



## University Courses & Curricula Committee 2019-2020

February 12, 2020  
Talley Student Union 5101  
12:45pm-2:45pm

### Call to Order 12:45pm

- Welcome from Chair Rudi Seracino
- Remarks and Updates from OUCCAS/DASA
- Approval of UCCC January 29<sup>th</sup> 2020 Minutes
- Course and Curricular Business

### New Business

Consent Agenda		
<a href="#">AES 250 Survey of Agricultural and Environmental Issues</a>	Drop	Course being Dropped
<a href="#">BAE 315 Properties of Biological Engineering Materials</a>	Drop	Course being Dropped
<a href="#">BAE 442 Systems Approach to Agricultural and Environmental Issues</a>	Drop	Course being Dropped
<a href="#">BAET 135 Introduction to Precision Agriculture</a>	Minor	Revision: Contact Hours
<a href="#">BAET 201 Shop Processes and Management</a>	Minor	Revision: Offering, Catalog Description
<a href="#">BAET 323 Water Management</a>	Minor	Revision: Course Prefix , Offering
<a href="#">BAET 332 Management of Animal Environments</a>	Minor	Revision: Course Prefix
<a href="#">BAET 333 Processing Agricultural Products</a>	Minor	Revision: Course Prefix
<a href="#">BAET 343 Agricultural Electrification</a>	Minor	Revision: Course Prefix , Offering
<a href="#">BAET 411 Agricultural Machinery and Power Units</a>	Minor	Revision: Course Prefix , Offering
<a href="#">BAET 432 Agricultural and Environmental Safety and Health</a>	Minor	Revision: Course Prefix
<a href="#">BAET 443 Environmental Restoration Implementation</a>	Minor	Revision: Course Prefix
<a href="#">CSC 455 Social Computing and Decentralized Artificial Intelligence</a>	Minor	Revision: Course Title
<a href="#">ENG 449 16th-Century English Literature</a>	Drop	Course being Dropped
<a href="#">FTM 400 Major Fashion Designers</a>	Minor	Revision: Grading Method
<a href="#">*GN 450/(550) Conservation Genetics</a>	Minor	Revision: Course Prefix
<a href="#">*HS 420/(520) Green Infrastructure</a>	Minor	Revision: Offering
<a href="#">ISE 352 Fundamentals of Human-Machine Systems Design</a>	Minor	Revision: Prerequisite
<a href="#">ISE 361 Deterministic Models in Industrial Engineering</a>	Minor	Revision: Prerequisite
<a href="#">ISE 362 Stochastic Models in Industrial Engineering</a>	Minor	Revision: Prerequisite
<a href="#">ISE 417 Database Applications in Industrial &amp; Systems Engineering</a>	Minor	Revision: Prerequisite
<a href="#">ISE 437 Data Analytics for Industrial Engineering</a>	Minor	Revision: Prerequisite
<a href="#">ISE 453 Design of Production, Logistics, and Service Systems</a>	Minor	Revision: Co-requisite
<a href="#">MAE 342 Introduction to Automotive Engineering</a>	Minor	Revision: Course Prefix , Offering
<a href="#">MIE 480 Business Policy and Strategy</a>	Minor	Revision: Co-requisites
<a href="#">SSC 440/(540) Geographic Information Systems (GIS) in Soil Science and Agriculture</a>	Minor	Revision: Offering, Prerequisite
<a href="#">*TT 327 Yarn Production and Properties</a>	Minor	Revision: Co-requisite, Prerequisite
<a href="#">*TT/NW 408/(508) Nonwoven Product Development</a>	Minor	Revision: Prerequisites
(17BIOSCBS-17BIOSCHB) BS in Biological Science: Human Biology	Minor	Revision: Adding 2 courses to Elective lists

University College			
Presenter	Reviewers	Action	Type
Carlson Welch	Muse, Janca, Rucker	<a href="#">THE 353 Fundamentals of Theatre Design</a>	New Course
Domingue	Klesath, Krause, Marshall	<a href="#">HESD 228 African Dance II</a>	New Course

College of Humanities and Social Sciences			
Presenter	Reviewers	Action	Type
Driscoll	Schaffer, Reynolds, Merrill	<a href="#">ENG 320 Anatomy and Physiology of Speech</a>	New Course
Driscoll	Bruce, Hessling, Shah	<a href="#">ENG 338 Speech Science</a>	New Course
Driscoll	Simpson, Carlson Welch, Fitzpatrick	<a href="#">ENG 439 Studies in English Renaissance Literature</a>	Revisions: Title, SLOs, eval methods, etc
Gruehn	Domingue, Klesath, Blank	<a href="#">ENG 467 American Colonial Literature</a>	Revisions: SLOs, eval methods, etc
Gruehn	Janca, Muse, Marshall	<a href="#">SOC/GEO 220 Cultural Geography</a>	Revisions: SLOs, eval methods, etc
Gruehn	Domingue, Rucker, Hessling	<a href="#">SOCWGS 304 Gender in Society</a>	Revisions: SLOs, eval methods, etc
Gruehn	Carlson Welch, Bruce, Schaffer	<a href="#">WGS 390 Queer Theory</a>	New Course

College of Agriculture and Life Sciences			
Presenter	Reviewers	Action	Type
Bruce	Gruehn, Reynolds, Klesath	<a href="#">ANS 495 Special Topics in Animal Science</a>	Revisions
Bruce	Klesath, Schaffer, Carlson Welch	<a href="#">BAET 200 Computer Applications in Biological and Agricultural Engineering Technology</a>	New Course
Bruce	Domingue, Muse, Hessling	<a href="#">BAET 450 Biological and Agricultural Engineering Technology Capstone</a>	New Course
Bruce	Rucker, Blank, Fitzpatrick	<a href="#">BBS/FS 326 Brewing Practices and Analyses</a>	New Course
Merrill	Marshall, Krause, Janca	<a href="#">NTR 492 Professional Internship Experience in Nutrition Science</a>	Revisions
Merrill	Shah, Muse, Blank	<a href="#">NTR 493 Research Experience in Nutrition Science</a>	Revisions
Merrill	Driscoll, Simpson, Reynolds	Crop and Soil Science (BS) Crop Biotechnology (11CSSCBS-11CSSPCB)	Revisions

College of Sciences			
Presenter	Reviewers	Action	Type
Klesath	Driscoll, Merrill, Blank	<a href="#">BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity</a>	Revisions: SLOs, eval methods, etc
Klesath	Domingue, Krause, Shah	<a href="#">BIO 183 Introductory Biology: Cellular and Molecular Biology</a>	Revisions: SLOs, eval methods, etc
Klesath	Simpson, Hessling, Carlson Welch	<a href="#">CH 102 General Chemistry Laboratory</a>	Revisions: SLOs, eval methods, etc
Klesath	Domingue, Marshall, Fitzpatrick	<a href="#">CH 111 Preparatory Chemistry</a>	Revisions: SLOs, eval methods, etc
Klesath	Rucker, Blank, Janca	(17BIOBA) Biological Sciences BA	Revisions: Adding courses to Elective lists, category rename
Muse	Merrill, Schaffer, Reynolds	(17BIOSCBS) BS in Biological Sciences (no sub-plan)	Revision: Adding courses to Elective lists
Muse	Bruce, Hessling, Driscoll	(17BIOSCBS-17BIOSCEEC) BS in Biological Sciences: Ecology, Evolution, and Conservation Biology	Revision: Adding courses to Elective lists
Muse	Gruehn, Simpson, Blank	(17BIOSCBS-17BIOSCIPN) B.S. in Biological Sciences: Integrative Physiology and Neurobiology	Revision: Adding courses to Elective lists
Muse	Gruehn, Janca, Krause	(17BIOSCBS-17BIOSCMCD) B.S. in Biological Sciences: Molecular, Cellular, and Developmental Biology	Revision: Adding courses to Elective lists
Muse	Marshall, Fitzpatrick, Carlson Welch	(17BIOSCBS) B.S. in Biological Sciences (all subplans except 17BIOSCEEC) & (17ZOOBS) B.S in Zoology (all subplans)	Revision: Update Additional Science and Math Electives and Free Electives

College of Engineering			
Presenter	Reviewers	Action	Type
Marshall	Muse, Domingue, Simpson	<a href="#">CSC 433 Privacy in the Digital Age</a>	New Course
Marshall	Klesath, Rucker, Shah	<a href="#">ISE/OR 433/(533) Service Systems Engineering</a>	New Course
Reynolds	Janca, Klesath, Krause	<a href="#">ISE 447/(547) Applications of Data Science in Healthcare</a>	New Course

**SLO= Student Learning Outcomes**

**\*=Course Action Initiated Before October 1, 2019**

**Discussion:**

**Notes:**

- All linked course actions are viewable in CIM.
- To view actions, please click on the hyperlink. You may need to use your Unity ID to log in.
- If you experience issues logging in, please go to <https://next-catalog.ncsu.edu/courseadmin/> and type the course prefix and number into the search bar.

