EP.20.53_FINAL
Approved by EP 12/09/2019

APPROVED BY SENATE
02/10/2020

New Proposal

Date Submitted: 09/20/19 8:46 pm

Viewing: **: JP: Computer Science & Animal Science, BS & Animal Science, MANSC**

Last edit: 11/20/19 9:17 am

Changes proposed by: Sandra Rodriguez-Zas

In Workflow

1. **U Program Review**
2. **1538 Head**
3. **1434 Head**
4. **KP Committee Chair**
5. **KP Dean**
6. **KL Committee Chair**
7. **KL Dean**
8. **University Librarian**
9. **Grad_College**
10. **Provost**
11. **Senate EPC**
12. Senate
13. U Senate Conf
14. Board of Trustees
15. IBHE
16. DMI

Approval Path

1. 09/23/19 9:05 am
   Deb Forgacs (dforgacs):
   Approved for U Program Review
2. 09/23/19 1:09 pm
   Rodney W. Johnson (rwjohn):
   Approved for 1538 Head
3. 09/26/19 12:08 am
   Elsa Gunter (egunter):
   Approved for 1434 Head
4. 10/29/19 11:24 am
   Brooke Newell

(bsnewell): Approved for KP Committee Chair
5. 10/30/19 9:11 am Jean Hanks (jhanks): Approved for KP Dean
6. 10/30/19 11:16 am Anthony Yannarell (acyann): Approved for KL Committee Chair
7. 10/30/19 12:49 pm Anna Ball (aball): Approved for KL Dean
8. 10/30/19 1:42 pm John Wilkin (jpwilkin): Rollback to KL Dean for University Librarian
9. 10/30/19 1:45 pm Anna Ball (aball): Rollback to KL Committee Chair for KL Dean
10. 10/31/19 12:05 pm Anthony Yannarell (acyann): Approved for KL Committee Chair
11. 10/31/19 3:00 pm Anna Ball (aball): Approved for KL Dean
12. 10/31/19 3:35 pm John Wilkin (jpwilkin): Approved for

University Librarian
13. 11/19/19 7:05 pm Allison McKinney (agrindly): Approved for Grad_College
14. 11/19/19 7:19 pm Kathy Martensen (kmartens): Approved for Provost

Proposal Type

Proposal Type:
Joint Program (ex. Master of Public Health & PhD. in Community Health)

Proposal Title:

if this proposal is one piece of a multi-element change please include the other impacted programs here. *example: A BS revision with multiple concentration revisions*

Establish a joint BS(CS+ANSC)/MANSC program in the Department of Animal Sciences

Official Program Name	JP: Computer Science & Animal Science, BS & Animal Science, MANSC
Banner/Codebook Name	

Program Code:

Major Code	Minor Code	Conc Code	Degree Code

EP Control Number	Ep.20.53
Senate Approval Date	
Senate Conference Approval Date	
BOT Approval Date	

IBHE Approval Date	
Effective Date:	
Effective Catalog Term	Fall 2020
Sponsor College	Agr, Consumer, & Env Sciences
Sponsor Department	Animal Sciences
Sponsor Name	Sponsor Email
College Contact	College Contact Email

Identify the existing programs to be joined:

Corresponding Program(s)
Computer Science & Animal Sciences, BS
Animal Sciences, MANSC

Academic Level: Graduate, Undergraduate

Program Description and Justification

Provide a ***brief*** description and justification of the program, including highlights of the program objectives, and the careers, occupations, or further educational opportunities for which the program will prepare graduates, when appropriate.

