Education Policy and Student Life - September 14, 2021

UNIVERSITY SYSTEM *of* MARYLAND

September 14, 2021 09:30 AM - 11:30 AM

Agenda Topic | | **Page**

UNIVERSITY SYSTEM
of MARYLAND

OFFICE OF ACADEMIC AND STUDENT AFFAIRS

MEMORANDUM

TO:	Michelle Gourdine, Chair	Ayotola Oludayo
	D'Ana Johnson, Vice Chair	Andrew Smarick
	Ada Beams	Signe Pringle
	Isiah Leggett	Bill Wood

FROM: Joann Boughman, Senior Vice Chancellor

DATE: Wednesday, September 8, 2021

SUBJECT: Tues., September 14th Meeting of the Committee on Education Policy and Student Life

The Committee on Education Policy and Student Life of the Board of Regents will meet in public session on Tuesday, September 14, 2021. The meeting will begin at 9:30 a.m.

The meeting will take place via Zoom for members of the Committee. An Outlook invitation with connection details will follow. Public listen-only access is available via 1-443-353-0686, Conference ID: 270 560 601#.

The agenda is attached, and supporting materials are posted on Diligent and will be on the USM website at https://www.usmd.edu/regents/agendas/ by Wednesday evening.

Committee members, please let me know if you are unable to participate on Tuesday and if you have any questions.

We look forward to engaging with you next week.

Enclosures

CC: Chairperson Linda Gooden
Office of the Attorney General
Members of the Chancellor's Council
Academic Affairs Advisory Council (Provosts)
Vice Presidents for Student Affairs
Academic and Student Affairs Senior Staff
Office of Communications
Elizabeth Brunn, Council of University System Faculty
Laila Shishineh, Council of University System Staff
Yvonne Harper, USM Student Council

UNIVERSITY SYSTEM
of **MARYLAND**

TOPIC: New Academic Program Proposal:
Towson University: Bachelor of Science in Computer and Mathematical Sciences

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, September 14, 2021

SUMMARY: The Department of Computer and Information Sciences at Towson University, in partnership with the Department of Mathematics, proposes a new Computer and Mathematical Sciences degree program. This program consists of two concentrations: an Applied Mathematics and Computer Science concentration and a Computer and Mathematical Sciences Secondary Education concentration addressing Maryland's growing need for Mathematics and Computer science educators.

The proposed Applied Mathematics and Computer Science concentration addresses a growing need for a combined major providing an opportunity for students pursuing computer science to bolster their mathematical and analytical skills and mathematics majors to build foundational computer science skills.

The Computer and Mathematical Sciences Secondary Education concentration will lead to dual teacher certification for Computer Science and Mathematics Secondary Education (grades 7-12). The most recent Maryland teacher staffing report identifies Computer Science and Mathematics as "areas of critical shortage," while the state requires high schools to begin offering at least one computer science course beginning AY 2021-2022 as per 2018 MD House Bill 281. This concentration is designed to address the needs of Maryland schools, many of whom may not be able to hire a dedicated computer science educator but would benefit from hiring an educator certified to teach both mathematics and computer science. The dual certification also addresses graduates' needs, offering them greater flexibility and opportunity to secure employment.

The Departments of Computer and Information Sciences and Mathematics have the resources, experience, and expertise to offer the proposed program to the benefit of the Maryland School districts, future graduates, and the reputation of Towson University.

ALTERNATIVE(S): The Regents may not approve the program or may request further information.

FISCAL IMPACT: No additional funds are required. The program can be supported by the projected tuition and fees revenue.

CHANCELLOR'S RECOMMENDATION: That the Education Policy and Student Life Committee recommend that the Board of Regents approve the proposal from Towson University to offer the Bachelor of Science in Computer and Mathematical Sciences.

COMMITTEE RECOMMENDATION:	DATE: September 14, 2021
BOARD ACTION:	DATE:
SUBMITTED BY: Joann A. Boughman 301-445-1992	jboughman@usmd.edu

1

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TU TOWSON UNIVERSITY

June 25, 2021

Kim E. Schatzel, Ph.D.
President

Office of the President
8000 York Road
Towson, MD 21252-0001

Jay Perman, MD
Chancellor
University System of Maryland
3300 Metzerott Road
Adelphi, MD 20783

Dear Chancellor Perman:

Towson University seeks review and approval of a **Bachelor of Science in Computer and Mathematical Sciences** under Code of Maryland Regulations (COMAR) 13B.02.03.06.

This program includes two concentrations: Applied Mathematics and Computer Science, and Computer and Mathematical Sciences Secondary Education, addressing Maryland's growing need for Mathematics and Computer science educators.

Thank you in advance for your review.

Sincerely,

Kim Schatzel, Ph.D.
President

KS/wrf

cc: Dr. Antoinette Coleman, Associate Vice Chancellor, Academic
            Affairs, USM
        Dr. David Vanko, Dean Fisher College of Science and Mathematics
        Dr. Maggie Reitz, Vice Provost

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UNIVERSITY SYSTEM OF MARYLAND INSTITUTION PROPOSAL FOR

x   New Instructional Program

_____ Substantial Expansion/Major Modification
_____ Cooperative Degree Program
_____

x   Within Existing Resources, or

_____ Requiring New Resources

Towson University

_____

Institution Submitting Proposal

Computer and Mathematical Sciences

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Title of Proposed Program

Bachelor of Science	Fall 2021
Award to be Offered	Projected Implementation Date

0833-01	13.1311
Proposed HEGIS Code	Proposed CIP Code

Computer and Information Sciences	Sidd Kaza
Department in which program will be located	Department Contact

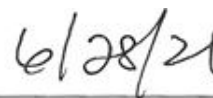| **410-704-2633**	**skaza@towson.edu**
Contact Phone Number	Contact E-Mail Address

Signature of President or Designee   6/28/21

Date

3

B.S. Computer and Mathematical Sciences

Executive Summary

The Department of Computer and Information Sciences at Towson University, in partnership with the Department of Mathematics, proposes a new Computer and Mathematical Sciences degree program. This program consists of two concentrations: an Applied Mathematics and Computer Science concentration, and a Computer and Mathematical Sciences Secondary Education concentration addressing Maryland's growing need for Mathematics and Computer science educators.

The proposed Applied Mathematics and Computer Science concentration addresses a growing need for a combined major providing an opportunity for students pursuing computer science to bolster their mathematical and analytical skills and mathematics majors to build foundational computer science skills.

The Computer and Mathematical Sciences Secondary Education concentration will lead to dual teacher certification for Computer Science and Mathematics Secondary Education (grades 7-12). The most recent Maryland teacher staffing report identifies Computer Science and Mathematics as "areas of critical shortage," while the state requires high schools to begin offering at least one computer science course beginning AY 2021-2022 as per 2018 MD House Bill 281. This concentration is designed to address the needs of Maryland schools, many of whom may not be able to hire a dedicated computer science educator but would benefit from hiring an educator certified to teach both mathematics and computer science. The dual certification also addresses graduates' needs, offering them greater flexibility and opportunity to secure employment.

The Departments of Computer and Information Sciences and Mathematics have the resources, experience, and expertise to offer the proposed program to the benefit of the Maryland School districts, future graduates, and the reputation of Towson University.

A. Centrality to institutional mission statement and planning priorities

This program aligns with and supports the Towson University Strategic Plan[1]:
Educate: Both concentrations include innovative and rigorous mathematics and computer science courses that prioritize engaged learning.

Innovate: Being among the first undergraduate Computer Science Education programs in the state, this program exemplifies innovative approaches to learning in STEM teacher preparation. It will also allow faculty to study the successes and challenges of the program, leading to the generation of new knowledge about computer science teacher preparation (a relatively new field of study).

Engage: The Secondary Education concentration, in cooperation with Towson UTeach, will partner with local public schools which serve as Professional Development Sites, bringing expertise about computer science education to the community. After graduation, teacher candidates will serve the region and the state with their ability to offer high-quality computer science courses in local school districts.
Include: Equity in computer science education is a founding principle of this new program. Special attention will be paid in several courses (including COSC418 and COSC 492) to concerns of equity, inclusion, diversity, and justice in computing and computer science education.

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[1] https://www.towson.edu/about/mission/strategicplan.html

Support: The Applied Mathematics and Computer Science concentration will allow for recruiting exceptionally talented computer science and mathematics majors into the dual-focused major, allowing them to build their mathematical and computing expertise simultaneously. The Secondary Education concentration will allow recruiting computer science and mathematics majors to the teaching profession. Both concentrations will support students through engaging campus experiences such as clubs, internships, and undergraduate research experiences.

Sustain: This program promotes sustainability by educating computer science teachers who will be able to sustain the profession by offering high-quality educational experiences to high school students, leading to *more, better prepared*, and *more diverse* computer science majors in the future.

Notable Design Features of the Proposed Program

The proposed Computer and Mathematical Sciences program's Applied Mathematics and Computer Science concentration addresses needs of a growing number of CS students who want to add a strong mathematical background to their CS degree, as well as mathematics majors who want to add a strong computing component to their pure or applied math degree. Given the current demand for computer scientists, especially those equipped with the strong problem-solving skills that come with a strong math background, the interest in this program from both students and industry is expected to grow further. The proposed Applied Mathematics and Computer Science concentration will work to satisfy the currently unmet demand. The Applied Mathematics and Computer Science concentration requires a minimum of 124 credits comprised of: 49 credits in computer science and related core requirements; 44 credits in mathematics, and 31 additional credits to complete the Towson Core Curriculum.

Towson University's proposed Computer and Mathematical Sciences Secondary Education concentration is specifically designed as a dual-certification concentration for computer science and mathematics secondary education. It requires a minimum of 127 credits, is comprised of 36 credits in computer science, 38 credits in mathematics, 25 credits in education, and 28 additional credits in core curriculum. In line with the University's mission statement seeking to meet the educational needs of the state, we have consulted with education, computer science, and mathematics faculty as well as advisers from four local community colleges. We have determined that in each case there exists a potential 2+2 pathway that includes a two-year degree at the community college level and culminates in a bachelor's degree leading to dual certification in computer science and mathematics.

The decision to develop a dual-certification concentration addresses the flexibility of needs of Maryland school districts. Many schools are not currently in the position to hire full-time teachers in computer science, despite a growing interest to do so. Graduates of this program will help school districts meet their staff needs in computer science, while also serving as mathematics instructors. This type of dual certification approach is supported by national organizations like Code.org (https://code.org/files/TeacherPathwayRecommendations.pdf) as well as conversations among Steering Committee members of the Maryland Center for Computing Education (MCCE). This program also aligns with the University's mission statement seeking to promote economic and workforce development to keep Towson graduates working in Maryland by providing a pathway for graduates who wish to teach computer science to find employment within the Maryland school system.

A dual-certification program in computer science and mathematics will also widen the prospects for recruiting students to this major. To date, there are few pre-service teacher preparation programs in Maryland that lead to secondary education certification in computer science. While awareness of the program matures in the early years, we expect that recruitment from computer science and mathematics majors will contribute significantly to the population of the major.

5

We note that all courses associated with an SPA assessment for CAEP certification of TU's existing Mathematics Secondary Education major are embedded in the proposed Computer and Mathematical Sciences Secondary Education major. Thus, in terms of certification, graduates of the Mathematics Secondary Education major and those of the proposed Computer and Mathematical Sciences Secondary Education major will not be distinguishable.

B. Critical and compelling regional or State-wide need as identified in the State Plan

There is a dramatic shortage of computing professionals in the U.S. Less than 80,000 bachelor's degrees in computing were awarded in 2019[2], while there were 500,000 unfilled computing jobs[3]. This has serious strategic and economic implications for the nation. As a result, there has been a concerted, national effort to integrate computer science education throughout K-12, jump-started by President Obama through the Computing for All initiative. Indeed, computational thinking has now been identified as a skill as fundamental as reading, writing and arithmetic for today's students, and critical for the U.S. to remain internationally competitive in the future[4]. The National Academies of Science, The National Science Foundation, and Code.org (sponsoring the annual Hour of Code[5], involving 100 million students from 180 countries) highlight some of the ongoing efforts to encourage and support efforts to provide and integrate computational thinking into curricula from elementary through secondary school (and on through the university level). Supplementing the current programmatic offerings at Towson, this new program answers two complementary needs – (1) educating more secondary school teachers in mathematics and computer science; and (2) producing more computing professionals with skills both in mathematics and computer science.

In recent years, computer science education in Maryland has gained greater prominence at the secondary school level. In 2016, the Maryland State Department of Education (MSDE) approved computer science courses as fulfilling the technology education requirement in Maryland public schools. The 2018 MD House Bill 281 requires that beginning in 2021-2022, each MD public school system must require each of its high schools to offer at least one computer science course. This, and a complementary national effort, has been the catalyst for the growing demand for computer science courses in Maryland schools, which, in turn, has created a rapidly growing need for properly trained teachers. This need will likely only increase in the foreseeable future. Current bills under consideration by the Maryland House of Delegates include HB 820, which would require each county school board, beginning in 2023-2024, to submit a report on CS course data, such as enrollment and demographics; HB 823, which would allow students to partially satisfy their mathematics requirements by completing a credit in certain CS courses under certain circumstances; and HB 824, which would create a cybersecurity safety guide and training course to be implemented in public schools. This ongoing legislation demonstrates the increasing attention to Computer Science education at the secondary level, and, if passed into law, will create additional demand for highly qualified computer science teachers.

Increasing the capacity for computer science courses in Maryland high schools can significantly increase the number and diversity of students choosing to major in computer science in college. According to Code.org, students who learn computer science in high school are six times more likely to major in it,

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[2] https://educationdata.org/number-of-college-graduates/
[3] https://csedweek.org/resource_kit/blurbs
[4] J.M. Wing, "Computational Thinking," CACM Viewpoint, March 2006, pp. 33-35
[5] https://hourofcode.com/us

while women are 10 times more likely[6]. To meet this challenge, school systems need teachers with the depth of knowledge of computer science commensurate with teachers in the other STEM disciplines. The proposed Computer and Mathematical Sciences program is designed to address this need of teachers and as a result address the greater need for a diverse workforce in the region.

C. Quantifiable and reliable evidence and documentation of market supply and demand in the region and State

The proposed program would be one of the first undergraduate program in the state with the designation of 13.132 (Computer Teacher Education). The most recent Maryland teacher staffing report 2016-2018[7] declares that educators for computer science and mathematics (grades 7-12) are "areas of critical shortage" and the Maryland State Department of Education states a need to expand computer science teacher certification options. This program attempts to address this public policy need. Table 1 (below) identifies the number of teacher candidates graduating from an approved program in Mathematics-Secondary Education from all Institutions of Higher in the state of Maryland[8]. Table 1 also demonstrates that Towson University is the leading institution in terms of the number of teacher candidates in Mathematics Secondary Education, indicating that we are well-positioned to offer this new program. Furthermore, the same Maryland State Department of Education data indicates that in all the years that data was collected (2013-2017), there were 0 graduates from Maryland IHEs who completed an approved Computer Science 7-12 certification program. This program attempts to address this public policy need.

Year	2013-2014	2014-2015	2015-2016	2016-2017	Total
Bowie State University	0	1	1	3	5
Frostburg State University	4	2	0	2	8
Hood College	0	0	0	2	2
Johns Hopkins University	1	1	3	1	6
Loyola University Maryland	2	5	1	5	13
McDaniel College	2	1	0	3	6
Mount St. Mary's University	4	2	1	2	9
Notre Dame of Maryland University	8	12	9	7	36
Salisbury University	4	8	12	10	34
St. Mary's College of Maryland	0	1	1	3	5

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6 https://code.org/advocacy/state-facts/MD.pdf
7 http://marylandpublicschools.org/stateboard/Documents/10252016/TabF.pdf
8 MSDE Approved Programs Dashboard:
https://mldscenter.maryland.gov/webcenter/faces/oracle/webcenter/page/scopedMD/sa8bbbac1_8caf_4819_a5a1_7b1d774ceb9d/Page6.jspx

Stevenson University	0	0	2	1	**3**
Towson University	18	15	8	13	**54**
Univ. of MD Eastern Shore	1	1	0	1	**3**
Univ. of MD University College	7	1	3	4	**15**
Univ. of MD, Baltimore County	7	11	9	3	**30**
Univ. of MD, College Park	11	9	11	13	**44**
Washington College	1	1	0	0	**2**
Total	**70**	**71**	**61**	**73**	**275**

Table 1: Initial teacher certification program graduates by university and year.

D. Reasonableness of program duplication

There exists no current single degree program in the state that is targeted at preparing graduates in both Mathematics and Computer science. The nearest comparison to the proposed program would be Universities that allow students to simultaneously meet the requirements for their Mathematics and Computer science programs, receiving a double major degree. For instance, University of Maryland[9] and McDaniel College[10] allow students to pursue a double major in Mathematics and Computer Science. A dual major degree requires students to complete the requirements of their primary major and take additional units to meet the requirements of the second major. For example, at McDaniel College the computer science major requires up to 54 total hours and the dual major of Computer Science of Mathematics requires an additional 17 hours. In contrast, the proposed program described herein is a single integrated program offering education in the areas of Computer Science and Mathematics.

The proposed program's Secondary Education concentration emphasizes the institutional goals of making Towson a first-choice institution for an increasing percentage of students. This program would be among only three approved programs in the state of Maryland for undergraduates wishing to pursue computer science secondary education, and the *only* degree program that prepares graduates for dual certification in both mathematics and computer science. The only two other programs in the state that lead to certification in computer science secondary education (at Washington College and University of Maryland – College Park, both approved since 2018) are both single-certification options. Graduates from the secondary education concentration will be certified to teach Mathematics, for which there is a growing need (see Section C. above), and Computer Science, helping to meet the MD House Bill 281 requirement that each high school is required to offer at least one computer science course and the increasing national demand for computer science educators.

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[9] University of Maryland Math and Computer Science Dual major.
https://www-math.umd.edu/double-major.html#cs
[10] McDaniel College Computer Science and Mathematics dual major.
http://catalog.mcdaniel.edu/preview_program.php?catoid=41&poid=3923&returnto=2712&print

8

E. Relevance to high-demand programs at Historically Black Institutions (HBIs)

Similar programs do not currently exist at HBIs, or elsewhere in the state. This program will have no impact on the uniqueness and institutional identities and missions of HBIs.

F. Relevance to Historically Black Institutions (HBIs)

Similar programs do not currently exist at HBIs, or elsewhere in the state. This program will have no impact on the uniqueness and institutional identities and missions of HBIs.

G. Adequacy of curriculum design and delivery to related learning outcomes consistent with COMAR 13B.02.03.10 (See COMAR Title 13B.02.03.10 for the regulation.)

The Applied Mathematics and Computer Science concentration in this program will not be a screened major and any student admitted to Towson University will be able to select this concentration.

The Secondary Education concentration will require the students to be admitted to the Towson University UTeach program (https://www.towson.edu/fcsm/departments/uteach/admission.html). The updated requirements are guided by the Towson Teacher Education Executive Board standards, and currently include completion of 45 college units, an overall 3.0 GPA, and satisfactory completion of a criminal background check.

Program Educational Objectives:

1. Graduates will be able to apply their depth of understanding in computer and mathematical sciences to facilitate successful careers in computer science and related fields.
2. Graduates will be able to apply their broad knowledge in the fundamental areas of computer and mathematical sciences to allow them to continue their professional development and sustain a life-long career in in the field either through graduate study or continuing self-directed learning and development activities.
3. Graduates will apply their teamwork, communication, and interpersonal skills to enable them to work effectively with interdisciplinary teams and practice their profession with regard to ethical and societal responsibilities.

The program educational objectives directly support the institutional mission by focusing on the development of knowledge in a specialized field, critical thinking skills, and effective communications skills. They also emphasize the institutional goals of developing an awareness of local and global culture and as well as high standards for integrity and societal contributions.

All students in the Computer and Mathematical Sciences Major must complete the shared coursework. Each student will also select the Applied Mathematics and Computer Science or Secondary Education concentration and fulfil all the requirements listed for that concentration. The two concentrations in the program will be assessed independently to support the student learning outcomes for each.

9

Applied Mathematics and Computer Science Concentration

The Applied Mathematics and Computer Science concentration requires students to complete 124-126 units, distributed between 49 units required from computer science and related core requirements, 44-46 units required from mathematics, and 31 additional units from the core curriculum. These are designed to combine the bulk of the core requirements of the computer science and mathematics majors and to maximize potential synergies between the majors and among their electives so that this concentration replicates the benefits of a double major (in computer science and mathematics) at a lower course load.

