APPROVAL FORM FOR

DEGREE PROGRAMS

MISSISSIPPI STATE UNIVERSITY

NOTE: This form is a cover sheet that must accompany the degree program change proposal. The actual proposal should be prepared in accordance with format requirements provided in the *Guide and Format for Curriculum Proposals* published by the UCCC. Both cover sheet and proposal should be submitted, along with all required copies, to UCCC, Garner, Room 279, (Mail Stop 9702).

College or School: Bagley College of Engineering **Department:** Ag & Biological Engineering

Contact Person: Steve Elder **Mail Stop:** 9632 **E-mail:** selder@abe.msstate.edu

Nature of Change: Degree modification **Date Initiated:** 2/6/2023 **Effective Date:** Fall '23

New or Current Degree Program Name: Biosystems Engineering

Summary of Proposed Changes:

New curriculum has stronger emphasis on agriculture natural resources; introductory courses have been modified and expanded to two credit hours; some previously required courses have been replaced by electives.

Approved by: Date:

J. Alex Thomasson Digitally signed by J. Alex Thomasson Date: 2023.02.07 11:49:18 -06'00' 2/7/23
Department Head

3/9/23
Chair, College or School Curriculum Committee

for Jason Keith 3/10/2023
Dean, College or School

Chair, University Committee on Courses & Curricula

Chair, Graduate Council (if applicable)

Chair, Deans Council

Dana Pomfuel - Dir. Ac. Grad 3/7/23

IHL Action Required

SACS Letter Sent

PROPOSAL TO MODIFY THE
BIOLOGICAL ENGINEERING BACHELOR OF SCIENCE PROGRAM

1. CATALOG DESCRIPTION

See Outline Chart below.

2. DEGREE MODIFICATION OUTLINE CHART

CURRENT Degree Description		PROPOSED Degree Description	
Degree: Bachelor of Science Major: *Biological Engineering* Concentration:		Degree: Bachelor of Science Major: **Biosystems Engineering** Concentration:	
Biological Engineering is that branch of the engineering profession that deals with engineering problems encountered in biological systems. The responsibilities of the *Biological* Engineer may include finding solutions to address the need for more complex food-producing systems, controlling and monitoring the deterioration of the earth's environment, autonomy in agriculture and biological systems, the use of new technologies in robotics and artificial intelligence, and the creation of new engineering designs based on the inherently creative characteristics of living systems. The curriculum in *Biological Engineering* is designed to give the student a thorough grounding in the basic sciences of mathematics, physics, chemistry, taken with and followed by a series of courses in the engineering and biological sciences.		**Biosystems** Engineering is that branch of the engineering profession that deals with engineering problems encountered in biological systems. The responsibilities of the **Biosystems** Engineer may include finding solutions to address the need for more complex food-producing systems, controlling and monitoring the deterioration of the earth's environment, autonomy in agriculture and biological systems, the use of new technologies in robotics and artificial intelligence, and the creation of new engineering designs based on the inherently creative characteristics of living systems. The curriculum in **Biosystems Engineering** is designed to give the student a thorough grounding in the basic sciences of mathematics, physics, chemistry, taken with and followed by a series of courses in the engineering and biological sciences.	
CURRENT CURRICULUM OUTLINE	Required Hours	**PROPOSED CURRICULUM OUTLINE**	Required Hours
<u>English Composition</u> EN 1103 English Comp I OR EN 1163 Accelerated Comp I EN 1113 English Comp II OR EN 1173 Accelerated Comp II	6	<u>English Composition</u> EN 1103 English Comp I OR EN 1163 Accelerated Comp I EN 1113 English Comp II OR EN 1173 Accelerated Comp II	6
<u>Mathematics</u> See Major Core	6-9	<u>Mathematics</u> See Major Core	6-9
<u>Natural Sciences</u> See Major Core	6-8	<u>Natural Sciences</u> See Major Core	6-8

