



COPPIN
STATE UNIVERSITY
— EST. 1900 —

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July 28, 2020

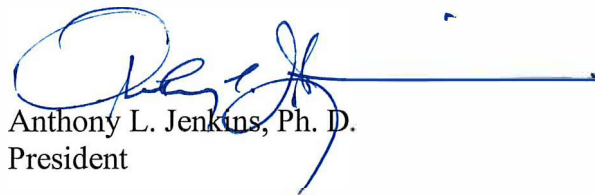
Dr. James D. Fielder, Jr.
Secretary of Higher Education
Maryland Higher Education Commission
6 North Liberty Street
Baltimore, MD 21201

Dear Dr. Fielder:

I am seeking your approval to offer a Masters of Science in Applied Molecular Biology and Biochemistry at Coppin State University (CSU). The new degree will be a total of 34 credits and its proposed codes are CIP 26.0210 and program code 0414-00. The program will contribute to STEM, workforce and innovation, and economic growth goals of Maryland as identified in the University System of Maryland's Strategic Plan.

The proposal has the approval of appropriate campus committees and was submitted to me for my endorsement. I am pleased to recommend this proposal and request your approval. Should you have any questions, please contact me or my staff. Additionally, you may contact Dr. Leontye Lewis, Provost and Vice President for Academic Affairs.

Sincerely,



Anthony L. Jenkins, Ph. D.
President

cc: Dr. Leontye L. Lewis, Provost & Vice President for Academic Affairs
Dr. Antoinette Coleman, Associate Vice Chancellor for Academic Affairs
Dr. Emily A. A. Dow, Assistant Secretary
Dr. James Takona, Dean, College of Arts and Sciences & Education
Mr. Michael W. Bowden, Assistant Vice President for Planning & Assessment



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Cover Sheet for In-State Institutions

New Program or Substantial Modification to Existing Program

Institution Submitting Proposal	Coppin State University
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Each action below requires a separate proposal and cover sheet.

- | | |
|---|---|
| <input checked="" type="radio"/> New Academic Program | <input type="radio"/> Substantial Change to a Degree Program |
| <input type="radio"/> New Area of Concentration | <input type="radio"/> Substantial Change to an Area of Concentration |
| <input type="radio"/> New Degree Level Approval | <input type="radio"/> Substantial Change to a Certificate Program |
| <input type="radio"/> New Stand-Alone Certificate | <input type="radio"/> Cooperative Degree Program |
| <input type="radio"/> Off Campus Program | <input type="radio"/> Offer Program at Regional Higher Education Center |

Payment <input type="radio"/> Yes	Payment <input checked="" type="radio"/> R*STARS	Payment 850.00	Date
Submitted: <input type="radio"/> No	Type: <input type="radio"/> Check	Amount:	Submitted: 07/20/20

Department Proposing Program	Natural Sciences		
Degree Level and Degree Type	Masters of Science		
Title of Proposed Program	Applied Molecular Biology and Biochemistry		
Total Number of Credits	34		
Suggested Codes	HEGIS: 0414.00	CIP: 26.0210	
Program Modality	<input checked="" type="radio"/> On-campus <input type="radio"/> Distance Education (<i>fully online</i>)		
Program Resources	<input type="radio"/> Using Existing Resources <input checked="" type="radio"/> Requiring New Resources		
Projected Implementation Date	<input type="radio"/> Fall <input checked="" type="radio"/> Spring <input type="radio"/> Summer Year: 2021		
Provide Link to Most Recent Academic Catalog	URL: www.coppin.edu/catalogs		
Preferred Contact for this Proposal	Name: Michael Bowden		
	Title: Asst. Vice President for Planning & Assessment		
	Phone: 410-951-3010		
	Email: mbowden@coppin.edu		
President/Chief Executive	Type Name: Leontye L. Lewis, Ed. D., Provost & VPAA		
	Signature:		Date: 7/31/2020
	Date of Approval/Endorsement by Governing Board:		

Revised 4/2020

UNIVERSITY SYSTEM OF MARYLAND INSTITUTION PROPOSAL FOR

<input checked="" type="checkbox"/>	New Instructional Program
<input type="checkbox"/>	Substantial Expansion/Major Modification
<input type="checkbox"/>	Cooperative Degree Program
<input checked="" type="checkbox"/>	Within Existing Resources, or
<input type="checkbox"/>	Requiring New Resources

Coppin State University

Institution Submitting Proposal

Master of Science in Applied Molecular Biology and Biochemistry

Title of Proposed Program

Master of Science

Award to be Offered

Spring 2021

Projected Implementation Date

0414-00

Proposed HEGIS Code

26.0210

Proposed CIP Code

Natural Sciences

Department in which program will be located

Dr. Mintesinot Jiru

Department Contact

410-951-4139

Contact Phone Number

mjiru@coppin.edu

Contact E-Mail Address

Signature of President or Designee

Date

A. Mission-Centrality to Institutional Mission and Planning Priorities:

1. Mission of CSU: CSU is a historically black university located in Baltimore, Maryland. CSU is accredited by the Middle States Commission on Higher Education. The proposed MS program builds on the strength of the existing undergraduate program in Biology and Life Sciences to offer students an opportunity to pursue postgraduate education. The mission of CSU is to educate a multi-generational student population and provides innovative education opportunities while promoting lifelong learning. The university fosters leadership, social responsibility, civic and community engagement, cultural diversity and inclusion, and economic development. The major academic programs of the institution that impact the communities are in Education, Health Care, and in STEM areas. CSU primarily focuses in these disciplines to prepare students to be competitive in the state, region, nation, and world employment markets.