Applied Mathematics and Computer Science Concentration Requirements

Required Computer Science Courses (34 credits)

COSC 236	Introduction to Computer Science I	4
COSC 237	Introduction to Computer Science II	4
COSC 290	Principles of Computer Organization	4
COSC 336	Data Structures and Algorithm Analysis	4
COSC 350	Data Communications and Networking	3
CIS 377	Information Systems Security	3
COSC 412	Software Engineering	3
COSC 439	Operating Systems	3
COSC 455	Programming Languages: Design & Implementation	3
COSC 457	Database Management Systems	3

Computer Science Elective Courses: Choose 2 of the following (6 credits)

COSC 397	Internship in COSC	3
COSC 417	Introduction to the Theory of Computing	3
COSC 459	Computer Simulation and Modeling	3
COSC 461	Artificial Intelligence	3
COSC 465	Robotics	3
COSC 471	Computer Graphics	3
COSC 483	Design and Analysis Algorithms	3
COSC 495	Independent Study[2]	3

Required Mathematics Courses (32 credits)

MATH 265	Elementary Linear Algebra	4
MATH 267	Introduction to Abstract Mathematics	4
MATH 273	Calculus I	4
MATH 274	Calculus II	4
MATH 275	Calculus III	4
MATH 330	Introduction to Statistical Methods	4
	or MATH 331 Probability	4
MATH 369	Introduction to Abstract Algebra	4
MATH 372	Real Analysis I	4

Math Elective Courses – Group 1: Choose 2 of the following (6-7 credits)

MATH 314	Introduction to Cryptography	3
MATH 331	Probability	4

MATH 332	Mathematical Statistics	3
MATH 374	Differential Equations	3
MATH 377	Mathematical Models	3
MATH 379	Fourier Analysis with Applications	3
MATH 435	Numerical Analysis I	3
MATH 437	Operations Research	3
MATH 439	Computational Probability Models	3

Math Elective Courses – Group 2: Choose 2 of the following (6-7 credits)

MATH 315	Applied Combinatorics	4
MATH 451	Graph Theory	3
MATH 457	Differential Geometry	3
MATH 463	Linear Algebra	3
MATH 465	Number Theory	3
MATH 467	Algebraic Structures	3
MATH 472	Real Analysis II	3
MATH 475	Complex Analysis	3
MATH 477	Topology	3

Required Core Courses (9 credits)

COMM 131	Public Speaking **(Core 5)**	3
ENGL 317	Writing for Business and Industry **(Core 9)**	3
COSC 418	Ethical and Societal Concerns CS **(Core 14)**	3

Total (93-95 required; 31 additional core) 124+
Course catalogue descriptions are included in Appendix I.

Secondary Education Concentration

The Secondary Education concentration will satisfy the Specialized Professional Associations (SPA) assessment for the Council for the Accreditation of Educator Preparation (CAEP) for Mathematics Secondary Education programs. In addition, the concentration will also align with Computer Science Teachers Association Standards (CSTA). Student achievement in each of the following standards will be assessed. Standard 1-16 SPA standards for Mathematics Secondary Education and Standards 17-21 are CSTA standards.

Standard 1: Knowledge of Mathematical Problem Solving
Standard 2: Knowledge of Reasoning and Proof
Standard 3: Knowledge of Mathematical Communication
Standard 4: Knowledge of Mathematical Connections
Standard 5: Knowledge of Mathematical Representation
Standard 6: Knowledge of Technology
Standard 7: Dispositions
Standard 8: Knowledge of Mathematics Pedagogy
Standard 9: Knowledge of Number and Operation
Standard 10: Knowledge of Different Perspectives on Algebra
Standard 11: Knowledge of Geometries
Standard 12: Knowledge of Calculus
Standard 13: Knowledge of Discrete Mathematics

11

Standard 14: Knowledge of Data Analysis, Statistics, and Probability
Standard 15: Knowledge of Measurement
Standard 16: Field-Based Experiences
Standard 17: Computer Science Knowledge and Skills
Standard 18: Equity and Inclusion
Standard 19: Professional Growth and Identity
Standard 20: Instructional Design
Standard 21: Classroom Practice

Secondary Education Concentration Requirements

Required Computer Science Courses

CIS 377	Information Systems Security	3
COSC 236[1]	Introduction to Computer Science I	4
COSC 237	Introduction to Computer Science II	4
COSC 336	Data Structures and Algorithm Analysis	4
COSC 412	Software Engineering	3
COSC 418	Ethical and Societal Concerns CS **(Core 14)**	3
COSC 109	Computers and Creativity **(Core 4)**	3
ITEC 250	Fundamentals of Computer Networks	3
COSC 482	Teaching Computer Science in Secondary Schools	3
COSC 492	Internship Secondary Education-Computer Science	6

Required Mathematics Courses

MATH 265	Elementary Linear Algebra	4
MATH 267	Introduction to Abstract Mathematics	4
	or MATH 263 Discrete Math	3
MATH 273	Calculus I	4
MATH 274	Calculus II	4
MATH 275	Calculus III	4
MATH 310	Functions and Modeling **(Core 9)**	3
MATH 330	Introduction to Statistical Methods	4
MATH 353	Euclidean and Non-Euclidean Geometry	3
MATH 423	Teaching Mathematics in the Secondary Schools	3
MATH 426	Internship Secondary Education – Mathematics	6

Required Education Courses

SEMS 110	Intro to STEM Teaching I	1
SEMS 120	Intro to STEM Teaching II	1
SEMS 230	Knowing & Learning	3
SEMS 240	Classroom Interactions	3
SEMS 250	Perspectives in Science and Mathematics **(Core 5)**	3
SEMS 370	Project-Based Instruction	3
SEMS 498	Intern. Math and Science Secondary Education	3
SEMS 430	Seminar in STEM Education	1
SCED 460	Using Reading & Writing in the Secondary Schools	4
SCED 461	Teaching Reading in the Secondary Content Areas	3

12

Total (100 required; 28 additional core) 127+
Course catalogue descriptions are included in Appendix I.

H. Adequacy of articulation

Towson has transfer agreements with community colleges with programs in the CIS Department and beyond. Many courses (that lie outside of articulation agreements) transfer through the transfer equivalency system at Towson (https://tes.collegesource.com/publicview/TES_publicview01.aspx?rid=5238dc5e-5503-4fd6-86a5-13b67093b7d0&aid=8f38118f-ccf9-4534-8f42-bbf970321b39).

Since this program is based on lower-level courses that already exist, we anticipate no issues in transferring equivalent courses form community colleges and other four-year institutions using our current mechanisms.

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

Faculty who will contribute to the program:

Faculty Member	Highest Degree Earned - Field and Year	Rank [1]	FT/PT	Courses Teaching [2]
Acharya, Subrata	Ph.D., Computer Science (2008)	P	FT	*NSF Rotation 2020-2021
Ali-Gombe, Aisha	Ph.D., Engineering and Applied Science-Computer Science (2017)	AST	FT	COSC 236
Alkharouf, Nadim	Ph.D. Computational Sciences and Informatics (2004)	P	FT	COSC 236
Brown, Cheryl Thomas	M.S., Information & Telecommunications Systems (1995)	I	FT	CIS 377
Chakraborty, Suranjan	Ph.D., Information Systems (2008)	P	FT	COSC 237
Conover, Adam	Sc.D., Applied Information Technology (2008)	AST	FT	COSC 236, COSC 455
Davani, Darush	Sc.D. Engineering and Applied Science (1985)	P	FT	COSC 175, COSC 459, COSC 465

13

Dehlinger, Josh	Ph.D., Computer Science (2008)	P	FT	CIS/COSC/ITEC 397, COSC 495
Deng, Lin	Ph.D., Information Technology (2017)	AST	FT	COSC 412
Dierbach, Charles	Ph.D., Computer Science (1991)	ASC	FT	COSC 109, COSC 237, COSC 495
Downing-Harris, Terry	M.S., Business Administration (2005)	I	FT	COSC 175
Dudley, Alfreda	Ph.D., Technology & Culture (2008)	P	FT	COSC 418
Eyer, Robert	M.S. Computer Science (2001)	I	FT	COSC 236
Hilberg, Scott	Ed.D., Organizational Innovation & Leadership (2007)	P	FT	
Hong, Sungchul	Ph.D., Management Science (1999)	ASC	FT	COSC 457
Hornberger, Alex	M.S. Computer Science	I	FT	CIS 377
Hossain, Moinul	Ph.D., Electrical and Computer Engineering (2020)	AST	FT	ITEC 250
Karne, Ramesh	Ph.D. Computer Science (1992)	P	FT	COSC 439
Kaza, Sidd	Ph.D., Management Information Systems (2008)	P	FT	COSC/CIS As needed.
Kelleher, Tina	Ph.D., Literature (2005)	I	FT	COSC 418
Kim, Yanggon	Ph.D., Computer Sciences (1995)	P	FT	COSC 290

Liao, Weixian	Ph.D., Computer Engineering (2018)	AST	FT	COSC 236
Loksa, Dastyni	Ph.D., Information Science – Computer Science Education (2020)	AST	FT	COSC 236
Lu, Chao	Ph.D., Engineering (1988)	P	FT	COSC 290
Meiselwitz, Gabriele	Ed. D., Instructional Technology (2005)	P	FT	COSC 109
Nguyen, Nam	Ph.D., Computer Science	ASC	FT	COSC 336, COSC 483
O'Leary, Michael	Ph.D., Mathematics	P	FT	
Pak, Jinie	Ph.D., Information Systems (2014)	ASC	FT	CIS 377, COSC 418
Saeedloei, Neda	Ph.D., Computer Science (2011)	AST	FT	COSC 455, COSC 461
Sanders, Willie	M.S., Applied Information Technology (2017)	I	FT	CIS 377
Song, Yeong-Tae	Ph.D., Computer Science (1999)	P	FT	COSC 290, COSC 412
Tang, Katherine	Ph.D., Computer Science (2011)	ASC	FT	COSC 336, COSC 439, COSC 471
Tavakolan, Mona	D. Sc., Towson University (2014)	AST	FT	ITEC 250
Taylor, Blair	D.Sc., Applied Information Technology (2008)	ASC	FT	CIS 377, COSC 236
Tessler, Chuck	Ph.D., Computer Science (2019)	AST	FT	COSC 439
Wang, Kathy	Ph.D., Computer and Information Science (2008)	AST	FT	COSC 418
Wijesinha, Alexander	Ph.D., Computer Science (1996)	P	FT	COSC 350

15

Wilbanks, Linda	Ph.D., Computer Science (1991)	I	FT	CIS 377
Yu, Wei	Ph.D., Computer Engineering (2008)	P	FT	COSC 237
Zimand, Iliana	M.S., Computer Science (1999)	I	FT	COSC 236, COSC 237
Zimand, Marius	Ph.D., Computer Science (1996)	P	FT	COSC 336
Mostafa Aminzadeh	Ph.D. in Statistics	P	FT	Math 27x, 330, 331
Sergiy Borodachov	Ph.D. in Mathematics	P	FT	Math 2xx, 374, 379, 435, 457, 472, 475
Christopher Cornwell	Ph.D. in Mathematics	AST	FT	Math 2xx, 369, 457, 463, 467, 477
Linda Cooper	Ph.D. in Mathematics Education	P	FT	SEMS 240, SEMS 370, Math 330, Math 426
Kimberly Corum	Ph.D. in Mathematics Education	AST	FT	SEMS 370, Math 426
Yunwei Cui	Ph.D. in Statistics	ASC	FT	Math 27x, 330, 331, 332, 439
Min Deng	Ph.D. in Statistics	P	FT	Math 331, 332
Kristin Frank	Ph.D. in Mathematics Education	AST	FT	Math 310, 420, 423, 426
Mathew Gluck	Ph.D. in Mathematics	I	FT	Math 2xx, 372, 374, 377, 435, 457, 472, 475
T Elizabeth Goode	Ph.D. in Mathematics	ASC	FT	Math 2xx, 369, 451,

16

Vincent Guingona	Ph.D. in Mathematics	AST	FT	Math 2xx, 315, 369, 372, 463, 465, 467
Ge Han	Ph.D. in Mathematics	ASC	FT	Math 27x, 330, 331, 332
Xuezhang Hou	Ph.D. in Mathematics	P	FT	Math 2xx, 372, 374, 379, 472, 475
Min Ji	Ph.D. in Actuarial Science	ASC	FT	Math 27x, 330, 331, 332
Gail Kaplan	Ph.D. in Mathematics	P	FT	Math 310, 320, 423, 426
Opel Jones	Ph.D. in Mathematics	I	FT	Math 2xx, 315, 369, 451
Alexei Kolesnikov	Ph.D. in Mathematics	P	FT	Math 2xx, 314, 315, 369, 377, 437, 467
Angel Kumchev	Ph.D. in Mathematics	P	FT	Math 2xx, 369, 372, 374, 463, 465, 467, 472, 475
Lindsey-Kay Lauderdale	Ph.D. in Mathematics	AST	FT	Math 2xx, 314, 315, 369, 451, 463, 465, 467
Nathan McNew	Ph.D. in Mathematics	AST	FT	Math 2xx, 314, 315, 369, 451, 463, 465, 467
Michael O'Leary	Ph.D. in Mathematics	P	FT	Math 27x, 314, 374, 377, 435, 437, 472, 475
Miriam Parnes	Ph.D. in Mathematics	I	FT	Math 2xx, 315, 369, 374, 463, 467
Moustapha Pemy	Ph.D. in Mathematics	P	FT	Math 27x, 331, 372, 374, 437, 439, 472

17

Tatyana Sorokina	Ph.D. in Mathematics	P	FT	Math 2xx, 372, 374, 435, 457, 463, 472, 477
Sandy Spitzer	Ph.D. in Mathematics Education	P	FT	SEMS 230, Math 426
Leonid Stern	Ph.D. in Mathematics	P	FT	Math 2xx, 369, 463, 465, 467
Jing Tian	Ph.D. in Mathematics	AST	FT	Math 2xx, 372, 374, 377, 379, 435, 457, 472, 475
Mircea Voisei	Ph.D. in Mathematics	ASC	FT	Math 2xx, 372, 374, 472
Rajeev Walia	Ph.D. in Mathematics	I	FT	Math 27x, 369, 374, 463
Xiaoyin Wang	Ph.D. in Mathematics	P	FT	Math 330, 332
Na Zhang	Ph.D. in Mathematics	AST	FT	Math 27x, 330, 331, 439
Jay Zimmerman	Ph.D. in Mathematics	P	FT	Math 2xx, 369, 451, 457, 465, 467, 475

[1] Code: P=Professor, ASC=Associate Professor, AST=Assistant Professor, I=Instructor, A=Adjunct, O=Other

[2] 2xx and 27x indicates teaching any 200 or 270 Math courses, respectively.

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

Towson University students and faculty benefit from the library's participation in two local library consortia, the University System of Maryland, and Affiliated Institutions (USMAI) and the Baltimore Academic Library Consortium (BALC). Towson University students and faculty can order materials through the shared USMAI catalog from other University System of Maryland Libraries and have them delivered directly to the Cook Library in three to five days. The University of Maryland College Park's EPS Library has a particularly strong computer and information science collection to support their well-known Computer Engineering program. University of Maryland at Baltimore County (UMBC) and Bowie State University have solid collections to support their accredited computer science programs. In

18

addition, students and faculty can check out materials from nearby BALC libraries such as Loyola University's library, another accredited computer science institution and member of the Baltimore Academic Library Consortium.

Through the Cook Library's **ILLiad online interlibrary loan system**, students and faculty may request items not available through the USMAI catalog or articles not accessible in print or online format through Cook Library. ILLiad facilitates the electronic delivery of interlibrary loan materials to the desktops of Towson faculty and students. In special cases, Cook Library can rush materials to users in 24 hours, but most interlibrary loan requests are filled within 10 to 14 days. Generally, materials are free to Towson University borrowers, but if the lending library charges special fees, these are passed on to borrowers. The interlibrary loan statistics enable the library to identify journals that should be owned at Towson University because of their high use.

K. Adequacy of physical facilities, infrastructure and instructional

equipment (as outlined in COMAR 13B.02.03.13)

This program will be housed in the department of Computer & Information Sciences and will utilize the existing physical facilities, infrastructure, and instructional equipment. The program will leverage existing classroom space and optimize timing of courses to offer the proposed program without requiring additional facilities, infrastructure, or instructional equipment. The computing resources available to students, as provided by the department and the university campus computing by OTS, gives students access to abundant computing resources. In addition, the Secondary Education concentration will utilize the existing infrastructure of the Towson UTeach program that includes two Towson UTeach designated classrooms as well as a student resource center (available for students to study, tutor, and team build).

Classrooms / Teaching Labs

The department has **eight traditional classrooms** and **nine teaching laboratories**, each outfitted with a front instructor's projection station and a front electric projection screen. Each of the classrooms and labs hold approximately 30 students, except for **one larger class** that holds up to 60 students.
Each classroom and teaching lab are equipped with a ceiling mounted Panasonic PT-RZ570 projector and Crestron control system. The instructor can project an image to the class from a variety of systems or viewing devices. The instructor's station is also outfitted with:

- Separate cables (audio, HDMI, Ethernet, and video) for the instructor to connect a laptop or other HDMI devices to the projection system.
- A Mid Atlantic Products PO-915RV-RN Power Amp and Crestron DMPS-300C Audio Mixer
- Bogen HFCSI recessed ceiling speakers (four)

The equipment meets the needs of instructors with different teaching styles, from markers and whiteboard to more web-enhanced and multi-media presentations. Equipment and instructor needs are reviewed each semester and updated as necessary.

Open Project Labs

The department has **two open project labs** that are available for student use. The labs are open from 8am-10pm Monday-Thursday, 8am-5pm Fridays, and 10am-3pm on Saturday and Sunday. Extended hours are available upon request and during Final Exams Week. Students in the secondary education

19

concentration also have access to the UTeach Student Resource Center which includes additional space and contexts for student work.

Research Labs

The department also has **nine research labs** located in the building to facilitate co-located work, meetings, and research. These labs would be accessible to students of the proposed program should they choose to contribute to research or are interested in more further engaging with the topics addressed in the lab.

- Research Project Lab
- Bare Machine Computing and Software Engineering Lab
- Human Computer Interface (HCI) Lab
- Advanced Network and Honeynet Lab
- Computer Vision Lab
- Forensics and Wireless/RFID Lab
- Learning Management Systems and Voice Over IP Lab
- Network Security Lab
- Bioinformatics Lab

Additionally, the department also has **four specialized technology teaching and research labs**, as follows:

- Security Lab
- Linux-VM Lab
- IT Program Lab
- Hardware Lab

Campus Computing Facilities

The university has a **wireless network** that gives students access to the university systems. Computer labs are also available for all students on campus in Cook Library, maintained by OTS. These labs are available from 8am - 9:30pm Monday-Thursday, 8am - 4pm on Friday, 10am - 5:30pm on Saturday, and 12pm - 9pm on Sunday.

Administrative Offices

The department has adequate office space and facilities for the administrators in the program. The "front/lobby area" of the department is directly off the main hallway. It contains a reasonable-sized waiting area staffed by the same fulltime level-two administrative assistant every day. The offices of the department chair, associate chair, and the Student Services Coordinator are easily accessible to the lobby area expediating addressing any needs for a student, staff, or faculty to speak with the administrators.

20

Faculty Offices

Each full-time faculty member in the department has their own office. All faculty offices are in the same area, with various printer stations at the perimeters.

Resident Students Computing Access

The **Towson University Resident Network** (ResNet) is a secure network managed by OTS that provides students access to campus computing from their dormitories.

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

The proposed program requires minimal additional resources as it is built upon the existing courses in the Mathematics and Computer Science Majors. All but two courses are permanent running courses in the two majors already. Reallocated funds are used to staff the courses (all but two of which already serve existing majors). We predict the hiring of one master teacher at the clinical track.

We do not anticipate needing any additional funding to cover the first year of the program. While we anticipate needing a new faculty member starting in year 2, the expected tuition from students in the proposed program will be enough to cover the salary and benefits of a new faculty member. Please see details in Table 1: Resources and Table 2: Expenditures.

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

The adequacy of the course content and learning outcomes for both concentrations within the program will be evaluated by a program committee which will be instituted when the program is approved. The program committee shall meet 3 times a semester and will oversee the program. The department of Computer and Information Sciences will be the home department for the program working on close coordination with the Department of Mathematics. While mid-semester meetings will focus on course development issues, the department retreat in August will be used to develop long-term strategic goals for the program and address any changes to accreditation requirements.

The program will be assessed within the 7-year assessment cycles at Towson University.
Faculty will be evaluated each semester using quantitative, qualitative and peer evaluations as measures. The evaluations will be reflected upon in the annual faculty reviews.

Student performance and outcomes will be assessed by many metrics including:

- Records of job offers and career advancement.

- Records of admission to graduate program

- Faculty evaluation of students' internship experiences combined with recommendations from industry professional.

- Faculty evaluation of students' paper discussing how they would be solving ethical issues related to computer science and related field.

The faculty committee will review the curriculum each semester. Appendix II includes the full Assessment Plan for this program.

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)

Towson University is one of the most diverse higher education institutions in the nation and is staunchly committed to building an inclusive, equitable and diverse campus community. In Fall 2020, a new diversity and equity strategic plan was launched at Towson focusing on TU's aspiration to become a more inclusive and equitable institution of distinction. The Fisher College of Science and Mathematics and Department of Computer and Information Sciences will align their diversity and inclusion plans with the university in 2021. In 2021, the CIS department also begins work on a department-wide effort to increase inclusion and retention of minorities in the computing programs through a grant from the Center of Inclusive Computing at Northeastern University. The CIS department has a student population that has 50% minorities (by race), and this program will use this population as a feeder group. Long-term, enhancing teachers' preparation and ability to offer computer science courses in Maryland high schools is likely to promote diversity within the Department Computer and Information Science (since empirical data suggests that students from historically under-represented populations, such as women and BIPOC, are more likely to choose computing as a career if they take a computer science course in high school)[11].

O. Relationship to low productivity programs identified by the Commission

Not Applicable.

