Salisbury UNIVERSITY
A Maryland University of National Distinction

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April 6, 2020

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

Dear Secretary Fielder,

On behalf of President Charles A. Wight, the faculty, and the entire Salisbury University (SU) community, I am requesting approval to add a new instructional program at SU. Our institution is seeking permission to offer a Bachelor of Science in Integrated Science. The complete proposal for a new instructional program is attached for your review.

If you have any questions, please contact me at 410 548-3374.

Sincerely,

Karen L. Olmstead, Ph.D.
Provost and Senior Vice President
for Academic Affairs

Enclosure

kg

cc Dr. Charles A. Wight, President, Salisbury University
Dr. Kara Owens, Associate Vice President for Planning and Assessment
Dr. Antoinette Coleman, Associate Vice Chancellor for Academic Affairs, USM

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MHEC
Creating a state of achievement

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

Institution Submitting Proposal	Salisbury University

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
Payment Amount: 850.00
Date Submitted: 4/6/20

Department Proposing Program	Henson Deans Office	
Degree Level and Degree Type	Bachelor of Science	
Title of Proposed Program	Bachelor of Science in Integrated Science	
Total Number of Credits	120	
Suggested Codes	HEGIS: 490200.00	CIP: 41.9999
Program Modality	(●) On-campus ( ) Distance Education (*fully online*) ( ) Both	
Program Resources	(●) Using Existing Resources ( ) Requiring New Resources	
Projected Implementation Date	(●) Fall ( ) Spring ( ) Summer	Year: 2020
Provide Link to Most Recent Academic Catalog	URL: https://www.salisbury.edu/administration/academic-affairs/catalog/index.aspx	
Preferred Contact for this Proposal	Name: Richard T. Wilkens, Ph.D.	
	Title: Associate Provost	
	Phone: (410) 543-6020	
	Email: rtwilkens@salisbury.edu	
President/Chief Executive	Type Name: Charles A. Wight, Ph.D.- Karen L. Olmstead, Ph.D.	
	Signature: Karen Olmstead	Date: 04/07/2020
	Date of Approval/Endorsement by Governing Board:	

Revised 12/2018

A. Centrality to Institutional Mission and Planning Priorities

1. Program Description

The Richard A. Henson School of Science and Technology at Salisbury University (SU) is pleased to submit a proposal for a new Bachelor of Science degree in Integrated Science. The B.S. in Integrated Science will provide students pursuing careers in a variety of fields with a course of study that balances a breadth of core fundamentals with two or more integrated STEM fields. The B.S. in Integrated Science will provide the knowledge and skills necessary to compete in rapidly-expanding industries that operate in a multifaceted and ever-evolving technological environment. The major accommodates students who wish to develop programs of study in two or more STEM disciplines or create a major in a STEM area of study not offered by any department at Salisbury University. Students will be able to create an individual and flexible major with a foundation in science and technology that is best suited to their interests or career goals. Most importantly, this program gives students the opportunity to integrate information across STEM disciplines fostering a more complete understanding of the chosen area(s) of study. In addition to Henson School of Science and Technology disciplines, students can include courses from other disciplines, e.g., environmental health science, environmental studies, exercise science, health science, information systems, or medical laboratory science. The addition of such courses would enable students to focus on cross-disciplinary areas such as environmental monitoring, renewable energy, human ecology, health information technology, adaptive physical education technology, et al. This unique degree program provides the rigorous technical background and experience to rapidly accelerate graduates into emerging roles across a wide diversity of careers in the public and private sectors. A degree in Integrated Science is a highly employable major according to data provided by the National Association of Colleges and Employers, and graduates will have an opportunity to explore numerous employment options in STEM-related career fields. This degree program, once approved, will be available to students beginning in August 2020 and most students will complete the Bachelor of Science in Integrated Science degree in four years.

2. How Proposed Program Supports Institution's Strategic Goals

The proposed Integrated Science B.S. program supports Salisbury University's mission to "empower our students with the knowledge, skills, and core values that contribute to active citizenship, gainful employment, and life-long learning in a democratic society and interdependent world" and to "actively contribute to the local Eastern Shore community and the educational, economic, cultural, and social needs of our State and nation" (SU's Mission and Values, 2019). The Integrated Science B.S. program provides students with a multidisciplinary background in science, technology, engineering, and mathematics to prepare them for the demands of STEM career fields.

While its administrative home will be in the Henson School of Science and Technology Dean's Office, the program utilizes an individual-designed, multi-disciplinary approach to allow students to pursue "a broad array of ideas and perspectives" as promoted in the University's mission. This approach will help students achieve excellence, envision their future as scientists, grow intellectually, and pursue career, leadership, and graduate school opportunities.

3. Brief Narrative Describing Adequate Financing of Program

Because this proposal incorporates existing courses into the new major, no new resources are required for the new Integrated Science B.S. program. Salisbury University's existing faculty will largely be able to offer the courses as part of their regular teaching load; therefore, it will not require any additional administrative support or increased funding. Future program growth may necessitate additional faculty. Advising support will be critical to the success of this program but that capacity is currently available within our Academic Advising Center. If the program were to grow significantly, more advising support would be necessary.