2. Strategic Plan of CSU: The strategic plan of CSU states that “Coppin will continue to identify and offer academic programs designed to alleviate key workforce shortages such as those in STEM and cyber security. The University aims to continue promoting graduate and professional education among its students to enable them to be more competitive in the workforce. This goal includes promoting a culture of innovation and entrepreneurship in a variety of disciplines that can lead to collaborative initiatives among faculty and academic units for partnerships external to the university”.

3. Alignment of New Post Graduate Program with CSU’s Mission and Strategic Plan Priorities: As stated above, the mission of CSU is to educate its students and cultivate their capacity for life-long learning so that they are prepared for the constantly evolving demands at the workplace. While designing this program, the Department of Natural Sciences made sure that the post graduate program aligns with the mission and strategic goals of CSU. As indicated in the strategic plan of the University and the recent blackboard study, STEM has been identified as one of the priority areas for growth. The proposed program will expose students to an advanced level of learning in molecular biology and biological chemistry and prepare them to either pursue PhD programs or seek employment opportunities in the biotechnology and pharmaceutical industry. We believe graduates from this program will be important contributors to research in molecular diagnostics of various human diseases. Coppin’s newly built Science and Technology Center (STC) has the capability to provide high quality molecular biology and biochemistry programs. Also, with its cutting-edge technology for instruction and research, the STC will also provide opportunities for the professional development of faculty and students and assist the University to advance the State’s agenda of increasing the numbers of health care professionals and STEM graduates.

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

1. Demonstrate demand and need for the program in terms of meeting present and future needs of the region and the State in general based on one or more of the following:

a) Need for advancement and evolution of knowledge:

Maryland is a biotech hub, with~ 150-200 biotech companies, hence there is a high demand for well-trained molecular biologists and biochemists. Moreover, Coppin State University is strategically situated in the heart of Baltimore city serving primarily citizens

of Baltimore city, Baltimore county, and neighboring regions. Introduction of graduate and certificate program in Applied Molecular Biology & Biochemistry is proposed with the intent to attract more minority students to pursue advanced science degrees, which have been projected by the Bureau of Labor Statistics as some of the most rapidly growing job markets. Increasing the number of graduates prepared to pursue these professions will help in filling these positions and increase their employment rate.

Regional need: Baltimore City Public Schools need more highly qualified teachers to teach and train high school students in biology. We anticipate that some graduates of AMBB will plan to be teachers and opt to teach biology to high school students to prepare them for college education. This in turn will strengthen and expand the capacity of HBCUs to provide high quality education in biology for the next generation.

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

The proposed Master's program has applications in various fields of biomedicine, pharmaceuticals, and health care. The coursework of this program is designed to equip students with multiple skills enabling not only employment in various sectors but also prepares them for doctoral programs. The strategic location of CSU is crucial for attracting minority populations who may find it very difficult to access such programs elsewhere due to social and financial constraints.

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

The proposed program directly addresses this issue. This kind of program does not exist in any of the HBCUs in Maryland. This will be the first of its kind to provide applied knowledge in molecular biology and biochemistry at the postgraduate level. The program will attract graduates from HBCUs in Maryland as well as other states. The need for such a program, therefore, justifies its implementation.

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

1. Describe the potential industries, employment opportunities, and expected level of entry:

It is understood that in today's competitive employment market, students are looking for a degree that provides a high likelihood of return on their time and financial investment. Molecular biology and Biochemistry are areas of study that involve an in-depth and detailed study of biological and biochemical processes at the molecular level. Because MS in AMBB degree is highly specialized, graduates will come into the job market with a skill-set that is highly sought after. The federal government, currently the main provider of jobs for molecular biologists in Maryland, has made it clear in recent years that the need is considerable in this area of specialization. The Bureau of Labor Statistics (BLS) estimates that many new job opportunities in the biomedical and molecular biology field will always be opened with constant and continuing growth. This is mainly due to the many new discoveries and technologies being brought to light and the need for researchers to take over labs or handle new equipment. A shortage of well-prepared

professionals is expected, which means recent graduates should have no difficulty finding a position, even with little to no experience under their belt. This program will contribute well trained graduates to fulfill the work force demand in Maryland-DC-Virginia biotech corridor.

2. Employment data for candidates with MS degree:

Labor Statistics (2019)								
Occupation	Employment with bachelor's degree	Percent with bachelor's degree	Employment with master's degree	Percent with master's degree	Median annual wage for bachelor's degree	Median annual wage for master's degree	Wage premium amount	Wage premium percent
Environmental scientists and geoscientists	30,737	47	25,079	38	62,000	80,000	18,000	29
Biological scientists	26,993	43	21,414	34	50,000	60,000	10,000	20

Footnotes: Source: U.S. Census Bureau, American Community Survey. The wage premium represents the wage increase for workers with a master's degree over that for workers with a bachelor's degree in the occupation.

3. Evidence of Market Surveys

The Department of Natural Sciences conducted a survey that was conducted internally and externally to determine demand for the new program. The initial survey administered throughout its department determined that current undergraduates within existing biology and chemistry programs would be interested in obtaining the new degree. Also, exit surveys revealed that Coppin's graduates within the natural sciences desired to remain at the university and pursue relevant graduate degrees if they were available as offerings.

4. Current and Projected Supply for Prospective Graduates

Survey results indicated that there would be 15 or more undergraduate students who would enroll in the first year of the program and by year 5, more than 50 undergraduate students are expected to be enrolled and on a path to graduation, contingent upon full approval to offer the program. This information is supplied in the resources and expenditure section of the proposal. The U.S. Bureau of labor also indicates that 18% of jobs will require a master's degree in 2022. A master's degree can make it easier to transition into more senior management and leadership positions. Also, those with a master's degree earn 35% more than an employee with a bachelor's degree. Interestingly, enhanced professional networking of master's degree holders is also recorded. Therefore, career advancement, specialized knowledge, increased earning potential, life-long learning and enhanced professional networking opportunities are possible. The U.S. Census Bureau, American Community Survey published wages earned by various groups of employees with selected STEM occupations in which workers with a master's degree earned a premium over workers with a bachelor's degree in STEM.