***SLO = Student Learning Outcomes***



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## University Courses and Curricula Committee

January 29, 2020  
Electronically Hosted  
Call to Order: Form Opened 22<sup>nd</sup> Jan

**Members Present:** Chair Rudi Seracino, Marta Klesath (past chair), Kanton Reynolds, Melissa Merrill, Daniel Gruehn, Catherine Driscoll, Peter Hessling, Wendy Krause, Peggy Domingue, Rucker Rob, Jackie Bruce, Annie Carlson Welch, Peter Janca, Gary Blank, Coleman Simpson, Spencer Muse, David Fitzpatrick, Tej Shah

**Members Absent:** Kristen Schaffer, Lisa Marshall,

**Guests:**

**Ex-Officio Members Present:** Li Marcus, Lexi Hergeth

### WELCOME AND INTRODUCTIONS

- **Remarks from Chair** - Welcomed the committee members and introduced the guests and proxies.
- **Remarks from OUCCAS/DASA**- Li thank
- **Office Of Assessment Presentation**
- **Approval of the Minutes from January 15<sup>th</sup> 2020** – Approved Unanimously
  - Discussion: Members moved to approve.

### NEW BUSINESS

#### Consent Agenda

- **BIO 421 Advanced Human Anatomy and Physiology-** Approved Unanimously  
Discussion: Member presented the course drop action.
- **BIO 426 Advanced Human Anatomy & Physiology Lab -** Approved Unanimously  
Discussion: Member presented the course drop action.
- **MEA 467 Marine Meteorology-** Approved Unanimously  
Discussion: Member presented the course action.

Discussion:

Meeting Form Closed at End of Day 29 Jan 2020

*Respectfully submitted by Lexi Hergeth*

**NC STATE UNIVERSITY**

TO: Office of the Dean for Academic and Student Affairs  
FROM: Jane Lubischer, Associate Department Head, Biological Sciences  
RE: Request to update Major Electives for the B.S. in Biological Science, Human Biology Concentration  
(17BIOSCBS-17BIOSCHB)  
DATE: 22 November 2019

**Proposed effective date:** when approved

**Proposed changes and justification**

New courses and re-evaluation of our elective lists has prompted us to expand and edit our list of Human Biology Electives for our B.S. in Biological Sciences – Human Biology Electives


**ADD to HUMAN BIOLOGY ELECTIVES options**

- GN 453 Personal Genomics
- PSY 491 Human Sexuality

**SIGNATURES:**

 11/25/19  
\_\_\_\_\_  
Head, Department of Biological Sciences Date

 1/14/2020  
\_\_\_\_\_  
Chair, Sciences Curriculum Committee Date

 1/17/2020  
\_\_\_\_\_  
Dean, College of Sciences Date

\_\_\_\_\_  
Chair, University Courses & Curricula Committee Date

\_\_\_\_\_  
Dean, Academic and Student Affairs Date

PROPOSED EFFECTIVE DATE: when approved

APPROVED EFFECTIVE DATE: \_\_\_\_\_

MEMORANDUM

DATE: 13 January 2020

TO: Office of Undergraduate Courses and Curricula

FROM: Dr. David Crouse, Director of Undergraduate Programs  
Crop and Soil Sciences



RE: Curriculum Action for B.S. in Crop and Soil Science– Crop Biotechnology

The Department of Crop and Soil Sciences requests the following changes in the Bachelor of Science in Crop and Soil Sciences (11CSSCBS) – Crop Biotechnology (11CSSPCB) be made to the Format A Semester-by Semester Curriculum Display:

Sophomore Year Spring Semester

- Delete BIT 410 Manipulation of Recombinant DNA
- Add CS 211 Plant Genetics

Junior Year Spring Semester

- Add BIT 410 Manipulation of Recombinant DNA
- Delete CS 211 Plant Genetics or GN 311 Principles of Genetics and GN 312 Elementary Genetics Laboratory

The department also requests the following changes in Format B, which will require a new degree audit:

- Change BCH 351 or BCH 451 – Biochemistry to BCH 351 for 3 credits (dropping BCH 451 option)
- Change Free Electives from 4-6 credits to 7 credits.

Justification:

The changes in course sequence are necessary to ensure the prerequisites for BIT 410 (which includes CH 223) are completed before enrollment in BIT 410. The two courses, BIT 410 and CH 223, cannot be taken concurrently.

The change in Format B (degree audit) is necessary to reflect a recent change in the credits for BCH 351. Effective Fall 2020, BCH 351 will be 3 credits. Changes are necessary to the Free Electives – from 4 *or* 6 to 7 – to result in a total credits for the degree to equal 120.

Attached to this memorandum are the relevant supporting documents: Original Eight Semester Display with track changes; Revised Eight Semester Display; Original Curriculum Requirements with track changes, and Revised Curriculum Requirements.



FORMAT A  
(SEMESTER-BY-SEMESTER CURRICULUM DISPLAY)

Indicate display status: Current: ☐ Proposed: ☒ Proposed Effective Semester: 7.2020

Degree/Plan Title: **Plant and Soil Sciences**

Concentration/Subplan Title: **Crop Biotechnology**

Plan SIS Code: **11CSSCBS**

Subplan SIS Code: **11CSSPCB**

New Degree Audit required? (Y or N) Y

Critical Path Courses - Identify using the code (CP) which courses are considered critical path courses, which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

FRESHMAN YEAR			
FALL SEMESTER	CREDITS	SPRING SEMESTER	CREDITS
ALS 103 Freshman Transitions & Diversity OR ALS 303 Transfer Transitions & Diversity	1	BIO 183 Intro to Biology: Cellular and Molecular	4
BIO 181 Intro to Biology: Ecol, Evol, and Biodiversity	4	CH 101 Chemistry – A Molecular Science	3
CS 290 Professional Development in Plant and Soil Sciences	1	CH 102 General Chemistry Lab	1
ENG 101 Academic Writing and Research	4	MA 231 Calculus for Life and Mgmt Sciences B	3
MA 131 Calculus for Life and Mgmt Sciences A	3	Physical Education/Healthy Living Elective <sup>E</sup>	1
Foundation Elective <sup>1</sup>	3	GEP Humanities Elective <sup>C</sup>	3
Total:	16	Total:	15
SOPHOMORE YEAR			
FALL SEMESTER	CREDITS	SPRING SEMESTER	CREDITS
CH 221 Organic Chemistry I	3	CH 223 Organic Chemistry II	3
CH 222 Organic Chemistry I Lab	1	CH 224 Organic Chemistry II Lab	1
CS 213 Crops Science	3	<del>BIT 410 Manipulation of Recomb DNA</del>	<del>4</del>
CS 214 Crop Science Laboratory	1	Restricted Electives <sup>3</sup>	3
SSC 200 Soil Science	3	COM 110 Public Speaking or COM 112 Interpersonal Communications	3
SSC 201 Soil Science Laboratory	1	GEP Interdisciplinary Perspectives Elective <sup>G</sup>	2
Restricted Elective <sup>3</sup>	3	<u>CS 211 Plant Genetics</u>	<u>3</u>
Physical Education/Healthy Living Elective <sup>E</sup>	1		
Total:	16	Total:	<del>16</del> 15
JUNIOR YEAR			
FALL SEMESTER	CREDITS	SPRING SEMESTER	CREDITS
PB 421 Plant Physiology	3	BCH 351 Gen Biochem <del>or BCH 451 Princ Biochem</del>	<del>4</del> 3
PY 131 Conceptual Physics	4	Restricted Electives <sup>3</sup>	3
ST 311 Intro to Statistics	3	GEP Humanities Elective <sup>C</sup>	3
ARE 201 Intro Agricultural & Resource Economics	3	<del>CS 211 Plant Genetics or GN 311 Principles of Genetics and GN 312 Elementary Genetics Laboratory</del>	<del>3 or 5</del>
GEP Social Sciences Elective <sup>D</sup>	3	<u>BIT 410 Manipulation of Recomb DNA</u>	<u>4</u>
Total:	16	Total:	<del>13 or 15</del> 13