4. Commitment to Adequate Continued Support

Salisbury University is committed to providing additional administrative, financial, and technical support to match increase in student demand. We also pledge to provide the appropriate support to enable all students officially enrolled in the program to complete their degree, even in the unlikely event we phase out the approved degree and stop admitting new students. Nonetheless, the proposed program is expected to attract a new set of students who are interested in designing their own STEM major and pursuing careers which require a broad skillset. Its unique, interdisciplinary curricular nature will draw students from the region and beyond.

For more financial details, see section L below.

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

1. Demonstrate Demand and Need for the Program

Integrated Science is an ideal way to prepare for interdisciplinary fields, like environmental science, ocean sciences, and neuroscience. This program is also a good choice for students interested in several science fields but who are unsure about choosing a major. It also provides a broader background in science that is especially useful in careers such as science journalism, teaching, law and biomedical ethics. Graduates of Integrated Science programs are in demand on their own. As of the date of this

proposal, the job-search firm Indeed found that there are over 32,000 listings for Integrated Science jobs in the United States and the demand continues to grow.[1]

2. Consistency with Maryland State Plan for Postsecondary Education

The State directs its postsecondary institutions to "respond nimbly to changes in industries, and programs must support student development in critical thinking, problem-solving, and communication skills throughout the curriculum," as indicated in Goal #5 of the Maryland State Plan for Postsecondary Education (2017-2021).[2] The Integrated Science degree will advance this goal by providing a unique high-quality program that facilitates "lifelong learning, preparing students to enter the workforce and advance in their careers, fostering cultural understanding, emphasizing ethical principles and practices in personal and professional interactions, and conveying the importance of contributing to the common good as a citizen of the local, national, and global communities."[3] The program prepares students to be effective scientists who can be competitive in an area of expanding demand.

In addition, this proposed Integrated Science degree program targets a very specific subpopulation that is a focus of the current Maryland State Plan for Postsecondary Education – veterans.[4] Veterans often have difficulty completing their degree in a reasonable period because the academic credits they earn during their time in-service do not naturally align with traditional academic disciplines/majors. Many veterans arrive at institutions like Salisbury University with as many as 60 credits of science and technology coursework, but are often disappointed and frustrated to learn that much of that credit will not count toward any particular disciplinary major. Because the Integrated Science program is designed to be flexible and does not have many prescribed required courses, veterans will be able to achieve a STEM degree in a shorter period than current practice allows.

Similarly, students interested in science careers who are transferring to SU may find that the Integrated Science program provides a more manageable pathway to a B.S. degree within two years as compared to more sequential majors in several traditional science disciplines.

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

As of the date of this proposal, there are currently 1,447 integrated scientist jobs in Maryland listed on Indeed.[5] Upon graduation, a student with this major should be able to apply for entry-level scientist or

[1] https://www.indeed.com/q-Integrated-Science-jobs.html
[2] https://bit.ly/2GgJnw8, pg 51
[3] https://bit.ly/32Dzvpx, pg 19
[4] https://bit.ly/2GgJnw8, pgs 15, 44-45, 54
[5] https://www.indeed.com/jobs?q=Integrated+Science&l=Maryland

analyst positions. Approximately 40% of the jobs listed seeking "integrated science" ask for a bachelor's degree as a requirement. The remaining 60% generally require an advanced degree or "a bachelor's degree plus equivalent work experience."

D. Reasonableness of program duplication

Salisbury University is one of only two USM institutions that serve the residents of the Eastern Shore of Maryland and the other, the University of Maryland Eastern Shore, does not offer an undergraduate degree in integrated science. Currently, no other USM institutions offer an undergraduate degree in integrated science.

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

HBIs in Maryland do not offer an undergraduate degree in integrated science.

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

HBIs in Maryland do not offer an undergraduate degree in integrated science.

G. Adequacy of curriculum design and delivery to related learning outcomes

1. <u>How the Proposed Program was Established; Faculty Oversight</u>

A full course listing with course titles and descriptions is provided in Appendix A. These courses were chosen to include stated industry needs of mathematics, computer programming, and various science disciplines. The unique design of this program combines a breadth of knowledge developed from a group of fundamental courses and the integration of two or more integrated STEM fields. By integrating specific science disciplines, students in the program will better develop an array of critical thinking, communication, and leadership aptitudes, which are broadly applicable in a rapidly changing technological environment and interdependent society.

The Integrated Science Major will be housed in the Henson School of Science and Technology Dean's Office, and will generally be managed by the Associate Dean, Dr. Mark W. Muller. However, chairs of departments with courses selected for a student's integrated science curriculum will be consulted as necessary: Dr. Matthew Bailey, Physics; Dr. Les Erickson, Biological Sciences; Dr. David Rieck, Chemistry; Dr. Donald Spickler, Mathematics and Computer Science; Dr. Dan Harris, Geography and Geosciences.

The Integrated Science B.S. program core requires 34 course credits, with additional general education courses, and electives.

2. Educational Objectives and Learning Outcomes

The Integrated Science B.S. program follows a student-centered learning approach that is the hallmark of Salisbury University[6] and focuses on principles, models and techniques that scientists use to perform their jobs effectively and support a broad array of applications.