The Department of Animal Sciences petitions a joint degree program that combines the BS in Computer Science and Animal Sciences [BS(CS+ANSC)] and the non-thesis Master of Animal Sciences (MANSC) programs. Students will receive a BS and MANSC degrees upon completion of 146 credit hours. These credit hours encompass the 126 credit hours required for the established BS degree plus the 32 credit hours required for the established MANSC degree minus 12 graduate-level (400- or 500-level) credit hours that count towards both degrees.
This program addresses the growing demands in the animal industry for students who have advanced foundation in animal sciences combined with a background in computer science and data analysis and management. The Animal Sciences Department already has several faculty members who are conducting research in bioinformatics, microbiome analysis, and animal management and the demand for a workforce that has this combination of backgrounds will grow.
The proposed 4+1 BS/MANSC program advances the land grant mission of the University of Illinois (UofI), College of ACES and Department of Animal Sciences, strengthens the competitiveness of the corresponding academic units, addresses private sector workforce needs, and enhances the likelihood that our graduates will secure high-paying and high-ranking jobs in the areas of food safety and production, health and well-being, environmental conservation, and sustainability.

Is This a Teacher Certification Program?

No

Will specialized accreditation be sought for this program?

No

Institutional Context

University of Illinois at Urbana-Champaign

Describe the historical and university context of the program's development. Include a short summary of any existing program(s) upon which this program will be built.

Explain the nature and degree of overlap with existing programs and, if such overlap exists, document consultation with the impacted program's home department(s).

The proposed joint BS/MANSC program addresses needs, capitalizes on resources, and advances the prospects of students and UofI because the 4+1 program:
* Enables UofI to remain competitive in the recruitment, retention, graduation, and placement of students in the interdisciplinary area encompassed by Computer Sciences and Animal Sciences. Although there are no other CS+ANSC programs in the USA, departments of Animal Sciences at peer institutions including North Carolina State University and Iowa State University already offer accelerated joint programs akin to that proposed and students pursing a double major or minor in computer sciences or similar areas could gain training comparable to that in the proposed joint program.
* Address the need of the agricultural, biomedical, companion animal and information technology industries and government agencies for a workforce that has advanced preparation in state-of-the-art computer science and animal science concepts and approaches. The proposed program will enable graduates to rapidly apply their cutting-edge knowledge in the areas of precision livestock management and health care, personalized health and well-being, traceability related to food safety and production, and environmental conservation and sustainability. The stand-alone MANSC program started in 2019 and already has 10 enrolled students, the majority of whom have BS degrees from other institutions.
* Answer the students' demands for accelerated joint programs that support efficient career preparation paths. Students in the 4+1 program will effectively use the departmental resources, faculty expertise, curricula, and hands-on research experiences in the areas of computer sciences and behavior, bioinformatics, genetics, genomics, immunobiology, microbiology, meat science and muscle biology, management, non-ruminant and ruminant nutrition, and reproductive physiology available at UofI.
* Grant students additional opportunities to take advantage of the 55 graduate-level (400- or 500-level) courses (http://catalog.illinois.edu/) offered by the Department of Animal Sciences and the more than 14 courses in Computer Sciences that are part of the CS+ANSC graduation requirements. The joint programs will also grant the students more opportunities for research and experiential learning. A typical CS+ANSC undergraduate student during a 4-year period enrolls in less than 25% of the Animal Sciences courses available.
* Build on the breadth and depth of the training that CS+ANSC undergraduate students receive by recognizing 12 graduate-level (400- or 500-level) credit hours that are in turn, applied towards a MANSC degree.

University of Illinois

Briefly describe how this program will support the University's mission, focus and/or current priorities. Demonstrate the program's consistency with and centrality to that mission.

* Support the land grant mission of UofI by offering a demanded service: a high quality preparation in Animal Sciences and Computer Sciences in an accelerated format that enables students to graduate with BS(CS+ANSC) and MANSC degrees within five years of admission.
* Strengthen the competitiveness of UofI by offering joint undergraduate (CS+ANSC) and graduate (MANSC) degrees that are not currently offered by peer institutions.
* Address industry workforce needs and enhance the likelihood of UofI graduates to secure high-paying and high-ranking jobs in precision agricultural, biomedical, and companion animal industries in the areas of individualized health and well-being, traceable food safety and production, environmental conservation, and sustainability.

