Academic Libraries which enables students, faculty and staff across the state to request and receive books from academic libraries in South Carolina. Per our institutional membership, FMU students and faculty may utilize this service to supplement their research needs when print resources are not available in-house.

Our faculty library liaison within the Department of Chemistry will continue to collaborate with our library faculty and staff to maintain our needed resources.

There is no new equipment needed for this modification. Our existing equipment, budget, and maintenance plan for equipment needs is adequate and will continue to be evaluated to ensure that program needs are met.

Below is an inventory of our major instruments. Most of these instruments are interfaced to computers for data acquisition and processing.

Francis Marion University Department of Chemistry Major Instruments

<u>Manufacturer</u>	<u>Model</u>	<u>Instrument Name</u>
Gow-Mac	69-350	Gas Chromatograph x4
Shimadzu	GC-17A v3.	Gas Chromatograph
Shimadzu	GC17A/QP-5000	GC/Mass Spectrometer
Agilent	5973N	GC/Mass Spectrometer with autosampler
Shimadzu	AA-6501	Atomic Absorption Spectrometer1
Shimadzu	SPD-10AV	UV-Vis Detector
Shimadzu	UV-1601	UV-Vis Spectrophotometer
Shimadzu	UV-1800	UV-Vis Spectrophotometer
Ocean Optics	USB2000	UV-Vis spectrometer
Shimadzu	SCL-10A	Controller
Waters	410, M5110 SDS	Gel Permeation Chromatograph
Varian	2050/2010/4290	HPLC
Shimadzu	LC-10AS	HPLC
Hitachi	R-1500	FTNMR (60MHz EFT-FT-NMR)
MIDAC	M1000	FTIR Spectrophotometer
Midac	PRS-102	FTIR Spectrophotometer
Perkin-Elmer	1600	FTIR x 2 (with ATR and DRIFTS accessories)
Perkin-Elmer	DSC7Y	Differential Scanning Calorimeter
Perkin-Elmer	LS50B	Luminescence Spectrophotometer
Turner	430	Spectrofluorometer
Rudolph	63	Polarimeter
Rudolph	5IA3	Polarimeter
Steig & Reuter	SR6	Polarimeter
PAR	174	Polarographic Analyzer
M317Parr	3911	Hydrogenation Apparatus
Fisher	T1081-1	Surface Tensiometer
Precision System	S 4002	Osmometer
Johnson-Matthey	MSB-1	Magnetic Susceptibility Balance 5/90

Computers and Software

- 1 Site license to Gaussian 09 Computational and Molecular Modeling Software
- 1 SHELXTL Crystallographic Software Package
- 1 Site license to CAChe Molecular Modeling Software Package
- 1 ChemDraw Software Package
- 1 Site license to MatLab
- 1 PLS_toolbox for MatLab (Chemometrics package)
- 1 Patriot Cluster (Supercomputer housed in FMU Department of Physics and Engineering)
- 25 PC computers with a wide variety of general software installed

Facilities:

There are no new facilities needed for this modification. Our existing facilities and facilities maintenance plan are adequate for the current program and will continue to be evaluated to ensure that program needs are met.

The Chemistry Department (<http://www.fmarion.edu>) enjoys excellent facilities for an undergraduate institution. It is housed on the third floors of two connecting buildings, the Leatherman Science Facility, a modern four-story complex that was completed in 1994, and the three-story McNair Science Building. The Chemistry Department's facilities are devoted to both undergraduate research and teaching. The space devoted to undergraduate research is highly adequate to fulfill the needs of the proposed research. This space includes a large lab, a prep room, and a stock room. The 1270 sq. ft. research lab, once used for organic chemistry labs until 1994 when the new organic lab in Leatherman was completed, contains 32 individual student work stations, each equipped with a fume hood. There are also six large hoods that are used for more elaborate work. Also available for undergraduate research when not in heavy use for teaching are the department's six teaching labs and its two computer labs. The Rogers Library offers a wide variety of chemistry journals, books, reference material and electronic databases to support the proposed research. Further, the Library provides the entire campus with access to SciFinder Scholar, ScienceDirect, and interlibrary loan that allow the chemistry faculty access to almost any journal article or book not currently available on campus.