SENIOR YEAR			
FALL SEMESTER	CREDITS	SPRING SEMESTER	CREDITS
Biotechnology Elective <sup>2</sup>	4	CS 413 Plant Breeding	2
Experiential Learning Elective <sup>4</sup>	3	ENG 331 Comm for Engineering & Technology or ENG 332 Comm for Business & Management or ENG 333 Comm for Science & Research	3
PB 480 Introduction to Plant Biotechnology	3	Restricted Electives <sup>3</sup>	4
GEP Additional Breadth Elective <sup>F</sup>	3	Free Electives	<del>4</del> <b>6</b>
Total:	<b>13</b>	Total:	<b>13 or 15</b>

Minimum Credit Hours Required for Graduation \* : 120

**Major/Program Footnotes:**<sup>1</sup> **Foundation Elective:** Select from ANT 261, CS 224, or STS 302.<sup>2</sup> **Biotechnology Electives:** Select from BEC 463, BIO 572, BIT 100, BIT 200, BIT 210, BIT 211, BIT 295, BIT 462, BIT 463, BIT 464, BIT 465, BIT 466, BIT 467, BIT 468, BIT 471, BIT 473, BIT 474, BIT 476, BIT 477, BIT 478, BIT 479, BIT 480, BIT 481, BIT 492, BIT 493, BIT 495, BIT 501, BIT 502, BIT 510, BIT 562, BIT 563, BIT 564, BIT 565, BIT 566, BIT 567, BIT 568, BIT 569, BIT 571, BIT 572, BIT 573, BIT 574, BIT 577, BIT 578, BIT 579, BIT 580, BIT 581, BIT 590, BIT 595, CH 572, CHE 463, CHE 563, MB 210, MB 211, PB 481, and PO 466.<sup>3</sup> **Restricted Electives:** Select from AEC 360, BIO 330, BIO 414, BIT 476, BIT 481, CS 211, CS 216, CS 218, CS 224, CS 230, CS 312, CS 411, CS 414, CS 415, CS 418, CS 424, CS 430, CS 480, CS 490, CS 495, ENT 425, GN 311, GN 312, GN 421, GN 423, MB 200, MB 351, PB 200, PB 250, PB 295, PB 345, PB 346, PB 400, PB 403, PB 405, PB 413, PB 414, PB 495, PB 565, PB 570, PB 575, PP 315, PP 495, SSC 185, SSC 332, SSC 341, SSC 342, SSC 421, SSC 427, SSC 428, SSC 440, SSC 442, SSC 452, SSC 455, SSC 461, SSC 462, SSC 470, ST 371, STS 302, STS 304, and STS 323.<sup>4</sup> **Experiential Learning Elective:** Select from CSSC 492 or CSSC 493**\*General Education Program (GEP) requirements and GEP Footnotes:**

To complete the requirements for graduation and the General Education Program, the following category credit hours and co-requisites must be satisfied.

University approved GEP course lists for each of the following categories can be found at <http://www.ncsu.edu/uap/academic-standards/gep/courselists/index.html>.

- A. Mathematical Sciences** (6 credit hours – one course with MA or ST prefix)  
Choose from the University approved GEP Mathematical Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: **These requirements are met through required courses. Students do not need to take additional math.**
- B. Natural Sciences** (7 credit hours – include one laboratory course or course with a lab)  
Choose from the University approved GEP Natural Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: **These requirements are met through required courses. Students do not need to take additional science.**
- C. Humanities** (6 credit hours selected from two different disciplines/course prefixes)  
Choose from the University approved GEP Humanities course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement.
- D. Social Sciences** (6 credit hours selected from two different disciplines/course prefixes)  
Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: **3 hours are met by the ARE 201 requirement**
- E. Physical Education/Healthy Living** (2 credit hours – at least one 100-level Fitness and Wellness Course)  
Choose from the University approved GEP Physical Education/Healthy Living course list.
- F. Additional Breadth** - (3 credit hours to be selected from the following checked University approved GEP course lists)  
☒ Humanities/Social Sciences/Visual and Performing Arts or ☐ Mathematical Sciences/Natural Sciences/Engineering
- G. Interdisciplinary Perspectives** (5-6 credit hours)  
Choose from the University approved GEP Interdisciplinary Perspectives course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement. **3 hours are met by ANT 261, CS 224 or STS 302 in the Foundation Elective requirement**
- H. Introduction to Writing** (4 credit hours satisfied by completing ENG 101 with a C- or better )

**The following Co-Requisites must be satisfied to complete the General Education Program requirements:**

- I. U.S. Diversity (USD)**  
Choose from the University approved GEP U.S. Diversity course list or choose a course identified on the approved GEP course lists as meeting the U.S. Diversity (USD) co-requisite. The following course(s) completed as part of the Major requirements may fulfill this requirement.
- J. Global Knowledge (GK)**  
Choose from the University approved GEP Global Knowledge course list or choose a course identified on the approved GEP course lists as meeting the Global Knowledge (GK) co-requisite. The following course(s) completed as part of the Major requirements may fulfill this requirement. **STS 302**
- K. Foreign Language proficiency** - Proficiency at the FL\_102 level is required for graduation.

Degree/Plan Title: **Crop and Soil Sciences**Concentration/Subplan Title: **Crop Biotechnology**

Indicate requirements status: Current: Proposed: **X**

New Degree Audit required? (Y or N) Y

**MAJOR FIELD OF STUDY REQUIREMENTS:**

**Required Courses/Groups/ Electives:**

### Credit Hours

*GEP category, if applicable*

Indicate if course or course groupings have a C-wall or MGPA requirement and which are considered Critical Path courses – indicate with (CP) next to applic. course.

**List GEP category and hours satisfied by a Major requirement**

MA 131 (CP)  
MA 231  
ST 311  
BIO 181 (CP)  
BIO 183 (CP)  
CH 101 (CP)  
CH 102  
CH 221  
CH 222  
CH 223  
CH 224  
PY 131  
~~BCH 351 or BCH 451~~ – Biochemistry

3  
3  
3  
4  
4  
3  
1  
3  
1  
3  
1  
4  
4 3

Mathematics and Natural Sciences (37 hours)

COM 110 or COM 112  
ENG 331 or ENG 332 or ENG 333

33

Communication and Advanced Writing  
(6 hours)

ARE 201  
BIT 410  
CS 213 (CP) [C- or better required]  
CS 214 [C- or better required]  
CS 413  
CS 290  
PB 421  
PB 480  
SSC 200 (CP) [C- or better required]  
SSC 201 [C- or better required]  
CS 211 or GN 311 and GN 312 — Genetics

3  
4  
3  
1  
2  
1  
3  
3  
3  
1  
3 or 5

Required Courses within Major (27 or 29 hours)

**Concentration Courses/Groups/Electives:**

Foundation Elective  
Biotechnology Electives  
Experiential Learning  
Restricted Electives

3  
4  
3  
13

See footnoted lists (23 hours)

**Free Electives:**

~~4 or 6~~ 7

<b>Total credit hours under Major Field of Study:</b> <i>Minimum 27 hours required in program area.</i>	96 hours	
<b>COLLEGE REQUIREMENTS:</b>		
<b>Orientation Course(s):</b> ALS 103 or 303	1	
<b>Other:</b>		
<b>Total credit hours under College Requirements:</b>	1 Hours	