Program objectives for graduates of the B.S. in Integrated Science are: 1) demonstrate the knowledge and skills central to the chosen integrated academic disciplines; 2) use formal techniques and methodologies of abstraction to create methods to solve real-world problems; 3) apply acquired knowledge to cross-disciplinary problems as part of a project team; and 4) effectively and competitively pursue careers to meet the growing demand for scientists and technologists. Before any program opens for admission, SU updates all curricular, course and degree requirements in our catalog and online (in both narrative and checklist formats). The Academic Advising Center prepares all advisors to assist incoming students with all academic programs; furthermore, the Academic Advising Center dedicates one of their advisors as a liaison to the Henson School of Technology, the home of the proposed degree. Our catalog and website make available all pertinent information to prospective and current students regarding academic and student support, SU's learning management system, financial aid resources and costs and payment policies.

3. Assessment and Documentation of Student Learning Outcomes: see Section M below.

4. List of Courses with Credit Hours and Course Descriptions

Overall Accounting of Credits

Courses	# of Credits
Core – Integrated Science Major	13-16
Upper Level – Integrated Science Major	15-20
Capstone – Integrated Science Major	6
General Education	29-31
Free Electives	47-57
TOTAL	**120 credits (minimum)**

Integrated Science Major Courses: Required courses include the following (see Appendix A for course descriptions).

CORE COURSES (4 Courses)

Complete the following:

A. Select two courses from the following (courses must be from two different areas):

BIOL 210 – Biology: Concepts and Methods	4
BIOL 211 – Microbiology	4

[6] https://www.salisbury.edu/discover-su/mission-values.aspx

CHEM 121 – General Chemistry I	4
ENGR 100 – Introduction to Engineering Design	3
ENGR 110 – Statics	3
GEOG 104 – Earth and Space Science	4
GEOG 105 – Introduction to Physical Geography	4
GEOG 111 – Introduction to Oceans and Coasts	3
GEOG 150 – Environmental Science: Concepts and Methods	4
GEOG 201 – Weather and Climate	4
GEOL 103 – Introduction to Physical Geography	4
PHYS 108 – Introduction to Astronomy	4
PHYS 109 – Principles of Astronomy	3
PHYS 121 – General Physics I	4
PHYS 221 – Physics I	4
B. Select one course from the following:	
MATH 155 – Modern Statistics with Computer Analysis	3
MATH 198 – Calculus I for Biology and Medicine	4
MATH 201 – Calculus I	4
MATH 210 – Introduction to Discrete Mathematics	4
MATH 216 – Statistical Thinking	4
C. Select one course from the following:	
COSC 117 – Programming Fundamentals	4
COSC 118 – Introductory Scientific Programming	4
COSC 120 – Computer Science I	4
Total Core Credits	**13-16 credit hours**

CAPSTONE COURSES (6 credits)

Complete a minimum of 6 semester hours from the following:

BIOL 415 – Research in Biology	3
BIOL 420 – Readings in Biology	3
BIOL 450 – Internship	3
BIOL 490 – Special Topics in Biology	4
CHEM 310 – Intermediate Chemistry Research	3
CHEM 403 – Principles of Chemical Research	3
CHEM 410 – Chemical Research	3
CHEM 413 – Internship/Co-Op in Chemistry	3
COSC 380 – Internship	3
COSC 385 – Directed Study	4
COSC 390 – Undergraduate Research Project	3
DSCI 470 – Research Methods in Data Science	3
DSCI 490 – Capstone Project	3
ENGR 395 – Intermediate Engineering Research	3
ENGR 490 – Research in Engineering	2
GEOG 414 – Research and Writing	3
GEOG 415 – Selected Problems	3
GEOG 460 – Internship	3
MATH 380 – Internship	3
MATH 385 – Directed Study	4
MATH 390 – Undergraduate Research Project	3
PHYS 450 – Internship/Co-Op in Physics	3

PHYS 470 – Senior Seminar	1
PHYS 490 – Research in Physics	2
Total	**6 credit hours**

UPPER-LEVEL COURSES (4-5 courses)

Complete a minimum of 15 semester hours in approved 300-/400-level STEM courses.

Total	**15-20 credit hours**

GENERAL EDUCATION COURSES: The following courses are required to meet the general education requirements for Salisbury University. In order satisfy the general education requirements, Salisbury University students must take courses from five different groups.

General Education Requirements

Group I: English Composition and Literature (2 Courses)

A. ENGL 103 (C or Better) or HONR 111	4
B. Literature course (from either ENGL or MDFL Depts.)	4

Group II: History (2 courses)

A. HIST 101, 102, or 103	4
B. HIST 101, 102, 103 or a HIST course above 103	4

Group III: Humanities and Social Sciences (3 courses)

A. ART, CMAT, DANC or THEA, MDFL, MUSC, PHIL, HONR 211	4
B. ANTH, CADR, ECON or FINA, ENVR, Human GEOG, POSC, PSYC, SOCI, HONR 112	3/4
C. Select one course from either Group IIIA or IIIB (course must be from a different area than previously selected)	3/4

Group IV: Natural Science, Math or Computer Science (4 courses)

A. Select courses with laboratories from at least two of the following four areas: BIOL, CHEM, GEOL or Physical GEOG, PHYS	4 4
B. Select one additional course (need not be a lab) from Group IVA or ENVH or ENVR or COSC or MATH or HONR 212	3/4
C. Select one course from MATH	3/4

Group V: Health Fitness (1 course)

FTWL 106 – Personalized Health/Fitness	3

Total general education credit hours	**43 - 47 credit hours**

5. Specialized accreditation or graduate certification requirements: N/A

6. Contracting with another institution or non-collegiate organization

   There are no contracts with other institutions or organizations.