State of Illinois

Indicate which of the following goals of the Illinois Board of Higher Education's Strategic Initiative are supported by this program: (choose all that apply)

College Affordability - ensure college affordability for students, families, and taxpayers.
Educational Attainment - increase educational attainment to match the best-performing states.
High Quality Credentials to Meet Economic Demand - Increase the number of high-quality post-secondary credentials to meet the demands of the economy and an increasingly global society.

Describe how the proposed program supports these goals.

The proposed program support the goal of educational attainment by offering continued training and experiential learning opportunities advised by faculty experts throughout the undergraduate + graduate-level (400- or 500-level) years of the program.
The proposed program supports college affordability because the students in the program can use 12 credit hours from their BS(CS+ANSC) degree towards MANSC graduate-level (400- or 500-level) requirements. Students will be assessed the undergraduate tuition rate and fees that apply to any student enrolled in the CS+ANSC BS program prior to being admitted by The Graduate College of U of I, and they will be assessed the graduate tuition rate that applies to students in the Master of Animal Sciences program thereafter.
The proposed programs supports high quality credentials to meet economic demand because the graduation requirements offer strong preparation to join the private sector workforce.

Admission Requirements

Desired Admissions Term	Fall 2020

Provide a brief narrative description of the admission requirements for this program. Where relevant, include information about licensure requirements, student background checks, GRE and TOEFL scores, and admission requirements for transfer students.

* Students enrolled in the joint programs will be able to apply a maximum of 12 graduate-level (400- or 500-level) credit hours from their B.S. degree in CS+ANSC towards the MANSC degree requirements. The 4+1 program will permit students to graduate with B.S. and MANSC degrees in as early as 5 years. Credit hours from the B.S. in CS+ANSC degree that are applied towards a second major, a minor or a transcriptable certificate cannot be used towards the MANSC degree. TOEFL requirements follow the Graduate College requirements. Applicants are expected to submit GRE scores.
* Students enrolled in the BS(CS+ANSC) program that have completed at least 60 credit hours of degree requirements and that have a minimum GPA of 3.0 are eligible to apply and be admitted to this program. Students that have a GPA above 2.75 may be admitted on probationary status. The Department of Animal Sciences will support the application to the MANSC program of the students in this joint program that have completed the required 126 credit hours towards a BS(CS+ANSC) degree (including 40 hours of 300- or 400- level courses) and that have a minimum GPA of 3.0. Up to 12 graduate-level (400- or 500-level) credit hours from the BS program will count towards the 32 credit-hour requirement of the MANSC program.
* The existing stand-alone MANSC program has a 6 credit hour requirement of an independent research project (ANSC 592/593). This requirement aims to address potential gaps in hands-on research experiences that undergraduate students from other institutions may have because the majorityof the UofI students that pursue a degree encompassing Animal Sciences have either for-credit (ANSC 398) or non-transcripted research experiences. Students in the proposed joint program have the option to substitute, partially or completely, the 6 credit hours of independent research required in the stand-alone MANSC program for graduate-level (400- or 500-level) coursework. This substitution must be petitioned and approved by the departmental faculty committee that also evaluates applications to the joint program. Substitutions will be granted to students that present evidence of research experiences comparable to that expected of MANSC graduates.

Describe how critical academic functions such as admissions and student advising are managed.

* A committee of Animal Sciences faculty will review the applications and determine admissions.
* The Department of Animal Sciences directors of graduate and undergraduate programs together with faulty members of the joint program committee will implement, oversee and regularly evaluate the progress of these programs.
* All students in the joint program will have an undergraduate and a graduate studies advisors. Their joint advising will ensure the student receives guidance on academic activities that support the effective completion of the joint program requirements and target the students’ career goals. Students pursuing research project credit hours will be advised by the faculty member overseeing the research project.