<b><u>NCSU GENERAL EDUCATION PROGRAM REQUIREMENTS</u></b>  <i>Courses in the Major and/or Minor may also fulfill a General Education requirement; however, a GEP category may not be subset to require a specific course from the category list. Required courses must be listed in the Major/College requirements.</i>  <i>Specific courses should not be listed in any of the fields below other than ENG 101.</i>		<b>At least one of the following must be listed:</b> 1 Choose course(s) from the University Approved GEP course list for this category. 2 Minimum requirements are satisfied by Major/College course requirements. 3 Major/College course requirement satisfies X credit hrs of this requirement. Remaining hours required must be chosen from the University Approved GEP course list for the category. 4 Co-requisite is satisfied by a Major/College course requirement. 5 Choose course(s) from the University Approved GEP course lists for the Humanities/ Social Sciences/ Visual & Performing Arts. 6 Choose course(s) from the University Approved GEP course lists for Natural Sciences/Mathematical Sciences.
<b>General Education Program Requirements:</b> <i>Minimum 39-40 hrs</i>	<b>Credit hours</b>	<b>How will the GEP requirement be met?</b> <b>(Choose applicable statement from 1-6 listed above)</b>
<b>Mathematical Sciences</b> (6 credits) (At least 1 course with MA or ST prefix) Course(s) in the Major may double-count to satisfy this requirement and also satisfy either the Global Knowledge or U.S. Diversity co-requisites.	0	(Choose statement 1, 2 or 3) 2
<b>Natural Sciences</b> (7 credits) (At least 1 lab course or course with a lab) Course(s) in the Major may double-count to satisfy this requirement and also satisfy either the Global Knowledge or U.S. Diversity co-requisites.	0	(Choose statement 1, 2 or 3) 2
<b>English 101</b> (C- or better required) (4 credits)	4	ENG 101
<b>Humanities</b> (6 credits) (Courses from two different disciplines) Course(s) in the Major may double-count to satisfy this requirement and also satisfy either the Global Knowledge or U.S. Diversity co-requisites.	6	(Choose statement 1, 2 or 3) 1
<b>Social Sciences</b> (6 credits) (Courses from two different disciplines) Course(s) in the Major may double-count to satisfy this requirement and also satisfy either the Global Knowledge or U.S. Diversity co-requisites.	3	(Choose statement 1, 2 or 3) 3, (Major course requirements satisfies 3 credits of this requirement. Additional 3 credits can come from COM 112, if chosen for the communications requirement).
<b>Additional Breadth</b> (3 credits) (Choose approach that is different from the approach of the Major) Major/College requirements cannot satisfy this requirement and an AB course cannot be double-counted except in satisfying the Global Knowledge or U.S. Diversity co-requisites.	3	(Choose statement 5 or 6) 5
<b>Interdisciplinary Perspectives</b> (5 credits) Course(s) in the Major may double-count to satisfy this requirement and also satisfy either the Global Knowledge or U.S. Diversity co-requisites.	2	(Choose statement 1, 2 or 3) 3 (Major course requirement satisfies 3 credit hours of this requirement)
<b>Health and Exercise Studies</b> (2 credits) (Including one Fitness and Wellness course)	2	Choose course(s) from the University Approved GEP course list for this category.
<b>Total credit hours needed to complete GEP that are not satisfied as part of the Major/College requirements.</b>	20 hours	
<b>GEP Co-Requisites:</b>		<i>Courses taken in the Major, GEP, or Minor may double-count to fulfill the co-requisites. Courses that satisfy the U.S. Diversity or Global Knowledge co-requisite are marked on course lists with a "USD" or "GK" Indicator.</i>
<b>U.S. Diversity co-requisite</b> (USD)	n/a	(Choose statement 1 or 4) 4

<b>Global Knowledge co-requisite</b> (GK)	n/a	(Choose statement 1 or 4) 4
<b>Foreign Language Proficiency</b>	n/a	Proficiency at the FL_102 level required.
<b>The following requirements must be satisfied within the College/Program:</b>		Place an X in the credit hour box to indicate below that the requirement is "Satisfied by College/Program Requirements"
<b>Communication in the Major (Advanced Communication)</b>		Satisfied by College/Program Requirements
<b>Technology Fluency</b>		Satisfied by College/Program Requirements
<b>Total credit hours required to complete Degree:</b> Total must be within 120-128 credit hours.	<b>120</b> Total hours	<b>As applicable, indicate here the overall GPA requirement for degree completion including course completion.</b>

**Concentration Electives:****Foundation Elective**

ANT 261 Technology in Society and Culture

CS 224 Seeds, Biotechnology and Societies

STS 302 Contemporary Science, Technology and Human Values

**Biotechnology Elective**

BEC 463 Fermentation of Recombinant Microorganisms

BIO 572 Proteomics

BIT 100 Current Topics in Biotechnology

BIT 200 Early Research in Biotechnology

BIT 210 Phage Hunters

BIT 211 Phage Genomics

BIT 295 Special Topics in Biotechnology

BIT 462 Gene Expression Analysis: Microarrays

BIT 463 Fermentation of Recombinant Microorganisms

BIT 464 Protein Purification

BIT 465 Real-time PCR Techniques

BIT 466 Animal Cell Culture Techniques

BIT 467 PCR and DNA Fingerprinting

BIT 468 Genome Mapping

BIT 471 RNA Interference and Model Organisms

BIT 473 Protein Interactions

BIT 474 Plant Genetic Engineering

BIT 476 Applied Bioinformatics

BIT 477 Metagenomics

BIT 478 Mapping the Brain

BIT 479 High-Throughput Discovery

BIT 480 Yeast Metabolic Engineering

BIT 481 Plant Tissue Culture and Transformation

BIT 492 External Learning Experience

BIT 493 Special Problems in Biotechnology

BIT 495 Special Topics in Biotechnology

BIT 501 Ethical Issues in Biotechnology

BIT 502 Biotechnology Networking and Professional Development

BIT 510 Core Technologies in Molecular and Cellular Biology

BIT 562 Gene Expression Analysis: Microarrays

BIT 563 Fermentation of Recombinant Microorganisms

BIT 564 Protein Purification

BIT 565 Real-time PCR Techniques

BIT 566 Animal Cell Culture Techniques

BIT 567 PCR and DNA Fingerprinting

BIT 568 Genome Mapping

BIT 569 RNA Purification and Analysis

BIT 571 RNA Interference and Model Organisms

BIT 572 Proteomics  
BIT 573 Protein Interactions  
BIT 574 Plant Genetic Engineering  
BIT 577 Metagenomics  
BIT 578 Mapping the Brain  
BIT 579 High-Throughput Discovery  
BIT 580 Yeast Metabolic Engineering  
BIT 581 Plant Transformation  
BIT 590 Independent Study in Biotechnology  
BIT 595 Special Topics  
CH 572 Proteomics  
CHE 463 Fermentation of Recombinant Microorganisms  
CHE 563 Fermentation of Recombinant Microorganisms  
MB 210 Phage Hunters  
MB 211 Phage Genomics  
PB 481 Plant Tissue Culture and Transformation  
PO 466 Animal Cell Culture Techniques

Experiential Learning

CSSC 492 Professional Internship Experience in Crop and Soil Sciences  
CSSC 493 Research Experience in Crop and Soil Sciences

Restricted Electives

AEC 360 Ecology  
BIO 330 Evolutionary Biology  
BIO 414 Cell Biology  
BIT 476 Applied Bioinformatics  
BIT 481 Plant Tissue Culture and Transformation  
CS 211 Plant Genetics  
CS 216 Southern Row Crop Production-Cotton, Peanuts, and Tobacco  
CS 218 Southern Row Crop Production-Corn, Small Grains and Soybeans  
CS 224 Seeds, Biotechnology and Societies  
CS 230 Introduction to Agroecology  
CS 312 Grassland Management for Natural Resources Conservation  
CS 411 Crop Ecology  
CS 414 Weed Science  
CS 415 Integrated Pest Management  
CS 418 Introduction to Regulatory Science in Agriculture  
CS 424 Seed Physiology  
CS 430 Advanced Agroecology  
CS 480 Sustainable Food Production (capstone)  
CS 490 Senior Seminar in Crop Science and Soil Science  
CS 495 Special Topics in Crop Science  
ENT 425 General Entomology  
GN 311 Principles of Genetics  
GN 312 Elementary Genetics Laboratory  
GN 421 Molecular Genetics  
GN 423 Population, Quantitative and Evolutionary Genetics  
MB 200 Microbiology and World Affairs  
MB 351 General Microbiology  
PB 200 Plant Life  
PB 250 Plant Biology  
PB 295 Special Topics in Botany  
PB 345 Economic Botany  
PB 346 Economic Botany Lab  
PB 400 Plant Diversity and Evolution  
PB 403 Systematic Botany  
PB 405 Wetland Flora  
PB 413 Plant Anatomy  
PB 414 Cell Biology

PB 495 Special Topics in Botany  
PB 565 Plant Community Ecology  
PB 570 Plant Functional Ecology  
PB 575 Introduction to Mycology  
PP 315 Principles of Plant Pathology  
PP 495 Special Topics in Plant Pathology  
SSC 185 Land and Life  
SSC 332 Environmental Soil Microbiology  
SSC 341 Soil Fertility and Nutrient Management  
SSC 342 Soil and Plant Nutrient Analysis  
SSC 421 Role of Soils in Environmental Management  
SSC 427 Biological Approaches to Sustainable Soil Systems  
SSC 428 Service-Learning in Urban Agriculture Systems  
SSC 440 Geographic Information Systems (GIS) in Soil Science and Agriculture  
SSC 442 Soil and Environmental Biogeochemistry  
SSC 452 Soil Classification  
SSC 455 Soils, Environmental Quality and Global Challenges  
SSC 461 Soil Physical Properties and Plant Growth  
SSC 462 Soil-Crop Management Systems  
SSC 470 Wetland Soils  
ST 371 Introduction to Probability and Distribution Theory  
STS 302 Contemporary Science, Technology and Human Values  
STS 304 Ethical Dimensions of Progress  
STS 323 World Population and Food Prospects

**FORMAT A**  
**(SEMESTER-BY-SEMESTER CURRICULUM DISPLAY)**

Indicate display status: Current: \_\_\_\_\_ Proposed:  X  Proposed Effective Semester: **7.2020**