7. Assurance that SU provides clear, complete and timely information to students

8. Assurance that advertising, recruiting and admission material are clear and accurate

All publications, including marketing, catalog and website admissions pages are vetted by the Marketing and Communications Department at SU, which fact-checks all submissions.

H. Adequacy of Articulation: N/A

I. Adequacy of Faculty Resources as outlined in COMAR 13B.02.03.11.

1. Narrative of Faculty Demonstrating Quality of Program Faculty

The integrated science courses will be taught by SU's faculty from the Henson School of Science and Technology. Collectively, these faculty have decades of experience teaching undergraduates.

Table of Faculty Resources. (note: all faculty are regular state employees, not contractual)

	Faculty Member	Terminal Degree	Field	Degree-granting Institution	Academic Rank	Full- or Part-Time	Courses overseen
Biological Sciences	Les Erickson	Ph.D.	Molecular and Cell Biology	Univ of Texas Dallas	Professor and Chair of Biological Sciences	FT	All BIOL courses
Chemistry	David Rieck	Ph.D.	Chemistry	Univ of Wisconsin Madison	Professor and Chair of Chemistry	FT	All CHEM courses
Geography and Geosciences	Daniel Harris	Ph.D.	Geoscience Education	Univ of Maryland College Park	Associate Professor and Chair of Geography/ Geosciences	FT	All GEOG and GEOL courses
Mathematics and Computer Science	Donald Spickler	Ph.D.	Pure Mathematics	Univ of Virginia	Professor and Chair of Mathematics and Computer Science	FT	All COSC, DSCI, and MATH courses
Physics	Matthew Bailey	Ph.D.	Physics	Utah State Univ	Associate Professor and Chair of Physics	FT	All ENGR and PHYS courses
	Mark W. Muller	Ph.D.	Mechanical Engineering	Univ of Hawai'i Manoa	Associate Professor and Associate Dean of the Henson School	FT	Program Coordinator

2. Demonstrate Pedagogical Training for Faculty

The Office of Instructional Design & Delivery provides professional development in pedagogy and instructional technologies. They provide ongoing online and in-person workshops on the Canvas learning managements system, plagiarism detection service, lecture capture software and more. In their weekly newsletter during Fall and Spring semesters, they provide best practices for traditional, hybrid and online learning environments. Additional opportunities are provided through the Faculty Development Committee and our Faculty Learning Communities such as the Distance Education FLC and the Scholarship of Teaching and Learning FLC. Finally, the institution hosts two annual faculty development events – one in August at the beginning of the semester (our most recent focused on Effective Teaching Strategies) and a Teaching & Learning conference in the Spring where faculty present on evidence-based practices and their experiences at SU.

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

Salisbury University Libraries have existing resources to support completely the new Integrated Science major. In relation to journal and newspaper articles, SU has a number of relevant titles through electronic access via our online database subscriptions, including (but not limited to): Academic Search Complete; Business Source Premier; EconLit; JSTOR; ProQuest Newspapers; Science Direct; and Web of Science. In regards to monographic titles, SU has a significant number of titles that would support this major and is frequently adding more. SU's ability to share resources within the USM system will also greatly support our students in the rare occasion that we might not have the exact title in-house that they would want or need, and these students would generally gain access to that title within the same week they requested it.

In sum, no new library resources are directly required to support the Integrated Science major. Existing resources that relate to integrated science will be purchased or acquired in the future as needed once the major is officially implemented. Active and ongoing communication from faculty teaching these courses regarding relevant resources is strongly recommended, with particular emphasis placed on areas of particular curricular focus along with information regarding newly released titles.

K. Adequacy of Physical Facilities, Infrastructure and Instructional Resources as outlined in COMAR 13B.02.03.13.

Delivery of the program will be in existing space and is not contingent on additional resources. Incremental growth of the program will support equipment maintenance and updates. We do not currently have plans to offer this program through distance learning.

Adequacy of Financial Resources as outlined in COMAR 13B.02.03.14.