Enrollment

Number of Students in Program (estimate)

Year One Estimate	2	5th Year Estimate (or when fully implemented)
5		

Estimated Annual Number of Degrees Awarded

Year One Estimate	0 (2, 1 year after admission)	5th Year Estimate (or when fully implemented)
5		

Delivery Method

This program is available:
Face-to-Face

Budget

Will the program or revision require staffing (faculty, advisors, etc.) beyond what is currently available?
No

Additional Budget Information
The proposed program builds on existing undergraduate and graduate programs. No additional costs are anticipated because the existing programs and most of the animal sciences courses are at under-capacity and computer sciences courses have dedicated spaces for ANSC students. Students will be assessed tuition charges corresponding to the BS(CS+ANSC) first, and once admitted by the Graduate College, tuition charges will correspond to those of the MANSC program. No campus or external resources will be requested.Students in the proposed program will be enrolled in the existing BS and MANSC programs and will take existing courses (please refer to the Appendix). The existing programs and most of the animal sciences courses are at under-capacity and computer sciences has allocated space for ANSC students. The proposed joint program and the expected enrollment will make effective use of the resources in place. Students pursuing independent projects will benefit from ongoing researcher projects directed by animal sciences faculty. No new courses are proposed.

Attach File(s)

Resource Implications

Facilities

Will the program require new or additional facilities or significant improvements to already existing facilities?

No

Technology

Will the program need additional technology beyond what is currently available for the unit?

No

Non-Technical Resources

Will the program require additional supplies, services or equipment (non-technical)?

No

Resources

Faculty Resources

Please address the impact on faculty resources including any changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc. Describe how the unit will support student advising, including job placement and/or admission to advanced studies.

The progression of academic resources and degree demands evidenced in the departmental profiles (https://dmi.illinois.edu) support the expected enrollment in the proposed joint program. In recent years, 7 junior tenure-track faculty and 3 specialized faculty have joined the Department of Animal Sciences, and all these positions have teaching responsibilities. Similar instructional hire trends are expected in the near future. Since 2014, the number of undergraduate students in Animal Sciences has oscillated between 534 students (2014-2015) and 495 students(2017-2018) while the number of graduate students (master and doctoral levels) has oscillated between 99 students (2014-2015) and 89 students(2017-2016). Similar patterns are observed in the number of BS degrees ranging from 157 degrees (2015-2016) to 111 degrees (2018-2019) meanwhilethe number of master's degrees ranged between 14 degrees (2014-2015) and 23 degrees (2017-2018). The number of BS degrees per faculty FTE hasoscillated from 4.7 (2015-2016) to 3.4 (2018-2019) whereas the number of master's degrees per faculty FTE is 0.7 at present. Also, ANSC students have allocated spaces in the required computer sciences courses. The previous information demonstrates that the present conditions enable the UofI to support the higher BS(CS+ANSC) and MANSC enrollment numbers that are anticipated from the joint program with no or minimal resource implication.

Library Resources

Describe your proposal's impact on the University Library's resources, collections, and services. If necessary please consult with the appropriate disciplinary specialist within the University Library.

Current University Library resources are adequate to meet the needs of the two programs (CS+ANSC BS and MANSC) on which this proposal is based. Given that expected enrollment in the program is expected to be limited (5-10 students in the first 5 years), we do not foresee that this program will place additional significant demands on Library resources.

Instructional Resources

Will there be any reduction in other course offerings, programs or concentrations by your department as a result of this new program/proposed change?

No

Does this new program/proposed change result in the replacement of another program?

No

Does the program include other courses/subjects impacted by the creation/revision of this program?

No

Financial Resources

How does the unit intend to financially support this proposal?

The proposal integrates programs that already in place. The instructional resources are not at capacity and the education and mentoring of students in the proposed self-supported program will not result in additional fixed costs. Once the program is established, a potential minor increase in variable costs associated with additional teaching assistant support can be defrayed with income from the self-supported MANSC degree.

Will the unit need to seek campus or other external resources?

No

Attach letters of support

Memorandum of Understanding CS+X_MSX joint degrees in ACES.pdf

Will an existing tuition rate be used or continue to be used for this program?