Also, as an institution, enhanced visibility of CSU among academicians, researchers, and program managers as a result of the new program activities will be able to attract new

undergraduate students and master's degree applicants. Moreover, this will be a steppingstone to bring PhD. Programs, and research capabilities, scholarships and Fellowships to CSU.

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.

Currently, several institutions in Maryland offer MS programs in Biology, Molecular Biology, Biochemistry and molecular biology, cellular and molecular biology and applied molecular biology. The proposed MS program in AMBB is significantly different from other MS programs such as MS in applied molecular biology (UMBC), Biochemistry and molecular biology (UMB and UMBC) and cellular and molecular biology (UMD) offered at our sister institutions in Maryland. This is because the course content designed for the proposed MS in AMBB includes a combination of advanced molecular biology and biochemistry courses with emphasis on bench- to- bedside applications. For example, courses such as Biomarkers and molecular diagnostics is purely applied towards the clinical manifestations of human and animal diseases diagnostics at the molecular level. The applied aspects of the program make it highly novel and unique, compared to current programs (mentioned above) offered at other institutions. Course schedules will be devised taking into consideration students who may have full time employment.

List of MS programs offered in our sister institutions related to the proposed CSU MS in AMBB:

1). UMBC's MS in Applied Molecular Biology: The M.S. program in Applied Molecular Biology (APMB) is an intensive, **two semester graduate program** that combines state-of-the-art training in the laboratory methods of molecular biology with a set of **four lecture courses** that provide the theoretical background for the field. Founded in 1981, the program was the first of its kind in the U.S.

2). UMD's Graduate Program in Biochemistry and Molecular Biology: It is an **intercampus** program that consists of faculty and departments on two University of Maryland campuses including the University Of Maryland School Of Medicine on the University of Maryland, Baltimore (UMB) campus and the University Of Maryland Baltimore County (UMBC). Together, they offer courses of study leading to the Master of Science and Doctor of Philosophy degrees. Graduate Program provides top-tier training in Biochemistry & Molecular Biology and boasts nationally renowned faculty members. The quality of mentoring afforded to each of our graduate students is of the highest caliber. The Graduate Program in Biochemistry & Molecular Biology's research foci include, Structural Biology (crystallography and NMR spectroscopy), Gene Expression & Regulation, Cardiac Muscle Biology, DNA Repair & Cancer Cell Biology, Fluorescence Spectroscopy and Viral DNA Packaging

3). The Cellular and Molecular Biomedical Science (CMBS) MS Program at the University of Maryland emphasizes **medically relevant scientific research and education**, utilizing state-of-the-art resources. The program is designed as a 2-year curriculum for full-time students, but may be completed over 5 years for part-time, working students. Students will become fluent in the study and implementation of biomedical research and will be well prepared as skilled researchers for careers in

academic research centers, government, and industry, including biotechnology firms and pharmaceutical companies. The CMBS MS Program combines traditional areas of biomedical study, including molecular and cell biology, neuroscience, pharmacology, physiology, cancer biology, and genomics into a unique interdisciplinary graduate training program. Specifically designed to develop scientists for the post-genomic era, CMBS students will gain knowledge, research skills, and familiarity with the state-of-the-art biomedical tools and methodologies to solve important and timely questions in biomedical science.

2. Justification for the proposed program

All the MS programs offered by our sister institutions are the following:

1. Two-semester programs focused on laboratory methods;
2. Intercampus programs focused on structural biology; and
3. Medically relevant scientific research and education.

Therefore, MS in AMBB is unique in both structural and contextual aspects with emphasis on advanced laboratory techniques and research opportunities in various areas including but not limited to infectious diseases, vision research, molecular biomarkers and developmental biology. It is imperative to note that CSU is an HBCU located in the heart of Baltimore surrounded by populations woefully underrepresented in the sciences and where baccalaureates do not even get the opportunities for post graduate education in other institutions for various reasons. The proposed program offers a unique opportunity for these students to pursue higher education, which will have a highly significant impact on reducing the achievement gap, increase employment potential, and will be a step forward in uplifting the socioeconomic status.

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

CSU is an HBCU and the mission and strategic goals of the institution are always programmed towards educating African American and minority student populations. CSU is proposing this high demand program to provide opportunities, mainly for minority students, who have the desire to pursuing academic careers in research and development in health care industries, biotech and pharmaceutical industries. Coppin is uniquely situated to be able to operate this program.

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

This Master's program in Applied Molecular Biology and Biochemistry is unique to the HBIs and will have a significant impact on CSU in fulfilling its mission. HBIs are engaged in creating high-demand programs that serve the workforce demand of their states. CSU, as one of the HBIs, is proposing this new program as there is a critical need, especially of African Americans (and minorities, at large), in the workforce, mainly in the field of Molecular Biology and Biochemistry.

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

1. Description of the program's establishment and faculty overseeing instruction of the program

The program was established using new and existing courses within the department to establish the proposed program. The Department of Natural Sciences (NS) at CSU offers

undergraduate programs in Biology and Life Sciences and Chemistry with concentrations and tracks in various professional disciplines (Pre-medicine, Pre-physician assistant, and Pre-pharmacy programs). These programs provide instruction in the fundamental concepts and theories, principles, and techniques in biological sciences (such as animal and plant sciences, human anatomy & physiology, microbiology, cell biology and molecular biology, and environmental science) and Chemistry (Organic, physical, advanced, and Biochemistry). The courses in the undergraduate programs are especially designed for students who are interested in acquiring knowledge and understanding of the basic concepts of biology, and its applications to biomedicine, allied health professions, and environmental sciences. Students also get experience in biology lab instrumentation, biotechnology methods, study of anatomical models, and physiology experiments.

