



Proposal to the Senate Educational Policy Committee

PROPOSAL TITLE: Establish a New Major in Computer Science and Animal Sciences for the Bachelor of Science in the Department of Animal Sciences in the College of Agricultural, Consumer and Environmental Sciences.

SPONSOR: David J. Miller, Professor and Undergraduate Teaching Coordinator, Department of Animal Sciences, 333-3408, djmille@illinois.edu, and Elsa Gunter, Research Professor and Director of Undergraduate Programs, Computer Science, 265-6118, egunter@illinois.edu

COLLEGE CONTACT: Mary Lowry, Assistant Dean, College of ACES Academic Programs, 333-9391, lowry@illinois.edu

BRIEF DESCRIPTION: This collaborative program in Computer Science and Animal Sciences is for undergraduate students who plan to pursue careers in the animal-related fields with a technology, data handling and management focus and/or a genomics focus. This degree will prepare students for advanced study at a graduate level, as well as immediate entry into the workforce.

JUSTIFICATION: The Department of Animal Sciences and the Department of Computer Science propose a new major that is a combination of Animal Sciences and Computer Science. This proposed new curriculum is in response to the growing demands in the animal industry for students who have a 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 we believe that the demand for students with this combination of backgrounds will grow. The animal industry is eager to find students who have skills in precision animal agriculture, remote sensing, bioinformatics, web programming, and data analysis. Through cooperation between the Computer Science and Animal Sciences Departments, we plan to provide an innovative program for students who are interested in these career fields. This proposed curriculum follows the precedent already established through the CS + X programs offered in Computer Science + Crop Sciences, Computer Science + Advertising, Computer Science + Anthropology, Computer Science + Astronomy, Computer Science + Chemistry, Computer Science + Linguistics, and CS + Music. This program would provide students who are interested in computer applications applied to Animal Sciences with that opportunity. The program will give students knowledge in both fields that is complimentary so that they can generate, analyze, and interpret large datasets.

The CS + ANSC degree is rigorous and will be selective. The proposed curriculum is challenging so students will need to perform at a high academic level to be successful. The CS + ANSC degree is not intended for students who are unable to be admitted into Computer Science; the interdisciplinary requirements of CS + ANSC would be unsuitable for them. The program is designed for selected students with specific interests and career goals that include both areas of study.

The course requirements include core courses in both disciplines and meet the IBHE requirements that 40 hours of upper division courses must be completed. Upper division courses have been described as 300 and 400 level courses and some 200 level courses with multiple prerequisites. The 200 level courses included as upper division courses in the CS + ANSC proposal have already been approved in other CS + X programs. The requirements include a minimum of 43 hours of upper division or upper division-approved coursework.

BUDGETARY AND STAFF IMPLICATIONS: *(Please respond to each of the following questions.)*

1) Resources

- a. How does the unit intend to financially support this proposal?

As is the case for the existing CS + X majors, students enrolled in this program will pay the same differential tuition as the current College of Engineering Computer Science students. Differential tuition will be shared equally by the College of Engineering and the College of ACES.

- b. How will the unit create capacity or surplus to appropriately resource this program? If applicable, what functions or programs will the unit no longer support to create capacity?

The need for new resources is not anticipated as both the Computer Science and Animal Sciences degrees already exist on campus, and both departments are prepared with the resources needed for regular growth of the programs. No new courses are being proposed specifically for the CS + ANSC degree. We expect to enroll 10-15 students per year (15 maximum) so the size of this degree is limited. Any additional resources that are needed in the future can be covered by the use of the differential tuition. A request for a differential tuition rate will be submitted for BOT approval.

- c. Will the unit need to seek campus or other external resources? If so, please provide a summary of the sources and an indication of the approved support.

Additional support will not be requested. Letters of support from the Departments of Computer Science and Animal Sciences are attached.

- d. Please provide a letter of acknowledgment from the college that outlines the financial arrangements for the proposed program.

A letter from the Colleges of ACES is attached.

2) Resource Implications

- a. Please address the impact on faculty resources including the changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc.