Degree/Plan Title: **Plant and Soil Sciences**

Concentration/Subplan Title: **Crop Biotechnology**

Plan SIS Code: **11CSSCBS**

Subplan SIS Code: **11CSSPCB**

New Degree Audit required? (Y or N) **Y**

Critical Path Courses - Identify using the code (CP) which courses are considered critical path courses, which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

<b>FRESHMAN YEAR</b>			
<b>FALL SEMESTER</b>	<b>CREDITS</b>	<b>SPRING SEMESTER</b>	<b>CREDITS</b>
ALS 103 Freshman Transitions & Diversity OR ALS 303 Transfer Transitions & Diversity	1	BIO 183 Intro to Biology: Cellular and Molecular	4
BIO 181 Intro to Biology: Ecol, Evol, and Biodiversity	4	CH 101 Chemistry – A Molecular Science	3
CS 290 Professional Development in Plant and Soil Sciences	1	CH 102 General Chemistry Lab	1
ENG 101 Academic Writing and Research	4	MA 231 Calculus for Life and Mgmt Sciences B	3
MA 131 Calculus for Life and Mgmt Sciences A	3	Physical Education/Healthy Living Elective <sup>E</sup>	1
Foundation Elective <sup>1</sup>	3	GEP Humanities Elective <sup>C</sup>	3
Total:	<b>16</b>	Total:	<b>15</b>
<b>SOPHOMORE YEAR</b>			
<b>FALL SEMESTER</b>	<b>CREDITS</b>	<b>SPRING SEMESTER</b>	<b>CREDITS</b>
CH 221 Organic Chemistry I	3	CH 223 Organic Chemistry II	3
CH 222 Organic Chemistry I Lab	1	CH 224 Organic Chemistry II Lab	1
CS 213 Crops Science	3	CS 211 Plant Genetics	3
CS 214 Crop Science Laboratory	1	Restricted Electives <sup>3</sup>	3
SSC 200 Soil Science	3	COM 110 Public Speaking or COM 112 Interpersonal Communications	3
SSC 201 Soil Science Laboratory	1	GEP Interdisciplinary Perspectives Elective <sup>G</sup>	2
Restricted Elective <sup>3</sup>	3		
Physical Education/Healthy Living Elective <sup>E</sup>	1		
Total:	<b>16</b>	Total:	<b>15 or 17</b>
<b>JUNIOR YEAR</b>			
<b>FALL SEMESTER</b>	<b>CREDITS</b>	<b>SPRING SEMESTER</b>	<b>CREDITS</b>
PB 421 Plant Physiology	3	BCH 351 Gen Biochemistry	3
PY 131 Conceptual Physics	4	Restricted Electives <sup>3</sup>	3
ST 311 Intro to Statistics	3	GEP Humanities Elective <sup>C</sup>	3
ARE 201 Intro Agricultural & Resource Economics	3	BIT 410 Manipulation of Recom DNA	4
GEP Social Sciences Elective <sup>D</sup>	3		
Total:	<b>16</b>	Total:	<b>13</b>



SENIOR YEAR			
FALL SEMESTER	CREDITS	SPRING SEMESTER	CREDITS
Biotechnology Elective <sup>2</sup>	4	CS 413 Plant Breeding	2
Experiential Learning Elective <sup>4</sup>	3	ENG 331 Comm for Engineering & Technology or ENG 332 Comm for Business & Management or ENG 333 Comm for Science & Research	3
PB 480 Introduction to Plant Biotechnology	3	Restricted Electives <sup>3</sup>	4
GEP Additional Breadth Elective <sup>F</sup>	3	Free Electives	7
Total:	13	Total:	16

Minimum Credit Hours Required for Graduation \* : 120

#### Major/Program Footnotes:

<sup>1</sup> Foundation Elective: Select from ANT 261, CS 224, or STS 302.

<sup>2</sup> Biotechnology Electives: Select from BEC 463, BIO 572, BIT 100, BIT 200, BIT 210, BIT 211, BIT 295, BIT 462, BIT 463, BIT 464, BIT 465, BIT 466, BIT 467, BIT 468, BIT 471, BIT 473, BIT 474, BIT 476, BIT 477, BIT 478, BIT 479, BIT 480, BIT 481, BIT 492, BIT 493, BIT 495, BIT 501, BIT 502, BIT 510, BIT 562, BIT 563, BIT 564, BIT 565, BIT 566, BIT 567, BIT 568, BIT 569, BIT 571, BIT 572, BIT 573, BIT 574, BIT 577, BIT 578, BIT 579, BIT 580, BIT 581, BIT 590, BIT 595, CH 572, CHE 463, CHE 563, MB 210, MB 211, PB 481, and PO 466.

<sup>3</sup> Restricted Electives: Select from AEC 360, BIO 330, BIO 414, BIT 476, BIT 481, CS 211, CS 216, CS 218, CS 224, CS 230, CS 312, CS 411, CS 414, CS 415, CS 418, CS 424, CS 430, CS 480, CS 490, CS 495, ENT 425, GN 311, GN 312, GN 421, GN 423, MB 200, MB 351, PB 200, PB 250, PB 295, PB 345, PB 346, PB 400, PB 403, PB 405, PB 413, PB 414, PB 495, PB 565, PB 570, PB 575, PP 315, PP 495, SSC 185, SSC 332, SSC 341, SSC 342, SSC 421, SSC 427, SSC 428, SSC 440, SSC 442, SSC 452, SSC 455, SSC 461, SSC 462, SSC 470, ST 371, STS 302, STS 304, and STS 323.

<sup>4</sup> Experiential Learning Elective: Select from CSSC 492 or CSSC 493

#### \*General Education Program (GEP) requirements and GEP Footnotes:

To complete the requirements for graduation and the General Education Program, the following category credit hours and co-requisites must be satisfied.

University approved GEP course lists for each of the following categories can be found at <http://www.ncsu.edu/uap/academic-standards/gep/courselists/index.html>.

- A. **Mathematical Sciences** (6 credit hours – one course with MA or ST prefix)  
Choose from the University approved GEP Mathematical Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: **These requirements are met through required courses. Students do not need to take additional math.**
- B. **Natural Sciences** (7 credit hours – include one laboratory course or course with a lab)  
Choose from the University approved GEP Natural Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: **These requirements are met through required courses. Students do not need to take additional science.**
- C. **Humanities** (6 credit hours selected from two different disciplines/course prefixes)  
Choose from the University approved GEP Humanities course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement.
- D. **Social Sciences** (6 credit hours selected from two different disciplines/course prefixes)  
Choose from the University approved GEP Social Sciences course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement: **3 hours are met by the ARE 201 requirement**
- E. **Physical Education/Healthy Living** (2 credit hours – at least one 100-level Fitness and Wellness Course)  
Choose from the University approved GEP Physical Education/Healthy Living course list.
- F. **Additional Breadth** - (3 credit hours to be selected from the following checked University approved GEP course lists)  
☒ Humanities/Social Sciences/Visual and Performing Arts or ☐ Mathematical Sciences/Natural Sciences/Engineering
- G. **Interdisciplinary Perspectives** (5-6 credit hours)  
Choose from the University approved GEP Interdisciplinary Perspectives course list or the following course(s) if completed as part of the Major requirements may fulfill part or all of this requirement. **3 hours are met by ANT 261, CS 224 or STS 302 in the Foundation Elective requirement**
- H. **Introduction to Writing** (4 credit hours satisfied by completing ENG 101 with a C- or better )

The following Co-Requisites must be satisfied to complete the General Education Program requirements:

- I. **U.S. Diversity** (USD)  
Choose from the University approved GEP U.S. Diversity course list or choose a course identified on the approved GEP course lists as meeting the U.S. Diversity (USD) co-requisite. The following course(s) completed as part of the Major requirements may fulfill this requirement.
- J. **Global Knowledge** (GK)  
Choose from the University approved GEP Global Knowledge course list or choose a course identified on the approved GEP course lists as meeting the Global Knowledge (GK) co-requisite. The following course(s) completed as part of the Major requirements may fulfill this requirement. **STS 302**
- K. **Foreign Language proficiency** - Proficiency at the FL\_102 level is required for graduation.