Humanities Any Gen Ed course	6	Humanities Any Gen Ed course	6
Fine Arts Any Gen Ed course	3	Fine Arts Any Gen Ed course	3
Social/Behavioral Sciences Any Gen Ed course	6	Social/Behavioral Sciences Any Gen Ed course	6
Major Core Math and Basic Science MA 1713 Calculus I MA 1723 Calculus II MA 2733 Calculus III MA 2743 Calculus IV MA 3253 Differential Equations I CH 1213 Chemistry I CH 1211 Investigations in Chemistry I CH 1223 Chemistry II CH 1221 Investigations in Chemistry II *CH 2503 Elementary Organic Chemistry OR* *CH 4513 Organic Chemistry I* *CH 2501 Elementary Organic Chem Lab OR* *CH 4511 Organic Chemistry I Lab* PH 2213 Physics I PH 2223 Physics II *BIO 3304 General Microbiology* *BCH 4013 Principles of Biochemistry OR General Biochemistry*	 *40*	Major Core Math and Basic Science MA 1713 Calculus I MA 1723 Calculus II MA 2733 Calculus III MA 2743 Calculus IV MA 3253 Differential Equations I CH 1213 Chemistry I CH 1211 Investigations in Chemistry I CH 1223 Chemistry II CH 1221 Investigations in Chemistry II PH 2213 Physics I PH 2223 Physics II	 **29**
Engineering Topics *ABE 1911 Intro to Engineering in Life Sciences* *ABE 1921 Intro to Engineering Design* ABE 4803 Biosystems Simulation ABE 3413 Bioinstrumentation I ABE 3303 Transport in Biological Environment ABE 4423 Bioinstrumentation II ABE 3813 Biophysical Properties of Materials	*39*	Engineering Topics **ABE 1912 Computer-Based Problem Solving in Biological Engineering** **ABE 1922 Intro to Engineering Design and Manufacturing** ABE 4803 Biosystems Simulation ABE 3413 Bioinstrumentation I ABE 3303 Transport in Biological Environment ABE 4423 Bioinstrumentation II ABE 3813 Biophysical Properties of Materials	**40**

ABE 4813 Principles of Engineering Design ABE 4833 Practices of Engineering Design *ABE 4911 Engineering Seminar* *MA 3123 Introduction to Statistical Inference* EM 2413 Engineering Mechanics I EM 2433 Engineering Mechanics II EM 3213 Mechanics of Materials EM 3313 Fluid Mechanics		ABE 4813 Principles of Engineering Design ABE 4833 Practices of Engineering Design EM 2413 Engineering Mechanics I EM 2433 Engineering Mechanics II EM 3213 Mechanics of Materials EM 3313 Fluid Mechanics **ABE 3513 GPS & GIS in Ag & Eng**	
Oral Communication Requirement Fulfilled in GE 3513 and other ABE courses		Oral Communication Requirement Fulfilled in GE 3513 and other ABE courses	
Writing Requirement GE 3513 Technical Writing	3	Writing Requirement GE 3513 Technical Writing	3
Computer Literacy Fulfilled in Engineering Topics courses		Computer Literacy Fulfilled in Engineering Topics courses	
Major Requirements and Engineering Electives *Biological Science Elective** *Biological Science Elective*** *ABE 4313 Biological Treatment of Nonpoint Source Pollutants OR ABE 4323 Physiological Systems in Biomedical Engineering* Approved Engineering Electives*** *Biological Science OR Engineering Elective* *ABE Elective* **Bio Sci Elective (3 Credit hours): BIO 1144 Biology II, BIO 2103 Cell Biology, BIO 3103 Genetics I, BIO 3104 Ecology, BIO 3504 Comparative Anatomy, BIO 4114*	 3 4 3 9 3 3	**Major Requirements and Restricted Electives** **ADS 1113 Animal Science** **PSS 1313 Plant Science** **PSS 3303 Soils** **PSS 3301 Soils Laboratory** **Restricted Engineering Electives*** Approved Engineering Electives** **ABE Electives** **Math Elective (3000- or 4000-level MA or ST)** **Laboratory OR Seminar**	 **3** **3** **3** **1** **9** **6** **6** **3** **1**