P. If proposing a distance education program, please provide evidence of adequacy of the program addressing the Council of Regional Accrediting Commissions (C-RAC) Interregional guidelines for the evaluation of distance education (as required in COMAR 13B.02.03.22C).

Not Applicable

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[11] https://code.org/diversity

Q. Program Resources and Expenditures Tables

TABLE 1: RESOURCES					
Fill in items highlighted in blue only					
Resources Categories	(Year 1)	(Year 2)	(Year 3)	(Year 4)	(Year 5)
1. Reallocated Funds[1]	**402,960**	**419,078**	**435,842**	**453,275**	**471,406**
2. Tuition/Fee Revenue[2]	**80,916**	**120,456**	**159,996**	**183,720**	**188,592**
a. Annual Full-time Revenue of New Students					
Number of Full-time Students	9	14	19	22	22
Annual Tuition Rate	$7,296	$7,296	$7,296	$7,296	$7,296
Subtotal Tuition	$65,664	$102,144	$138,624	$160,512	$160,512
Annual Fees	$612	$612	$612	$612	$612
Subtotal Fees	$5,508	$8,568	$11,628	$13,464	$13,464
Total Full-time Revenue of New Students	$71,172	$110,712	$150,252	$173,976	$173,976
b. Annual Part-time Revenue					
Number of Part-Time Students	2	2	2	2	3
Credit Hour Tuition Rate	$304	$304	$304	$304	$304
Annual Fees Per Credit Hour	$102	$102	$102	$102	$102
Annual Credit Hours Per Student	12	12	12	12	12
Subtotal Tuition	$7,296	$7,296	$7,296	$7,296	$10,944
Subtotal Fees	$2,448	$2,448	$2,448	$2,448	$3,672
Total Part Time Revenue	$9,744	$9,744	$9,744	$9,744	$14,616
3. Grants, Contracts & Other Sources[3]	$0	$0	$0	$0	$0
4. Other Sources	$0	$0	$0	$0	$0
TOTAL (Add 1 - 4)	$483,876	$539,534	$595,838	$636,995	$659,998

23

TABLE 2: EXPENDITURES					
Fill in blue shaded areas only.					
Expenditure Categories	**(Year 1)**	**(Year 2)**	**(Year 3)**	**(Year 4)**	**(Year 5)**
1. Total Faculty Expenses	$0	$99,750	$103,740	$107,890	$112,205
(b + c below)					
a. #FTE	0.0	1.0	1.0	1.0	1.0
b. Total Salary		75,000	78,000	81,120	84,365
c. Total Benefits	0	24,750	25,740	26,770	27,840
2. Total Administrative Staff Expenses	0	0	0	0	0
(b + c below)					
a. #FTE	0.0	0.0	0.0	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	0	0	0	0	0
(b + c below)					
a. #FTE	0.0	0.0	0.0	0.0	0.0
b. Total Salary					
c. Total Benefits	0	0	0	0	0
4. Equipment	5,000	5,000	5,000	5,000	5,000
5. Library					
6. New or Renovated Space					
7. Other Expenses	7,200	7,200	7,200	7,200	7,200
TOTAL (1-7)	$12,200	$111,950	$115,940	$120,090	$124,405

24

25

UNIVERSITY SYSTEM
of **MARYLAND**

TOPIC: New Academic Program Proposal:
University of Maryland, Baltimore: Master of Science in Clinical Informatics

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, September 14, 2021

SUMMARY: The University of Maryland, Baltimore Graduate School seeks to offer a Master of Science (MS) in Clinical Informatics. We intend to offer it as a mixture of didactic coursework and practical training, with 34 credits required for the MS. All didactic courses will be accessible online. The practical courses will have both on-site and online options. The proposed degree will allow students with a professional healthcare background to be trained in best practices of Clinical Informatics. The program will be geared toward physicians, nurses, pharmacists, other healthcare professionals, biologists, and scientists, who will study and apply informatics approaches to enhance their professional skills. The program will focus on biomedical data, computational systems, and clinical process improvement, which students will apply to the practice of medicine, to enhance health outcomes, improve patient care, and strengthen the clinician-patient relationship.

ALTERNATIVE(S): The Regents may not approve the program or may request further information.

FISCAL IMPACT: No additional funds are required. The program can be supported by the projected tuition and fees revenue.

CHANCELLOR'S RECOMMENDATION: That the Education Policy and Student Life Committee recommend that the Board of Regents approve the proposal from University of Maryland, Baltimore to offer the Master of Science in Clinical Informatics.

COMMITTEE RECOMMENDATION:	DATE: September 14, 2021
BOARD ACTION:	DATE:
SUBMITTED BY: Joann A. Boughman 301-445-1992	jboughman@usmd.edu

UNIVERSITY *of* MARYLAND
BALTIMORE

DR. ROGER J. WARD, JD, MSL, MPA
Interim Provost and Executive Vice President
Academic Affairs/Graduate School
220 Arch Street, 14th Floor
Baltimore, MD 21201
410 706 2477
rward@umaryland.edu

www.umaryland.edu

July 26, 2021

Jay A. Perman, MD
Chancellor
University System of Maryland
3300 Metzerott Road
Adelphi, MD 20783

Dear Chancellor Perman:

The University of Maryland, Baltimore is seeking authorization to offer a Master of Science (MS) in Clinical Informatics. Our proposed program leverages institutional expertise from both UMB and UMBC to tackle systemic problems in Clinical Informatics. In order to enhance health outcomes, improve patient care, and strengthen the clinician-patient relationship, this program will apply biomedical data, computational systems, and clinical process improvement to the practice of medicine.

The program will be offered as a mixture of didactic coursework and practical training, with 34 credits required for a MS. All didactic courses will be accessible online. The practical courses will have both on-site and online options. The proposed degree will allow students with a professional healthcare background to be trained in best practices of Clinical Informatics. The program will be geared toward physicians, nurses, pharmacists, other healthcare professionals, biologists, and other scientists, who will study and apply informatics approaches to enhance their professional skills. The program will focus on biomedical data, computational systems, and clinical process improvement, which students will apply to the practice of medicine and to clinical decision support, in order to enhance health outcomes, improve patient care, and strengthen the clinician-patient relationship. We plan to offer this program beginning with the Fall 2022 term.

Thank you for your time and consideration of this request. Please contact me if you need additional information.

Regards,

Dr. Roger J. Ward, JD, MSL, MPA
Interim Provost and Executive Vice President
Dean, Graduate School

DENTISTRY • LAW • MEDICINE • NURSING • PHARMACY • SOCIAL WORK • GRADUATE STUDIES

UNIVERSITY SYSTEM OF MARYLAND INSTITUTION PROPOSAL FOR

X	New Instructional Program
	Substantial Expansion/Major Modification
	Cooperative Degree Program
X	Within Existing Resources, or
	Requiring New Resources

University of Maryland, Baltimore
Institution Submitting Proposal

Master of Science in Clinical Informatics
Title of Proposed Program

Master of Science (MS)
Award to be Offered

Fall 2022
Projected Implementation Date

Proposed HEGIS Code

51.2706
Proposed CIP Code

University of Maryland Graduate School
Department in which program will be located

Dr. Courtney Resnick
Department Contact

410-706-1527
Contact Phone Number

cresnick@umaryland.edu
Contact E-Mail Address

Dr. Roger J. Ward, JD, MSL, MPA
Interim Provost and Executive Vice President
Dean, Graduate School

July 26, 2021
Date

A PROPOSAL FOR A NEW ACADEMIC PROGRAM at THE UNIVERSITY OF MARYLAND, BALTIMORE FOR A MASTER OF SCIENCE IN CLINICAL INFORMATICS

TABLE OF CONTENTS

4

A. Centrality to Institutional Mission and Planning Priorities:

1. Provide a description of the program, including each area of concentration (if applicable), and how it relates to the institution's approved mission.

The University of Maryland, Baltimore (UMB) submits this proposal to create a Master of Science in Clinical Informatics. We intend to offer it as a mixture of didactic coursework and practical training, with 34 credits required for a Master of Science (MS). All didactic courses will be accessible online. The practical courses will have both on-site and online options. The proposed degree will allow students with a professional healthcare background to be trained in best practices of Clinical Informatics. The program will be geared toward physicians, nurses, pharmacists, other healthcare professionals, biologists, and scientists, who will study and apply informatics approaches to enhance their professional skills. The program will focus on biomedical data, computational systems, and clinical process improvement, which students will apply to the practice of medicine, in order to enhance health outcomes, improve patient care, and strengthen the clinician-patient relationship.

The Master of Science in Clinical Informatics will be organized around two PBCs in Data Science (currently offered by UMBC) and Clinical Information (proposal forthcoming), along with hands-on practicums and conferences. The PBC in Data Science will be hosted by UMBC, and the other courses will be hosted by UMB to form a joint institutional collaboration. Full-time and part-time plans of study will be available to students. The curriculum will be a joint effort, using clinical and practical courses taught at UMB along with data science courses from UMBC. The hands-on practicums will be supervised by UMB and UMBC faculty with advanced training in Clinical Informatics and Computer Science and focus on relevant clinical projects at the University of Maryland Medical Center and the University of Maryland School of Medicine.

The program will prepare students from a wide range of healthcare backgrounds for careers in clinical data science and clinical informatics. They will provide leadership and expertise in the procurement, customization, development, implementation, management, evaluation, and continuous improvement of clinical information systems. They will work with a large range of computational systems, including electronic health record systems, decision-support systems, practice management tools, imaging systems, clinical research systems, and public health systems. They will find employment as Chief Medical Information Officers (CMIOs), researchers, educators, and in industry, all of which are in high demand. In addition, by obtaining ACGME certification, qualified physicians who complete the program can become board-eligible in the ABMS specialty of Clinical Informatics. For other health professionals and scientists, completion of this program, along with other professional activities, can lead to eligibility as a Fellow of the American Medical Informatics Association.

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

5

UMB has a long history of developing qualified healthcare professionals. The program in Clinical Informatics continues this tradition by recognizing the need for interdisciplinary professionals with training in both informatics and healthcare. The new medical subspecialty in Clinical Informatics is further evidence of the need for multidisciplinary individuals to lead the data revolution in healthcare. The knowledge and skills in Clinical Informatics are crucial to future success in patient care, biomedical research, and public health, as well as to health policy design and implementation The American Medical Informatics Association (www.amia.org) estimates that 70,000 trained specialists are needed in the near future to support these efforts, with other estimates in 2018 as high as 150,000 specialists, if all hospitals followed the Electronic Medical Record Adoption Model (JAMIA Open. 2018 Oct; 1(2): 188–194).

The M.S. in Clinical Informatics program directly aligns with the first theme of UMB's strategic plan, "Health, Justice, and Social Impact", in order to "deepen and expand local and global engagement by providing health, legal, and social work programs and engaging in research to promote social justice and improve health." Our proposed program leverages institutional expertise to tackle systemic problems in Clinical Informatics. In order to enhance health outcomes, improve patient care, and strengthen the clinician-patient relationship, this program will apply biomedical data, computational systems, and clinical process improvement to the practice of medicine. The proposed program also supports UMB's second theme, "Research and Scholarship", by harnessing our interdisciplinary strengths across UMB and UMBC in Clinical Medicine and Computer Science, respectively. Related to this, the proposed program also supports UMBC's strategic goal, "Collective Impact in Research, Scholarship, And Creative Achievement", by increasing national prominence in selected multidiscipline areas, including Information Technology. The UMB and UMBC campuses, with their complementary strengths in Clinical Medicine and Computer Science, will make ideal partners for this training program.

3. **Provide a brief narrative of how the proposed program will be adequately funded for at least the first five years of program implementation.**

   The program will be well-resourced and will rely on existing faculty at UMB and UMBC, with much of the coursework already developed. Versions of the most courses already exist and will be updated with best practices for online learning in collaboration with UMB's Faculty Center for Teaching and Learning. Because of this, the UMB Graduate School will have the capacity to offer the proposed degree program within existing resources and to ensure continued funding to support the program into the foreseeable future.

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

6

The UMB Graduate School has an ongoing commitment to sustaining new degree programs it has developed. The Graduate School has committed significant resources in the realm of administrative support including a vice dean, assistant dean, and program director who will provide leadership for the quality and sustainability of the Master of Science in Clinical Informatics. Additionally, leadership within the UMBC Department of Computer Science and Electrical Engineering and leadership within the UMBC Professional Studies in Data Science have expressed their commitment to this proposed program. Helping to manage this collaboration will be Dr. Michael Grasso at UMB and Dr. Anupam Joshi at UMBC. Dr. Grasso is a practicing physician in the Department of Emergency Medicine and a board-certified Clinical Informaticist. He is also a Ph.D. Computer Scientist, who completed this training at UMBC. Dr. Joshi is also a Ph.D. Computer Scientist, Chair of the Department of Computer Science and Electrical Engineering and is an active member of the UMB ICTR research group. Dr. Ergun Simsek, program director of the UMBC Data Science program, will provide additional leadership. Drs. Grasso and Joshi have worked together for the past 20 years on various research grants, educational activities, and peer-reviewed publications.

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

The 2017-2021 Maryland State Plan articulates three primary goals for postsecondary education: access, success, and innovation. The proposed M.S. in Clinical Informatics aligns well with the State Plan.

- Access – The proposed program ensures equitable access. Placing the bulk of the program online offers non-traditional students as well as those not geographically located in the Baltimore a pathway to completing the program. The format also allows them to balance their educational objectives with competing demands of family and work.
- Success – Programs such as this one are expected to attract students from diverse backgrounds originating both locally and internationally. UMB has a full-service student support model to ensure early identification of students who may be struggling academically and to intervene to improve the likelihood of graduate school completion.
- Innovation – The curriculum focuses on the new and innovating area of Clinical Informatics, with immersion experiences that provide hands-on experiences with real-world challenges. For those who qualify, it can also lead to eligibility in the Clinical Informatics subspecialty as well as a Fellow of the American Medical Informatics Association.

The program curriculum will also address bias, equity, and social determinants of health. Disparity is an important challenge in the delivery of healthcare, and as such, it carries over into clinical information systems and decision-support algorithms. Big data analytics and machine learning approaches are especially susceptible to unintended bias, which can lead to discriminatory or exclusionary practices. Bias, equity, and social determinants of health are included in the curriculum objectives under "Fundamentals" and "Clinical Decision Making and

7

Care Process Improvement" and are incorporated into the Foundations in Clinical and Health Informatics course and the Clinical Decision Support Systems in Healthcare course.

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

At UMB and UMBC, we regularly receive inquiries about Clinical Informatics training for healthcare professionals, including training leading to board-eligibility and fellow accreditation. The existing UMBC Data Science program with which we will collaborate has roughly 200 active students and continues to grow. Clinical Informatics is a rapidly growing interdisciplinary field, which applies biomedical data, process improvement, and information technology to the delivery of healthcare. The U.S. Bureau of Labor Statistics predicts a growth rate of more than 8% in employment opportunities over the next 10 years (https://www.bls.gov/), with many related health informatics jobs on the rise (https://www.monster.com/career-advice/article/health-informatics-jobs), and with the demand especial high in the Baltimore-Washington region (https://www.transparencymarketresearch.com/healthcare-informatics-market.html).

The critical role of health professions trained in informatics is recognized as integral to the success of our national health agenda. The amount of clinical data that is now available from health record systems is larger than healthcare providers have ever dealt with. National policy, including the Health Information and Technology for Economic Clinical Health Act (HITECH) and Health Insurance Portability and Accountability Act (HIPAA) have imposed important requirements and incentives on healthcare providers with respect to electronic health records. Physicians, nurses, pharmacists, scientists, and researchers trained in informatics are uniquely equipped to direct optimal implementation of health information technology for clinical care delivery and continuous quality improvement. Expansion of the health informatics workforce and development of leadership at local and national levels are priorities for our national healthcare system. The demand for informatics expertise will only grow as our healthcare system continues to evolve.

D. Reasonableness of Program Duplication

No programs exist in Maryland or Washington D.C. that offer a Master's Degree in Clinical Informatics and which also leads to board-eligibility for physicians in Clinical Informatics. The closest programs are at the University of Virginia (ACGME Program #3225132001) and the Children's Hospital of Pennsylvania (ACGME Program #3224132001).

We are aware of other local Health Informatics programs. Johns Hopkins University offers an applied and research Master's Degree in Health Science Informatics, as well as a PBC in Clinical Informatics, but these programs have a more scientific or research emphasis and lack an option for board-eligibility. George Washington University offers a Biomedical Informatics program, which has an emphasis on epidemiology and genomics, and does not lead to board-eligibility. Morgan State University offers an excellent Bioinformatics program, with a specific emphasis on Computational Biology, which focuses more on genetics and not on the application of

8

Informatics for the delivery of healthcare. University of Maryland Global Campus offers a program with a focus on Health Administration.

UMBC offers a Data Science graduate program, which we will collaborate with, and which will provide some courses for this new program. The Data Science program provides an excellent foundation in Computer Science, which we will augment with courses on healthcare fundamentals, clinical decision support, clinical process improvement, and practicums.

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

The proposed program does not have relevance to the uniqueness and/or institutional identities and missions of HBIs.

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

The proposed program does not have relevance to the identity of HBIs in Maryland.

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

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

   The Clinical Informatics program was proposed by the UMB faculty. A series of meetings was held by Dr. Flavius Lilly and Dr. Mary Jo Bondy and included more than a dozen representatives from the School of Medicine, School of Nursing, School of Pharmacy, School of Law, and School of Social Work. The group recognized the compelling need for specific education and training in Clinical Informatics that was focused on the practice of medicine and improved clinical outcomes.

   The faculty realized that many of the courses required to offer this program already existed (or existed but required updates) at UMB and UMBC, and that there was considerable expertise to create a world-class educational experience for students. All the Data Science courses already exist and are currently being taught. The CLIN 601, 602, and 604 already exist, and have been taught in the past, but need to be updated.

   The faculty overseeing the program are listed with their credentials in Section I, subsection 1: Adequacy of Faculty Resources.

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

   By the completion of the proposed M.S. in Clinical Informatics, students will develop core competencies in four key areas: foundations and theory, clinical decision making and care process improvement, health information systems, and leadership and change management, as defined by the American Medical Informatics Association

9

(https://www.amia.org/sites/amia.org/files/AMIA-Clinical-Informatics-Core-Content.pdf).

- <u>Foundations and Theory</u> – At the end of this program, students will have basic knowledge that provides health informaticians with a common vocabulary and understanding of the environment in which they function. Students will be able to:
  - o Describe the key concepts of Clinical Informatics, Nursing Informatics, Pharmacy Informatics, and Clinical Research Informatics.
  - o Analyze key concepts, models, and theories of informatics.
  - o Understand ethics, professionalism, legal, equity and social determinants of health, and regulatory issues.
  - o Describe the key concepts of the health system, including organizational structures, the delivery of care, economics, policy.
  - o Analyze quality improvement efforts regarding safety, effectiveness, efficiency, patient-centeredness, timeliness, and equity.
- <u>Clinical Decision Making and Care Process Improvement</u> – At the end of the program, students will understand the knowledge and skills that enable a health informatician to implement effective clinical decision-making systems and participate in the development of clinical processes that support effective, efficient, safe, timely, equitable, and patient-centered care. Students will be able to:
  - o Understand the nature and cognitive aspects of human decision making.
  - o Analyze various decision science approaches, including decision analysis, probability theory, advanced modeling, and cost-effective analysis.
  - o Apply decision science using various approaches, understanding various users of these approaches, evaluating their effectiveness, and understanding legal, regulatory, quality, and safety issues.
  - o Understand evidence-based medicine, evidence sources, evidence grading, implementation of guidelines, and information retrieval and analysis.
  - o Analyze methods for clinical workflow analysis, redesign, and process improvement.
  - o Understand the existence of bias in decision support algorithms and apply methods for identifying and addressing bias in decision-support systems.

10

- Health Information Systems - At the end of the program, students will understand the knowledge and skills that enable a health informatician to participate in the development or selection of an information system for clinicians; prepare clinicians prior to implementation and support them during implementation and ongoing operation of a clinical information system; and evaluate the effectiveness of a system in meeting clinical needs. Students will be able to:

  o Understand computer systems, including programming, control structures, data structures, software development methods, computing architectures, networking, security, data management, data manipulation, and data sharing.

  o Analyze approaches to human factors engineering.

  o Critically evaluate health information systems applications by type of functionality, setting where systems are used, telehealth capabilities, and relationship to the electronic health record.

  o Understand the system lifecycle, including governance, analysis, implementation, testing, evaluation, training, maintenance, and evolution.

  o Apply computing techniques to develop and validate software components and data artifacts.

- Leadership and Managing Change - At the end of the program, students will understand the knowledge and skills that enable clinical informaticians to lead and manage changes associated with implementing clinical information systems and promoting adoption by health professionals. Students will be able to:

  o Understand the dimensions of effective leadership, including governance, negotiation, conflict management, and motivation.

  o Build effective of interdisciplinary leadership teams and communication strategies.

  o Evaluate organizational structures, behavior, and change theory.

3. **Explain how the institution will provide for assessment of student achievement of learning outcomes in the program and document student achievement of learning outcomes in the program.**

Faculty will assess student achievement and mastery of learning outcomes in their courses using a variety of assessments including meaningful and substantive contributions to online course discussions, satisfactory completion of assignments and reflections, scores on quizzes and examinations, scores on team collaboration, scores on written essays and term papers,

11

and evaluation of research and capstone project contribution to the field of Clinical Informatics.