The new MS program in Applied Molecular Biology and Biochemistry (AMBB) is being established to provide a unique and ideal framework for studying and understanding advanced concepts of biochemistry and molecular biology, develop interdisciplinary and integrative abilities in order to prepare competent professionals to solve problems in the field of applied biochemistry and molecular biology. This program envisions educating and training in applied molecular biology and biochemistry; such advanced learning will eventually help in developing molecular diagnostics. In addition, students will acquire hands-on experimental skills, which are required to test the principles governing AMBB by using advanced methods and techniques and instrumentation in biochemistry and molecular biology and biotechnology laboratories. The programs also provide opportunities for students to develop research skills (including critical thinking and analysis) as graduate students will be required to undertake thesis work in infectious diseases, vision research, metabolic studies in various tissues, chemistry of biomolecules, protein engineering, and cell culture methodologies. Students in this program are required to take a total of 34 Credits; 25 credits must be earned from core courses such as Advanced Biostatistics, Advanced Biochemistry, Advanced Molecular Biology, Protein Engineering, Bio-Omics and Seminars, 4 credits should be earned from elective courses—either Biological membranes or Biomarkers and Molecular diagnostics, and 6 credits must be earned from a successful execution and completion of thesis research. The research thesis will require an independent, original, and scholarly investigation of suitable research work guided by a faculty member from the Department of Natural Sciences. Students who complete a minimum of 15 credits of the program will receive a Post Baccalaureate Certificate in in AMBB.

2. The educational objectives and intended student learning outcomes.

General educational objectives of the program:

The Master of Science in AMBB program is designed to provide an ideal framework for studying and understanding the advanced concepts of biochemistry and molecular biology, develop interdisciplinary and integrative abilities in order to prepare competent professionals to solve problems in the field of applied biochemistry and molecular biology. This program, in addition, is designed to provide hands-on experimental skills, which are required to test the principles governing AMBB by using advanced methods and techniques of biochemistry and molecular biology in laboratories. The program also provides ample opportunities for students to develop research skills, including critical thinking and analysis. Students will also be required to undertake thesis\ work in infectious diseases, molecular aspects of ophthalmology, metabolic studies in various tissues, chemistry of biomolecules, protein engineering, biopolymers, and cell culture methodologies.

3. Explain how the institution will:

Provide assessment of student achievement of learning outcomes in the program:

a) Specific objectives of the program and student learning outcomes

1. Students will acquire hands on laboratory experiences in biochemistry, molecular biology, and computation biology used in investigating and resolving normal and abnormal structures and functions of biological molecules and learn to design and conduct research projects
2. Students will understand that several experimental methods can be used to achieve a specific goal. Students will understand limitations for each research method and explore how each method is used to answer a wide range of biological questions.
3. Students will learn how to articulate and critique scientific papers and writings and acquire necessary skills in writing research reports, manuscripts, thesis, and oral presentation.
4. Students will acquire sound knowledge in theoretical aspects of molecular biology and its applications.
5. Students will demonstrate mastery of the scientific method and scientific primary literature, the design and application of experiments, and evaluation of data and apply biological knowledge to individual, community, and global problems. Also, students will demonstrate awareness of legal and ethical implications of scientific issues in society and demonstrate scientific ethical conduct.
6. The key objective of this program at CSU is to develop workforce in the specialization of molecular biology and biochemistry among minority student population. Additional information is included in a separate section.

Coppin students' experiences and instruction will be anchored within an academic framework of the University's Student Learning Outcomes (SLOs) such as Oral and Written Communication and Analytical Reasoning. These SLOs, by definition, represent the university's commitment to provide students with academic experiences that support their ability to write clear expository and persuasive prose; to use valid research-based arguments as support for their written or oral positions; to express their ideas in language that is both appropriate to the topic and for the target audience, and to write and speak proficiently for those various audiences. Moreover, students will be trained to apply classical and/or current theories and principles from specific content areas; to use critical judgments from a combination of evidences and assumptions to reach viable conclusions; and to collect, analyze, and interpret data via computational literacy and scientific reasoning.

b) document student achievement of learning outcomes in the program

Through the Assessment Committee utilizing Blackboard Outcomes and the Nuventive software platform, assessment of student learning will be regularly monitored, reviewed, and if necessary, enhancements to the curriculum will be provided to ensure student success. The Assessment schedule of the university will drive routine and systematic assessment of learning.

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

Core Courses: BIOL 500, BIOL 501, BIOL 502, BIOL 503, BIOL 504, BIOL 505 and BIOL 508

Total Credits: 25

BIOL 500

Course Number and Title: *BIOL 500 Biostatistics*

Semester: Spring

Credit hours: 3

Course Description: Advanced Biostatistics (Core)

This course is designed for an understanding of the principles of experimental design and experimental data analysis; hypothesis testing; application of statistical methods for comparing discrete and continuous data including ANOVA, t-test, correlation, and regression.

BIOL 501

Course Number and Title: *BIOL 501- Advanced Biochemistry (Core)*

Semester: Fall

Credit hours: 4

Course Description: Advanced Biochemistry

The course is designed for an advanced understanding of macromolecules by analyzing the biophysical and biochemical properties of macromolecules and how these physicochemical properties are exploited in various biological pathways for a better understanding of the role of these molecules. In addition, a brief introduction to methods used to determine the structures of macromolecules and supramolecular assemblies will be presented. The knowledge gained will be exploited to understand the physicochemical basis of structure-function relationships in macromolecules.