Cellular Physiology, BIO 4204 Plant Anatomy, BIO 4213 Plant Ecology, BIO 4324 Micro & Ecology in Soil, BIO 4404 Environmental Micro, BIO 4413 Immunology, BIO 4502 Toxicology, BIO 4503 Vertebrate Histology, BIO 4504 Compar Verte Embryo, BIO 4513 Ichthyology, BIO 4514 Animal Physiology, WF 4371 Water Qual Mgt Lab, WF 4372 Water Quality Management, WF 3131 Ap Aq & Ter Ecol Lab, WF 3133 Ap Aq Ter Ecol ***Bio Sci Elective (4 credit hours): ADS 1114 Animal Science, BIO 1134 Biology I, BIO 1144 Biology II, BIO 1504 Principles of Zoology* ****Engineering Electives: ABE 2873 Land Surveying, ABE 3513 GPS/GIS - AG. & ENG, ABE 4263 Soil & Water Mgt, ABE 4513 Dynamics Of Aging, ABE 4523 Biomedical Materials, ABE 4533 Rehab Engineering, ABE 4613 Biomechanics, ABE 4624 Exp Met Mat Res, ABE 4723 Tissue Engineering, CE 3523 Water Res Engr, CE 3824 Environmental Engr, CE 4843 Environ Engineering Chemistry, CE 4893 Haz Waste Mgt, CHE 3413 Eng Materials, CHE 4613 Air Pol Con Design, CHE 4623 Haz Waste Incineration, CHE 4990 Special Topic in CHE, ECE 3714 Digital Devices, EM 4123 Intro Finite Element, EM 4133 Composite Materials, EM 4213 Adv Mec Of Mat, IE 391 Engr Economy I, IE 4173 Occup Safety Eng, IE 4233, IE 4613 Eng Statistics I, MA 3113 Intro Linear Algebra, ME 4403 Machine Design, ME 4483, Computer-Aided Dsgn, ME 4653*		***Restricted Engineering Electives (9 credit hours): ABE 4313 Biological Treatment of NPS Pollution, ABE 4483 Introduction to Remote Sensing Technology, ABE 4990 Geospatial Comput in Biosys Apps, CE 2803 Environmental Issues, CE 3503 Water Resource Engineering, CSE 4643 AI Robotics, ME 3133 Engineering Analysis, ME 3423 Mechanics of Machinery, ME 3613 System Dynamics, ME 4643 Introduction to Vibrations and Controls** ****Engineering Electives: ABE 2873 Land Surveying, ABE 4263 Soil and Water Management, ABE 4313 Biological Treatment of NPS Pollution, ABE 4483 Introduction to Remote Sensing Technology, ABE 4443 Spectroscopic Sensing in Biosys, ABE 4463 Intro to Imaging in Bio Eng Sys, ABE 4990 Geospatial Comput in Biosys Apps, ASE 4423 Introduction to Computational Fluid Dynamics, ASE 4713 Introduction to Unmanned Aircraft Systems, CE 2803 Environmental Issues, CE 3313 Construction Materials, CE 3413 Soil Mechanics, CE 3503 Water Resource Engineering, CE 3603 Structural Mechanics, CE 3823 Environmental Engineering, CE 4233 Control, CE 4243 Land Surveys, CE 4513 Engineering Hydrology, CE 4523 Open Channel Hydraulics, CE 4533 Computational Methods in Water Resources Engineering, CE 4563**	

MISSISSIPPI STATE UNIVERSITY

Department of Agricultural and Biological Engineering
P. O. Box 9632, Mississippi State, MS 39762
Phone: 662.325.3282; Website: abe.msstate.edu

December 19, 2022

Dr. Andy Perkins, Chair
University Committee on Courses and Curricula

Dear Dr. Perkins,

We propose to modify the BME Bachelor of Science program to increase our students' elective choices and to facilitate the creation of new emphases in areas such as biomaterials and biosensors. The new curriculum will also accommodate the existing pre-medical emphasis with minor modification.

This modification was partly motivated by feedback from our departmental advisory board.

Sincerely,

Steve Elder
Digitally signed by Steve Elder
Date: 2023.01.10 10:58:25 -06'00'

Steven Elder, Ph.D.
Professor and Biomedical Engineering Curriculum Coordinator

Concurrence:

Gary D. Chesser, Jr. Digitally signed by Gary D. Chesser, Jr. Date: 2023.01.03 10:31:56 -06'00'
Daniel Chesser

Jessica Drewry Digitally signed by Jessica Drewry Date: 2023.01.03 10:38:13 -06'00'
Jessica Drewry

John Wesley Lowe Digitally signed by John Wesley Lowe Date: 2023.01.04 13:51:18 -06'00'
John Lowe

Yuzhen Lu

Vitor S. Martins Digitally signed by Vitor S. Martins Date: 2023.01.05 08:20:26 -06'00'
Vitor Martins

Prem Parajuli Digitally signed by Prem Parajuli Date: 2023.01.05 15:06:51 -06'00'
Prem Parajuli