Students will also have the opportunity to evaluate courses and faculty through a standard evaluation of every course. Formal assessment planning is already in place throughout UMB Schools including the Graduate School. Our approach includes ensuring that student learning is in alignment with course learning outcomes, alignment of mission at institutional and program levels, alignment of mission with learning outcomes, then program outcomes with curriculum, flowing down to course outcomes and assignments. Assessment activities emphasize analysis of results and feedback loops for continuous improvement. Additional evaluation includes tracking of student retention, grade distributions, and cost-effectiveness, and regular academic program reviews consider these factors.

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

    Students must complete the following 4 core courses at UMB (12 credits) to complete a PBC in Clinical Informatics, 3 courses (10 credits) in practical activities at UMB, and an additional 4 courses at UMBC (12 credits) to complete a PBC in Data Science, for a total of 34 program credits.

Course Name	UMB PBC Clinical Informatics	UMBC PBC Data Science	UMB Practical Courses
CLIN 601 Foundations in Clinical and Health Informatics	X		
CLIN 602 Advanced Foundations in Clinical and Health Informatics	X		
CLIN 603 Computer Programming for Healthcare Personnel	X		
CLIN 604 Decision Support Systems in Healthcare	X		
CLIN 610 Clinical Informatics Practicum			X
CLIN 611 Advanced Clinical Informatics Practicum			X
CLIN 612 Clinical Informatics Conference			X
DATA 601 Introduction to Data Science		X	
DATA 602 Introduction to Data Analysis and Machine Learning		X	
DATA 603 Platforms for Big Data Processing		X	
DATA 604 Data Management		X	

PBC Clinical Informatics Courses, 12 credits (UMB)

- CLIN 601 Foundations in Clinical and Health Informatics (3 credits)

  This course will cover the fundamentals of informatics as it applies to healthcare and research. The course focuses on the expanding role of information technology for the delivery of healthcare and provides a theoretical and practical introduction to the assessment, implementation, and management of these systems. The course underscores the application of these systems to the practice of medicine, in order to

12

enhance health outcomes, improve patient care, and strengthen the clinician-patient relationship. Topics will emphasize the clinical informatics board-certification core content, which include fundamentals of clinical and biomedical informatics, clinical decision making and process improvement, health information systems, equity and social determinants of health, and management.

- CLIN 602 Advanced Foundations in Clinical and Health Informatics (3 credits)

  This course will cover advanced concepts of informatics as it applies to healthcare and research, with a focus on critical thinking skills. The course is the second of a two-part series of courses in Clinical Informatics. The focus of the course will be on the software engineering and socio-technical challenges specific to the design, development, validation, and implementation of these systems. Topics will include clinical software engineering, continuous process improvement, decision support systems, bioinformatics, public health informatics, telehealth, clinical imaging systems, personalized medicine, and health informatics literature.

- CLIN 603 Computer Programming for Healthcare Personnel (3 credits)

  This course will provide an introductory overview of computer science and programming for students who are not working in technology-based professions. This course is meant for beginners, with no prior experience in computer programming, and is meant to introduce healthcare professionals to the fundamentals of computer programming and information systems. Topics include fundamental programming concepts, fundamental data structures, scripting languages, web-based systems, algorithm design, database design, human factors, and software lifecycles.

- CLIN 604 Decision Support Systems in Healthcare (3 credits)

  This course will give students an overview of information systems and decision systems used in health organizations. The course will examine the design, development, and implementation of decision support systems, focusing on how they fit into clinical workflows across various healthcare settings. Students will examine the analytical foundations of these systems, identify areas that might benefit from these systems, and gain an understanding in the challenges surrounding their implementation. Topics include decision support, evidence-based care, process improvement, privacy and security, unintended bias, database analysis and design, and data and information flow.

Practical Courses, 10 credits (UMB)

- CLIN 610 Clinical Informatics Conference (1 credits)

13

This course will give students the opportunity to discuss and learn about important issues in the use of information technology to improve patient care. The conference meets monthly each semester, *with students required to enroll for a minimum of 4 semesters to complete the M.S. in Clinical Informatics.* Activities in the conference include grand rounds, journal club, and board review activities. Student can join the conference in-person or online.

- CLIN 611 Clinical Informatics Practicum (3 credits)

  This course will give students the ability to demonstrate the knowledge and skills that have been acquired, with a focus on data collection, project management, and presentation skills. Students will be embedded in an informatics setting within the University of Maryland Medical System, work with interdisciplinary teams to address significant informatics challenges in both clinical and academic settings. As an alternative to embedding students on-site at the University of Maryland, distance-learning students can work online to develop a proposal and perform independent work under the supervision of an advisor.

- CLIN 612 Advanced Clinical Informatics Practicum (3 credits)

  This course will give advancing students the ability to demonstrate substantive application of the knowledge and skills that have been acquired, with a focus on performing independent research. Students will be embedded in an informatics setting within the University of Maryland Medical System or an academic setting within the University of Maryland. As an alternative to embedding students on-site at the University of Maryland, distance-learning students can work online to develop a proposal and perform independent work under the supervision of an advisor.

Data Science Courses, 12 credits (UMBC)

- DATA 601 Introduction to Data Science (3 credits)

  The goal of this class is to give students an introduction to and hands on experience with all phases of the data science process using real data and modern tools. Topics that will be covered include data formats, loading, and cleaning; data storage in relational and non-relational stores; data analysis using supervised and unsupervised learning using Python; data visualization; and scaling up for Big Data.

- DATA 602 Introduction to Data Analysis and Machine Learning (3 credits)

  This course provides a broad introduction to the practical side of machine-learning and data analysis. Topics covered include decision trees, logistic regression, linear discriminant analysis, linear and nonlinear regression, basic functions, support vector

14

machines, neural networks, ensemble methods, evaluation methodologies, experiment design, and Bayesian networks.

- DATA 603 Platforms for Big Data Processing (3 credits)

  The goal of this course is to introduce methods, technologies, and computing platforms for performing data analysis at scale. Topics include the theory and techniques for data acquisition, cleansing, aggregation, management of large heterogeneous data collections, processing, information, and knowledge extraction. Students are introduced to map-reduce, streaming, and external memory algorithms and their implementations using Hadoop and its eco-system (HBase, Hive, Pig and Spark). Students will gain practical experience in analyzing large existing databases.

- DATA 604 Data Management (3 credits)

  This course is specifically designed to support the range of complex data challenges data practitioners face today from optimizing relational database systems to managing big data. Students will get an overview of relational database management systems, SQL programming, and emerging big data technologies. Advanced topics include parallel and GPU computing using expert driven course materials and hands on labs from Nvidia.

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

   Not applicable.

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

   There are no specialized accreditation or graduate certification requirements for the proposed M.S. in Clinical Informatics.

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

   There is a Memorandum of Understanding between UMB and UMBC (Appendix B)

7. **Provide assurance and any appropriate evidence that the proposed program will provide students with clear, complete, and timely information on the curriculum, course and degree requirements, nature of faculty/student interaction, assumptions about technology competence and skills, technical equipment requirements, learning management system, availability of academic support services and financial aid resources, and costs and payment policies.**

15

The Graduate School maintains up-to-date information of its degree programs on the program explorer web site (https://www.graduate.umaryland.edu/Program-Explorer/). The web site has information on the curriculum, course descriptions, degree requirements, and cost of education. The website has links to information about the learning management system, support services, and financial aid. We affirm that the same information will be available for prospective and existing students in the proposed M.S. in Clinical Informatics.

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

     The Graduate School at UMB affirms that all advertising, recruiting and admissions materials will accurately represent the M.S. in Clinical Informatics, as do all materials produced by UMB's Graduate School for programs it offers.

H.   Adequacy of Articulation

Not applicable.

I.   Adequacy of Faculty Resources

1. Provide a brief narrative demonstrating the quality of program faculty. Include a summary list of faculty with appointment type, <u>terminal degree title and field,</u> academic title/rank, status (full-time, part-time, adjunct) and the course(s) each faulty member will teach in the proposed program.

The following table summarizes information about the faculty who will be responsible for designing and instructing coursework in the M.S. in Global Health program:

Name	Terminal Degree and Discipline	Rank and FT/PT Status	Course
UMB Faculty			
Michael Grasso	MD, PhD, Medicine, Computer Science	Assistant Professor, FT	Foundations in Clinical and Health Informatics, Advanced Foundations in Clinical and Health Informatics, Clinical Informatics Conference
Jon Mark Hirshon	MD, PhD, Medicine, Epidemiology	Professor, FT	Decision Support Systems in Healthcare
Dan Lemkin	MD, Medicine	Assistant Professor, FT	Advanced Clinical Informatics Practicum
Zachary Dezman	MD, MS, Medicine, Epidemiology	Assistant Professor, FT	Clinical Informatics Practicum

16

Mark Sutherland	MD, Medicine	Assistant Professor, FT	Clinical Informatics Practicum
UMBC Faculty			
Anupam Joshi	PhD, Computer Science	Professor, FT	Concepts in Computer Programming for Healthcare Personnel
Ergun Simsek	PhD, Computer Science	Professor, FT	Data 601 Introduction to Data Science
Murat Guner	PhD, Computer Science	Lecturer, PT	Data 602 Introduction to Data Analysis and Machine Learning
Waleed Youssef	PhD, Computer Science	Lecturer, PT	Data 603 Platforms for Big Data Processing
Patricia Stanton	PhD, Computer Science	Lecturer, PT	Data 604 Data Management

In addition to those listed above, the following faculty have also expressed a desire to help develop this program.

- Fadia Shaya, PhD, MPH, School of Pharmacy

- Bimbola Akintade, PhD, MBA, ACNP-BC, School of Nursing

- Eun-Shim Nahm, PhD, RN, School of Nursing

- Rick Barth, PhD, MSW, School of Social Work

- Jeff Fink, MD, School of Medicine

- John Hong, MD, School of Medicine

- Lee-Ann Wagner, MD, School of Medicine

2. **Demonstrate how the institution will provide ongoing pedagogy training for faculty in evidenced-based best practices, including training in:**

UMB has a robust process for training faculty and ensuring effective instruction. Based on Quality Matters standards, UMB developed a rubric which details the best practices for distance education; this rubric helps faculty and instructional designers create the courses; assesses the readiness of the course and ensures that the online courses are instructionally and pedagogically sound. The best practices are a synthesis of strategies, activities, design techniques, and organizational items that have been successful in higher education. The specific domains of this checklist are as follows:

- Course overview and introduction to the students

- Course organization and design

- Learning Objectives (competencies)

17

- Instructional Materials

- Learner Communication, Interaction and Collaboration

- Assessment and Evaluation (measurement)

- Course Technology

- Learner Support

The Learning Management Platform UMB utilizes and provides IT support for is the Blackboard Learning Management System for online course delivery. Within Blackboard, is the Collaborate conferencing software that we will use for our synchronous live activities, i.e., orientation and presentation face-to-face class sessions and recurring webinars. Additionally, the Faculty Center for Teaching and Learning which houses expert Instructional and Educational Medial Specialists, uses of a video camera to record lectures, integrate webcams, and an interactive smart board. We also use the Camtasia software for screen lecture capture.

J. Adequacy of Library Resources

The University of Maryland, Baltimore's Health Sciences and Humans Services Library (HS/HSL) collection contain more than 30,000 electronic journals, 162 current print journals, approximately 170,000 books, and 6,000 electronic books. Students can access the electronic resources offered on the library website by logging in with their University ID number. The library serves as the regional medical library for ten southeastern states as part of the National Library of Medicines National Network of Libraries of Medicine. In addition to the library services and collections, the building also houses computing services. Faculty librarians are dedicated to providing direct service to students. They use subject expertise to develop online resources and provide in-person consultations.

The HS/HSL is one of the largest health sciences libraries in the United States with a track-record of user-centered innovative services and programs. The library consists of 57 employees including 27 faculty librarians. The attractive and vibrant facility, which opened in 1998, serves as a hub for collaboration and learning with resources, programs, and tools that promote discovery, creativity, and innovation. With wireless connectivity throughout the building, the HS/HSL has 45 group study rooms, three computer classrooms, an Innovation Space which includes 3D printers; a presentation and practice studio, art gallery, and multiple technology enhanced meeting spaces. Through the HS/HSL's website (www.hshsl.umaryland.edu,) the UMB community has access to a full range of resources and services.

The HS/HSL supports the University's students, faculty, and staff members in the schools of dentistry, law, medicine, nursing, pharmacy, and social work; the Graduate School; the University of Maryland Medical Center; and other affiliated institutions. Research Connection, the library's suite of research services, is available for all programs on campus and includes individual research consultations, a systematic review service, research impact assessment, reference assistance, and more. For over 30 years, the HS/HSL has provided liaison services, in which faculty librarians are assigned to work with specific user communities. Faculty librarians

18

have many years of instructional experience in the classroom, in the community, and the online environment. In FY16, faculty librarians reached 4,131 faculty, staff, and students through online, and in-person instructional sessions offered through the curriculum and in library-sponsored workshops.

In FY16, the HS/HSL licensed 116 databases, 4,524 journals, 18,018 e-books, and maintained a print collection of 360,104 volumes. One hundred percent of the current journal subscriptions are available electronically. Through its interlibrary loan and document delivery service, library staff can acquire articles and other resources not available through the library's collections. These are secured through local, regional, and national networks including the University System of Maryland and Affiliated Institutions, the National Library of Medicine's DOCLINE service, and OCLC, among others. The HS/HSL is also home to the National Network of Libraries of Medicine/Southeastern Atlantic Region (NNLM/SEA), whose mission is to advance the progress of medicine and improve the public health by providing all U.S. health professionals with equal access to biomedical information and improve the public's access to information to enable them to make informed decisions about their health. With only eight regions in the U.S. designated as regional medical libraries under contract to the National Library of Medicine at the National Institutes of Health, the Southeastern/Atlantic Region serves ten southeastern states, Puerto Rico, the U.S. Virgin 18 Islands, and the District of Columbia. The HS/HSL has held this competitive and prestigious designation for over 30 years.

K. Adequacy of Physical Facilities, Infrastructure, and Instructional Equipment

UMB's 71-acre research and technology complex encompasses 67 buildings in west Baltimore near the Inner Harbor. Faculty have offices provided within their respective departments and the Graduate School has identified office space to house the Program Manager Specialist and instructional technology personnel. UMB has adequate facilities, infrastructure, and equipment to support any distance learning needs of the Master's Program. Students will have full access to the computing facilities at UMB. Students will be provided with UMB e-mail and library accounts and will have complete journal searching ability via PubMed. UMB possesses computing facilities that includes a networked computing environment for support of a broad range of information technology functions, including basic research, clinical research, patient information and general office management.

L. Adequacy of Financial Resources with Documentation

No new general funds will be required for implementation of the proposed MS and PBC which will be coordinated and administered fully through the Graduate School. A budget is included in Appendix A.

M. Adequacy of Provisions for Evaluation of Program

Students will have the opportunity to evaluate courses and faculty through a standard evaluation of every course. Formal assessment planning is already in place throughout UMB Schools including the Graduate School. Our approach includes ensuring that student learning is in alignment with course learning outcomes, alignment of mission at institutional and program levels, alignment of mission with learning outcomes, then program outcomes with curriculum,

19

flowing down to course outcomes and assignments. Assessment activities emphasize analysis of results and feedback loops for continuous improvement. Additional evaluation includes tracking of student retention, grade distributions, and cost-effectiveness, and regular academic program reviews consider these factors.

N. Consistency with the State's Minority Student Achievement Goals

UMB is strongly committed to cultural diversity and the recruitment and retention of underrepresented minority students. Recruitment efforts for the M.S. in Clinical Informatics will include specific outreach to Historically Black Institutions to make students aware of the program and related opportunities designed to improve their competitiveness in the job market and reach their professional goals if they are admitted and successfully complete the program.

O. Relationship to Low Productivity Programs Identified by the Commission

The proposed MS is not directly related to an identified low productivity program identified by the Maryland Higher Education Commission.

P. Adequacy of Distance Education Programs

Context of Online Education at UMB

> As the State's public health, law, and human services university, the mission of UMB is to excel at professional and graduate education, research, patient care, and public service, and to educate leaders in healthcare delivery, biomedical science, global health, social work, and the law. Also, UMB emphasizes interdisciplinary education in an atmosphere that explicitly values civility, diversity, collaboration, and accountability. UMB expects to achieve its mission in education excellence and to be competitive; the Graduate School has designed and offered online degree programs that respond to the following changes occurring in higher education (Allen, 2010).

> 1. Education Pipeline. The education pipeline includes a highly diverse prospective applicant pool. Prospective students are typically working adults who pursue part-time and non-residential educational opportunities, but who wish to remain in their regional geographic area, while pursuing advanced education. According to the National Center for Education Statistics, National Postsecondary Graduate Student Aid Study (NCES, NPSAS: GR; 2017), between the period of 2008 and 2017, there was a slight increase (3%) in the number of graduate students reporting full-time (FT) enrollment at a single institution. We suspect this may be partially influenced by availability of new online educational programs, where one can work, be considered enrolled FT, yet negotiate academic studies as one's lifestyle permits.

20

2. Changing Demographics. Data indicate a shift from the traditional student (the 18-22-year-old, full-time resident) to older students studying part-time. In 2015-2016, the National Center for education Statistics (NCES, 2017) reported that 37.58% of graduate students were married and the average graduate student was 32 years old (*SD*= 9.66). Nearly 9% of single/unmarried/divorced graduate students reported dependents, and nearly 60% of graduate students were female.

3. Technology Shift. Educational research suggests that online education achieves the same as, or better student learning outcomes, than traditional face-to-face delivery models (Tallent-Runnels, et al., 2006; Means et al., 2009. Online delivery is far outpacing traditional forms of educational delivery. Between 2002 to 2008, online enrollments grew at an annual rate of 19% vs. 1.5% versus all of Higher Education. By the fall of 2008, 25% (4.6 million) of all students took at least one online course. In 2019, the top five highest reported college enrollments nationally four were online universities, offering at least some graduate programs (NCES).

4. Growth of Mobile Technologies. Mobile technologies and miniaturization are changing the computing environment and the educational delivery paradigm. Technologies like netbooks, e-Readers, iPhones, and iPads have revolutionized the delivery space and to provide anywhere, anytime learning.

5. Web 2.0 Revolution. Other technologies that are already figuring widely into the future of education are part of the Web 2.0 revolution. The use of a variety of technologies is disaggregating the educational experience into 'the cloud'. Many of the technologies for the future, like blogs, wikis, podcasts, video, social networking and social media, virtual worlds, mobile learning, and Personal Learning environments, will have profound effects on the future learning landscape.

Essentially, online education represents a strategy that can address the restrictions of traditional onsite college courses, opening accessibility for variety of learners, for a variety of reasons and expanding access to global education opportunities and expertise, beyond the walls of the campus. Major determinants of successful online programs include 1) course design that incorporates best practices (e.g., course alignment, integration of technology and content), 2) quality faculty who can engage students in the material (e.g., provide feedback and relevant expertise), and 3) provide responsible academic oversight. All three of these determinants are present in this proposal.

21

Collectively, the distance learning team will provide the following services to ensure that best pedagogical practices are used to train and support the most of effective presentation of their course content.

- Guided tutorials on the online course development process, with open questions and answer session.

- Written instructions accompanied by training videos to guide faculty on how to use the learning management system.

- A manual for the faculty regarding principles of good practice and the pedagogy of distance education.

- Provide timely support to the faculty in the use of the technology and trouble shoot any problems that might arise during instruction.

- Work with faculty to design and develop courses, monitor the delivery of the course, and assess and revise the course for future offerings.

Supporting Students in Distance Education

All the courses for the M.S. in Clinical Informatics will be online. Students enrolled in the practicum courses will have the option of working on-site or online. We realize that the key to the success of the online courses is dependent on a) students knowing upfront the assumptions, requirements, and responsibilities of taking an online course, 2) the ability of students to have the background, knowledge, and technical skills to undertake an online program; and 3) their having access to academic and technical support services to support their online activities. Accordingly, we will provide the following services to support the students in accessing distance learning technology:

- Communicate to students the nature of online learning, including their requirements, roles and responsibilities, and access to support services. All our advertising, recruiting, and admissions materials shall clearly and accurately represent the program and the services available.

- Ensure that enrolled students shall have reasonable and adequate access to the range of student services to support their learning.

- Ensure that accepted students will have the background, knowledge, and technical skills needed to undertake the program.

- Make available the library Services to students so that they can have access to research databases, online catalog of books and media, chat with or e-mail a Librarian, electronic interlibrary loan, and more.

22

Evaluation and Assessment of Online Courses

We will adhere to a quality improvement model for assuring the continuous quality of the online courses. The process will involve the following steps:

1. Assessment of course readiness as measured by our quality indicators of best practices (including assessment of faculty readiness)
2. Monitoring of course delivery as assessed by the instructional designers with use of our "course evaluation' rubric"
3. Obtainment of feedback from the faculty and students and instructional designers.
4. Analysis of feedback as performed by the Distance Learning Committee.
5. Institute course revisions based on comments by the Distance Learning Committee.

Finally, to ensure the sustainability of the distance learning program, the Academic Affairs Office at UMB affirms the following:

- UMB Policies for faculty evaluation includes appropriate consideration of teaching and scholarly activities related to programs offered through distance learning.