TABLE 1: RESOURCES for the Integrated Science B.S. at Salisbury University					
Resources Categories	(Year 1 - FY21)	(Year 2 -FY22)	(Year 3 -FY23)	(Year 4 -FY24)	(Year 5 -FY25)
1.Reallocated Funds	$0	$0	$0	$0	$0
2. Tuition/Fee Revenue (c+g below)	$157,788	$195,318	$244,732	$285,375	$349,272
a. #F.T. Students	15	18	22	25	30
b. Annual Tuition/Fee Rate (FY20 Resident rate)*	$10,044	$10,245	$10,450	$10,659	$10,872
c. Annual Full Time Revenue (a x b)	$150,660	$184,410	$229,900	$266,475	$326,160
d. # Part Time Students	2	3	4	5	6
e. Credit Hour Rate*	$297	$303	$309	$315	$321
f. Annual Credit Hours	12	12	12	12	12
g. Total Part Time Revenue (d x e x f)	$7,128	$10,908	$14,832	$18,900	$23,112
3. Grants, Contracts, & Other External Sources	$0	$0	$0	$0	$0
4. Other Sources	$0	$0	$0	$0	$0
TOTAL (Add 1 - 4)	$157,788	$195,318	$244,732	$285,375	$349,272

*Figured with a 2% Annual Increase

TABLE 2: EXPENDITURES – for the Integrated Science B.S. at Salisbury University					
Expenditure Categories	(Year 1-FY21)	(Year 2-FY22)	(Year 3-FY23)	(Year 4-FY24)	(Year 5-FY25)
1. Total Faculty Expenses (b + c below)	$94,292	$96,178	$122,626	$125,079	$127,580
a. # FTE	1.00	1.00	1.25	1.25	1.25
b. Total Salary (plus 2% increase each year)	$70,896	$72,314	$92,200	$94,044	$95,925
c. Total Benefits (33% of salary)	$23,396	$23,864	$30,426	$31,035	$31,655
2. Total Administrative Staff Expenses (b + c below)	$0	$0	$0	$0	$0
a. # FTE	0	0	0	0	0
b. Total Salary	$0	$0	$0	$0	$0
c. Total Benefits	$0	$0	$0	$0	$0
3. Total Support Staff Expenses (b + c below)	$0	$0	$0	$0	$0
a. # FTE	0	0	0	0	0
b. Total Salary	$0	$0	$0	$0	$0
c. Total Benefits	$0	$0	$0	$0	$0
4. Equipment	$0	$0	$0	$0	$0
5. Library	$0	$0	$0	$0	$0
6. New or Renovated Space	$0	$0	$0	$0	$0
7. Other Expenses	$0	$0	$0	$0	$0
TOTAL (Add 1 - 7)	$94,292	$96,178	$122,626	$125,079	$127,580

L. Adequacy of provisions for evaluation of program as outlined in COMAR 13B.02.03.15.

The Henson School of Science and Technology has a long tradition of assessment and accreditation. Within the Henson School's Departments of Mathematics and Computer Science, Biological Sciences, Geography and Geosciences, Chemistry, and Physics, all faculty members are evaluated every year by their department chairs and all degree programs undergo comprehensive review every seven years. With guidance from the SU's Office of University Analysis, Reporting, and Assessment, course and program-based assessments are being developed at the start. Thus, the curriculum, program faculty and other resources, and student learning outcomes will be routinely evaluated through the annual and periodic review assessment cycles. In addition, once the Integrated Science B.S. program is launched, the program and courses will be evaluated using student surveys and program committee reviews on a regular basis.

M. 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.

Any student meeting the SU admissions requirements can choose to pursue the B.S. in Integrated Science. The program will work to help all accepted students improve their workplace competitiveness and reach their professional goals, an aim consistent with the State's minority student achievement goals.

More specifically, Strategy 7 of the Maryland State Plan for Postsecondary Education (2017-2021) calls on universities to enhance career advising and planning services and integrate them explicitly into academic advising and planning.[7] The program will reach out to undeclared undergraduate students at Salisbury University to inform them of the wide array of career opportunities available with the Integrated Science major.

Strategy 8 of the State plan calls on universities to "develop new partnerships between colleges and businesses to support workforce development and improve workforce readiness."[8] As the only undergraduate program of its kind in the USM, the Integrated Science B.S. program will result in new public-private partnerships for students in this program. The program requires that students complete a senior capstone project, and the project can be completed through collaborations with local, state, federal, and private sectors.

N. Relationship to low productivity programs identified by the Commission: The proposed program is not directly related to an identified low productivity program.

O. Adequacy of Distance Education Programs as outlined in COMAR 13B.02.03.22: No distance learning is proposed at this time.

[7] https://bit.ly/2GgJnw8, pg 60
[8] https://bit.ly/2GgJnw8, pg 66

Appendix A

B.S. Integrated Science - Salisbury University
Course Descriptions

Core Courses

BIOL 210: BIOLOGY: CONCEPTS AND METHODS (4 credit hours)
Introduction to the study of biology, focusing on how biologists know things and study the world of life, with emphases on cell biology, genetics, ecology and evolution. First course required for biology majors. Four hours lecture/laboratory, two hours online per week.

BIOL 211: MICROBIOLOGY (4 credit hours)
Fundamental course in the study of microorganisms and their activity, with emphasis on bacteria. Prerequisite: BIOL 101 or 210 or 215. Two hours lecture, four hours laboratory per week.

CHEM 121: GENERAL CHEMISTRY I (4 credit hours)
Study of fundamental laws of chemistry and atomic structure emphasizing quantitative relationships. Prerequisite: Two years high school algebra and chemistry, or CHEM 100. Three hours lecture, one three-hour laboratory per week.