Digitally signed by Joel O. Paz Date: 2023.01.05 16:12:45 -06'00'
Joel Paz

Lauren Priddy Digitally signed by Lauren Priddy Date: 2023.01.05 16:16:58 -06'00'
Lauren Priddy

Digitally signed by Chartrisa LaShan Simpson Date: 2023.01.06 09:52:34 -06'00'
LaShan Simpson

Digitally signed by Amirtaha Taebi Date: 2023.01.09 09:28:59 -06'00'
Amirtahà Taebi

Digitally signed by Mary Love Tagert DN: cn=Mary Love Tagert, o, ou=ABE, email=mlt@agri.abe.msstate.edu, c=US Date: 2023.01.09 09:57:45 -06'00'
Mary Love Tagert

J. Alex Thomasson Digitally signed by J. Alex Thomasson Date: 2023.01.09 10:03:07 -06'00'
J. Alex Thomasson

FilpTo Digitally signed by FilpTo Date: 2023.01.10 07:08:50 -06'00'
Filip To

Digitally signed by David Vandenheever Date: 2023.01.10 09:38:15 -06'00'
David Vandenheever

Nuwan K. Wijewardane Digitally signed by Nuwan K. Wijewardane Date: 2023.01.10 09:41:23 -06'00'
Nuwan Wijewardane

Fei Yu Digitally signed by Fei Yu Date: 2023.01.10 09:49:45 -06'00'
Fei Yu

Xin Zhang Digitally signed by Xin Zhang Date: 2023.01.10 09:57:40 -06'00'
Xin Zhang

Fluid Power Control, ME 4833 *Intermed Fluid Mech* ***Math/Physics Electives: MA 3113 Introduction to Linear Algebra, MA 3353 Differential Equations II, MA 4143 Graph Theory, MA 4373 Introduction to Partial Differential Equations, PH 2233 Physics III, PH 3613 Modern Physics, PH 4113 Elec Circuit Scien		**Sedimentation Engineering, CE 4843 Environmental Engineering Chemistry, CE 4923 Structural Dynamics, CE 4963 Steel Structures I, CE 4983 Engineering of Wood Structures, CHE 3113 Chemical Engineering Thermodynamics I, CHE 3123 Chemical Engineering Thermodynamics II, CHE 4163 Nanotech Chem App, CHE 4173 Polymer Science & Technology, CHE 4613 Air Pollution Control Design, CHE 4673 Industrial Microbiology, CHE 4683 Fundamentals of Biofuels Production, CSE 3713 Introduction to Cybersecurity, CSE 4153 Data Communications and Computer Networks, CSE 4243 Information and Computer Security, CSE 4413 Principles of Computer Graphics, CSE 4423 Data Visualization, CSE 4503 Database Management Systems, CSE 4613 Bio-computing, CSE 4623 Computational Biology, CSE 4633 Artificial Intelligence, CSE 4643 AI Robotics, CSE 4683 Machine Learning and Soft Computing, CSE 4693 Introduction to Machine Learning, ECE 3283 Electronics, ECE 3443 Signals and Systems, ECE 4413 Digital Signal Processing, ECE 4423 Introduction to Remote Sensing Technologies, ECE 4783 Vision Based Guidance for MAVs, ECE 4813 Communications Theory, ECE 4823 Digital Communications, ECE 4943 Automation, Data Acquisition, and PLCs, IE 3323 Manufacturing Processes, IE 3913 Engineering Economy I, IE 4113 Human**	

		Factors Engineering, IE 4173 Occupational Safety Engineering, IE 4333 Production Control Systems I, IE 4353 Materials Handling, IE 4513 Engineering Administration, IE 4533 Project Management, IE 4553 Engineering Law and Ethics, IE 4573 Process Improvement Engineering, IE 4613 Engineering Statistics I, IE 4623 Engineering Statistics II, IE 4653 Industrial Quality Control, IE 4673 Reliability Engineering, IE 4683 Machine Learning with Industrial Engineering Applications, IE 4713 Operations Research I, IE 4743 Engineering Design Optimization, IE 4753 Systems Engineering and Analysis, IE 4923 Six Sigma Methods and Project, ME 3133 Engineering Analysis, ME 3103 Experimental Measurements and Techniques, ME 3163 Introduction to Mechanical Design with Finite Element Analysis, ME 3313 Heat Transfer, ME 3403 Materials for Mechanical Engineering Design, ME 3423 Mechanics of Machinery, ME 3513 Thermodynamics I, ME 3523 Thermodynamics II, ME 3613 System Dynamics, ME 4113 Material Selection in Design ME 4123 Failure of Engineering Materials, ME 4133 Mechanical Metallurgy, ME 4193 Automotive Engineering, ME 4223 Mechanical Systems Analysis, ME 4233 Fundamentals of Finite Element Analysis, ME 4343 Intermediate Heat Transfer, ME 4353 Alternate Energy Sources, ME 4403 Machine Design, ME 4413 Casting and Joining, ME 4423 Machining and Forming, ME 4443	