- Commitment to ongoing support, both financial and technical, and to a continuation of the program for a period sufficient to enable students to complete a certificate.

23

APPENDIX A: BUDGET

TABLE 2: PROGRAM EXPENDITURES:					
Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b + c below)	$94,900	$108,400	$118,845	$150,120	$162,630
a. Number of FTE	0.80	0.90	0.90	1.10	1.10
b. Total Salary	$78,300	$90,400	$95,000	$120,000	$130,000
c. Total Benefits	$16,600	$18,000	$23,845	$30,120	$32,630
2. Admin. Staff (b + c below)	$19,320	$9,660	$4,830	$4,830	$4,830
a. Number of FTE	0.2	0.1	0.05	0.05	0.05
b. Total Salary	$14,000	$7,000	$3,500	$3,500	$3,500
	$5,320	$2,660	$1,330	$1,330	$1,330
3. Support Staff (b + c below)	$0				
a. Number of FTE	0.1	0.1	0.1	0.1	1.1
b. Total Salary	$5,500	$5,610	$5,722	$5,837	$5,953
c. Total Benefits	$2,090	$2,132	$2,174	$2,218	$2,262
4. Technical Support and Equipment	$5,000	$2,000	$2,000	$2,000	$2,000
5. Library		$5,000	$5,000	$5,000	$5,000
6. New or Renovated Space					
7. Other Expenses	$20,000	$10,000	$10,000	$10,000	$10,000
TOTAL (Add 1 – 7)	$139,220	$135,060	$140,675	$171,950	$184,460

TABLE 1: PROGRAM RESOURCES					
Resource Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Reallocated Funds	0	0	0	0	0
2. Tuition/Fee Revenue (c +g below)	$69,878	$158,390	$201,948	$247,184	$252,128
a. Number of F/T Students*	0	0	0	0	0
b. Annual Tuition/Fee Rate	$0	$0	$0	$0	$0
c. Total F/T Revenue (a x b)	0	0	0	0	0
d. Number of P/T Students	9	20	25	30	30
e. Credit Hour Rate	$706	$720	$734	$749	$764
f. Annual Credit Hour Rate	11	11	11	11	11
g. Total P/T Revenue (d x e x f)	$69,878	$158,390	$201,948	$247,184	$252,128
3. Grants, Contracts & Other External Sources	$0	$0	$0	$0	$0
4. Other Sources	$69,342	$0	$0	$0	$0
TOTAL (Add 1 – 4)	$139,220	$158,390	$201,948	$247,184	$252,128

24

APPENDIX B: MOU – UMBC + UMB

MEMORANDUM OF UNDERSTANDING

Between the University of Maryland, Baltimore Graduate School and

University of Maryland Baltimore County

Master of Science

Clinical Informatics

This Cooperative Program Agreement (the "Agreement") is made effective on the date of the last signature below, by and between the University of Maryland, Baltimore ("UMB") acting through its academic department the University of Maryland Graduate School (the "UMB Graduate School") and the University of Maryland Baltimore County ("UMBC"). Hereinafter collectively referred to as the "Parties."

WHEREAS, the UMB Graduate School has developed a curriculum for a Master of Science in Clinical Informatics ("CLIN"). Enrolled students will earn two Post-Baccalaureate Certificates (PBCs). The first PBC will be in Clinical Informatics and will be developed by UMB. The second PBC will be the existing Data Science PBC offered by UMBC.

WHEREAS, UMB will develop additional practical courses for students enrolled in the Master of Science in Clinical Informatics program. The two PBCs will be combined with these practical courses to complete the Master of Science program.

NOW, THEREFORE, UMB and UMBC agree to the following terms and conditions:

A. PROGRAM ORGANIZATION AND DEVELOPMENT

The Parties agree to collaborate regarding seeking all approvals necessary from MHEC and any other applicable regulatory agencies for the Program. Each party agrees to comply with all laws and regulations that apply to the program.

25

UMB RESPONSIBILITIES

1.   Certify student eligibility, based on UMB admissions criteria, for enrollment in the CLIN degree program and award the CLIN degree upon successful completion of degree requirements.

2.   Maintain student records pertaining to matriculation and progression toward the CLIN degree.

3.   Conduct orientation and advising for students entering the CLIN degree program.

4.   Designate a Program Director dedicated to the CLIN degree program(s). The Program Director's responsibilities will include, but are not limited to, institutional responsibilities and resources, assume admissions administrative/clerical responsibilities based on the Graduate Schools' admissions policies and procedures, and chair the curriculum and student progression committees. The Program Director will act as a liaison between UMB and UMBC to address logistical and administrative issues. Additionally, the Program Director will work closely with a UMBC faculty designee overseeing the Data Science PBC to ensure effective operations of all academic and student affairs functions.

UMBC RESPONSIBILITIES

1.   Designate a faculty member as a co-Program Director with appropriate skills and effort to meet the demands of UMB's CLIN program. The responsibilities of this position will include:

        a.   Work in conjunction with the Program Director at UMB to maintain and execute UMBC's Data Science courses that may be part of the CLIN program curriculum;

        b.   Provide input and assistance to the UMB Program Director in the initial establishment of the Admissions criteria, Curriculum and Student Progression committees;

26

c.   Serve on an ongoing basis on the Admissions, Curriculum and Student Progression committees;

d.   Oversee the delivery and maintenance of UMBC's coursework described herein (Appendix A) for students enrolled in the CLIN program in accordance with the CLIN curriculum;

e.   Meet regularly with the UMB Program Director and other leadership at UMB to ensure effective coordination, leadership, and management of the CLIN degree program.

2.   Designate UMBC faculty to serve on the Curriculum, Student Progression, and Admissions Committees for the CLIN program. The administrative responsibilities for these committees will be a joint responsibility of the UMB and UMBC Program Directors.

3.   Designate UMBC faculty who will be responsible for teaching Data Science courses and evaluating students in those courses.

B. CURRICULUM

1.   Overall curriculum design and direction will come from the CLIN Curriculum Committee, composed of UMB and UMBC faculty, the both the UMB and UMBC CLIN Co-Program Directors.

2.   UMBC may make curriculum changes to the Data Science PBC as it deems necessary and within MHEC guidelines and without the need to proceed through the process in Paragraph 3 below. The UMBC faculty designee will, however, notify the CLIN Curriculum Committee of any such curriculum changes.

3.   The CLIN Curriculum Committee will meet on a regular basis and curricular changes initiated by the CLIN Curriculum Committee will be sponsored by appropriate individuals originating from the UMB Graduate School, or UMBC, to facilitate courses or any other relevant changes through the UMB curriculum approval process. Changes to the CLIN curriculum will be effective if a unanimous vote by the Committee has been

27

reached, and all modifications to the CLIN curriculum will be in writing. Should changes of 33% or more of the MS or PBC curriculum be necessary, Maryland Higher Education Commission approval is required.

4.   Courses in Clinical Informatics and Data Science PBCs are complementary but are not interdependent. Courses in the Clinical Informatics and Data Science PBCs can be taken in any order, as designated by UMB and UMBC respectively. The Master of Science includes 34 total credits, which break down as 12 credits for the UMB Clinical Informatics PBC, 12 credits for the UMBC Data Science PBC, and 10 credits in practical courses hosted at UMB. See the table below along with Appendix A for a detailed description of all courses.

Course Name	UMB PBC Clinical Informatics	UMBC PBC Data Science	UMB Practical Courses
CLIN 601 Foundations in Clinical and Health Informatics	X		
CLIN 602 Advanced Foundations in Clinical and Health Informatics	X		
CLIN 603 Computer Programming for Healthcare Personnel	X		
CLIN 604 Decision Support Systems in Healthcare	X		
CLIN 610 Clinical Informatics Practicum			X
CLIN 611 Advanced Clinical Informatics Practicum			X
CLIN 612 Clinical Informatics Conference			X
DATA 601 Introduction to Data Science		X	
DATA 602 Introduction to Data Analysis and Machine Learning		X	
DATA 603 Platforms for Big Data Processing		X	
DATA 604 Data Management		X	

28

C. ADMISSIONS CRITERIA

To be accepted into the UMB MS or PBC in Clinical Informatics program, applicants will be required to apply to the CLIN degree program(s) at UMB. The selection of students will be made cooperatively by the joint Admissions Committee. The administration of admissions and enrollment in the CLIN MS and PBC in Clinical Informatics program will happen at UMB. To be accepted into the UMBC PBC in Data Science applicants will be required to apply to that degree program at UMBC. The selection of students will be made cooperatively by the joint Admissions Committee. The administration of admissions and enrollment in the PBC in Data Science will happen at UMBC.

D. COMMITTEE ROLES & RESPONSIBILITIES

UMB and UMBC recognize that it is with mutual interest that faculty play a meaningful role in defining the curriculum of the CLIN program and the two PBCs. Considering that faculty participation in such decision-making occurs primarily through the work of committees, UMB and UMBC faculty will work collaboratively on the Admissions Committee, Curriculum Committee, and Student Progression Committee.

UMB will:

1.   Develop an Admissions Committee with UMB and UMBC to establish screening criteria and engage in the selection of applicants. Screening criteria shall include but not be limited to: Total GPA 3.0 or greater; demonstration of English proficiency consistent with both UMB and UMBC graduate school admission requirements. The composition of and number of members on the Admissions Committee shall be mutually determined by UMB and UMBC. This committee may include admissions staff.

2.   Develop a Curriculum Committee with UMB and UMBC to develop, review and make policy determinations regarding the CLIN curriculum, establish degree requirements, determine student educational objectives, monitor content and workload of courses, monitor, and propose changes in pedagogy, review proposals for new courses and course reductions, and evaluate the curriculum annually. The Curriculum Committee will also verify and certify that faculty are properly trained to teach online.

3.   Develop a Student Progression Committee with UMB and UMBC to review and evaluate the overall achievement and performance records of students pursuing the CLIN degree for the purposes of promotion, graduation, program alteration, remediation, retention, repetition, and dismissal. Students must maintain at least a C average to remain in the program based on the academic policy and procedures at UMB and UMBC. The Student Progression Committee will additionally assist with degree certification. The composition of and number of members on the Student Progression Committee shall be mutually determined by UMB and UMBC.

29

UMBC will:

1.   Ensure participation of the faculty designee and other UMBC faculty members on the Admissions, Curriculum, and Student Progression Committees. In general, the Faculty Program Director and one additional faculty member will serve on each committee.

The faculty Program Directors at each institution are listed below:

University of Maryland, Baltimore

Michael A. Grasso, MD, PhD

University of Maryland Baltimore County

Ergun Simsek, PhD

E. ADMINISTRATION, INSTRUCTIONAL DESIGN AND FACULTY TRAINING

The two institutions' academic officers shall appoint a cross-institutional implementation team that will meet and document further the operational details of the cooperative program. This documentation will be appended to this agreement prior to the program launch.

F. FINANCIAL OBLIGATIONS

Tuition, Fees, Student Financial Assistance and Scholarships

1. Tuition and fees will be set by each institution for its own courses and activities. UMB will be the home school for all UMB and UMBC Clinical Informatics students for purposes of student financial assistance.

2.   UMB office of University Student Financial assistance will process and disburse student aid based on the combined registered hours at both UMB and UMBC for each semester of an academic year. UMBC agrees it will not award any loans to Clinical Informatics students.

3.   To ensure compliance with federal financial aid regulations, students will receive financial aid from only one institution, UMB. If UMBC chooses to award scholarships, the amount of the scholarship will be calculated by UMB as a reduction to tuition cost. UMBC will promptly inform UMB of scholarships awarded, and UMB will account for the scholarship in determining the loan amount each student requires. UMB will classify such scholarships as an outside resource. UMB's current process will be to send a check or use RSTARS to UMBC for each student to cover tuition and fees at UMBC, by term. Any desired modifications to this process will be discussed and mutually agreed upon between UMB and UMBC.

30

4.   UMBC will be required to submit semester grade reports and scheduled enrollment status updates to UMB. The list must include the student's name, ID number, email address and telephone number.

5.   UMBC will notify the UMB University Student Financial Assistance of all enrollment changes, and the receipt of any scholarships and financial aid or scholarship resources that come to its attention that are received by a Cooperative Program student within 5 business days. If a change of enrollment occurs, a student's aid may be adjusted and the student may be billed. Financial assistance will be calculated on the combination of registered hours at both UMB and UMBC. Refunds will be issued in accordance with the policies of UMB and will be issued on the same schedule as those to other UMB students.

6.   UMB will notify UMBC if a student in the program withdraws, is suspended, or has another such significant enrollment change.

7.   For students who complete the UMBC data science certificate before entering the master's program, those courses count toward the CLIN program.

8.   Students enrolled in the program at UMB will enroll in the data science courses at UMBC through inter-institutional enrollment.

G. TERM AND TERMINATION

2. Unless otherwise terminated, this Agreement will run for a term of five years and be renewable. It may be reviewed and revised at any time by mutual written consent of the UMB and UMBC.

3. Either party may terminate this Agreement upon 90 days advance written notice to the other party in the event of a material breach by the other party that is not resolved within 90 days of written notice.

4. Either party may terminate this Agreement without cause upon 365 days advance written notice to the other party. A decision to terminate the agreement must take into consideration a reasonable plan to teach-out students currently enrolled.

5. Each institution reserves the right to suspend their portion of the curriculum (the PBC for UMBC and the overall MS for UMB). Written notice of at least six months must be provided prior to notification to the State of the intention to suspend the program. Discontinuation may follow suspension, or the program may be reactivated.

31

G. PROGRAM REVIEW

1.   At the end of each academic year, the parties will discuss the effectiveness of this Agreement and make suggestions as to what mutually agreeable programmatic changes or amendments, if any, should be made to the Agreement in writing.

2.   UMB will be responsible for program review to the University System of Maryland for the MS.

3.   Academic assessment consistent with MSCHE standards will be conducted on an iterative cycle consistent with other academic programs.

H. POLICIES

Each Party will apply its unique institutional policies, including but not limited to academic policies, to its portion of the curriculum and to the Program students' enrollment at that Party's school. Each Party's minimum grade requirement for transfer of credits from another school will apply to credits student earns at the other Party's school as part of the Program.

The Parties agree to communicate as necessary to manage institutional policy issues which may arise affecting students enrolled in the Program and agree to work cooperatively to identify and promptly resolve any such issues that may arise. As needed to implement the Program and address issues related to a Program student's enrollment in either Party's school, the Parties may share the information in the education records of Program students, subject to any applicable provisions of USM policy and the Family Educational Rights and Privacy Act. As a condition of admission to the Program, each Party will require a Program student to acknowledge that the Parties may share information from the educational records of the students.

I. ADDITIONAL TERMS

1.   When students are enrolled in a UMBC course, they are subject to the UMBC code of conduct and all other UMBC policies; when students are enrolled in a UMB course, they are subject to the UMB code of conduct and all other UMB policies.

2.   Each party may use the name and institutional trademark of the other party for the limited purposes of use in press releases and advertising announcing this Program and institutional announcements promoting the Program and seeking applicants. Neither university will modify the trademarks of the other university or use them in connection with any activity

32

other than the purposes set forth herein without the prior written permission of the other university. This permission will automatically terminate upon the expiration or termination of this MOU.

3.   Each Party will be responsible for direct and indirect expenses related to its portion of the Program. The Parties will not be individually responsible for any cost incurred by the other unless otherwise agreed in writing. In addition, neither Party is authorized to act for the other for any reason including but not limited to the incurring of any costs, liabilities, or exposures. This Agreement does not affect in any way the institutional reimbursement rules, policies, and requirements that each institution has for its own staff, faculty, and students.

4.   The parties will not discriminate. The parties will not discriminate against any employee, applicant or student enrolled in their respective programs on the basis of race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, marital status, gender identity or expression, creed, genetic information, or any other status or characteristic protected by law.

5.   This Agreement shall be governed by and construed in accordance with the laws of Maryland. This Agreement may be executed in any number of counterparts, each of which shall be an original, but which together constitute one and the same instrument.

READ AND AGREED BY THE PARTIES:

FOR: UNIVERSITY OF MARYLAND BALTIMORE

_____   _____

Flavius Lilly, Vice Provost   Date

FOR: UNIVERSITY OF MARYLAND BALTIMORE COUNTY

_____   _____

Janet C. Rutledge, Vice Provost   Date

33

APPENDIX C: PLAN OF STUDY

Full-Time Plan of Study, Fall Start

Semester	Course	Credits	CI PBC (UMB)	DS PBC (UMBC)	P (UMB)
Year 1					
Fall A	CLIN 601 Foundations in Clinical and Health Informatics	3	X		
Fall B	CLIN 602 Advanced Foundations in Clinical and Health Informatics	3	X		
Fall A/B	DATA 601 Introduction to Data Science	3		X	
Fall A/B	CLIN 610 Clinical Informatics Conference	1			X
Spring A	CLIN 603 Computer Programming for Healthcare Personnel	3	X		
Spring B	CLIN 604 Decision Support Systems in Healthcare	3	X		
Spring A/B	DATA 602 Introduction to Data Analysis and Machine Learning	3		X	
Spring A/B	CLIN 610 Clinical Informatics Conference	1			X
Year 2					
Fall A/B	DATA 603 Platforms for Big Data Processing	3		X	
Fall A	CLIN 611 Clinical Informatics Practicum	3			X
Fall A/B	CLIN 610 Clinical Informatics Conference	1			X
Spring A/B	DATA 604 Data Management	3		X	
Spring B	CLIN 612 Advanced Clinical Informatics Practicum	3			X
Spring A/B	CLIN 610 Clinical Informatics Conference	1			X

Full-Time Plan of Study, Spring Start

Semester	Course	Credits	CI OBC (UMB)	DS PBC (UMBC)	P (UMB)
Year 1					
Spring A	CLIN 603 Computer Programming for Healthcare Personnel	3	X		
Spring B	CLIN 604 Decision Support Systems in Healthcare	3	X		
Spring A/B	DATA 601 Introduction to Data Science	3		X	
Spring A/B	CLIN 610 Clinical Informatics Conference	1			X
Fall A	CLIN 601 Foundations in Clinical and Health Informatics	3	X		
Fall B	CLIN 602 Advanced Foundations in Clinical and Health Informatics	3	X		
Fall A/B	DATA 602 Introduction to Data Analysis and Machine Learning	3		X	
Fall A/B	CLIN 610 Clinical Informatics Conference	1			X
Year 2					
Spring A/B	DATA 603 Platforms for Big Data Processing	3		X	
Spring A	CLIN 611 Clinical Informatics Practicum	3			X
Spring A/B	CLIN 610 Clinical Informatics Conference	1			X
Fall A/B	DATA 604 Data Management	3		X	
Fall B	CLIN 612 Advanced Clinical Informatics Practicum	3			X
Fall A/B	CLIN 610 Clinical Informatics Conference	1			X

Part-Time Plan of Study, Fall Start

Semester	Course	Credits	CI	DS	P
Year 1					
Fall A	CLIN 601 Foundations in Clinical and Health Informatics	3	X		
Fall B	CLIN 602 Advanced Foundations in Clinical and Health Informatics	3	X		
Fall A/B	CLIN 610 Clinical Informatics Conference	1			X
Spring A	CLIN 603 Computer Programming for Healthcare Personnel	3	X		
Spring B	CLIN 604 Decision Support Systems in Healthcare	3	X		
Spring A/B	CLIN 610 Clinical Informatics Conference	1			X
Year 2					
Fall A/B	DATA 601 Introduction to Data Science	3		X	
Fall A/B	DATA 602 Introduction to Data Analysis and Machine Learning	3		X	
Spring A/B	DATA 603 Platforms for Big Data Processing	3		X	
Spring A/B	DATA 604 Data Management	3		X	
Spring A/B	CLIN 610 Clinical Informatics Conference	1			X
Year 3					

34

Fall A	CLIN 611 Clinical Informatics Practicum	3			X
Fall A/B	CLIN 610 Clinical Informatics Conference	1			X
Fall B	CLIN 612 Advanced Clinical Informatics Practicum	3			X

Part-Time Plan of Study, Spring Start

Semester	Course	Credits	CI	DS	P
Year 1					
Spring A	CLIN 603 Computer Programming for Healthcare Personnel	3	X		
Spring B	CLIN 604 Decision Support Systems in Healthcare	3	X		
Spring A/B	CLIN 610 Clinical Informatics Conference	1			X
Fall A	CLIN 601 Foundations in Clinical and Health Informatics	3	X		
Fall B	CLIN 602 Advanced Foundations in Clinical and Health Informatics	3	X		
Fall A/B	CLIN 610 Clinical Informatics Conference	1			X
Year 2					
Spring A/B	DATA 601 Introduction to Data Science	3		X	
Spring A/B	DATA 602 Introduction to Data Analysis and Machine Learning	1		X	
Fall A/B	DATA 603 Platforms for Big Data Processing	3		X	
Fall A/B	DATA 604 Data Management	3		X	
Fall A/B	CLIN 610 Clinical Informatics Conference	1			X
Year 3					
Spring A	CLIN 611 Clinical Informatics Practicum	3			X
Spring A/B	CLIN 610 Clinical Informatics Conference	1			X
Spring B	CLIN 612 Advanced Clinical Informatics Practicum	3			X

35

UNIVERSITY SYSTEM
of MARYLAND

TOPIC: New Academic Program Proposal:
University of Maryland, College Park: Bachelor of Arts in Technology and Information Design

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, September 14, 2021

SUMMARY: The University of Maryland, College Park (UMD) proposes to establish a Bachelor of Arts in Technology and Information Design. This program is designed to teach students to frame important problems at the intersection of people and information; to design solutions for those problems; and to realize, deploy and iterate on those solutions. Students will participate in hands-on studio and laboratory classes in user-centered design, technology development, problem-solving and cross-disciplinary communication. Graduates may become designers, planners, technology consultants, project managers, and entrepreneurs, in such wide-ranging fields as user experience, mobile development, healthcare, law, entertainment, policy, smart-city development, libraries and archives.