<b>Degree/Plan Title: Crop and Soil Sciences</b>	<b>Plan SIS Code: 11CSSCBS</b>
<b>Concentration/Subplan Title: Crop Biotechnology</b>	<b>Subplan SIS Code: 11CSSPCB</b>
<b>Indicate requirements status:</b> Current:      Proposed: <u>  X  </u>	<b><u>Proposed</u> Effective Semester: July 2020</b>
<b><u>New Degree Audit required?</u> (Y or N) Y</b>	
<b><u>Critical Path Courses</u> - Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.</b>	

MAJOR FIELD OF STUDY REQUIREMENTS:		
<i>Required Courses/Groups/ Electives:</i>	<i>Credit Hours</i>	<i>GEP category, if applicable</i>
Indicate if course or course groupings have a C-wall or MGPA requirement and which are considered Critical Path courses – indicate with (CP) next to applic. course.		List GEP category and hours satisfied by a Major requirement
MA 131 (CP)	3	Mathematics and Natural Sciences (37 hours)
MA 231	3	
ST 311	3	
BIO 181 (CP)	4	
BIO 183 (CP)	4	
CH 101 (CP)	3	
CH 102	1	
CH 221	3	
CH 222	1	
CH 223	3	
CH 224	1	
PY 131	4	
BCH 351	3	
COM 110 or COM 112	3	Communication and Advanced Writing (6 hours)
ENG 331 or ENG 332 or ENG 333	3	
ARE 201	3	Required Courses within Major (27 or 29 hours)
BIT 410	4	
CS 213 (CP) [C- or better required]	3	
CS 214 [C- or better required]	1	
CS 413	2	
CS 290	1	
PB 421	3	
PB 480	3	
SSC 200 (CP) [C- or better required]	3	
SSC 201 [C- or better required]	1	
CS 211	3	
<b><u>Concentration Courses/Groups/Electives:</u></b>		See footnoted lists (23 hours)
Foundation Elective	3	
Biotechnology Electives	4	
Experiential Learning	3	
Restricted Electives	13	
<b><u>Free Electives:</u></b>	7	

<b>Total credit hours under Major Field of Study:</b> <i>Minimum 27 hours required in program area.</i>	<b>96 hours</b>	
<b>COLLEGE REQUIREMENTS:</b>		
<b>Orientation Course(s):</b> ALS 103 or 303	<b>1</b>	
<b>Other:</b>		
<b>Total credit hours under College Requirements:</b>	<b>1 Hours</b>	

<b><u>NCSU GENERAL EDUCATION PROGRAM REQUIREMENTS</u></b>  <i>Courses in the Major and/or Minor may also fulfill a General Education requirement; however, a GEP category <u>may not be subset</u> to require a specific course from the category list. Required courses must be listed in the Major/College requirements.</i>  <i>Specific courses should not be listed in any of the fields below other than ENG 101.</i>		<b>At least one of the following must be listed:</b> 1 Choose course(s) from the University Approved GEP course list for this category. 2 Minimum requirements are satisfied by Major/College course requirements. 3 Major/College course requirement satisfies <u>X</u> credit hrs of this requirement. Remaining hours required must be chosen from the University Approved GEP course list for the category. 4 Co-requisite is satisfied by a Major/College course requirement. 5 Choose course(s) from the University Approved GEP course lists for the Humanities/ Social Sciences/ Visual & Performing Arts. 6 Choose course(s) from the University Approved GEP course lists for Natural Sciences/Mathematical Sciences.
<b>General Education Program Requirements:</b> <i>Minimum 39-40 hrs</i>	<b>Credit hours</b>	<b>How will the GEP requirement be met?</b> <b>(Choose applicable statement from 1-6 listed above)</b>
<b>Mathematical Sciences</b> (6 credits) (At least 1 course with MA or ST prefix) Course(s) in the Major may double-count to satisfy this requirement and also satisfy either the Global Knowledge or U.S. Diversity co-requisites.	0	(Choose statement 1, 2 or 3) 2
<b>Natural Sciences</b> (7 credits) (At least 1 lab course or course with a lab) Course(s) in the Major may double-count to satisfy this requirement and also satisfy either the Global Knowledge or U.S. Diversity co-requisites.	0	(Choose statement 1, 2 or 3) 2
<b>English 101 (C- or better required)</b> (4 credits)	4	ENG 101
<b>Humanities</b> (6 credits) (Courses from two different disciplines) Course(s) in the Major may double-count to satisfy this requirement and also satisfy either the Global Knowledge or U.S. Diversity co-requisites.	6	(Choose statement 1, 2 or 3) 1
<b>Social Sciences</b> (6 credits) (Courses from two different disciplines) Course(s) in the Major may double-count to satisfy this requirement and also satisfy either the Global Knowledge or U.S. Diversity co-requisites.	3	(Choose statement 1, 2 or 3) 3, (Major course requirements satisfies 3 credits of this requirement. Additional 3 credits can come from COM 112, if chosen for the communications requirement).
<b>Additional Breadth</b> (3 credits) (Choose approach that is different from the approach of the Major) Major/College requirements cannot satisfy this requirement and an AB course cannot be double-counted except in satisfying the Global Knowledge or U.S. Diversity co-requisites.	3	(Choose statement 5 or 6) 5
<b>Interdisciplinary Perspectives</b> (5 credits) Course(s) in the Major may double-count to satisfy this requirement and also satisfy either the Global Knowledge or U.S. Diversity co-requisites.	2	(Choose statement 1, 2 or 3) 3 (Major course requirement satisfies 3 credit hours of this requirement)
<b>Health and Exercise Studies</b> (2 credits) (Including one Fitness and Wellness course)	2	Choose course(s) from the University Approved GEP course list for this category.
<b>Total credit hours needed to complete GEP that are <u>not</u> satisfied as part of the Major/College requirements.</b>	<b>20 hours</b>	
<b>GEP Co-Requisites:</b>		<i>Courses taken in the Major, GEP, or Minor may double-count to fulfill the co-requisites. Courses that satisfy the U.S. Diversity or Global Knowledge co-requisite are marked on course lists with a "USD" or "GK" indicator.</i>
<b>U.S. Diversity co-requisite (USD)</b>	n/a	(Choose statement 1 or 4) 4

<b>Global Knowledge co-requisite</b> (GK)	n/a	(Choose statement 1 or 4) 4
<b>Foreign Language Proficiency</b>	n/a	Proficiency at the FL_102 level required.
<b>The following requirements must be satisfied within the College/Program:</b>		Place an X in the credit hour box to indicate below that the requirement is "Satisfied by College/Program Requirements"
<b>Communication in the Major (Advanced Communication)</b>		Satisfied by College/Program Requirements
<b>Technology Fluency</b>		Satisfied by College/Program Requirements
<b>Total credit hours required to complete Degree:</b> Total must be within 120-128 credit hours.	120 Total hours	<b>As applicable, indicate here the overall GPA requirement for degree completion including course completion.</b>

**Concentration Electives:****Foundation Elective**

ANT 261 Technology in Society and Culture

CS 224 Seeds, Biotechnology and Societies

STS 302 Contemporary Science, Technology and Human Values

**Biotechnology Elective**

BEC 463 Fermentation of Recombinant Microorganisms

BIO 572 Proteomics

BIT 100 Current Topics in Biotechnology

BIT 200 Early Research in Biotechnology

BIT 210 Phage Hunters

BIT 211 Phage Genomics

BIT 295 Special Topics in Biotechnology

BIT 462 Gene Expression Analysis: Microarrays

BIT 463 Fermentation of Recombinant Microorganisms

BIT 464 Protein Purification

BIT 465 Real-time PCR Techniques

BIT 466 Animal Cell Culture Techniques

BIT 467 PCR and DNA Fingerprinting

BIT 468 Genome Mapping

BIT 471 RNA Interference and Model Organisms

BIT 473 Protein Interactions

BIT 474 Plant Genetic Engineering

BIT 476 Applied Bioinformatics

BIT 477 Metagenomics

BIT 478 Mapping the Brain

BIT 479 High-Throughput Discovery

BIT 480 Yeast Metabolic Engineering

BIT 481 Plant Tissue Culture and Transformation

BIT 492 External Learning Experience

BIT 493 Special Problems in Biotechnology

BIT 495 Special Topics in Biotechnology

BIT 501 Ethical Issues in Biotechnology

BIT 502 Biotechnology Networking and Professional Development

BIT 510 Core Technologies in Molecular and Cellular Biology

BIT 562 Gene Expression Analysis: Microarrays

BIT 563 Fermentation of Recombinant Microorganisms

BIT 564 Protein Purification

BIT 565 Real-time PCR Techniques

BIT 566 Animal Cell Culture Techniques

BIT 567 PCR and DNA Fingerprinting

BIT 568 Genome Mapping

BIT 569 RNA Purification and Analysis

BIT 571 RNA Interference and Model Organisms

BIT 572 Proteomics  
 BIT 573 Protein Interactions  
 BIT 574 Plant Genetic Engineering  
 BIT 577 Metagenomics  
 BIT 578 Mapping the Brain  
 BIT 579 High-Throughput Discovery  
 BIT 580 Yeast Metabolic Engineering  
 BIT 581 Plant Transformation  
 BIT 590 Independent Study in Biotechnology  
 BIT 595 Special Topics  
 CH 572 Proteomics  
 CHE 463 Fermentation of Recombinant Microorganisms  
 CHE 563 Fermentation of Recombinant Microorganisms  
 MB 210 Phage Hunters  
 MB 211 Phage Genomics  
 PB 481 Plant Tissue Culture and Transformation  
 PO 466 Animal Cell Culture Techniques