BIOL 502

Course Number and Title: *BIOL 502-Advanced Molecular Biology (Core)*

Semester: Fall

Credit hours: 4

Course Description: Organization and Expression of Genetic Information

This course is designed to provide an advanced level of understanding on the structure of DNA, RNA and protein. Understanding on the physical and chemical properties of DNA, RNA AND proteins coupled with their roles in cellular metabolism. Emphasis will be placed on the contemporary scientific findings on the principles, processes, and methodology of molecular Biology.

BIOL 503

Course Number and Title: *BIOL 503 Protein Engineering (Core)*

Semester: Spring

Credit hours: 4

Course Description: Protein Engineering: Structural and Functional Analyses of Proteins

This course is designed to understand the concepts, principles and applications of various expression systems for protein production and bio-separations, protein purification.

Emphasis will be placed on protein engineering by directed mutagenesis and rational design for the production of novel proteins. Understanding the *in vitro* synthetic enzymatic biosystems for biomanufacturing.

BIOL 504

Course Number and Title: *BIOL 504 Molecular and Biochemical Signaling (Core)*

Semester: Fall

Credit hours: 4

Course Description: **Molecular and Biochemical Signaling**

This course is designed for students to understand how cells communicate by means of extracellular signaling molecules. The mechanism of synthesis, assembly and delivery of these signaling molecules will be discussed. Also, a detailed mechanism that these signaling molecules recognize and bind to receptors on the surface of the target cells will be studied in detail. The interaction of signaling molecules and the elicitation of signal transduction pathways for an effective communication within the cells will also be addressed in detail. Also, how intracellular cascades of molecules transduce various signals for a functional response of the downstream molecules within the cells will also be analyzed.

BIOL 505:

Course Number and Title: *BIOL 505, BIO OMICS (Core)*

Semester: Spring

Credit hours: 4

Course Description: **BIO OMICS: Genomics, transcriptomics, proteomics and metabolomics**

This course is designed to study the fundamental principles of genomics, transcriptomics, proteomics, and metabolomics by meta-analysis of structural and functional aspects of genomes, transcriptomes, proteomes, and metabolomes of various organisms. Bioinformatics principles and tools will be applied and analyzed both in theoretical and experimental approaches.

BIOL 506:

Course Number and Title: *BIOL 506, Biomarkers and molecular diagnostics (Elective)*

Semester: Fall

Credit hours: 4

Course Description: **Biomarkers and molecular diagnostics (Elective)**

This course is designed to understand detailed biochemical, molecular biological, and cell biological approaches used in the diagnosis of various abnormalities in human population by using -Nucleic Acids, -protein, -carbohydrate and lipid –based biological markers. This course will also provide the opportunity for students to understand the latest technological advances, diagnostic applications and improve the future prospects for molecular approaches to disease diagnosis.

BIOL 507:

Course Number and Title: *BIOL 507, Biological Membranes (Elective)*

Semester: Fall

Credit hours: 4

Course Description: **Biological Membranes (Elective)**

This course is designed to understand the integrated perspective on the biogenesis, dynamics and physiological functions of biological membranes and cellular micro-compartments.

CHEM 507:

Course Number and Title: *CHEM 507, Instrumentation (Elective)*

Semester: Fall

Credit hours: 4

Course Description: *Instrumentation (Elective)*

A course that explains the theory and operation of 10 instruments used to characterize matter. This course is available for students in the polymer and material science master's program and the microbiology master's program. The instruments studied are FTIR, Raman, UV-VIS, NMR, Circular dichroism, mass spectrometry, HPLC, GC MS, AA, and metrohm voltammetry.

BIOL 508:

Course Number and Title: *BIOL 508, Seminar (Core)*

Semester: Fall

Credit hours: 2

Course Description: *Seminar: Learnings from Nobel Discoveries in Biochemistry, Physiology and Medicine.*

This course is designed for students to do literature search, analyze invited speakers lectures and student presentations, their significant findings presented at the lectures, the findings significance and how the findings strengthen science in general. Students should write a report and submit for evaluation to the course director.

BIOL 509:

Course Number and Title: *Biol 509, Techniques in Molecular Biology (Elective)*

Semester: Spring

Credit hours: 2

Course Description: *Techniques in Molecular Biology*

This course is designed to provide hands-on experience in various advanced molecular biological and immunological techniques for the development of diagnostics for various clinical manifestation related to human health. This course is also designed for students to learn molecular, biochemical and pharmacological aspects of various diagnostic methodologies.

BIOL 510:

Course Number and Title: *BIOL 510, Research and Dissertation (Core)*

Semester: Fall

Credit hours: 6

Course Description: *Research and Dissertation: Requirement (6 credits)*

An independent, original, and scholarly research investigation is required for a M.S. Degree. The thesis must be written using APA format. It must be submitted to the master's Program Office as a research thesis in the form specified by the CSU Graduate School Guidelines for Thesis and Dissertations. It will then be considered and accepted or rejected by the student's research advisor(s) and the thesis committee. A Candidacy Exam/proposal of the thesis topic must be completed by the beginning of the second year of the program. The graduate program coordinator will then form a committee to evaluate the candidacy proposal and submit his/her recommendation to the Chair of the Natural Sciences Department and the Dean of the Graduate School for approval.

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

a. The proposed program is a graduate level degree. Students admitted into this program are expected to have met all General Education Requirements of a receiving institution and shall demonstrate the credentials by providing evidence of a bachelor's degree.

b. Identify Any Specialized Accreditation of Graduate Certification Requirements

Currently, there are no specialized accreditation requirements established for the program, nor any graduate certification requirement.

6. Identify Any Specialized Accreditation of Graduate Certification Requirements

Currently, there are no specialized accreditation requirements established for the program, nor any graduate certification requirement.

7. Contracting with Another Institution

The university is not contracting with another institution or non-collegiate organization to administer this program.