Yes

Market Demand

What market indicators are driving this proposal? If similar programs exist in the state, describe how this program offers a unique opportunity for students:

No similar program exist in the state or country. However, Departments of Animal Sciences at peer institutions including North Carolina State University and IowaState University already offer accelerated joint programs in Animal Sciences and students pursuing a double major or minor in computer sciences could gain expertise akin to that in the proposed program. The proposed program will enable UofI to remain competitive in therecruitment, retention, graduation, and placement of students in the field of Animal Sciences with a focus on computer sciences. Animal scientist employment was estimated at approximately more than 1.2 million positions (U.S. Bureau of Labor Statistics, 2015). This metricincludes animal scientists, animal breeders, agricultural managers, non-farm animal caretakers, laboratory animal caretakers, zoologists, and wildlifebiologists and excludes veterinarians. The job opportunities for animal scientists alone are expected to increase more than 8% between 2012 and2022. Post-secondary animal science education and non-farm animal caretakers will see even higher increases during the same 10-year period.

What type of employment outlook should these graduates expect? Explain how the program will meet the needs of regional and state employers, including any state agencies, industries, research centers, or other educational institutions that expressly encourage the program's development.

The more than 1.2 million positions associated with animal sciences disciplines include biotechnology researchers, animal breeders, agricultural managers, non-farm animal caretakers, laboratory animal caretakers, zoologists, and wildlife biologists and excludes veterinarians. The job opportunities for animal scientists alone are expected to increase more than 8% between 2012 and 2022. Post-secondary animal science educationand non-farm animal caretakers will see even higher increases during the same 10-year period. Broader opportunities are available to those that also receive complementary formal training in computer sciences.

What resources will be provided to assist students with job placement?

Comprehensive assistance with job placement is already offered to undergraduate and graduate students and these resources will be available to the students in the proposed program. These resources include invited departmental seminar speakers that represent private sector areas. Interaction with representatives from industry is also common for animal sciences students that participate in research projects funded by state, country andglobal industry partners. The Department of Animal Sciences regularly communicate job opportunities (an average of 3/week) to students through email lists. Animal science students are also encouraged to participate in the career fairs offered by the College of ACES.

If letters of support are available attach them here:

Program Regulation

Describe how the program is aligned with or meets licensure, certification, and/or entitlement requirements, if applicable.

Briefly describe the plan to assess and improve student learning, including the program's learning objectives; when, how, and where these learning objectives will be assessed; what metrics will be used to signify student's achievement of the stated learning objectives; and the process to ensure assessment results are used to improve student learning.

Not applicable.

Is the career/profession for graduates of this program regulated by the State of Illinois?

No

Program of Study

"Baccalaureate degree requires at least 120 semester credit hours or 180 quarter credit hours and at least 40 semester credit hours (60 quarter credit hours) in upper division courses" (source: https://www.ibhe.org/assets/files/PrivateAdminRules2017.pdf). For proposals for new bachelor's degrees, if this minimum is not explicitly met by specifically-required 300- and/or 400-level courses, please provide information on how the upper-division hours requirement will be satisfied.

All proposals must attach the new or revised version of the Academic Catalog program of study entry. Contact your college office if you have questions.

For new programs, attach Program of Study: ANSC4+1CSANMANacademiccatalogrev2_sep172019.docx

Catalog Page Text

Catalog Page Text: Description of program for the catalog page. This is not official content, it is used to help build the catalog pages for the program. Can be edited in the catalog by the college or department.

The joint BS(CS+ANSC)/MANSC program integrates a baccalaureate degree (BS) preparation in Computer Sciences and Animal Sciences (CS+ANSC) with a non-thesis Master of Animal Sciences (MANSC) preparation. Students enrolled in the BS(CS+ANSC) program that have completed at least 60 credit hours of degree requirements and that have a minimum GPA of 3.0 are eligible to apply and be admitted to this program. Students that have a GPA above 2.75 may be admitted on probationary status. The Department of Animal Sciences will support the application to the MANSC program of the students in this joint program that have completed the required 126 credit hours towards a BS(CS+ANSC) degree (including 40 hours of 300- or 400- level courses) and that have a minimum GPA of 3.0. Up to 12 graduate-level (400- or 500-level) credit hours from the BS program will count towards the 32 credit-hour requirement of the MANSC program.