#### Experiential Learning

CSSC 492 Professional Internship Experience in Crop and Soil Sciences  
 CSSC 493 Research Experience in Crop and Soil Sciences

#### Restricted Electives

AEC 360 Ecology  
 BIO 330 Evolutionary Biology  
 BIO 414 Cell Biology  
 BIT 476 Applied Bioinformatics  
 BIT 481 Plant Tissue Culture and Transformation  
 CS 211 Plant Genetics  
 CS 216 Southern Row Crop Production-Cotton, Peanuts, and Tobacco  
 CS 218 Southern Row Crop Production-Corn, Small Grains and Soybeans  
 CS 224 Seeds, Biotechnology and Societies  
 CS 230 Introduction to Agroecology  
 CS 312 Grassland Management for Natural Resources Conservation  
 CS 411 Crop Ecology  
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 CS 415 Integrated Pest Management  
 CS 418 Introduction to Regulatory Science in Agriculture  
 CS 424 Seed Physiology  
 CS 430 Advanced Agroecology  
 CS 480 Sustainable Food Production (capstone)  
 CS 490 Senior Seminar in Crop Science and Soil Science  
 CS 495 Special Topics in Crop Science  
 ENT 425 General Entomology  
 GN 311 Principles of Genetics  
 GN 312 Elementary Genetics Laboratory  
 GN 421 Molecular Genetics  
 GN 423 Population, Quantitative and Evolutionary Genetics  
 MB 200 Microbiology and World Affairs  
 MB 351 General Microbiology  
 PB 200 Plant Life  
 PB 250 Plant Biology  
 PB 295 Special Topics in Botany  
 PB 345 Economic Botany  
 PB 346 Economic Botany Lab  
 PB 400 Plant Diversity and Evolution  
 PB 403 Systematic Botany  
 PB 405 Wetland Flora  
 PB 413 Plant Anatomy  
 PB 414 Cell Biology

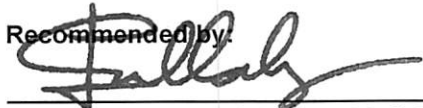
PB 495 Special Topics in Botany  
PB 565 Plant Community Ecology  
PB 570 Plant Functional Ecology  
PB 575 Introduction to Mycology  
PP 315 Principles of Plant Pathology  
PP 495 Special Topics in Plant Pathology  
SSC 185 Land and Life  
SSC 332 Environmental Soil Microbiology  
SSC 341 Soil Fertility and Nutrient Management  
SSC 342 Soil and Plant Nutrient Analysis  
SSC 421 Role of Soils in Environmental Management  
SSC 427 Biological Approaches to Sustainable Soil Systems  
SSC 428 Service-Learning in Urban Agriculture Systems  
SSC 440 Geographic Information Systems (GIS) in Soil Science and Agriculture  
SSC 442 Soil and Environmental Biogeochemistry  
SSC 452 Soil Classification  
SSC 455 Soils, Environmental Quality and Global Challenges  
SSC 461 Soil Physical Properties and Plant Growth  
SSC 462 Soil-Crop Management Systems  
SSC 470 Wetland Soils  
ST 371 Introduction to Probability and Distribution Theory  
STS 302 Contemporary Science, Technology and Human Values  
STS 304 Ethical Dimensions of Progress  
STS 323 World Population and Food Prospects

SIGNATURE PAGE

COURSE ACTION for Revision to Undergraduate Major

Crop and Soil Sciences – Crop Biotechnology (11CSSCBS-11CSSPCB)

Recommended by:



Head, Department of Crop and Soil Sciences

1-13-2020

Date

Recommended by:

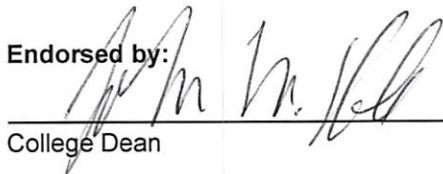


Chair, College Curriculum Committee

17 Jan 2020

Date

Endorsed by:



College Dean

1/17/2020

Date

Approved by:

Chair, University Courses & Curricula Committee

Date

Chair, Council on Undergraduate Education

Date

Dean, Division of Academic and Student Affairs (DASA)

Date



**NC STATE UNIVERSITY**

TO: Office of the Dean for Academic and Student Affairs

FROM: Jane Lubischer, Director, BA in Biology

RE: Request to add courses to elective lists in 17BIOBA

DATE: 20 November 2019

**Proposed effective date:** when approved


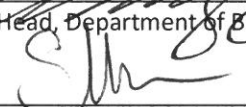

**Proposed changes and justification**

Please change the name of the "Statistics" category to be "Quantitative Requirement" and update electives lists in this curriculum as indicated:

Elective List	Courses to add
Communication and Writing – <i>Communication Courses</i>	COM 289 Science Communication and Public Engagement COM 292 Language, Communication, and Culture
Communication and Writing – <i>Writing Courses</i>	ENG 275 Literature and War ENG 341 Literature and Science
"Statistics" → change name to "Quantitative Requirement"	BIO 310 Quantitative Approaches to Biological Problems
Life Science Electives 300/400 level	BIO 310 Quantitative Approaches to Biological Problems BIO 416 Cancer Cell Biology BIO 418 Cell Biology Research Lab BIT 463 Fermentation of Recombinant Microorganisms BIT 477 Metagenomics BIT 478 Mapping the Brain BIT 479 High Throughput Discovery BSC 514 Studying Animal Behavior BSC 516 Toxics, Human Health, and the Environment BSC 546 Humans and Disease: Communicable Diseases GN 453 Personal Genomics ZO 334 Captive Animal Biology Lab GN 428 Introduction to Machine Learning AEC/GN 450 Conservation Genetics
Life Science Electives (200/300/400)	BIO 310 Quantitative Approaches to Biological Problems BIO 416 Cancer Cell Biology BIO 418 Cell Biology Research Lab

Life Science Electives (200/300/400) -continued-	BIT 463 Fermentation of Recombinant Microorganisms BIT 477 Metagenomics BIT 478 Mapping the Brain BIT 479 High Throughput Discovery BSC 514 Studying Animal Behavior BSC 516 Toxics, Human Health, and the Environment BSC 546 Humans and Disease: Communicable Diseases GN 453 Personal Genomics ZO 334 Captive Animal Biology Lab GN 428 Introduction to Machine Learning AEC/GN 450/550 Conservation Genetics
Experiential Learning	BIO 499 Honors Project Part 2 BSC 492 Professional Experience BSC 493 Research Experience BSC 494 Teaching Experience BSC 498 Biological Sciences Honors Project Part 2

**SIGNATURES:**

 11/25/19  
 Head, Department of Biological Sciences Date  
 1/14/2020  
 Chair, Sciences Curriculum Committee Date  
 1/17/2020  
 Janelle Simpson  
 Dean, College of Sciences Date

\_\_\_\_\_  
Chair, University Courses & Curricula Committee Date

\_\_\_\_\_  
Dean, Academic and Student Affairs Date

PROPOSED EFFECTIVE DATE: when approved

APPROVED EFFECTIVE DATE: \_\_\_\_\_

**NC STATE UNIVERSITY**

TO: Office of the Dean for Academic and Student Affairs  
FROM: Jane Lubischer, Associate Department Head, Biological Sciences  
RE: Request to update Major Requirements and Electives for the B.S. in Biological Science, 17BIOSCBS (no sub-plan)  
DATE: 22 November 2019

**Proposed effective date:** when approved

**Proposed changes and justification**

New courses and re-evaluation of our elective lists has prompted us to expand and edit our list of Major Requirement Option and Major Electives for our B.S. in Biological Sciences (no sub-plan).