COSC 117: PROGRAMMING FUNDAMENTALS (4 credit hours)
Introductory course in computer programming, which involves solving problems by designing, implementing and testing algorithms. Emphasis is on problem solving through the use of algorithms and learning to develop computer programs that are reliable, well-documented, and correct. Implementation is done in object-oriented based languages concentrating on fundamental instructions and the development and implementation of events, methods, and functions. Three hours lecture, two hours lab per week.

COSC 118: INTRODUCTORY SCIENTIFIC PROGRAMMING (4 credit hours)
Introduction to program design and development. Programs focus on development of applications for science including applications related to GIS. The object-oriented approach is emphasized throughout. No previous programming experience is required. Three hours lecture, two hours lab per week.

COSC 120: COMPUTER SCIENCE I (4 credit hours)
Step-by-step approach to problem solving, modular structured design, and structured programming in C++. Emphasizes production of readable, well documented, efficient, tested and correct programs. Includes time intensive assignments. Prerequisite: C or better in COSC 117 or permission of department. Three hours lecture, two hours laboratory per week.

ENGR 100: INTRODUCTION TO ENGINEERING DESIGN (3 credit hours)
Introduction to the art and science of engineering design. Students work in teams to design, manufacture, assemble and test a product. Examples of products include a postal scale, solar cooker and human-powered water pumping systems. CAD and modeling software will also be used. Four hours lecture/activity per week.

ENGR 110: STATICS (3 credit hours)

The equilibrium of stationary bodies under the influence of various kinds of forces. Forces, moments, couples, equilibrium, trusses, frames and machines, centroids, moment of inertia, beams and friction. Vector and scalar methods used to solve problems. Prerequisite: PHYS 221. Prerequisite/Corequisite: MATH 202. Three hours per week.

GEOG 104: EARTH AND SPACE SCIENCE (4 credit hours)

An introductory course in earth and space science for prospective elementary school teachers. An examination of the physical character of the Earth and its place in the solar system. Students cannot receive credit for both GEOG 104 and GEOG 105. Prerequisite: Intended for elementary education majors. Three hours lecture and one two-hour lab per week.

GEOG 105: INTRODUCTION TO PHYSICAL GEOGRAPHY (4 credit hours)

Introduction to the variable physical character of the earth. Treatment of weather, climate, soil, vegetation, landforms and oceanic circulation with emphasis on processes, interrelationships and distributional patterns. Students cannot receive credit for both GEOG 104 and GEOG 105. Three hours lecture, one two-hour laboratory per week.

GEOG 111: INTRODUCTION TO OCEANS AND COASTS (3 credit hours)

The study of coastlines, coastal landforms, and the tectonic and oceanographic forces that shape them. One mandatory Saturday half-day field trip to Assateague Island is required. Three hours per week.

GEOG 150: ENVIRONMENTAL SCIENCE: CONCEPTS AND METHODS (4 credit hours)

Explores global and regional environmental processes and systems, as well as the impact of humans on these systems. Addresses current environmental issues such as climate change, habitat loss and water pollution, emphasizing the role of science in identifying problems and finding solutions. May not receive credit for both BIOL 150 and GEOG 150. Three hours lecture, two hours laboratory per week.

GEOG 201: WEATHER AND CLIMATE (4 credit hours)

Examination of weather and climate with emphasis on processes and distributional patterns. Interrelationships between climatic controls stressed. Three hours lecture, two hours laboratory per week.

GEOL 103: INTRODUCTION TO PHYSICAL GEOLOGY (4 credit hours)

Introduction to the nature and character of the Earth's crust and the geological processes that generate and shape landform features. Topics include minerals, rocks, earth structure and plate tectonics, geological processes and associated landforms. Three hours lecture, two hours laboratory per week.

MATH 155: MODERN STATISTICS WITH COMPUTER ANALYSIS (3 credit hours)

Descriptive and inferential analysis of raw data, emphasizing appropriate assumptions, computer use and interpretation. Consideration of parametric and nonparametric methods and comparison of their powers. Intended for students in the social and natural sciences. May not receive credit for more than one: MATH 150, 155, 213 or 216. Prerequisites: High school Algebra II and plane geometry. Three hours per week.

MATH 198: CALCULUS I FOR BIOLOGY AND MEDICINE (4 credit hours)

Introduction to analytic geometry, limits, continuity, derivatives of elementary functions, applications of derivatives and antiderivatives in a biological context. May not receive credit for both MATH 198 and MATH 201. Prerequisite: C or better in MATH 140 or equivalent. Four hours per week.

MATH 201: CALCULUS I (4 credit hours)
Introduction to analytic geometry, limits, continuity, derivatives of elementary functions, applications of the derivatives. May not receive credit for both MATH 198 and MATH 201. Prerequisite: MATH 140 or equivalent. Four hours per week.

MATH 210: INTRODUCTION TO DISCRETE MATHEMATICS (4 credit hours)
Introduction to basic techniques and modes of reasoning for discrete problem solving. Set theory, recurrence relations, counting, graphs and lattices, number theory. Prerequisites: MATH 140 or equivalent. Four hours per week.