Statement for Programs of Study Catalog

The joint BS(CS+ANSC/MANSC program integrates a baccalaureate (BS) in CS+ANSC preparation with a non-thesis Master of Animal Sciences (MANSC) preparation. Students enrolled in the BS(CS+ANSC) program that have completed at least 60 credit hours of degree requirements and that have a minimum GPA of 3.0 are eligible to apply and be admitted to this program. Students that have a GPA above 2.75 may be admitted on probationary status. The Department of Animal Sciences will support the application to the MANSC program of the students in this joint program that have completed the required 126 credit hours towards a BS(CS+ANSC) degree (including 40 hours of 300- or 400- level courses) and that have a minimum GPA of 3.0. Up to 12 graduate-level (400- or 500-level) credit hours from the BS program will count towards the 32 credit-hour requirement of the MANSC program.
Please refer to the Academic Catalog entries for the BS(CS+ANSC) and MANSC programs for the requirements of each program component.

EP Documentation

Attach
Rollback/Approval
Notices

DMI Documentation

Attach Final
Approval Notices

Attached
Document

Justification for
this request

Program Reviewer
Comments

Deb Forgacs (dforgacs) (09/20/19 8:37 am): Rollback: proposer request.
John Wilkin (jpwilkin) (10/30/19 1:42 pm): Rollback: Please include the Appendix referred to in the proposal. In order to evaluate the Library portion, which relies on the Appendix, we will need that in the proposal.
Anna Ball (aball) (10/30/19 1:45 pm): Rollback: Tony, they need an appendix, do you have this to attach or does it need to be rolled farther?
Anthony Yannarell (acyann) (10/31/19 12:05 pm): In consultation with the Dr. Rodriguez-Zas (the original proposer), I've modified the language of the Library Resources section to better address this question, and I've removed the mention of the Appendix.

Key: 887

Academic Catalog program of study entries (BS CS+ANSC, and MANSC)

Degree of Bachelor of Science Major in Computer Science & Animal Sciences

Code	Title	Hours
Composition and Speech (choose 1 from):		**6-7**
RHET 105 & CMN 101	Writing and Research and Public Speaking	4&3
CMN 111 & CMN 112	Oral & Written Comm I and Oral & Written Comm II	
Advanced Composition (students select from Gen Ed List)		**3-4**
Cultural Studies		
Western Culture (students select from Gen Ed List)		3
Non-Western Culture (students select from Gen Ed List)		3
US Minority Culture (students select from Gen Ed List)		3
Language other than English (at or above 3rd level)		
Natural Sciences and Technology		**8**
CHEM 102 & CHEM 103	General Chemistry I and General Chemistry Lab I	4
CHEM 104 & CHEM 105	General Chemistry II and General Chemistry Lab II	4
Humanities and the Arts (students select from Gen Ed List)		**6**
Social and Behavioral Sciences		**6-7**
ECON 102	Microeconomic Principles	3
or ACE 100	Agr Cons and Resource Econ	
Students choice from Gen Ed List		
Mathematical Foundations (fulfills Quantitative Reasoning I & II)		**12-13**

Code	Title	Hours
CS 361	Probability & Statistics for Computer Science	3
MATH 220	Calculus	4-5
or MATH 221	Calculus I	
MATH 225	Introductory Matrix Theory	2
MATH 231	Calculus II	3
Computer Sciences Core		**22**
CS 100	Freshman Orientation	0-1
CS 125	Intro to Computer Science	4
CS 126	Software Design Studio	3
CS 173	Discrete Structures	3
CS 225	Data Structures	4
CS 374	Introduction to Algorithms & Models of Computation	4
CS 357	Numerical Methods I	3or3
or CS 421	Programming Languages & Compilers	
Computer Science Technical Track (two options)		**9-11**
CS 233 & CS 241	Computer Architecture and System Programming	4&4
OR		
CS 240	Introduction to Computer Systems	3
& Two CS 400	Any two (2) 400-level CS courses except CS 491	6-8
Animal Sciences Core		**34-36**
ANSC 100	Intro to Animal Sciences	4
ANSC 221	Cells, Metabolism and Genetics	3