The program requires 55 credits of coursework directly related to the major, in addition to the University's general education requirements. The core elements of the curriculum include 37 credits of courses in information science, design, introduction to contemporary societal issues, statistics, modeling, and simulation. Students will take an additional 18 credits of elective courses in a range of topics that includes information organization and user assessment, data privacy and security, design related to human disability and aging, ethics, policy, and artificial intelligence. Learning outcomes include an ability to implement design thinking strategies in user design with specific attention to ethics and equity; and development of solutions using skills such as scope assessment, people organization, management, testing, evaluation, and auditing.

ALTERNATIVE(S): The Regents may not approve the program or may request further information.

FISCAL IMPACT: No additional funds are required. The program can be supported by the projected tuition and fees revenue.

CHANCELLOR'S RECOMMENDATION: That the Education Policy and Student Life Committee recommend that the Board of Regents approve the proposal from University of Maryland, College Park to offer the Bachelor of Arts in Technology and Information Design.

COMMITTEE RECOMMENDATION:	DATE: September 14, 2021
BOARD ACTION:	DATE:
SUBMITTED BY: Joann A. Boughman 301-445-1992	jboughman@usmd.edu

UNIVERSITY OF MARYLAND

OFFICE OF THE PRESIDENT

1101 Thomas V. Miller, Jr. Administration Building
College Park, Maryland 20742
301.405.5803 TEL
301.314.9560 FAX

July 6, 2021

Chancellor Jay A. Perman
University System of Maryland
3300 Metzerott Road
Adelphi, MD 20783

Dear Chancellor Perman:

I am writing to request approval for a new Bachelor of Arts program in Technology and Information Design. The proposal for the new program is attached. I am also submitting this proposal to the Maryland Higher Education Commission for approval.

The proposal was endorsed by the appropriate faculty and administrative committees. I also endorse this proposal and am pleased to submit it for your approval.

Sincerely,

Darryll J. Pines
President
Glenn L. Martin Professor of Aerospace Engineering

DJP/mdc

cc: Antoinette Coleman, Associate Vice Chancellor for Academic Affairs
       Jennifer King Rice, Senior Vice President and Provost
       Keith Marzullo, Dean, College of Information Studies

UNIVERSITY SYSTEM OF MARYLAND INSTITUTION PROPOSAL FOR

_____ New Instructional Program

_____ Substantial Expansion/Major Modification

_____ Cooperative Degree Program

___X___ Within Existing Resources, or

_____ Requiring New Resources

University of Maryland, College Park
Institution Submitting Proposal

Technology and Information Design
Title of Proposed Program

Bachelor of Arts	Fall 2022
Award to be Offered	Projected Implementation Date

070202	30.3101
Proposed HEGIS Code	Proposed CIP Code

College of Information Studies	Kate Izsak
Department in which program will be located	Department Contact

301-405-1246	kworboys@umd.edu
Contact Phone Number	Contact E-Mail Address

	07-06-2021
Signature of President or Designee	Date

A. Centrality to the University's Mission and Planning Priorities

Description. The College of Information Studies (iSchool) at the University of Maryland is proposing a new Bachelor of Arts in Technology and Information Design, known as InfoDesign. This program is designed to teach students to frame important problems at the intersection of people and information; to design solutions for those problems; and to realize, deploy and iterate on those solutions. Students will participate in hands-on studio and laboratory classes in user-centered design, technology development, problem-solving and cross-disciplinary communication. Graduates may become designers, planners, technology consultants, project managers, or entrepreneurs, in such wide-ranging fields as user experience, mobile development, healthcare, law, entertainment, policy, smart-city development, libraries and archives. The locus of study of this program is closely connected to graduate programs in the iSchool in Information Management, in Human-Computer interaction, and in Library and Information Science. The iSchool's mission combines these areas of research strength "to foster access to information, improve information interfaces, and expand how information is used in an evolving world."

Relation to Strategic Goals. The University's mission statement includes an intent to create a climate of intellectual growth and mutual respect, that addresses policy issues critical to the state, nation, and world, that sits at the forefront of multi-disciplinary knowledge, and that improves student learning and success through expanded use of innovative teaching methods and opportunities for collaboration and engagement. The iSchool's vision statement reads, "We envision a world... where information and technology can be fully leveraged to solve real world problems and foster a culture of trust and respect." The iSchool's mission is to use our groundbreaking and innovative research and academics to strengthen information institutions, foster responsible information use, increase information reliability, and ensure equitable access to information. In support of these goals, the InfoDesign program will teach students to use technology in the service of the greater good; to apply and expand their creativity; to approach life and work with a start-up mentality, in which they must try solutions and fail first to succeed; to see opportunities for innovation amidst grand challenges; and to engage in rapid development and prototyping and subsequently conduct rapid evaluation and assessment efforts to make their ideas real. The major will teach students the importance of developing a deep understanding of people, places and communities and understanding the dynamics of people, information, and technology at the micro, meso, and macro scales.

Funding. Resources for the new program will be drawn from a reallocation of resources from within the iSchool, leveraging the growing popularity of its master's programs. Details of the budget are presented in section L below. No new tuition revenue to support the program is assumed; it is expected that the major will draw from existing academic majors, including the iSchool's relatively new B.S. in Information Science, which has grown to an enrollment of over 1200 majors since its inception just five years ago in 2016. The new Bachelor of Arts will serve students whose interests are less focused on the technical aspects of information science but more on meeting the needs of humans as information consumers.

Institutional Commitment. The Provost and President fully support the development of this program. The iSchool's significant increase in growth in the undergraduate sector has been supported by the university with additional resources for tenure track and professional track instructional faculty, as well as planned enhancements in space.

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

Need. As technology and information use continues to evolve and increase in influence in business, public life, and personal lives, an academic program that incorporates human understanding, technological development, and information design is more important than ever. Technology and information use will not only continue to shape the businesses and workforce needs of the future, but also continue to have a profound effect on nearly all aspects of our lives. From a practical standpoint, this program will emphasize entrepreneurship and job creation of human-centered technological and information science jobs, that is, jobs that cannot be easily replaced by automation. From a social standpoint, the program will also emphasize the ethical and social impact of technology and information design, as well as the importance of applying technological innovation to problems facing humanity. This program, therefore, responds to a regional, statewide, and national need to increase knowledge about information and design in a way that responds to societal needs in our rapidly changing world.

State Plan. This program addresses three components within the [Maryland State Plan for Postsecondary Education](): (1) student success; (2) innovation; and (3) workforce development. To the first component, this degree program is geared towards students whose interdisciplinary interests make them a poor fit for other, disciplinarily defined degree programs. Students who begin their undergraduate degree believing that they are particularly interested in computer science, business, or education (for example), may discover that they are in fact interested in the intersection between design, information, and technology. A degree program designed specifically to support such students will increase the likelihood of retention and graduation. Secondly, as the Secretary notes in his opening to the Maryland State Plan, Maryland is well known for its quality of higher education, and its reputation as "the most innovative state in the nation." This degree program - the first of its kind in Maryland, and one of very few across the nation - will advance both. Third, to support the goal of "student success with less debt", this unique program will provide alternative educational pathways for students, reducing the likelihood that they will leave with debt and without a degree. The market demand for the primary skills this degree will provide ensures that our graduates will have access to well-paying jobs that assist in rapidly paying down any student debts that they may have accrued.

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

The USBLS Occupational Outlook Handbook shows a projected rate of growth of 12% from 2018 to 2028 in Computer and Information Technology Occupations (CITO) and note that this rate of growth is "much faster than the average for all occupations." Within CITO, there are two subcategories that are a particularly good fit for graduates of this degree program: Computer and Information Research Scientists; and Web Developers. The projected increase for Computer and Information Research Scientists is 16%, and the USBLS handbook notes that such individuals "are likely to enjoy excellent job prospects, because many companies report difficulties finding these highly skilled workers." The projected increase for Web Developers is 13% and is driven specifically by the "growing popularity of mobile devices and e-commerce."

Within Arts and Design Occupations, the only relevant occupation is that of Graphic Designer. Graphic Designers are only projected to increase 3%, less than average. USBLS notes that Graphic Designers face

Page **5** of **22**

67

challenges on the market, but we anticipate that the focus on information and technology will set our graduates apart.

Within Business and Financial Occupations, the category of Management Analyst (also known as Business Analyst or Process Consultant) is an apt fit, and these are projected to increase by 14%. The USBLS handbook notes that "demand for the services of these workers should grow as organizations continue to seek ways to improve efficiency and control costs."

Currently, there are no similar programs in the state, and consequently we expect the rapid increase in demand to continue, exceeding the existing supply of skilled workers, making this degree program a crucial contributor to industry and society. We anticipate 80 students graduating per year, beginning three years after implementation of this degree.

D. Reasonableness of Program Duplication

The InfoDesign major will not result in unreasonable duplication of an existing program within the state. Programs in the area with some curricular similarity fall into two categories: 1) those with a business or entrepreneurship focus; and 2) those with a fine arts and physical design focus. These programs represent pieces of the new proposed major, but not the overall curriculum nor the innovative combination of skills and content proposed here.

Morgan State University (MSU) and Mount Saint Mary's University (MSMU) offer programs in entrepreneurship that have some overlap with InfoDesign. MSU's major in Entrepreneurship is housed within its Earl G. Graves School of Business & Management and is heavily focused on commercialization, customer identification and validation, business plan development and intellectual property protection. It does not have the emphasis on design and creativity central to the InfoDesign program. MSMU's Entrepreneurship major is an interdisciplinary program but is similar to MSU's, with emphasis on skills such as financial management, small business development, business plan design, and social media and marketing. The InfoDesign major will include some emphasis on these types of skills, but they will be integrated with the development of design principles. The University of Maryland, Baltimore County (UMBC) offers an Entrepreneurship minor and supporting coursework most closely aligned with the computer science and information systems undergraduate programs in the College of Engineering and Information Technology. This is a supplementary, not stand-alone, program that does not have a dedicated design focus.

The Maryland Institute College of Art (MICA) offers a BFA in Interactive Arts, which shares some similarities to InfoDesign. Focused on "crafting interactions across an array of media and forms," the Interactive Arts program more narrowly emphasizes human-computer interaction, with specific attention to technologies such as P2P/Blockchain, Artificial Intelligence (AI), and Virtual Reality/Augmented Reality (VR/AR). Students focus on coding and immersive media, rather than on the broader cycle of iterative design that underpins InfoDesign. Students in the MICA program also take a first year of fundamentals in fine arts, making the program inaccessible to students not interested in developing traditional drawing and color theory skills. MICA also offers a Game Design concentration (similar to a minor) that teaches design skills, but again, specifically within a specific context. The University of Baltimore offers a similar program, a B.A. in Simulation and Game Design, which focuses primarily on coding skills, without discussion of design principles applied to broader subject matter.

Much closer to InfoDesign is MICA's Product Design BFA. The Product Design program is a hands-on curriculum focused on reimagining objects and inventing new ones through the same type of ethical values and iterative design processes that underpin InfoDesign. The Product Design BFA, however, is focused on the design of physical objects, rather than the proposed major's broader focus that includes design of intangible products. Like the Interactive Arts program, the Product Design program is restricted to fine arts students who take a first year of fundamentals in fine arts, making the program inaccessible to students not interested in developing traditional drawing and color theory skills.

While not in Maryland, Virginia Tech could prove to be a relatively local competitor to InfoDesign with its B.S. in Industrial Design or its BFA in Creative Technologies. However, the Industrial Design program is constructed similarly to MICA's Product Design program, which emphasizes the creation of tangible objects. And the Creative Technology program focuses on design within the limited scope of digital and new media technologies.

E. Relevance to Historically Black Institutions (HBIs)

Because there is no analogous program in the state, and because we anticipate the largest source of students to be those who internally transfer from another major, the creation of the InfoDesign major should not have an impact on any of the state's HBIs.

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

We do not anticipate any impact on the identities of the State's HBIs.

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

Curricular Development. The development of this curriculum has grown out of the intersecting expertise in UMD's iSchool, on people, information, and society. Beginning in 2018, the iSchool's faculty and administrative leaders worked with the iSchool's Leadership, Entrepreneurship, Advocacy, and Development (iLead) advisory group to identify a set of challenges anticipated to shape iSchool education, nationally, over the coming decade. Suggestions included the need for graduates who could grapple with life and work challenges related to AI and robotic automation, and who could foster entrepreneurship in small communities, particularly among underrepresented or under-resourced groups. Skills associated with gathering and analyzing data would be critical to support these efforts. Using a collaborative process of "design fiction" the iSchool faculty identified an additional series of educational objectives, including producing graduates who could create more engaging news across multiple media and support better understanding of platforms that govern finances, social networks and news consumption; creation of jobs that balance equity and productivity through entrepreneurship; and producing technical professionals who understand organizations and their ethical and political impact.

Graduates will know how to design, reason, and act in circumstances with high levels of uncertainty, thus preparing them to respond to grand challenges with long and noisy feedback loops. They will be able to function in complex environments and work across many levels of analysis because grand challenges typically require integrated efforts across many interlocking levels of a problem.

Faculty Oversight. The program will be managed by a Faculty Director, who will be appointed by the Dean for a three-year term and may be reappointed. The Faculty Director, in collaboration with the Assistant and Associate Deans, academic administrators, and members of the faculty, will provide intellectual leadership for the proposed major. The Faculty Director will chair a curricular committee to provide faculty oversight of academic and pedagogical strategies, policies for student recruitment, and curricular planning for the major. Appendix A contains a list of the relevant faculty who will be actively engaged in teaching the core elements of the data science courses in the curriculum.

Educational Objectives and Learning Outcomes. The educational objectives of the program are as shown below. Upon completion of the program, students will be able to:

1. Frame important problems at the intersection of people and information:
   a) Analyze the interplay of people, information, and technology at various scales (e.g., individuals or small groups, communities or organizations, regions, or institutions);
   b) Leverage a systems-thinking approach through modeling and simulation;
   c) Design solutions for these problems.

2. Implement design thinking skills, including user research, ideation, prototyping, and participatory design:
   a) Communicate ideas to gather momentum and iterate through sketching, prototyping and data visualization;
   b) Iteratively assemble existing components to form new solutions within a supportive culture of critique;
   c) Attend to the ethical and equitable implications of their designs.

3. Realize, deploy, and iterate on these solutions at appropriately selected scale(s):
   a) Assess the scale of the problem and the appropriate deployment of potential solutions;
   b) Organize people to properly implement solutions through leadership and entrepreneurship skills;
   c) Evaluate success of a solution in a socially embedded setting, to include the employment of skills such as testing, evaluation, and auditing.

Metrics to monitor and assess student outcomes are based on our shared vision of high standards for the entire learning experience at the iSchool and include standards for the courses and activities, faculty effectiveness, and administrative and technical support services for students. Faculty and content designers will use these metrics to guide the development and any necessary revisions of each course. Assessment strategies will include direct measures of student learning, such as evaluation of students' performance in integrative design studio courses by supervisors and instructors based upon stated program objectives; the evaluation of students' portfolios; internal and external reviews of studio projects; and performance on examinations given in foundational core and specialization courses. Indirect measures will include job placement data; surveys of graduates and employers; exit interviews; and satisfaction surveys. Appendix B has a curriculum map indicating which courses will be assessed for which outcomes. Students graduating from InfoDesign will also be eligible for the [Greater Washington Partnership](#) Capital CoLab Digital Generalist and Data Analytics Specialist credentials (see https://capitalcolab.com/).

Institutional assessment and documentation of learning outcomes. The degree to which InfoDesign is meeting its goals will be assessed by a process that is consistent with that outlined in the UMD

Undergraduate Program Learning Outcomes Assessment Plan. The Undergraduate Program Committee will direct the assessment process. Assessments will be conducted annually in the spring semester, beginning in the first year of the program. The assessment report to the Provost each fall will include the results of the assessment and recommendations for program improvement that are based on these results.

Course requirements.   The program requires 55 credits of coursework directly related to the major, in addition to the University's general education requirements. These include 17 credits of core courses, plus an additional 18 credits (6 courses) from a suite of electives, shown in the table below (courses labeled with an asterisk are new).

Core Courses	Title	Credits
INST104*	Design Across Campus	3
INST126	Introduction to Programming for Information Science	3
IDEA258	Special Topics in Innovation (IDEA258A Becoming a Design Thinker: Tools and Mindsets for Innovation)	1
INST201	Introduction to Information Science	3
SOCY105	Introduction to Contemporary Social Problems	3
STAT100	Elementary Statistics and Probability	3
INST204*	Designing Fair Systems	3
PLCY380	Innovation and Social Change: Do Good Now	3
INST367*	Prototyping and Development Technologies Studio	3
INST406*	Cross-disciplinary Design Communication Lab	3
INST454*	Modeling and Simulating Systemic Problems	3
INST466	Technology, Culture, and Society	3
INST491*	Integrated Capstone for Technology and Information Design	3
	Total Core Courses	**37**
Major Electives	**18 credits (6 courses) from the list below**	
INST311	Information Organization	3
INST352	Information User Needs and Assessment	3
INST366	Privacy, Security and Ethics for Big Data	3
INST401	Design and Human Disability and Aging	3
INST402	Designing Patient-Centered Technologies	3
INST404*	Youth Experience Design Studio	3
INST405*	Game Design Studio	3
INST441	Information Ethics and Policy	3
INST460*	Video Games as Emergent Experiences	3
INST463*	AI and Society	3
	Total Credits	**55**

A typical four-year plan can be found in Appendix D, and course descriptions can be found in Appendix C. All other course descriptions are available in the University's Undergraduate Catalog (https://academiccatalog.umd.edu/).

General Education. Students will complete some of their general education requirements by way of fulfilling major requirements, with space in the curriculum for all other General Education requirements. Students who transfer to UMD with an associate degree from a Maryland community college are deemed to have completed their General Education requirements except for Professional Writing, which is typically taken in their third year of study.

Accreditation or Certification Requirements.

N/A

Other Institutions or Organizations. The department does not currently intend to contract with another institution or non-collegiate organization for this program.

Student Support.   Students enrolled in this program will have access to all the resources necessary to succeed and make the most of the learning opportunity. Students entering the university as either first-time college students or transfer students will learn about the program through their orientation program. Students entering the major as internal transfers will meet with an advisor in the program when they declare the major. Existing administrative and advising resources will be used, which include a Director of Undergraduate Operations, a team of undergraduate advisors, and two coordinators. Advising capacity will expand as the program grows.

Marketing and Admissions Information. The program will be clearly and accurately described in the university website and be marketed at university recruiting events.

H. Adequacy of Articulation

Montgomery College is typically the largest feeder of transfer students to the university on the College Park campus.   As the program develops, outreach will continue with other local community colleges in, for example, Frederick and Prince Georges County. Students who complete the associate degree at a Maryland Community College and transfer to the University of Maryland are deemed to have completed their general education requirements, except for Professional Writing. The University does not, typically, create specific articulation agreements with community colleges for programs such as this one that may have a variety of pathways for entry. The four-year plan provides a strong indicator of what courses should be taken at the community college prior to transfer.

I. Adequacy of Faculty Resources

Program faculty. Appendix A contains a list of the relevant faculty who will be actively engaged in teaching the core course and list of electives for the major.

Faculty training. Faculty teaching in this program will have access to instructional development opportunities available across the College Park campus, including those offered as part of the Teaching and Learning Transformation Center. For online elements of the coursework, instructors will work with the learning design specialists on campus to incorporate best practices when teaching in the online environment.

Page **10** of **22**

J. Adequacy of Library Resources

The University of Maryland Libraries has assessed library resources required for this program. The assessment concluded that the University Libraries can meet, with its current resources, the curricular and research needs of the program.

K. Adequacy of Physical Facilities, Infrastructure, and Instructional Resources

No additional facilities are needed to deliver the program: most courses will be taught in any of the University's 334 general purpose classrooms. The iSchool is also in the process of designing a community space, code-named "TinkerTech" that will include infrastructure for virtual and augmented reality game design and other digital media design, providing student access to software and technology through common licensing. The University is in the process of repurposing space on the ground floor of Hornbake Library to accommodate the iSchool's expansion. This area will have studio-friendly classrooms and team workspaces in addition to office space.

L. Adequacy of Financial Resources

Resources for the program will come primarily from a reallocation of resources within the iSchool. No new tuition revenue is assumed. Tables 1 and 2 contain a listing of resources and expenditures, with explanatory information below.