MATH 216: STATISTICAL THINKING (4 credit hours)
Descriptive and inferential analysis of data, emphasizing appropriate assumptions, computer use and interpretation. Parametric and non-parametric methods are compared and contrasted. Includes a weekly laboratory. Prerequisite or Corequisite: C or better or concurrent enrollment in MATH 160, 198, 201 or similar calculus experience. Four hours per week.

PHYS 108: INTRODUCTION TO ASTRONOMY (4 credit hours)
Survey of modern astronomy for non-science majors. Basic physics concepts utilized to study the night sky, light, optics and telescopes, planets, the moon and sun, stars nebulae, galaxies and the universe. Some night observations required. May not be taken for credit if student already has credit for PHYS 109. Three hours lecture, two hours laboratory per week.

PHYS 109: PRINCIPLES OF ASTRONOMY (3 credit hours)
Introductory course for non-science majors. Principles of astronomy are developed in a conceptual way. Topics covered include scale of the universe, a guide to the sky, cycles of the sun and moon, atoms and spectra, the sun and stars, structure and evolution of stars, the Milky Way and other galaxies, the solar system, and life on other worlds. May not be taken for credit if student already has credit for PHYS 108. Three hours lecture per week.

PHYS 121: GENERAL PHYSICS I (4 credit hours)
Introduction to Newtonian mechanics and applications. Topics include kinematics, dynamics, rotational motion, equilibrium, conservation laws and fluids. Not intended for physics or chemistry majors. Recommended Prerequisite: College algebra. Three hours lecture, two hours laboratory per week.

PHYS 221: PHYSICS I (4 credit hours)
Introduction to calculus-based Newtonian mechanics for students majoring in physics, engineering and chemistry. Prerequisite or Corequisite: MATH 201. Six hours lecture/activity per week.

Capstone Courses

BIOL 415: RESEARCH IN BIOLOGY (3 credit hours)
Independent student research under the supervision of a faculty member. May receive credit within the major for up to six credits combined of BIOL 415, 416, 417 and 420. Prerequisite: Permission of instructor. Schedule to be arranged individually. Forty-five contact hours per credit hour.

BIOL 420: READINGS IN BIOLOGY (1-3 credit hours)

Readings designed to permit in-depth study of selected topics. Students submit written reports of their findings at the end of the semester. Specific topics are indicated on students' transcripts. Prerequisites: Sixteen hours in biology, permission of instructor.

BIOL 450: INTERNSHIP IN BIOLOGY (1-3 credit hours)

Experiences in biology-related work provide students with an opportunity to use acquired biological knowledge in a professional way and to investigate potential career options. Under special circumstances this course may be taken a second time for credit, but only with permission of the internship coordinator. Prerequisites: Junior standing, biology major and approval of Internship Coordinator. 45 student contact hours per credit hour. Permission to register must be granted prior to the experience and registration must be concurrent with the experience. (P/F)

BIOL 490: ADVANCED SPECIAL TOPICS IN BIOLOGY (1-4 credit hours)

Study of a specific area of biological science. Topic varies semester to semester. May be taken twice for credit under different subtitles. Prerequisites: Permission of instructor or 12 credits of biology, junior standing. One to four hours per week.

CHEM 310: INTERMEDIATE CHEMISTRY RESEARCH (1-3 credit hours)

Intermediate level individual chemical research on an approved subject under supervision of a member of the faculty. Written report and seminar presentation required. May be taken twice for credit. Prerequisites/Corequisites: CHEM 221 and permission of department chair. Three hours per week per credit.

CHEM 403: PRINCIPLES OF CHEMICAL RESEARCH (3 credit hours)

Individual undergraduate research on approved subject under supervision of a member of the faculty. Students will be introduced to the chemical literature, writing styles, and presentation styles used in chemistry. Prerequisite: Twenty-four hours of chemistry and permission of department chair. Nine hours per week.

CHEM 410: CHEMICAL RESEARCH (3 credit hours)

Individual undergraduate research on approved subject under supervision of a member of the staff. Written report, seminar presentation required. May be taken twice for credit. Prerequisites: CHEM 403 and permission of department chair. Nine hours per week, conference with the instructor.

CHEM 413: INTERNSHIP/CO-OP IN CHEMISTRY (3 credit hours)

Work experience designed to provide qualified students opportunities to use acquired chemical knowledge in a professional way. Written report, seminar presentation required. Prerequisites: Twenty-four hours of chemistry, consent of instructor. Six hours work per week, conference with supervisor.

COSC 380: INTERNSHIP (3 credit hours)

Students work under supervisors in a local firm or public institution in conjunction with an advisor from the department. Cross-listed with MATH 380. MATH/COSC 380 may be taken twice for a maximum of six credits, but used only once toward a major in mathematics or computer science. Prerequisite: Approval of department chair. Eight to ten hours per week. (P/F)

COSC 385: DIRECTED STUDY (1-4 credit hours)

For students who desire to pursue a special topic in computer science not covered in the current curriculum. Under most circumstances students will take this course for three credit hours. This course may be repeated under different subtitles for a total of nine credits, but only a total of four credit hours from MATH 385 and /or COSC 385 may be used toward a major or minor. Prerequisite: Consent of the instructor and Chair of the Department of Mathematics and Computer Science. One to four hours per week.