		Mechanical Systems Design, ME 4453 Lubrication, ME 4543 Combustion Engines, ME 4623 Control Systems, ME 4643 Introduction to Vibrations and Controls, ME 4833 Intermediate Fluid Mechanics	
Total Hours	128	Total Hours	128

The proposed modification accommodates emphases such as Natural Resources and Environment. Students expressing an interest in a Natural Resources and Environment emphasis will be advised to register for the electives like ABE 2873 Land Surveying, ABE 4263 Soil and Water Management, ABE 4313 Biological Treatment of NPS Pollution, ABE 4483 Introduction to Remote Sensing Technology, and ABE 4990 Geospatial Computing in Biosystems Applications.

3. JUSTIFICATION AND STUDENT LEARNING OUTCOMES

Our newly titled "Biosystems Engineering" program is in the early stages of transitioning from its former title of "Biological Engineering." Over the last few decades, the Biological Engineering program had become dominated by medically oriented students. With the creation of the Biomedical Engineering program a few years ago, most of the current and incoming students migrated to Biomedical Engineering, leaving a small number of students in Biological Engineering, at most 10% of ABE's engineering students. The new Biosystems Engineering title is (a) easier to differentiate from the Biomedical Engineering title, (b) easier to associate with the intended focus areas of agriculture and natural resources, and (c) more in line with sister programs at other land grant universities around the country. The change to Biosystems Engineering concomitantly requires a curriculum that is significantly different from the Biomedical Engineering curriculum and easily associated with agriculture and natural resources.

Students will benefit from the curriculum modification by having a curriculum that better prepares them for (a) careers in the broad area of agriculture and natural resources and (b) emerging technologies that are the future of engineering for agriculture and natural resources, such as sensors, analytics, and robotics. It is expected that the clarification of the program's goals and benefits will bring additional students into the program. The hope is that the program will grow from its current number of 20 to 30 total students to 100 within 5 years. Upon graduation, Biosystems Engineering students will be able to demonstrate the 7 outcomes of ABET-accredited engineering programs:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Most historical Agricultural Engineering programs do not have a biomedical engineering component, so a comparison was made to the engineering programs in University of Nebraska's Department of Biological Systems Engineering, which does have an emphasis in biomedical engineering, and is well respected in our disciplinary area. Their two degree programs are entitled Agricultural Engineering, which has emphases in Machine Design Engineering, Test Engineering, and Natural Resources and Irrigation Engineering; and Biological Systems Engineering, which has emphases in Biomedical Engineering, Ecological and Environmental Engineering, and Food and Bioprocess Engineering. While the degree titles are different, our newly titled Biosystems Engineering curriculum is similar to UNL's Agricultural Engineering degree program. The emphases at UNL bear similarity to the proposed emphases at MSU, in terms of both the overall direction and the curriculum.

The ABE Advisory Board has discussed the newly titled Biosystems Engineering degree program at its last four meetings:

- April 9, 2021. Advisory Board was in favor of the title change from Biological Engineering to Biosystems Engineering.
- September 10, 2021. Advisory Board was in favor of emphasis areas for ABE engineering majors.
- March 4, 2022. Advisory Board expressed the need for some group of engineering graduates to have stronger mechatronic skills, consistent with the move to emphasize autonomous systems for agriculture.
- September 23, 2022. Advisory Board expressed the need to market the newly titled Biosystems Engineering program by tying the emphasis areas to particular industry jobs and faculty research areas, both of which relate directly to the curricular emphases in autonomous agricultural systems (under development) and natural resources and environment.

Responses to specific questions are below.

- Will this program change meet local, state, regional, and national educational and cultural needs?