Impact on Existing Programs

Will the proposed program impact existing degree programs or services at the institution (e.g., course offerings or enrollment)? If yes, explain

Yes

No

This proposed forensic science option for the chemistry degree should increase numbers of those graduating with degrees in chemistry. It will also make use of the new course, Chemistry 204 Essential Forensic Chemistry.

Financial Support

Estimated Sources of Financing for the New Costs						
Category	1 st	2 nd	3 rd	4 th	5 th	Total
Tuition Funding	415,272	436,568	468,512	521,752	585,640	2,427,744
Program-Specific Fees						
Special State Appropriation						
Reallocation of Existing Funds	198,943	209,145	224,448	249,954	275,459	1,157,949
Federal, Grant, or Other Funding						
Total	614,215	645,713	692,960	771,706	861,099	3,585,693
Estimated New Costs by Year						
Category	1 st	2 nd	3 rd	4 th	5 th	Total
Program Administration and Faculty and Staff Salaries	232,170	244,076	261,936	291,701	321,466	1,351,349
Facilities, Equipment, Supplies, and Materials	24,757	26,027	27,931	31,105	34,279	144,099
Library Resources	10,358	10,889	11,686	13,014	14,342	60,289
Other (specify)	141,624	148,887	159,781	177,938	196,094	824,324
Total	408,909	429,879	461,334	513,758	566,182	2,380,062
Net Total (i.e., Sources of Financing Minus Estimated New Costs)	205,305	215,834	231,627	257,948	294,917	1,205,631

Budget Justification

Analysis of the program financial operations shows that the program will generate revenues sufficient to cover total cost within the first year of enrollment. The demand and class size of this program will provide tuition revenue to increase the school and FMU's net income over the foreseeable future. Costs of the program are based on the proportional share of this program's share of the chemistry program and its proportional share of library resources and indirect costs.

Evaluation and Assessment

Program Objectives	Student Learning Outcomes Aligned to Program Objectives	Methods of Assessment
Students will demonstrate that they have the knowledge and skills needed that will allow them to communicate chemistry effectively in both oral and written form. (Chem 201, 202, 203, 204, 497, 499)	Students in the Chemistry Senior Capstone course, on average, will perform at the 80% level or above when demonstrating competency in presenting technical information through oral communication.	Presentation (Oral), Talks and/or posters at conferences, courses in which students receive a grade for research papers/presentations.
Students will demonstrate that they can adequately apply their knowledge of chemistry (Chem 497 and 499)	80% of graduating Chemistry students will, on average, perform at the 50 th percentile or above when demonstrating their understanding of integrated chemical concepts based on their performance on a nationally standardized chemistry exam.	DUCK exit exam, exit interviews
Students will demonstrate an understanding of safe laboratory skills and procedures for laboratory experiments that they perform (Chem 101, 102, 201, 202, 203, 204, 301, 303, 497)	100% of students enrolled in Chemistry 201 will demonstrate an understanding of laboratory safety procedures at the 70% level or above	Safety exam, graded lab reports, presentations, research papers

Will any the proposed modification impact the way the program is evaluated and assessed? If yes, explain.

Yes

No

As part of FMU's ongoing Institutional effectiveness and assessment process, upon implementation of the new concentration (forensic science option), the faculty will evaluate the assessment model and realign it as necessary to reflect the desired outcomes of the new concentration.

Will the proposed modification affect or result in program-specific accreditation? If yes, explain; and, if the modification will result in the program seeking program-specific accreditation, provide the institution's plans to seek accreditation, including the expected timeline.

Yes

No

Will the proposed modification affect or lead to licensure or certification? If yes, identify the licensure or certification.

ACAP

06/09/2020

Agenda Item 3r

Yes

No

Explain how the program will prepare students for this licensure or certification.

If the program is an Educator Preparation Program, does the proposed certification area require national recognition from a Specialized Professional Association (SPA)? If yes, describe the institution's plans to seek national recognition, including the expected timeline.

Yes

No