8. Assurance of Providing Students with Clear, Complete, and Timely Information:

Advertising in the Graduate Catalog will detail that the Master of Science in AMBB program is designed to provide an ideal framework for studying and understanding the advanced concepts of biochemistry and molecular biology, develop interdisciplinary and integrative abilities in order to prepare competent professionals to solve problems in the field of applied biochemistry and molecular biology. This program, in addition, is designed to provide hands-on experimental skills, which are required to test the principles governing AMBB by using advanced methods and techniques of biochemistry and molecular biology in laboratories. The program description and services will also be provided on the department's website, as well as the college level page location. It will be noted that the program provides ample opportunities for students to develop research skills, including critical thinking and analysis. Students will also be required to undertake thesis\ work in infectious diseases, molecular aspects of ophthalmology, metabolic studies in various tissues, chemistry of biomolecules, protein engineering, biopolymers, and cell culture methodologies.

9. Assurance of Advertising, Recruiting, and Admissions Materials Represent the Program and Services Available

The program will be advertised within the Graduate Catalog along with the appropriate student supports. As appropriate, the catalog will direct students for academic advising, disability, and counseling services should the need arise.

H. Adequacy of Articulation

To date, there have been no articulation agreements. However, should the need arise for partnerships and other collaborative opportunities, the university will commit resources to ensure partnerships that have a positive impact on student success and contribute to the STEM are forged.

I. Adequacy of faculty resources (as outlined in COMAR 13B.02.03.11)

Dr. Kavita Hegde, MD, Ph. D. in Biochemistry, Full time Associate Professor of Biology
Dr. Kavita Hegde's research investigating the molecular mechanisms of oxidative stress induced damage to the lens and retina. She has experiences in teaching Biochemistry, Neuroscience and Human Anatomy and Physiology courses.

Dr. Thavamani Rajapandi, Ph. D. in Molecular Biology, Full time Associate Professor of Biology
Dr. Rajapandi's research project pertains to malaria transmission from human to mosquitoes: Molecular mechanism(s) of differentiation of transmissible form of Plasmodium falciparum malaria in human and the development of transmission blocking small molecules and monoclonal antibodies.

Dr. Jacob Adeyeye, Ph. D. in Molecular Biology, Full time Associate Professor of Biology
Dr. Adeyeye's research is focuses on (1) Analysis and Characterization of MRSA capsular material with the view of exploring some of the epitopes for vaccine development and (2) Regeneration of Conocephalum conicum as influenced by mineral nutrients, light and gravity.

Dr. Dondra Griggs, Ph. D. in Molecular Genetics, Full time Assistant Professor of Biology
Dr. Dondra Griggs: Dr. Grigg's research deals with the maternal effect genes required for axes formation of the vertebrate embryo. She has been primarily focusing on the involvement of cytoskeletal cross-linker proteins to establish oocyte polarity using zebrafish as a model organism.

J. Adequacy of library resources (as outlined in COMAR 13B.02.03.12).

Coppin State University has a library on-campus with adequate resources such as books, computers, reading rooms, etc. for students. Journals and books from libraries of other institutes in the University System of Maryland are available through inter-library loan.

K. Adequacy of physical facilities, infrastructure and instructional equipment (as outlined in COMAR 13B.02.03.13)

1. The new, \$80 million, 150,332 sq. ft. Science and Technology Center (STC) at CSU, reflects a remarkable transformative opportunity at Coppin, especially for the STEM. The center is well-equipped and houses laboratories, classrooms, and study areas for students, and enables access to cutting edge, high performance in sciences and technology. The Biology laboratories have capabilities for tissue and cell culture, spectrophotometry, gel electrophoresis, high resolution microscopes, thermocyclers (for polymerase chain reaction) etc. Chemistry research laboratories are equipped with NMR, UV-VIS-IR spectrophotometers, fluorescence spectrophotometers, gas chromatography, atomic force microscope, etc. STC also has highly sophisticated instruments such as scanning and transmission electron microscopes, which will be used for various biomedical research projects. The Center has a vivarium with capability of housing small and medium-sized laboratory animals used in the conduct of biomedical research.

2. Students enrolled in the program are assigned an email address, access to the institution's Learning Management System, Blackboard, and all other appropriate platforms to support the student's experience. Additionally, students are able to access 24/7 OIT Student Help desk should needs arise using any of the technology.

L. Adequacy of financial resources with documentation (as outlined in COMAR 13B.02.03.14)

The new program will be housed in the newly built Science and Technology Center (STC) building. The STC has state-of-the-art technology for classrooms and laboratories. Delivery of the program will be in existing space and is not contingent on additional funds.

The Department of Natural Sciences is having discussions with NSF to establish a Center of Research Excellence in Science and Technology (CREST) at Coppin State University. Funds from this program will be used to support the PMS program.

The success of this program will require faculty members specialized in biochemistry, cell and molecular biology, bioinformatics, biostatistics and various active research programs by the faculty. Current faculty can support a part of the required teaching, research and advisement and faculty in the department of Mathematics will teach the statistics course. This program will require 2 full-time faculty members (over five years) and the faculty salary will be partly paid from the tuition revenues (Table 1) and the staff support will be provided by CSU. The Department is also actively pursuing grants from the National Science Foundation (NSF) to create a CREST center to support the new graduate program and its students.