**ADD to PHYSIOLOGY REQUIREMENT Options**

- BIO 240 Principles of Human Anatomy and Physiology [A]
- BIO 245 Principles of Human Anatomy and Physiology [B]

**ADD to LIFE SCIENCE ELECTIVES, Ecology & Evolution List Only**

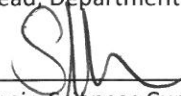
- BIO 432 Evolutionary Medicine

**ADD to LEARNING EXPERIENCE ELECTIVE Options**

- MB 360 Scientific Inquiry in Microbiology: At the Bench
- BSC 494 Teaching Experience

**SIGNATURES:**

 11/25/19  
\_\_\_\_\_  
Head, Department of Biological Sciences Date

 1/14/2020  
\_\_\_\_\_  
Chair, Sciences Curriculum Committee Date

 1/17/2020  
\_\_\_\_\_  
Dean, College of Sciences Date

\_\_\_\_\_  
Chair, University Courses & Curricula Committee Date

\_\_\_\_\_  
Dean, Academic and Student Affairs Date

PROPOSED EFFECTIVE DATE: when approved

APPROVED EFFECTIVE DATE: \_\_\_\_\_



**NC STATE UNIVERSITY**

TO: Office of the Dean for Academic and Student Affairs  
FROM: Jane Lubischer, Associate Department Head, Biological Sciences  
RE: Request to update Major Electives for the B.S. in Biological Science, Ecology, Evolution, and Conservation Biology Concentration (17BIOSCBS-17BIOSCEEC)  
DATE: 22 November 2019

**Proposed effective date:** when approved

**Proposed changes and justification**

New courses and re-evaluation of our elective lists has prompted us to expand and edit our list of Major Electives for our B.S. in Biological Sciences – Ecology, Evolution, and Conservation Biology Concentration.

**ADD to EEC ELECTIVE options**

- BCH 351 General Biochemistry
- BIO 310 Quantitative Approaches to Biological Problems
- FW 460 International Wildlife Management
- GN 435 Personal Genomics
- MB 470 Emerging and Re-emerging Infectious Diseases


**ADD to Learning Experience Elective List**

- BSC 494 Teaching Experience

**SIGNATURES:**

 11/25/19  
Head, Department of Biological Sciences Date

 1/14/2020  
Chair, Sciences Curriculum Committee Date

 1/17/2020  
Dean, College of Sciences Date

\_\_\_\_\_  
Chair, University Courses & Curricula Committee Date

PROPOSED EFFECTIVE DATE: when approved

APPROVED EFFECTIVE DATE: \_\_\_\_\_

**NC STATE UNIVERSITY**

TO: Office of the Dean for Academic and Student Affairs  
FROM: Jane Lubischer, Associate Department Head, Biological Sciences  
RE: Request to update Major Electives for the B.S. in Biological Science, Integrative Physiology and Neurobiology Concentration (17BIOSCBS-17BIOSCIPN)  
DATE: 22 November 2019

**Proposed effective date:** when approved

**Proposed changes and justification**

New courses and re-evaluation of our elective lists has prompted us to expand and edit our list of Major Electives for our B.S. in Biological Sciences – Integrative Physiology and Neurobiology Concentration.

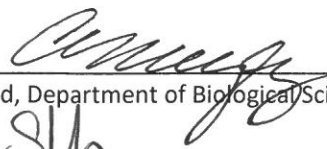
**ADD to IPN ELECTIVE options**

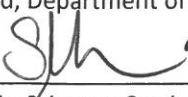
- ANS 220 Reproductive Physiology
- ANS 221 Reproductive Physiology Lab
- ANS/NTR/PO 415 Comparative Nutrition
- ANS 452/552 Comparative Reproductive Biology and Biotech
- BIO 361 Developmental Biology
- BIO 418 Cell Biology Research Laboratory
- BIO 432 Evolutionary Medicine
- BIO 478 Research Fundamental in Behavioral Neurobiology
- BIT 466/566 Animal Cell Culture Techniques
- BIT 471 RNA Interference and Model Organisms
- BIT 564 Protein Purification
- GN 434 Genes and Development
- GN 453 Personal Genomics
- GN 441 Human and Biomedical Genetics
- PO 404/504 Avian Anatomy and Physiology
- TOX 401/501 Principles of Toxicology

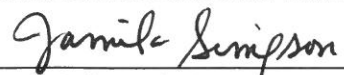
**ADD to SUPRAORGANISMAL ELECTIVE LIST**

- BIO 432 Evolutionary Medicine

**SIGNATURES:**

 11/25/11  
Head, Department of Biological Sciences Date

 1/14/2020  
Chair, Sciences Curriculum Committee Date

 1/17/2020  
Dean, College of Sciences Date

\_\_\_\_\_  
Chair, University Courses & Curricula Committee Date

\_\_\_\_\_  
Dean, Academic and Student Affairs Date

PROPOSED EFFECTIVE DATE: when approved

APPROVED EFFECTIVE DATE: \_\_\_\_\_



**NC STATE UNIVERSITY**

TO: Office of the Dean for Academic and Student Affairs  
FROM: Jane Lubischer, Associate Department Head, Biological Sciences  
RE: Request to update Major Electives for the B.S. in Biological Science, Molecular, Cellular, and Developmental Biology Concentration (17BIOSCBS-17BIOSCMCD)  
DATE: 22 November 2019

**Proposed effective date:** when approved

**Proposed changes and justification**

New courses and re-evaluation of our elective lists has prompted us to expand and edit our list of Major Electives for our B.S. in Biological Sciences – Molecular, Cellular, and Developmental Biology Concentration.

**ADD to MCD ELECTIVE options**

- BIO 418 Cell Biology Research Laboratory
- BIO 488 Neurobiology
- GN 421 Molecular Genetics
- GN 453 Personal Genomics
- MB 470 Emerging and Re-emerging Infectious Diseases

**REMOVE from MCD ELECTIVE options – Fall '19 requirement plan**

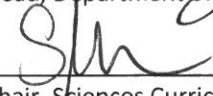
- BIO 421 Advanced Anatomy and Physiology
- BIO 426 Advanced Anatomy and Physiology Laboratory

**ADD to Learning Experience Elective List**

- BSC 494 Teaching Experience

**SIGNATURES:**

 11/25/19  
Head, Department of Biological Sciences Date

 1/14/2020  
Chair, Sciences Curriculum Committee Date

 1/17/2020  
Dean, College of Sciences Date

PROPOSED EFFECTIVE DATE: when approved

**NC STATE UNIVERSITY**

TO: Office of the Dean for Academic and Student Affairs  
FROM: Jane Lubischer, Associate Department Head, Biological Sciences  
RE: Request to update Additional Science and Math Electives and Free Electives for the B.S. in Biological Science, 17BIOSCBS and the B.S. in Zoology 17ZOBS  
DATE: 22 November 2019

**Proposed effective date:** when approved

**Proposed changes and justification**

New courses and re-evaluation of our elective lists has prompted us to expand and edit our list of Additional Science and Math Electives for our B.S. in Biological Sciences and Zoology. This is a common elective list across all curricula within these majors except 17BIOSCEC.

We have also reviewed our Free Electives exceptions list and have decided that these lists should match across these curricula and be significantly truncated.

**Additional Science/Math Electives**

**Add**

- AEC/GN 450 Conservation Genetics (*in the process of changing from AEC to GN prefix*)
- BEC/BIT 463 Fermentation of Recombinant Microorganisms
- BIO 230 The Science of Studying Dinosaurs
- BIO 240 Principles of Human Anatomy and Physiology [A]
- BIO 245 Principles of Human Anatomy and Physiology [B]
- BIO 310 Quantitative Approaches to Biological Problems
- BIO 416 Cancer Cell Biology
- BIO 418 Cell Biology Research Lab
- BIO 432 Evolutionary Medicine
- BIT 477 Metagenomics
- GN 428 Introduction to Machine Learning
- GN 453 Personal Genomics
- MA 331 Diff Equations for the Life Sciences
- MB 470 Emerging and Re-emerging Infectious Disease
- PB 205 Our Green World
- ZO 334 Captive Animal Biology Field Laboratory

**REMOVE from Fall '19 requirement terms**

- BIO 421 Advanced Anatomy and Physiology (no longer offered)
- BIO 426 Advanced Anatomy and Physiology Lab

## Free Electives

**REMOVE** all courses not required by the University to be on this list except for:

- MA 107
- MA 108
- MA 111
- CH 111

### SIGNATURES:

 11/25/17  
\_\_\_\_\_  
Head, Department of Biological Sciences Date

 1/14/2020  
\_\_\_\_\_  
Chair, Sciences Curriculum Committee Date

 1/17/2020  
\_\_\_\_\_  
Dean, College of Sciences Date

\_\_\_\_\_  
Chair, University Courses & Curricula Committee Date

\_\_\_\_\_  
Dean, Academic and Student Affairs Date

PROPOSED EFFECTIVE DATE: when approved

APPROVED EFFECTIVE DATE: \_\_\_\_\_