COSC 390: UNDERGRAD RESEARCH PROJECT (1-3 credit hours)

Offers study of some area of computer science in more depth than is possible in the usual classroom setting. Students work on projects under the direction of faculty members. Prerequisite: Department approval. (P/F)

DSCI 470: RESEARCH METHODS IN DATA SCIENCE (3 credit hours)

Preparation for professional research and problem solving in data science and DSCI 490 projects. This course includes discussion of methodologies that can be used within data science, to ensure that the data used in problem solving is relevant and properly manipulated to support data science projects. Students will gain an understanding of the philosophy of using experimentation to gain scientific knowledge and the important components of successful experimentation and presentation. Basic information literacy techniques including; searching for primary literature and information using library reference materials and on-line databases; writing reports and research papers; analyzing and presenting graphical data; the ethical use of information; and presenting research using presentation development software will be discussed. Prerequisite: C or better in COSC 311. Three hours per week.

DSCI 490: CAPSTONE PROJECT (3 credit hours)

Capstone project in one of the areas of data science chosen, designed, and carried out by the student with the advice and approval of a faculty member. Actual work may be carried out at off-campus sites. Written report, seminar presentation are required. Pre-requisites: DSCI 470 and permission of instructor who will direct study.

ENGR 395: INTERMEDIATE ENGINEERING RESEARCH (1-3 credit hours)

Intermediate level, individual research project in engineering with supervision of a member of the faculty. May be repeated for up to six credits. Prerequisites: Eight credits of physics and/or engineering and departmental approval. Two hours per week per credit.

ENGR 490: RESEARCH IN ENGINEERING (2 credit hours)

Research project in engineering chose, designed and carried out by student with the advice and approval of a faculty member. Actual work may be carried out at off-campus sites. Written report, seminar presentation required. Prerequisites: PHYS 470, 40 credits of physics/engineering (or senior standing), department chair approval. Six hours per week.

GEOG 414: RESEARCH AND WRITING (3 credit hours)

Development of research methods in geography. Topics include formulation of problems, establishment of hypotheses, development of structures for testing hypotheses and practice with forms of geographic presentation. Maps, numerical and field methods are used. Cannot receive credit for both GEOG 300 and GEOG 414. Prerequisites: Twelve hours of geography, including completion of GEOG 204 or consent of instructor. Three hours per week.

GEOG 415: SELECTED PROBLEMS (1-3 credit hours)

Independent study permitting research or in-depth work on a selected topic to be indicated on student's transcript. May be taken twice for credit under different subtitles. Intended for seniors with 18 or more hours in geography and/or geology. Prerequisite: Permission of department chair. Three hours per week for each credit hour.

GEOG 460: INTERNSHIP (1-3 credit hours)

Provides students with opportunities to apply geographic/planning theory, techniques and knowledge as practicing professionals. Intended for seniors with 18 or more hours in geography. Cannot be used to satisfy requirements for the major. May be offered for undergraduate or graduate credit. Prerequisite: Approval of the department. Three hours per week for each credit hour. (P/F)

MATH 380: INTERNSHIP (3 credit hours)

Students work under supervisors in a local firm or public institution in conjunction with an advisor from the math department. Cross-listed with COSC 380. MATH/COSC 380 may be taken twice for a maximum of six credits, but used only once toward a major in mathematics or computer science. Prerequisite: Approval of department chair. Eight-to-ten hours per week. (P/F)

MATH 385: DIRECTED STUDY (1-4 credit hours)

For students who desire to pursue a special topic in mathematics not covered in the current curriculum. Under most circumstances students will take this course for three credit hours. This course may be repeated under different subtitles but only a total of four credit hours from MATH 385 and/or COSC 385 may be used toward a major or minor. Prerequisite: Permission of the instructor and chair of the Department of Mathematics and Computer Science. One to four hours per week.

MATH 390: UNDERGRADUATE RESEARCH PROJECT (1-3 credit hours)

Offers study of some area of the mathematical sciences in more depth than is possible in the usual classroom setting. Students work on a project under the direction of faculty members. Prerequisite: Approval of research committee and department chair. (P/F)

PHYS 450: INTERNSHIP/ CO-OP PHYSICS (3 credit hours)

Work experience in which qualified students use knowledge of physics in a professional setting. Students summarize experiences in written reports with seminar presentations. Prerequisites: Twenty hours of physics, permission of department chair. Six hours per week.

PHYS 470: SENIOR SEMINAR (1 credit hour)

Senior seminar for Physics majors. Introduction to research practices. Preparation for PHYS 475 or PHYS 490 projects. Prerequisites: 30 credits of physics and/or engineering, or department chair approval. One hour per week.

PHYS 490: RESEARCH IN PHYSICS (3 credit hours)

Research project in one of the areas of physics chosen, designed and carried out by student with the advice and approval of a faculty member. Actual work may be carried out at off-campus sites. Written report, seminar presentation required. Prerequisites: PHYS 470 and 40 credits of physics (or senior standing) and department chair approval.