Resources and Expenditures

TABLE 1: RESOURCES					
Resources Categories	(Year 1)	(Year 2)	(Year 3)	(Year 4)	(Year 5)
1.Reallocated Funds ¹	0	0	0	0	0
2. Tuition/Fee Revenue ²	76155	257214	543177	941945	1713089
(c+g below)					
a. #F.T Students	3	6	9	13	16
b. Annual Tuition/Fee	7901	7901	7901	7901	7901
Rate					
c. Annual Full Time	23703	47406	71109	102713	126416
Revenue (a x b)					
d. # Part Time Students	2	4	6	8	11

e. Credit Hour Rate	4371	4371	4371	4371	4371
f. Annual Credit Hours	6	12	18	24	33
g. Total Part Time	52452	209808	472068	839232	1586673
Revenue (d x e x f)					
3. Grants, Contracts, &	50,000	50000	100000	0	0
Other External					
Sources ³					
4. Other Sources	0	0	0	0	0
TOTAL (Add 1 - 4)	126,155	307,214	643,177	941,945	1,713,089

TABLE 2: EXPENDITURES					
Expenditure Categories	(Year 1)	(Year 2)	(Year 3)	(Year 4)	(Year 5)
1. Total Faculty Expenses	91780	91780	149750	156400	216390
(b + c below)					
a. # FTE	1	1	2	2	2
b. Total Salary	70000	70000	125000	130000	189000
c. Total Benefits	21780	21780	24750	26400	27390
2. Total Administrative					
Staff Expenses (b + c below)					
a. # FTE	0.5	0.5	0.5	1	1
b. Total Salary	18000	18000	18000	36000	36000
c. Total Benefits	1440	1440	1440	2880	2880
3. Total Support Staff	0	0	0	0	0
Expenses (b + c below)					
a. # FTE	0	0	0	0	0
b. Total Salary	0	0	0	0	0
c. Total Benefits	0	0	0	0	0
4. Equipment	0	0	0	0	0
5. Library	125	125	0	0	0
6. New or Renovated Space	0	0	0	0	0
7. Other Expenses	0	0	0	0	0
TOTAL (Add 1 - 7)	91905	91905	149750	156400	216390

Narrative for Table 2. Program needs and expenditures

Program Director:

The MS in AMBB program will be overseen by a Program Director who will also teach molecular biology and biochemistry. The remaining courses will be taught by a combination of current faculty in the department of natural sciences and adjunct faculty.

New Faculty positions:

Two new fulltime faculty will be hired over the next 5 years.

Funding source: CSU

Administrative Staff:

The program will be administrated by the program director, a faculty member with support from staff.

Funding source: CSU

Support Staff (recruitment):

The program will need a staff person who will be charged to recruit graduate students

Funding source: CSU

Equipment

MS in AMBB program will rely mostly on existing infrastructure. Additional equipment such as a DNA sequencer, protein purification columns and Fluorescent microscope will be purchased.

Funding source: CSU

Other expenses

A marketing budget to help launch the program will be needed.

Funding source:

CSU, CREST grant, other NSF

M. Adequacy of provisions for evaluation of program (as outlined in COMAR 13B.02.03.15).

1. The curriculum, program faculty, and student learning outcomes will be routinely evaluated throughout the semester, annually, and as required by the USM's periodic review process. The program, courses, and faculty will be evaluated using student surveys and program committee reviews on a regular basis. The faculty are also evaluated by Department Chair and peers. The graduate curriculum and assessment tools will be reviewed every five years to determine effectiveness in achieving the proposed program's objectives and outcomes. Standard rubrics will be used for various assessment methods. Samples are included in the course syllabi. The student assessment method includes tests, quizzes, capstone assignments, written assignment, and oral presentation. In addition, students will be required to write term papers and a thesis paper based on laboratory research. A well-written thesis that is scientifically thorough and technically sound will be expected of the students before graduation. Students will also be assessed for proficiency in oral presentations. Faculty evaluations will be conducted once a year, as is the current norm, by the departmental Chair.

Faculty members will be evaluated on teaching ability, research publication and scholarship, and community engagement. In addition, faculty evaluations by students will be done twice a year, in the fall and spring semesters.

2. The Institution through the Assessment Committee will evaluate academic programs for their impact on teaching and learning, and student success. A comprehensive assessment system and process has been established by the acquisition of a new software platform and evaluation committees charged by the institution's President and Chief Academic Officer.

N. Consistency with the State's minority student achievement goals (as outlined in COMAR 13B.02.03.05 and in the State Plan for Postsecondary Education).

1. Of the total student population at CSU, a historically black university, over 80% are minority. The faculty and staff of CSU are well trained to work with multi-generational and minority student population. According to Maryland State Plan for Postsecondary Education, reducing the achievement gap is an important goal not only because it helps to remedy persistent social inequalities, but also because it improves the overall educational attainment of the State's population. Although the achievement gap is not a new issue within the State, Maryland remains committed to improving outcomes for groups that have historically lagged behind those of their peers. Chief among these groups are: 1) African Americans, roughly 30% of all Marylanders and the State's largest racial/ ethnic minority group; 2) Hispanics, the State's fastest-growing minority population; and 3) Pell Grant recipients (i.e., low-income students), approximately 30% of all undergraduate students in Maryland. In addition to closing gaps in performance among student populations, there is also a commitment to narrowing disparities that exist among postsecondary institutions in the State. Specifically, Maryland must focus on narrowing the retention and graduation gaps that exist between the State's historically black colleges and universities (HBCUs) and its traditionally white institutions (TWIs).

Promote and implement practices and policies that will ensure student success.

As stated in *Higher Education Tomorrow: 2017-2021 State Plan Goals and Strategies*, CSU has policies and practices that are student-focused and ensure student success. Plans are in place for the execution of student advisement and individualized supervision of every student attending CSU. CSU also has robust plans for non-traditional students' success. MS in AMBB program will support both traditional and nontraditional students' success by providing evening classes and weekend lab work, which will enable them to have a full-time job while taking their MS studies. As stated in *Higher Education Tomorrow; 2017-2021 State Plan Goals and Strategies*, CSU will continue to ensure equal educational opportunities for all Marylanders by supporting all postsecondary institutions (Strategy 4), ensure that statutes, regulations, policies, and practices that support students and encourage their success are designed to serve the respective needs of both traditional and non-traditional students (Strategy 5), improve the student experience by providing better options and services that are designed to facilitate prompt completion of degree requirements (Strategy 6). and enhance career advising and planning services and integrate them explicitly into academic advising and planning (Strategy 7).