Code	Title	Hours
ANSC 222	Anatomy and Physiology	3
ANSC 223	Animal Nutrition	3
ANSC 224	Animal Reproduction and Growth	4
ANSC 398	UG Experiential Learning	1
ANSC 498	Integrating Animal Sciences	2
Applied Animal Sciences Courses (choose 3)		**9**
ANSC 201	Principles of Dairy Production	3
ANSC 204	Intro Dairy Cattle Evaluation	2
ANSC 205	World Animal Resources	3
ANSC 206	Horse Management	3
ANSC 211	Breeding Animal Evaluation	3
ANSC 219	Meat Technology	3
ANSC 250	Companion Animals in Society	3
ANSC 301	Food Animal Production, Management, and Evaluation	3
ANSC 305	Human Animal Interactions	3
ANSC 307	Companion Animal Management	3
ANSC 309	Meat Production and Marketing	2
ANSC 310	Meat Selection and Grading	3
ANSC 312	Advanced Livestock Evaluation	3
ANSC 313	Horse Appraisal	2
ANSC 314	Adv Dairy Cattle Evaluation	2
ANSC 322	Livestock Feeds and Feeding	3

Code	Title	Hours
ANSC 370	Companion Animal Policy	3
ANSC 400	Dairy Herd Management	3
ANSC 401	Beef Production	3
ANSC 402	Sheep Production	3
ANSC 403	Pork Production	3
ANSC 404	Poultry Science	3
ANSC 405	Advanced Dairy Management	2
ANSC 407	Animal Shelter Management	3
ANSC 424	Pet Food & Feed Manufacturing	3
ANSC 435	Milk Quality and Udder Health	2
ANSC 437	Adv Reproductive Management	2
ANSC 471	ANSC Leaders & Entrepreneurs	3
Basic Animal Sciences Courses (choose 3)		**9**
ANSC 251	Epidemics and Infectious Diseases	3
ANSC 306	Equine Science	3
ANSC 331	Biology of Reproduction	2-4
ANSC 350	Cellular Metabolism in Animals	3
ANSC 363	Behavior of Domestic Animals	3
ANSC 366	Animal Behavior	3
ANSC 406	Zoo Animal Conservation Sci	3
ANSC 409	Meat Science	3
ANSC 420	Ruminant Nutrition	3

Code	Title	Hours
ANSC 421	Minerals and Vitamins	3
ANSC 422	Companion Animal Nutrition	3
ANSC 431	Advanced Reproductive Biology	3
ANSC 438	Lactation Biology	4
ANSC 440	Applied Statistical Methods I	4
ANSC 441	Human Genetics	3-4
ANSC 444	Applied Animal Genetics	3
ANSC 445	Statistical Methods	4
ANSC 446	Population Genetics	3-4
ANSC 447	Advanced Genetics and Genomics	4
ANSC 448	Math Modeling in Life Sciences	3-4
ANSC 449	Biological Modeling	3-4
ANSC 450	Comparative Immunobiology	4
ANSC 451	Microbes and the Anim Indust	3
ANSC 452	Animal Growth and Development	3-4
ANSC 453	Stem Cell Biology	3-4
ANSC 467	Applied Animal Ecology	3
ANSC 509	Muscle Biology	2
ANSC 510	Science of Animal Well-Being	1.5
ANSC 520	Protein and Energy Nutrition	3
ANSC 521	Regulation of Metabolism	4
ANSC 522	Advanced Ruminant Nutrition	3