Resources:
1. Reallocated Funds: The University anticipates that some additional startup costs will be incurred until a full cohort of students is enrolled in the program. Reallocated resources will come from a redirection of effort from within the iSchool and from general university funds.
2. Tuition revenue: The University does not anticipate an overall increase in enrollment, and thus no new additional tuition revenue is projected for those students.
3. Grants, Contracts and External Sources: none
4. Other Sources: none

Expenditures:
1. Most courses are already available and taught by faculty across the engaged colleges. Additional instructional FTE will be required to staff new sections of courses beginning in FY23, which is year 1 of program delivery.
2. Approximately 3.0 FTE of administrative support will be assigned to assist with program management, student advising, and class coordination once the program is in full operation.
3. Approximately 1.0 FTE of staff support will be technical support for system software administration and data management.
4. Teaching assistants will be allocated for the program each semester to assist with classroom instruction/discussion.
5. Equipment funding includes computing needs and hourly undergraduate student employees.
6. No new library resources are required for the program, but expenses include software licenses and annual cloud storage fees.
7. Renovations to or reallocation of space is not required.
8. Operational expenses include tuition remission for graduate teaching assistants.

M. Adequacy of Program Evaluation

Formal program review is carried out according to the University of Maryland's policy for Periodic Review of Academic Units, which includes a review of the academic programs offered by, and the research and administration of, the academic unit (http://www.president.umd.edu/policies/2014-i-600a.html). Program Review is also monitored following the guidelines of the campus-wide cycle of Learning Outcomes Assessment (https://irpa.umd.edu/Assessment/loa_overview.html). Faculty within the department are reviewed according to the University's Policy on Periodic Evaluation of Faculty Performance (http://www.president.umd.edu/policies/2014-ii-120a.html). Since 2005, the University has used an online course evaluation instrument that standardizes course evaluations across campus. The course evaluation has standard, university-wide questions and allows for supplemental, specialized questions from the academic unit offering the course.

N. Consistency with Minority Student Achievement goals

The student populations in the colleges engaged in this new major are among the most diverse at the university, with percentages of URM students five to 10 percentage points above that of the overall undergraduate student population.   More generally, diversity, equity, and inclusion (DEI) sit at the core of the values of the engaged colleges. Educators and scholars in these units serve as powerful thought leaders in anti-racism scholarship, health disparities, and racial inequities in access to technology and information. The program is grounded in the importance of applying DEI principles across the curriculum.

O. Relationship to Low Productivity Programs Identified by the Commission

N/A

P. Adequacy of Distance Education Programs

N/A

Tables 1 and 2: Resources and Expenditures

Tuition revenue is based on AY2020-21 rates for the University. It does not include mandatory fees or laboratory fees. The University is not anticipating overall enrollment growth on the College Park campus because of this new major, so no new tuition revenue is included for the on-campus delivery.

Resources	Year 1	Year 2	Year 3	Year 4	Year 5
1.Reallocated Funds	$375,000	$950,000	$1,000,000	$1,325,000	$1,400,000
2. Tuition/Fee Revenue (c+g below)	$0	$0	$0	$0	$0
a. #FT Students					
b. Annual Tuition/Fee Rate	$14,046	$14,468	$14,902	$15,349	$15,809
c. Annual FT Revenue (a x b)	$0	$0	$0	$0	$0
d. # PT Students					
e. Credit Hour Rate	$475.90	$490.18	$504.88	$520.03	$535.63
f. Annual Credit Hours	14	14	14	14	14
g. Total Part Time Revenue (d x e x f)	$0	$0	$0	$0	$0
3. Grants, Contracts, & Other External Sources	$0	$0	$0	$0	$0
4. Other Sources	$0	$0	$0	$0	$0
TOTAL (Add 1 - 4)	$375,000	$950,000	$1,000,000	$1,325,000	$1,400,000

Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. TTK Faculty (b+c below)	$161,625	$332,948	$342,936	$529,836	$545,731
a. #FTE	1.0	2.0	2.0	3.0	3.0
b. Total Salary	$125,000	$257,500	$265,225	$409,773	$422,066
c. Total Benefits	$36,625	$75,448	$77,711	$120,063	$123,665
2. PTK Faculty (b+c below)	$0	$239,722	$246,914	$254,321	$261,951
a. #FTE	0.0	2.0	2.0	2.0	2.0
b. Total Salary	$0	$185,400	$190,962	$196,691	$202,592
c. Total Benefits	$0	$54,322	$55,952	$57,630	$59,359
3. Admin. Staff (b+c below)	$94,780	$97,623	$100,552	$103,569	$106,676
a. #FTE	1.0	1.0	1.0	1.0	1.0
b. Total Salary	$70,000	$72,100	$74,263	$76,491	$78,786
c. Total Benefits	$24,780	$25,523	$26,289	$27,078	$27,890
4. Total Support Staff (b+c below)	$64,650	$133,179	$137,174	$141,290	$145,528
a. #FTE	1.0	2.0	2.0	2.0	2.0
b. Total Salary	$50,000	$103,000	$106,090	$109,273	$112,551
c. Total Benefits	$14,650	$30,179	$31,084	$32,017	$32,977
5. Graduate Assistants (b+c)	$0	$91,009	$187,478	$241,378	$248,619
a. #FTE	0.0	2.0	4.0	5.0	5.0
b. Stipend	$0	$51,500	$106,090	$136,591	$140,689
c. Total Benefits	$0	$12,515	$25,780	$33,192	$34,187
d. Tuition Remission	$0	$39,509	$81,388	$104,787	$107,931
6. Equipment	$25,000	$25,000	$25,000	$25,000	$25,000
7. Library	$5,000	$5,000	$5,000	$5,000	$5,000
8. New or Renovated Space	$0	$0	$0	$0	$0
9. Other Expenses: Operational Expenses	$25,000	$25,000	$25,000	$25,000	$25,000
TOTAL (Add 1 - 8)	$376,055	$949,481	$1,070,054	$1,325,393	$1,363,505

Notes: Graduate assistants are included in the budget to support instruction, and other expenses include tuition remission for graduate teaching assistants. "Equipment" includes hourly wages for undergraduate student employees.

Appendix A: Faculty who will support the Social Data Science Program

All faculty hold doctoral degrees in a field relevant to the discipline. Faculty biographies and research interests for all faculty can be found on the iSchool's web site (https://www.ischool.umd.edu/about); All faculty listed below are full-time. Specific course assignments have not yet been made but will be made in time to schedule the courses for the target start term of the program.

Faculty Name	Highest Degree Earned - Field and Institution	Rank
Elizabeth Bonsignore	Ph.D., Information Studies, University of Maryland	Assistant Research Scientist
Joel Chan	Ph.D., Cognitive Psychology, University of Pittsburgh	Assistant Professor
Tamara Clegg	Ph.D., Interactive Computing, Georgia Tech	Associate Professor
Vedat Diker	Ph.D., Information Science, SUNY Albany	Principal Lecturer
Niklas Elmqvist	Ph.D., Computer Science, Chalmers University of Technology (Sweden)	Professor
Dan Greene	Ph.D., American Studies, University of Maryland	Assistant Professor
Jonathan Lazar	Ph.D., Information Systems, University of Maryland, Baltimore County	Professor
Alex Leitch	Master of Design, Art, Media and Design, Ontario College of Art and Design	Lecturer
Wayne Lutters	Ph.D., Information and Computer Science, University of California, Irvine	Associate Professor
Katie Shilton	Ph.D., Information Studies, University of California, Los Angeles	Associate Professor
Mega Subramanian	Ph.D., Information Studies, Florida State University	Associate Professor
Jessica Vitak	Ph.D. in Media and Information, Michigan State University	Associate Professor
Caro Williams-Pearce	Ph.D., Curriculum and Instruction, University of Wisconsin	Assistant Professor

Page **15** of **22**

Appendix B: Student Learning Outcome Curriculum Map

SLO / Core Course Mapping	IDEA258	INST126	INST104	INST201	SOCY105	STAT100	PLCY338D	INST362	INST367	INST406	INST454	INST466	INST491
Frame important problems at the intersection of people and information													
FRAME: Analyze the interplay of people, information, and technology at various scales (e.g., individuals or small groups, communities or organizations, regions or institutions)					2		3	3					4
FRAME: Leverage a systems-thinking approach through modeling and simulation	1										4		
Design solutions for these problems													
DESIGN: Implement design thinking skills, including user research, ideation, prototyping, and participatory design	2		1				3	3		3			4
DESIGN: Communicate ideas to gather momentum and iterate through sketching, prototyping and data visualization	1		1	2	1		1	2	4	4			4
DESIGN: Iteratively assemble existing components to form new solutions within a supportive culture of critique	1	3											4
DESIGN: Attend to the ethical and equitable implications of their designs			1	3						2		4	
Realize, deploy, and iterate on these solutions at appropriately selected scale(s)													
REALIZE: Assess the scale of the problem and the appropriate deployment of potential solutions	1										4		2
REALIZE: Organize people to properly implement solutions through leadership and entrepreneurship skills	2						2	2					4
REALIZE: Evaluate success of a solution in a socially embedded setting, to include the employment of skills such as testing, evaluation, and auditing	1		1				3	2	2				4

Levels of Mastery
1: Awareness
2: Content Literacy
3: Expert Experience-Guided
4: Expert Experience-Independent

Appendix C: Course Descriptions for the core courses of the Social Data Science major

Courses in this list represent the core curriculum required of all students, beyond their Fundamental Studies general education requirements. Most courses are already approved and have been offered. All approved course descriptions can also be found in the University's Undergraduate Catalog (https://academiccatalog.umd.edu/).

Core Course requirements (37 credits)

INST104 Design Across Campus (3). Explores different design meanings and methodologies in various disciplines through modules created by faculty members in INFO, ARCH, ARHU, BSOS, CMNS and ENGR. (NEW)

INST126 Introduction to Programming for Information Science (3). An introduction to computer programming for students with very limited or no previous programming experience. Topics include fundamental programming concepts such as variables, data types, assignments, arrays, conditionals, loops, functions, and I/O operations.

IDEA258A Becoming a Design Thinker: Tools and Mindsets for Innovation (1). Boost your creative confidence. Unleash your inner design thinker. Learn how to see the world like a designer. Become an idea-generating machine by embracing methods and mindset that bolster creativity and lead to innovation in this 1-credit course open to all majors. You'll only pass if you learn how to fail.

INST201 Introduction to Information Science (3). Examining the effects of new information technologies on how we conduct business, interact with friends, and go through our daily lives. Understanding how technical and social factors have influenced the evolution of information society. Evaluating the transformative power of information in education, policy, and entertainment, and the dark side of these changes.

SOCY105 Introduction to Contemporary Social Problems (3). An examination of contemporary social problems through sociological perspectives; ways in which social problems are part of the organization of society; a detailed study of selected social problems including social conflict and social inequality.

STAT100 Elementary Statistics and Probability (3). Simplest tests of statistical hypotheses; applications to before-and-after and matched pair studies. Events, probability, combinations, independence. Binomial probabilities, confidence limits. Random variables, expected values, median, variance. Tests based on ranks. Law of large numbers, normal approximation. Estimates of mean and variance.

INST204 Designing Fair Systems (3). Explores how policy shapes design and how design can act as de facto policy. Introduces students to interdisciplinary research on fairness, accountability, transparency, and justice in technical systems, bringing together fields such as law, computer science, and political theory. Students will learn how to assess the impact of automated decision-making in domains such as criminal justice and transportation, conduct audits of these systems, and re-design them for increased community input. (NEW)

PLCY380 Innovation and Social Change: Do Good Now (3). Introduces students to the concept of social innovation while exploring the many mechanisms for achieving social impact. It is team-based, highly interactive and dynamic, and provides an opportunity for students to generate solutions to a wide range of problems facing many communities today. Deepens students' understanding of entrepreneurship and innovation practices by guiding them through the creation and implementation process as applied to a project idea of their choice.

INST367 Prototyping and Development Technologies Studio (3). Builds upon students' experiences with interaction design to develop a deeper understanding of the process of defining, iterating, developing, and researching products. When interacting with systems, people build expectations and mental models of how

things work, based upon their previous experience with similar products or processes, and the successful or unsuccessful nature of their interactions determines the success of the design. This studio course is about how to build a product that people find usable, useful, and desirable, and conduct research throughout that building process from contextual inquiry to evaluating the final product. (NEW)

INST406 Cross-disciplinary Design Communication Lab (3). Best practices of writing and sketching for designers. Students learn how to solicit needs from clients and other stakeholders; how to craft proposals, be they technical or process-oriented; how to create visually compelling documents; and how to present written analyses for audiences of varying levels of expertise. (NEW)

INST454 Modeling and Simulating Systemic Problems (3). Growing complexities in organizations and societies have brought about systemic problems that cannot be fully understood and addressed using solely traditional linear approaches, and purely local solutions limited to a single organization. This course explores paradigms, methods and tools for articulating complex, non-linear, feedback-driven relationships in a range of socio-technical systems, which may span distributed organizations and other social structures, through formal models. Those models can then be simulated to identify the root causes of the systemic problems present and develop solution strategies for addressing those problems. (NEW)

INST466 Technology, Culture and Society (3). Individual, cultural, and societal outcomes associated with development of information & communication technologies (ICTs), including pro- and anti-social factors. Unpacking how gender, race, ethnicity, sexual orientation, disabilities, and political affiliations affect consumption and production of online experiences. Unpacking how structures of dominance, power and privilege manifest at individual, institutional and cultural levels. Understanding the relationship between local and global problems in technology development. Comparing global and historical variation in the design, deployment, use and regulation of technology. Prerequisite: minimum grade of C- from INST201 or INST301; minimum grade of C- from PSYC100 or SOCY105; must be in the Information Science or Technology and Information Design programs.

INST491 Integrated Capstone for Technology and Information Design (3). Capstone course for the major. Students collaborate in teams on a second semester-long project for a real-world client, bringing together lessons from across the Technology and Information Design curriculum to frame the client's problems, design a solution to them, and realize the solution in context. Students apply knowledge they have gained in the program to work with clients to craft design proposals, conduct user and system analyses, and review project successes and failures. (NEW)

Major elective options (students will choose 18 credits):

INST311 Information Organization (3). Examines the theories, concepts, and principles of information, information representation and organization, record structures, description, and classification. Topics to be covered in this course include the methods and strategies to develop systems for storage, organization, and retrieval of information in a variety of organizational and institutional settings, as well as policy, ethical, and social implications of these systems. Must be in the Technology and Information Design or Information Science programs.

INST352 Information User Needs and Assessment (3). Focuses on use of information by individuals, including the theories, concepts, and principles of information, information behavior and mental models. Methods for determining information behavior and user needs, including accessibility issues will be examined and strategies for using information technology to support individual users and their specific needs will be explored.

INST366 Privacy, Security and Ethics for Big Data (3). Evaluates major privacy and security questions raised by big data, Internet of Things (IoT), wearables, ubiquitous sensing, social sharing platforms, and other AI-driven systems. Covers history of research ethics and considers how ethical frameworks can and should be applied to digital data.

INST401 Design and Human Disability and Aging (3). Focuses on the design of consumer products and information systems to enable their use by persons with a wider range of physical, sensory, and cognitive abilities. Overviews aging and major types of impairment as they relate to resulting problems using consumer products and information systems. Focuses on principles of design of mass market products.

INST402 Designing Patient-Centered Technology (3). What does it mean to design a human-centered digital health technology specifically for patients? What are the methods we can use to gather design considerations, and how to use the findings to inform the design? Through a combination of project- and lecture-based class, students will learn topics such as Patient-Centered Technology; Co-Design; Health Monitoring; Persuasive System Design; Goal Setting & Gamification; Health Literacy, and Patient-Clinician Communication. We will apply these concepts to support the unique needs of older adults and patients with a variety of conditions (e.g., diabetes, stroke, dietary issues, enigmatic disease), and to support an individual's health and well-being.

INST404 Youth Experience Design Studio (3). Explores historical, organizational, and contemporary contexts for formal and informal learning spaces, principles of teaching and learning, and information literacy. Students will use methods of design thinking specifically in and for youth contexts, including user-centered design, understanding user needs, ideation, contextual design, participatory design, iterative prototyping, and visual design. (NEW)

INST405 Game Design Studio (3). Games are a structured form of play that are typically undertaken for recreational--but sometimes also educational and even professional--purposes. But what constitutes a successful game? In this course, you will learn the fundamentals of game design: applying elements and principles of game design, such as goals, rules, and challenges to create games, such as board games, card games, and digital games. You will be introduced to the basic tools and methods of game design: paper and digital prototyping, design iteration, design critique, and user testing. As part of the course, you will be designing and remixing several games of different types, each which you will be able to add to your growing portfolio of game design concepts. (NEW)

INST441 Information Ethics and Policy (3). Explores via case studies the legal, ethical, and technological challenges in developing and implementing policies for managing digital assets and information. Emphasizes access questions pertinent to managing sensitive information and the roles and responsibilities of information professionals. Prerequisite: One course with minimum grade of C- from (INST341, PLCY380)

INST460 Video Games as Emergent Experiences (3). Videogames are designed objects that players bring their own history to, resulting each time in a unique emergent experience. If you've ever wondered why, you love a certain game, but others hate it, why you prefer one genre of game over another, or why the frustration you feel in complicated games is often actually enjoyable, this is the class for you! We will examine design principles instantiated in various games, analyze how failure and feedback support productive gameplay, discuss how mechanics and aesthetics contribute to emergent experiences, and develop an understanding of the field of games scholarship. (NEW)

INST463 AI and Society (3). Reviews the technical, legal, and business history of artificial intelligence, and contemporary deployments in domains such as hiring, health, policing, and advertising. Students will discuss both high-level ethical issues and concrete policy dilemmas related to, e.g., self-driving cars, and compare their impact in different social and geographic settings. Students will conduct independent research on the design, testing, deployment, and assessment of AI technologies. (NEW)

Appendix D: Sample Four Year Plan for Social Data Science Major

Fall			Spring		
Year 1					
ENGL101 (FSAW)	Academic Writing	3	STAT100 (FSAR) (MC)	Elementary Statistics and Probability	3
IDEA258A (MC)	Become a Design Thinker	3	INST126 (MC)	Intro: Programming for Info Science	3
INST104 (MC)	Design Across Campus	3	SOCY105 (DSHS) (MC)	Intro: Contemp. Social Problems	3
Gen Ed (DSHU) (SCIS)	Humanities/I-Series	3	Gen Ed (DVUP) (SCIS)	Diversity: Plural Societies/I-Series	3
MATH115 (FSMA)	Pre-Calculus	3	Gen Ed (FSOC)	Oral Communication	3
	Total credits	15		Total Credits	15
Year 2					
INST201 (DSHS) (MC)	Introduction to Information Science	3	PLCY380 (MC)	Innovation and Social Change	3
INST204 (MC)	Designing Fair Systems	3	Gen Ed (DVCC)	Diversity: Cultural Competence	3
Gen Ed (DSNL)	Natural Science Lab	4	INST311 (ME)	Info Organization	3
Gen Ed (SCIS)	I-Series	3	Gen Ed (DSNS)	Natural Science	3
Gen Ed (DSHU)	Humanities	3	Elective		3
	Total Credits	16		Total Credits	15
Year 3					
INST406 (MC)	Design Communication Lab	3	INST367 (MC)	Prototyping and Development Studio	3
INST367 (MC)	Prototyping and Development Studio	3	INST404 (ME)	Youth Experience Design Studio	3
INST352 (ME)	Info User Needs and Assessment	3	INST441 (ME)	Information Ethics and Policy	3
ENGL39X (FSPW)	Professional Writing	3	Gen Ed (DSSP)	Scholarship in Practice	3
Elective		3	Elective		3
	Total Credits	15		Total Credits	15
Year 4					
INST454 (MC)	Modeling and Simulating Systemic Problems	3	INST491 (MC) (DSSP)	Integrated Capstone	3
INST466 (MC)	Technology, Culture and Society	3	INST463 (ME)	AI and Society	3
INST405 (ME)	Game Design Studio	3	Electives		8
Electives		6			
	Total Credits	15		Total Credits	14
Total Credits: 120					

Category	Credits	Code
Major Requirements: 55 Credits		
Major Core Courses	37	MC
Major Elective Courses	18	ME
Major courses may double-count to fulfill General Education requirements (see below).		
General Education Requirements: 40 Credits Minimum		
Fundamental Studies: 15 Credits		
Fundamental Studies Academic Writing	3	FSAW
Fundamental Studies Professional Writing	3	FSPW
Fundamental Studies Oral Communication	3	FSOC
Fundamental Studies Mathematics	3	FSMA
Fundamental Studies Analytic Reasoning[2]	3	FSAR

[2] If a student passes an Analytic Reasoning course that requires a Fundamental Studies Math course as a prerequisite, then the Fundamental Studies Math course is considered to be fulfilled (e.g., students who place into and pass a calculus course, which counts for FSAR, do not need to take a less advanced Math course to fulfill the FSMA requirement).

Category	Credits	Code
Distributive Studies: 25 Credits		
Distributive Studies Natural Sciences	3	DSNS
Distributive Studies Natural Science Lab Course[3]	4	DSNL
Distributive Studies History and Social Sciences	6	DSHS
Distributive Studies Humanities	6	DSHU
Distributive Studies Scholarship in Practice[4]	6	DSSP

[3] A second DSNL course can fulfill the DSNS course requirement.
[4] Students learn and practice skills of critical evaluation and participate in the process of applying knowledge in the pursuit of a tangible goal. At least one course must be outside of the major.