  Yes, This program modification meets these needs by focusing on the areas of agriculture and natural resources, which are substantial components of Mississippi's economy and which feature prominently in our culture. In fact, agriculture and forestry is Mississippi's top industry. Whereas the previous curriculum was extremely broad and had been designed to accommodate a biomedical engineering emphasis, the modified curriculum

has a strong emphasis on technology designed to promote agricultural production and manage natural resources.

- Will this program change result in duplication in the System?

  No. It will remain the only Mississippi engineering bachelor of science program that is closely associated with agriculture.

- Will this program change/advance student diversity within the discipline?

  We believe that the modified degree program will be more appealing to all students. As a department, we fully support a diversified faculty and student body.

- Will this program change result in an increase in the potential placement of graduates in MS, the Southeast, and the U.S.?

  Yes. We expect that students who complete the new curriculum will be more competitive for jobs in the agriculture industry, which is increasingly reliant on technological innovation (e.g., sensors, analytics, and robotics) to increase productivity and limit environmental impact. The new curriculum includes more engineering electives, the careful choice of which will allow students to emphasize in a particular area of interest such as Natural Resources and Environment. We anticipate adding more emphases and that they will expand our graduates' job opportunities.

- Will this program change result in an increase in the potential salaries of graduates in MS, the Southeast, and the U.S.?

  Yes. We expect the additional jobs for which graduates of the new program may qualify will be at the upper end of the salary scale for agricultural/biosystems engineers.

4. SUPPORT
   See attached letter.

5. PROPOSED 4-LETTER ABBREVIATION
   BE

6. EFFECTIVE DATE
   August 15, 2023

MISSISSIPPI STATE UNIVERSITY

Department of Agricultural and Biological Engineering
P. O. Box 9632, Mississippi State, MS 39762
Phone: 662.325.3282; Website: abe.msstate.edu

January 6, 2023

Dr. Andy Perkins, Chair
University Committee on Courses and Curricula

Dear Dr. Perkins,

We seek approval to modify the Biological Engineering Bachelor of Science program, including a name change to Biosystems Engineering. The new Biosystems Engineering title is (a) easier to differentiate from the Biomedical Engineering title, (b) easier to associate with the intended focus areas of agriculture and natural resources, and (c) more in line with sister programs at other land grant universities around the country. The change to Biosystems Engineering concomitantly requires a curriculum that is significantly different from the Biomedical Engineering curriculum and easily associated with agriculture and natural resources. Students will benefit from the curriculum modification by having a curriculum that better prepares them for careers in the broad area of agriculture and natural resources, as well as emerging technologies that are the future of engineering for agriculture and natural resources, such as sensors, analytics, and robotics.

Thank your for your assistance.

Sincerely,

Steve Elder Digitally signed by Steve Elder Date: 2023.01.06 15:05:55 -06'00'

Steven Elder, Ph.D.
Professor and Biological Engineering Curriculum Coordinator
Concurrence:

Gary D. Chesser, Jr. Digitally signed by Gary D. Chesser, Jr. Date: 2023.01.09 09:29:26 -06'00'
Daniel Chesser

Jessica Drewry Digitally signed by Jessica Drewry Date: 2023.01.09 09:56:47 -06'00'
Jessica Drewry

John Wesley Lowe Digitally signed by John Wesley Lowe Date: 2023.01.09 09:58:29 -06'00'
John Lowe

~~Yuzhen Lu~~

Vitor S. Martins Digitally signed by Vitor S. Martins Date: 2023.01.09 10:10:35 -06'00'
Vitor Martins

Prem Parajuli Digitally signed by Prem Parajuli Date: 2023.01.09 12:42:11 -06'00'
Prem Parajuli

Digitally signed by Joel O. Paz Date: 2023.01.09 13:48:20 -05'00'
Joel Paz

Lauren Priddy Digitally signed by Lauren Priddy Date: 2023.01.09 14:00:03 -06'00'
Lauren Priddy

Digitally signed by Chartrisa LaShan Simpson Date: 2023.01.09 15:11:38 -06'00'
LaShan Simpson

Digitally signed by Amirtaha Taebi Date: 2023.01.09 15:16:33 -06'00'
Amirtahà Taebi

Mary Love Tagert Digitally signed by Mary Love Tagert Date: 2023.01.10 09:14:45 -06'00'
Mary Love Tagert

For J.A. Thomasson
J. Alex Thomasson

Filip To

David Vandenheeyer

N.K. W
Nuwan Wijewardane

Fei Yu

Xin Zhang
Xin Zhang