Code	Title	Hours
ANSC 523	Techniques in Animal Nutrition	3
ANSC 524	Nonruminant Nutrition Concepts	2
ANSC 525	Topics in Nutrition Research	1
ANSC 526	Adv Companion Animal Nutrition	3
ANSC 533	Repro Physiology Lab Methods	1-3
ANSC 541	Regression Analysis	5
ANSC 542	Applied Bioinformatics	4
ANSC 543	Bioinformatics	4
ANSC 545	Statistical Genomics	3-4
ANSC 554	Immunobiological Methods	3
ANSC 561	Animal Stress Physiology	2
The required 126 hours must include a minimum of 40 hours of 300- and 400-level courses		

And

Animal Sciences, MANSC

Degree Requirements

Code	Title	Hours
ANSC 590	Animal Sciences Seminar	2
ANSC 440	Applied Statistical Methods I	4
or ANSC 445	Statistical Methods	
500-level courses		6
(excludes ANSC 590, ANSC 592, ANSC 593)		
400- or 500-level ANSC courses		6
(excludes ANSC 590, ANSC 592, ANSC 593, ANSC 440, ANSC 445)		

Code	Title	Hours
Other graduate-level electives		8
(excludes ANSC 590, ANSC 592, ANSC 593, ANSC 440, ANSC 445)		
ANSC 592	Adv Topics in Animal Science	6
or ANSC 593	Res Studies in Animal Sciences	
Total Hours		**32**

Course List

* A maximum of 12 graduate-level credit hours from the B.S. degree will count towards the MANSC degree

Memorandum of Understanding (MOU)
Between
The Grainger College of Engineering and The College of Agricultural, Consumer & Environmental Sciences

The goal of this Memorandum of Understanding (MOU) is to outline logistics surrounding the administration of the joint degree programs of BS (CS+ANSC)/MANSC in the Department of Animal Sciences and the BS (CS+Crop Sciences)/MS in Crop Sciences in the Department of Crop Sciences.

Of specific focus is how and when students transition from the BS portion of the joint degree (during which they pay undergraduate tuition including engineering differential and have preferential access to coursework in the Department of Computer Science required to complete the degree and services provided by the Grainger College of Engineering), to the MS portion of the joint degree (during which they pay graduate tuition which includes neither engineering differential nor preferential access to coursework in the Department of Computer Science nor services provided by the Grainger College of Engineering).

Specifically, it is understood and agreed that:

1) A student who is accepted into either joint degree program continues to pay the engineering tuition and differential assessed to undergraduate students in the relevant CS+X program until requirements are completed for the CS+X undergraduate degree (less "shared" credits in the related graduate degree, which must be in the X discipline). During this time, the student continues to have preferred access to Computer Science undergraduate courses (through the 400 level) required to complete their undergraduate degree. They also continue to have access to support services provided by the Grainger College of Engineering (e.g., Computer Science departmental advising, Engineering Career Services, International Programs in Engineering, Engineering City Scholars).
2) Once a student has completed the undergraduate degree requirements for the CS+X degree (less "shared" credits), they are coded as a graduate student in the department offering the graduate degree within the joint degree, begin paying the graduate student tuition associated with that graduate degree, and lose preferred access to courses offered by the Department of Computer Science and other services offered by the Grainger College of Engineering.
3) It is the responsibility of the Department/College offering the joint program to certify that the undergraduate degree requirements (less "shared" credits) are satisfied before transferring the student to the graduate program. This specifically includes that all Computer Science courses required for the undergraduate CS+X degree are completed. It is also the responsibility of the offering Department/College to advise the student about the implications of losing future preferential access to Computer Science courses and engineering services.

4) A student who has been transferred to the graduate program and decides not to complete the graduate degree may petition the offering Department/College to withdraw from the combined program. They may request to have their graduate hours earned converted to undergraduate hours and applied toward the completion of the traditional undergraduate CS+X degree (full credit hour version without a reduction for "shared" credits).

Both parties agree to these arrangements for the initial implementation of the joint degree programs. Modifications may be requested by either party and enacted, through an addendum to this agreement, if agreed to by both parties.

Agreement entered into on October 22, 2019.

Jonathan J. Makela
Associate Dean for Undergraduate Programs
Grainger College of Engineering

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