Innovation: Foster innovation in all aspects of Maryland higher education to improve access and student success.

CSU will develop new partnerships with other colleges, mainly with other HBCUs and businesses with biotech companies in Maryland to support workforce development and improve workforce readiness (Strategy 8) in order to strengthen and sustain development

and collaboration in addressing teaching and learning challenges (strategy 9), expand support for research and research partnerships (Strategy 10), and will encourage a culture of risk-taking and experimentation (Strategy 11). The proposed “MS in AMBB” program in the Department of Natural sciences is aimed at accomplishing these goals. Also, faculty supported student research and development activities will help to fulfill strategies 8, 9, 10, and 11 by making novel innovations by performing high risk research projects for novel discoveries.

Therefore, the need for this program at CSU is more on the societal needs, including expanding educational opportunities and choices for minority and educationally disadvantaged students. It is an absolute need to strengthen and expand the capacity of CSU, an HBCU to provide high quality and unique educational programs such as MS in AMBB.

Programs that Address Cultural Diversity

CSU is uniquely capable of addressing the preparation of multigenerational students from the State of Maryland, Baltimore City and County, and regions beyond. The University extends its preparations beyond the traditional classroom by providing experiential and authentic learning experiences to students who have been differently prepared. To address the cultural diversity goals of the USM, the university has aligned its plan to help the system meet its goals accomplish greater diversity and inclusion. Data below and explanations show progress towards greater diversity and inclusion.

Selected initiatives across the campus within the Student Affairs and Enrollment Management, as well as Academic Affairs have supported the University’s efforts to attract and retain a proportional mix of students that reflect the community. However, there is room for continued improvement.

The following programs, strategies, and initiatives support enrollment, retention, and graduation, and continue to yield positive results. Selected support programs and interventions include:

- **Summer Academic Success Academy (SASA)** - The Summer Academic Success Academy is an intensive, six-week campus-based, residential program that prepares students for the transition from high school to college. At-risk students have the opportunity to develop confidence and earn college credit prior to the start of the fall semester. SASA students receive information on financial literacy, career planning, personal growth, and other campus resources and support services.
- **First Year Experience (FYE)** - The First-Year Experience program serves as the advisement hub for first-year and sophomore students. Students receive intrusive advisement and guidance through the completion of the first 30 credits of their General Education curriculum.
- **Academic Success Centers (ASC)** - The Centers, housed within each of the four colleges, are staffed by full-time academic advisors and retention coordinators. Staff members monitor student progression, perform registration outreach, and direct students to support services needed for success.
- **Our House Community Mentoring** - Our House provides mentoring for incoming freshmen through a combined peer mentoring and staff mentoring program. Run as a

pilot in AY2014, results show a higher freshmen to sophomore retention rate and academic achievement when compared to the University.

- **Connecting Ladies across Campus (CLAC)** - CLAC is designed to build self-esteem in female students with the ultimate goal of empowering them in womanhood, sustaining academic excellence, and building personal and professional relationships that may lead to successful careers. Paired with a mentor from the University's faculty or staff, CLAC supports CSU women of all backgrounds.
- **Living Learning Communities (LLCs)** - The LLC integrates academic learning and residential community living for Honors Scholars and entering first-year and transfer students pursuing a healthcare major. These students have the opportunity to become a part of a learning community within the residence halls. A service-learning component enhances the living learning experience for the students and assists in the development of civic responsibility and awareness.
- **Child Development Center** - Child care services offered through the James E. McDonald Child Development Center support students, employees of the University, and the community with the purpose of providing a safe, nurturing, and educational program that focuses on developmentally appropriate experiences for children. The Center addresses both the need of the campus community as well as provides quality service to the surrounding community. Students who major in Early Childhood Education complete experiential learning at the Center, contributing to their academic preparation.
- **The Center for Counseling and Student Development (CCSD)** - The Center provides quality counseling and mental health services to students experiencing personal, developmental, and psychological issues or distress. They assist students in crisis, intervene in potentially life threatening situations, provide quality outreach programs and offer other important additional services. These services address the developmental concerns of students while emphasizing prevention and professional consultative services that increase the understanding of challenges faced by students and promotes psychological well-being.
- **Disability Support Services - Disability Support Services (DSSP)** - Housed under the Division of Academic Affairs, DSSP has been charged to create an accessible university community to ensure students have equal access to University programs, activities, and services. Policies and procedures are developed to provide students with as much independence as possible and to promote self-advocacy. The services to faculty, staff, and students on disability issues address the needs of individuals to improve the quality and effectiveness of services; advocate for the upgrading and maintenance of the accessibility of all facilities; promote access to technology resources; and provide students with disabilities the same academic opportunities as non-disabled students in all areas of academic life.
- **Center for Adult Learners (CAL)** - The Center was formed with the adult learner in mind, given that the average age of the CSU student is 26 years of age. The goals of the CAL include the following: to increase educational opportunities for first-generation college students; to strengthen the level of engagement in the culture of academic rigor; to provide a campus climate in which adult learners demonstrate satisfaction with their program of study and go on to assume careers in their disciplines or continue matriculation into graduate or professional schools; to provide a model to be replicated

on a larger-scale for the University; and to inform teaching and learning effectiveness through assessment.

O. Relationship to Low Productivity Programs Identified by the Commission:

1. The program is not related to an identified low productivity program

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

1. The program will not be offered via distance education.
2. Not applicable