I-Series Courses: 6 Credits [5]

The signature courses of the UMD General Education program, I-Series courses investigate a significant issue in depth and demonstrate how particular disciplines and fields of study address problems.

Category	Credits	Code
I-Series Course	6	SCIS

[5] I-Series credits may be double-counted with courses taken for the Distributive Studies requirement.

Diversity: 4-6 Credits[6]

Category	Credits	Code
Diversity Understanding Plural Societies[7] Courses examine how diverse cultural and ethnic groups co-exist.	3-6	DVUP
Diversity Cultural Competence Courses help students develop skills to succeed in a diverse world.	0-3	DVCC

[6] These credits may be double counted with courses taken for the Distributive Studies requirement.
[7] Students may take either two DVUP courses or one DVUP course and one DVCC course.

UNIVERSITY SYSTEM
of MARYLAND

BOARD OF REGENTS
SUMMARY OF ITEM FOR ACTION,
INFORMATION, OR DISCUSSION

TOPIC: Annual Review of Committee Bylaws and Charge and Role and Responsibilities

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, September 14, 2021

SUMMARY: As recommended in the University System of Maryland Governance Review Final Report submitted by the Association of Governing Boards on April 18, 2019, USM Board of Regents committees should bring clarity to committee work by reviewing and/or developing committee bylaws, charges, and practices to ensure expectations and structures remain consistent with current System priorities.

In accordance with established procedures, today, the committee conducts its annual review and approval of the Education Policy and Student Life (EPSL) section of the Board of Regents Bylaws as well as the EPSL Charge, Role, and Responsibilities guidance.

ALTERNATIVE(S): Regents can offer recommendations that can be agreed upon during the meeting or taken back for further exploration and consideration.

FISCAL IMPACT: There is no fiscal impact.

CHANCELLOR'S RECOMMENDATION: The Chancellor recommends that the Committee on Education Policy and Student Life recommend that the Board of Regents reaffirm (1) the EPSL section of the Board of Regent Bylaws and (2) the EPSL Committee Charge, Role, and Responsibilities guidance.

COMMITTEE RECOMMENDATION:	DATE: September 14, 2021
BOARD ACTION:	DATE:
SUBMITTED BY: Joann A. Boughman 301-445-1992	jboughman@usmd.edu

UNIVERSITY SYSTEM of MARYLAND

BYLAWS OF THE BOARD OF REGENTS
OF THE UNIVERSITY SYSTEM OF MARYLAND

(Adopted by the Board of Regents, April 5, 1989; Amended, September 27, 1990; Amended February 27, 1991; Amended June 9, 1995; Amended August 25, 1995; Amended December 1, 1995; Amended April 12, 1996; Amended April 4, 1997, Amended December 8, 2000, Amended August 23, 2002; Amended September 12, 2003; Amended December 12, 2003, Amended October 21, 2005, Amended September, 2008, Amended April 15, 2011, Amended December 7, 2012, Amended April 11, 2014, Amended June 10, 2016, Amended December 9, 2016, Amended February 22, 2019; Amended April 6, 2020 to be effective immediately, amended April 16, 2021 to be effective July 1, 2021)

Article X
Section 4. Committee on Education Policy and Student Life. – 9.14.21 Review

A. The Committee on Education Policy and Student Life shall consider and report or recommend to the Board on all matters relating to institutional mission statements and education policies and programs for all institutions and major units, and all issues relating to academic programs such as curriculum development, adequacy of instructional facilities and specialized centers and institutes, and institutional support for student academic services.

   a. This Committee shall consider and report or recommend to the Board proposals for new academic programs and review and report to the board on the review of existing academic programs that align with the institution's mission, strategic plan, and priorities.
   b. This Committee shall also consider and report or recommend to the Board on matters and policies relating to faculty, including but not limited to conditions affecting recruitment, appointment, rank, tenure, and retention, and issues brought to the Advisory Councils and USM Office of Academic and Student Affairs.

B. This Committee shall also consider and report or recommend to the Board matters and policies related to students and student support services including, but not limited to, student enrollment, recruitment, retention, transfer, and articulation; financial aid; campus safety and security; athletics; student health and wellness; student government; and student organizations.

C. This Committee shall also consider and report or recommend matters and policies on inter-institutional cooperation, System-wide activities to include, but not limited to, research, training and public service, collaboration with affiliated organizations, and alumni engagement.

D. This Committee shall also consider and report or recommend to the Board related matters brought to it by the Chancellor or the Board.

UNIVERSITY SYSTEM
of MARYLAND

Board of Regents
Committee on Education Policy and Student Life
Charge, Role, and Responsibilities

Charge:
The Committee on Education Policy and Student Life shall perform all necessary business and provide guidance to the Board of Regents on issues that pertain to academic affairs and student affairs functions at the institutions within the University System of Maryland.

Role and Responsibilities:
The Committee on Education Policy and Student Life shall consider and report or recommend to the Board of Regents on matters concerning academic and student affairs-related policies and programs for all institutions and major units including, but not limited to, all issues relating to academic programs such as curriculum development, adequacy of instructional facilities and specialized centers and institutes, and institutional support for student academic services; matters and policies relating to faculty; student enrollment, recruitment, retention, transfer, and articulation; financial aid; campus safety and security; athletics; student health and wellness; student government; and student organizations; and the overall intellectual, social, and emotional climate of the university.

Members of the Committee on Education Policy and Student Life are appointed annually by the Chairperson of the Board. The Committee holds at least five regularly-scheduled meetings during the fiscal year. The members of the Committee may expect to receive information for review in order to consider and report or recommend to the Board of Regents on any of the following matters:

  A. Institutional mission statements and goals
  B. Establishment and disestablishment of schools and colleges
  C. Proposals for new academic programs
  D. Review of existing academic programs and enrollments within those programs
  E. P-20 partnerships and initiatives
  F. Academic transformation and innovation
  G. Academic integrity
  H. Civic education and civic engagement
  I. Student life and student services
  J. Diversity and inclusion
  K. Student enrollment, recruitment, and retention
  L. Transfer and articulation
  M. Access and affordability
  N. Student health and wellness
  O. Academic issues related to intercollegiate athletics
  P. Campus safety and security
  Q. Title IX and sexual misconduct

Approved by EPSL on November 23, 2020   *Reviewed by EPSL on September 14, 2021*

R. Faculty life and faculty conduct
S. Faculty policies and procedures including, but not limited to, appointments in rank and promotion to tenure
T. Faculty workload
U. Faculty awards nominations
V. Honorary degree nominations
W. Extramural funding
X. Relevant issues, reports, or requests as brought to the USM by the Maryland Higher Education Commission and other state agencies
Y. Additional pertinent issues as raised by the student, staff, and faculty advisory councils; university administrators; USM officials; and regents

Approved by EPSL on November 23, 2020   *Reviewed by EPSL on September 14, 2021*

UNIVERSITY SYSTEM
of MARYLAND

TOPIC: Report on Academic Program Actions Delegated to the Chancellor, AY 2020 - 2021

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, September 14, 2021

SUMMARY: In accordance with Board Resolution III-7.03, a report of program actions delegated to the Chancellor is submitted annually to the Board of Regents. Between September 2020 and August 2021, the Chancellor approved 23 new certificates, 1 modified certificate, 11 modified degrees, 15 title changes, 3 off-site offerings of existing degrees at a USM regional higher education center, and 1 reactivated area of concentration within an existing degree. He also approved the suspension or discontinuation of 8 degrees, 1 area of concentration within an existing degree, and 1 certificate.

In addition, the Board of Regents approved 15 new degree programs.

A chart detailing the Chancellor's actions and programs approved by the Board for a total of 96 approvals for this report is attached.

ALTERNATIVE(S): This is an information item.

FISCAL IMPACT: This is an information item.

CHANCELLOR'S RECOMMENDATION: This is an information item.

COMMITTEE RECOMMENDATION: Information Only	DATE: September 14, 2021
BOARD ACTION:	DATE:
SUBMITTED BY: Joann A. Boughman 301-445-1992	jboughman@usmd.edu

Academic Program Actions
AY 2020 - 2021

Institution	Chancellor's Actions			Board Actions
	Discontinued or Suspended Concentrations and Programs	**New Certificates, Concentrations/Modified Programs and Degree Changes**	**Title Changes**	
Bowie State University		B.S. in Computer Science existing program – Off-Site at USMSM (3-17-2021) U.D.C. in Entrepreneurship – New (8-20-2021) U.D.C. in Data Analytics – New (8-20-2021)		
Coppin State University		M.Ed. in Rehabilitation Counseling – Substantial Modification (11-30-2020) MS in Addiction Counseling – Substantial Modification (11-30-2020) U.D.C. in Entrepreneurship and Innovation – New (1-25-2021) P.B.C. in Applied Molecular Biology and Biochemistry – New (4-12-2021) P.B.C. in Polymer and Materials Sciences – New (4-12-2021)		M.S. in Applied Molecular Biology and Biochemistry (9-18-2020) M.S. in Polymers and Materials Sciences (9-18-2020) B.S. in Data Science (6-17-2021) M.S. in Health Information Management (6-17-2021)
Frostburg State University	Suspend BS in Ethnobotany (1-25-2021) Suspend BS in Environmental Analysis and Planning (4-12-2021)	B.S. in Health and Physical Education – Substantial Modification (4-12-2021) U.D.C. in Manufacturing Leadership Management – New (4-12-2021) U.D.C. in Small Business Management – New (4-12-2021) B.S. in Philosophy – Substantial Modification (8-13-2021)		

1

AOC:	Area of Concentration	CAS:	Certificate of Advanced Studies	LDC:	Lower-Division Certificate
BA:	Bachelor of Arts	DNP:	Doctor of Nursing Practice	PBC:	Post-Baccalaureate Certificate
BFA:	Bachelor of Fine Arts	MA:	Master of Arts	PMC:	Post-Master's Certificate
BS:	Bachelor of Science	MFA:	Master of Fine Arts	UDC:	Upper-Division Certificate
BTS:	Bachelor of Technical Studies	MPS:	Master of Professional Studies		
BPS:	Bachelor of Professional Studies	MS:	Master of Science		

Institution	Chancellor's Actions			Board Actions
	Discontinued or Suspended Concentrations and Programs	New Certificates and Concentrations/Modified Programs and Degree Changes	Title Changes	
Salisbury University	Suspend M.S. in Athletic Training (6-8-2021)		MS in Applied Health Physiology to *MS in Health and Human Performance* (1-25-2021) B.S. in Community Health to *B.S. in Public Health* (3-17-2021)	
Towson University	Discontinue AOC in Legal Studies in the existing Bachelor of Business Administration (8-20-2021)	M.A. in Gifted and Creative Education – Online (3-17-2021) M.Ed. in Reading Education – Online (3-17-2021) B.S. in Elementary Education existing program – Off-Site at USMSM (4-12-2021) M.Ed. in Special Education – Online (4-12-2021) P.B.C. in Autism Spectrum Disorder in the Classroom – Online (4-12-2021) P.B.C. in Foundation Special Education – Online (4-12-2021) P.B.C. in Action Research for School Improvement – Online (5-24-2021) P.B.C. in Community Engagement and Leading School Change – Online (5-24-2021) Master of Science in Nursing (M.S.N.) – Substantial Modification (7-19-2021) P.B.C. in Arts Integration – Online (7-19-2021) P.B.C. in Professional Studies within M.A. in Professional Studies – New (7-19-2021)		

AOC:	Area of Concentration	CAS:	Certificate of Advanced Studies	LDC:	Lower-Division Certificate
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BPS:	Bachelor of Professional Studies	MS:	Master of Science		

Institution	Chancellor's Actions			Board Actions
	Discontinued or Suspended Concentrations and Programs	**New Certificates and Concentrations/Modified Programs and Degree Changes**	**Title Changes**	
University of Baltimore	Discontinue B.A. in International Studies (7-19-2021) Discontinue B.A. in Nonprofit Management and Community Leadership (7-19-2021) Discontinue BS in Real Estate and Economic Development (7-19-2021) Discontinue M.S. in Forensic Science – Forensic Accounting (7-19-2021) Discontinue – P.B.C. in Forensic Accounting (7-19-2021)	M.A. in Global Affairs and Human Security – Online (7-19-2021) M.S. in Negotiations and Conflict Management – Online (7-19-2021)		
University of Maryland, Baltimore		Professional Certificate Program in Neonatal Nurse Practitioner – New (1-25-2021) Professional Certification Program in Nursing Anesthesia – New (1-25-2021) P.B.C. in Medical Cannabis Clinical Science – New (7-19-2021) P.B.C. in Medical Cannabis Pharmaceutical Science – New (7-19-2021) P.B.C. in Medical Cannabis Science, Therapeutics, and Policy – New (7-19-2021) P.B.C. in Medical Physics – New (7-19-2021)	P.B.C. in Global Health Systems and Innovation to *P.B.C. in Global Health Systems* (11-30-2020)	M.S. in Health Professions Education (2-19-2021) M.S. in Diversity, Equity and Inclusion Leadership (4-16-2021) Ph.D. in Palliative Care (6-17-2021)

3

AOC: Area of Concentration	CAS: Certificate of Advanced Studies	LDC: Lower-Division Certificate
BA: Bachelor of Arts	DNP: Doctor of Nursing Practice	PBC: Post-Baccalaureate Certificate
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BS: Bachelor of Science	MFA: Master of Fine Arts	UDC: Upper-Division Certificate
BTS: Bachelor of Technical Studies	MPS: Master of Professional Studies	
BPS: Bachelor of Professional Studies	MS: Master of Science	

Institution	Chancellor's Actions			Board Actions
	Discontinued or Suspended Concentrations and Programs	New Certificates and Concentrations/Modified Programs and Degree Changes	Title Changes	
University of Maryland, Baltimore County		P.B.C. in Professional Studies – Modified (3-17-2021) P.B.C. in Dementia Care Services -New (6-8-2021) U.D.C. in Arabic – New (7-19-2021) U.D.C. in Japanese – New (7-19-2021)	B.A. in Health Administration and Policy to *B.A. in Public Health* (1-25-2021) U.D.C. in Web Development to *U.D.C .in User Experience, Web and Mobile Development* (1-25-2021)	
University of Maryland, College Park		Master of Professional Studies in Game, Entertainment and Media Analytics – New Iteration (1-25-2021) Master of Finance – Online (1-25-2021) Master of Quantitative Finance – Online (1-25-2021) M.S. in Accounting – Online (1-25-2021) M.S. in Business and Management – Online (1-25-2021) M.S. in Geospatial Information Sciences – Online (1-25-2021) M.S. in Information Systems – Online (1-25-2021) M.S in Marketing Analytics – Online (1-25-2021)	Master of Professional Studies in Corporate Innovation to *Master of Profession Studies in Product Management* (4-12-2021) B.A. in Germanic Studies to *B.A. in German Studies* (5-24-2021) M.A. in German Language and Literature Studies to *M.A. in German Studies* (5-24-2021) Ph.D. in German Language and Literature Studies to *Ph.D. in German Studies* (5-24-2021) U.D.C. in Lesbian, Gay, Bisexual and Transgender Studies to *U.D.C. in LGBTQ* (5-24-2021)	B.S. in Mechatronics (2-19-2021) Program received MHEC objection. UMCP withdrew program August 2021. Master of Extension Education (4-16-2021) B.S. in Fermentation Science (6-17-2021) B.S. in Social Data Science (6-17-2021)

4

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BPS: Bachelor of Professional Studies	MS: Master of Science	

Institution	Chancellor's Actions			Board Actions
	Discontinued or Suspended Concentrations and Programs	**New Certificates and Concentrations/Modified Programs and Degree Changes**	**Title Changes**	
		B.S. in Electrical Engineering Minor in Computer Engineering existing program – Off-Site at USMSM (3-17-2021) M.P.S. in Security and Terrorism Studies – New Iteration (3-17-2021) P.M.C. in Bilingual Speech- Language Pathology for Practitioners – New (4-12-2021) P.B.C. in Technology Management – New (4-12-2021) Master's in Professional Studies in Data Journalism – New Iteration (5-24-2021) Master of Public Health – Substantial Modification (5-24-2021) P.B.C. in Latin American and Caribbean Studies – New (6-8-2021) P.B.C. of Professional Studies Program Planning, Monitoring, and Evaluation – New Iteration (7-19-2021) P.B.C. in Dual Language Education – New (8-13-2021)	Ph.D. in Survey Methodology to *Ph.D. in Survey and Data Science* (5-24-2021) B.A in Women's Studies to *B.A. in Women, Gender, and Sexuality Studies* (5-24-2021) U.D.C. in Women's Studies to *U.D.C. in Women, Gender, and Sexuality Studies* (5-24-2021) U.D.C. in Latin American Studies to *U.D.C. in Latin American and Caribbean Studies* (6-8-2021)	

5

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BS: Bachelor of Science	MFA: Master of Fine Arts	UDC: Upper-Division Certificate
BTS: Bachelor of Technical Studies	MPS: Master of Professional Studies	
BPS: Bachelor of Professional Studies	MS: Master of Science	

Institution	Chancellor's Actions			Board Actions
	Discontinued or Suspended Concentrations and Programs	New Certificates and Concentrations/Modified Programs and Degree Changes	Title Changes	
University of Maryland Eastern Shore	Suspend B.S. in Mathematics Program (11-30-2020)			B.A. in Digital Media Studies (9-18-2020) B.S.in Sport Management (2-19-2021)
University of Maryland Global Campus		Doctor of Management with an A.O.C. in Community College Policy and Administration – Substantial Modification (11-30-2020) U.D.C. in Business Analytics – New (7-19-2021) Doctor of Management A.O.C. in Community College Policy and Administration – Reactivate (8-13-2021) P.B.C. in Acquisition and Contract Management – New (8-20-2021)	M.S. in Accounting and Information Systems to *M.S. in CyberAccounting* (5-24-2021)	B.S. in Cloud Computing Systems (4-16-2021) B.S. in Data Science (4-16-2021)

6

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BS: Bachelor of Science	MFA: Master of Fine Arts	UDC: Upper-Division Certificate
BTS: Bachelor of Technical Studies	MPS: Master of Professional Studies	
BPS: Bachelor of Professional Studies	MS: Master of Science	

UNIVERSITY SYSTEM
of MARYLAND

BOARD OF REGENTS
SUMMARY OF ITEM FOR ACTION,
INFORMATION, OR DISCUSSION

TOPIC: Education Policy and Student Life Tentative Annual Agenda, 2021-2022

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, September 14, 2021

SUMMARY: The Tentative Agenda for 2021-2022 comprises anticipated action items, including new academic program proposals and new Board of Regents policies, as well as information and discussion items. Some of the information items are reported on an annual schedule to ensure that the regents are well informed about topics of general interest (e.g. extramural funding, civic engagement and education, academic innovation), while others respond to specific requests for reports and recommendations on a variety of topics of interest to the Committee as previously noted by the regents.

Today, the Committee has an opportunity to review the proposed annual agenda and suggest modifications, including the addition of items that Committee members believe warrant particular attention by the Board.

ALTERNATIVE(S): This is an information item.

FISCAL IMPACT: This is an information item.

CHANCELLOR'S RECOMMENDATION: This is an information item.

COMMITTEE RECOMMENDATION: Information Only	DATE: September 14, 2021
BOARD ACTION:	DATE:
SUBMITTED BY: Joann A. Boughman 301-445-1992	jboughman@usmd.edu

Draft – September 7, 2021

USM BOARD OF REGENTS
COMMITTEE ON EDUCATION POLICY AND STUDENT LIFE
TENTATIVE AGENDA 2021-2022

Tuesday, September 14, 2021
1. New Academic Program Proposals (Action)
2. Annual EPSL Bylaws and Charge Review (Action)
3. Report on Academic Program Actions Delegated to the Chancellor, AY 2020-2021 (Information)
4. Fall 2021 Update (Information)
5. Tentative Annual Agenda, 2021-2022 (Information)

Monday, November 8, 2021
1. New Academic Program Proposals (Action)
2. Notification of Awards: Regents Scholarships and Elkins Professorships (Information)
3. Articulation Efforts Between USM and Other Institutions (Information)
4. K-12 Partnerships and Pipeline (Information)

Tuesday, January 11, 2022
1. New Academic Program Proposals (Action)
2. Results of Periodic (7-Year) Reviews of Academic Programs (Information)
3. Report on Extramural Funding – FY 2021 (Information)
4. Report: Workload of the USM Faculty – Academic Year 2020-2021 (Information)
~~~~~~~~~~~Closed Session~~~~~~~~~~~
5. Board of Regents Faculty Awards Recommendations (Action)
6. Honorary Degree Nominations (Action)

Friday, March 4, 2022
1. New Academic Program Proposals (Action)
2. Campus Crime Reports (Information)
3. Update: P-20 Initiatives (Information)
4. Update: William E. Kirwan Center for Academic Innovation (Information)
5. New Program 5-Year Enrollment Review (Information)

Tuesday, May 10, 2022
1. New Academic Program Proposals (Action)
2. Diversity, Equity, and Inclusion - 2022 Cultural Diversity Reports and Beyond (Action)
3. Civic Engagement and Civic Education (Information)
4. 2022-2023 EPSL Agenda Brainstorming (Information)

To Be Slated or Monitored:
Possible Policy Amendments - Undergraduate Admissions
Possible Policy Amendments - Academic Integrity
Academic Affairs Advisory Report on Review of Program Viability
Health Disparities Work
Enrollment-related Presentation