The Computer Science and Animal Sciences courses that are required for the major have the capacity or can be expanded through the use of differential tuition to accommodate new students. The Departments will work jointly to advise students, and ensure a timely graduation rate. The Departments do not believe that an additional 10-15 students/year in this major will exceed capacity in courses in either Computer Science or Animal Sciences. The 100 and 200 level required courses in Animal Sciences can easily add this number of students and students have many choices for upper division courses so the number in any one course will not change significantly. The Departments will be working together to advertise the major and keep advising channels open so students receive the best education possible. The students in this major will be primarily advised in Animal Sciences, with advice from CS about the CS curriculum. The Department of Animal Sciences has capacity to advise additional students and specific appropriate faculty within Animal Sciences will be assigned as advisors. There is an open search for a new tenure-track faculty member in Digital Animal Sciences/Animal Bionomics and the holder of this position will be one of the advisors of these students.

- b. Please address the impact on course enrollment in other units and provide an explanation of discussions with representatives of those units. (*A letter of acknowledgement from units impacted should be included.*)

It is not anticipated that an additional 10-15 students/year in the CS + ANSC major will impact course enrollment in classes outside of Computer Science or Animal Sciences Departments. No significant changes in class enrollment outside of the Departments are anticipated.

- c. Please address the impact on the University Library (*A letter of estimated impact from the University Librarian must be included for all new program proposals. If the impact is above and beyond normal library business practices, describe provisions for how this will be resourced.*)

No impact is expected since both the Computer Science and Animal Sciences degrees already exist. A letter from the University Librarian is attached.

- d. Please address the impact on technology and space (e.g. computer use, laboratory use, equipment, etc.)

No impact is expected on computer or teaching spaces. Most students will use their own computers and needed software is available for free download to students through the University. The classroom sizes for the 100 and 200 level required courses in Animal Sciences can easily add this number of students. If necessary, additional lab sections will be added. Animal Sciences students have many choices for upper division courses so the number in any one course will not change significantly.

LOGISTICS FOR TRANSFER STUDENTS

Transfer Students

A limited number of current UIUC students will be allowed to transfer into the CS + ANSC degree, provided they meet the following minimum criteria:

- Completion of MATH 220 or 221 with a grade of A- or higher or Credit (AP, IB, A-Level, Proficiency): If MATH 231 has been taken at the time of transfer, an A- or higher is required in this course as well.
- Completion of CS 173 and CS 225 with a grade of A- or above in both courses (and any additional CS courses taken at the time of transfer); at least two CS courses must be taken on the UIUC campus.
 - Students will receive overrides for CS “gateway” courses with approval from the ANSC advisor (ANSC advisor will contact CS advisor with approval)
- Completion of ANSC 100 with a grade of A- or above (and any additional ANSC courses taken at the time of transfer): at least one ANSC course must be taken on the UIUC campus.
- Overall GPA must be greater than 3.67 (both UIUC and Combined)

Students meeting these requirements will complete an ICT request form to transfer to the CS + ANSC program, available in Animal Sciences and submit it during the transfer period. Admission to the CS + ANSC program must be approved by the ANSC academic office. Such decisions will also consider the capacity of the program. Students falling beneath the minimum criteria may petition the ANSC department.

For new degree programs only:

- 3) Briefly describe how this program will support the University’s mission, focus, and/or current priorities. Include specific objectives and measurable outcomes that demonstrate the program’s consistency with and centrality to that mission.

The first of its kind in the U.S., the CS + ANSC degree will enhance the reputation of the University of Illinois as an innovator in applying technology to animal sciences. The generation of huge data sets in several areas of animal sciences, such as genomic selection and prediction through molecular genetics and data from remote sensors detecting animal behavior, physiology and health, and microbiome analysis are creating a

growing requirement for people with backgrounds and skills combining animal and computer science. These individuals are essential for management, analysis, and interpretation of the data generated. The proposed cooperative program between two departments in different colleges provides unique opportunities for students to obtain a background that will provide them with an exceptional blend of skills needed to meet this demand that already exists and is expected to grow significantly in the coming years. Students completing this program will possess a distinctive interdisciplinary education and skill set that will allow them to transform the management of food animals to feed a growing population and service/companion animals to make our lives easier and more pleasant. This program will serve the industry by educating students who will be highly sought and will promote economic development by educating highly qualified graduates. Outcome measurements will include the number and quality of the applicants, the nature and the number of student transfers in and out, the “technical GPA” in comparison to the stand-alone CS and ANSC programs, the average time to degree completion, the number of graduates (up to 15 per year), the placement rate and starting salary, and the percentage of graduates finding jobs in related industries.

- 4) Please provide an analysis of the market demand for this degree program. What market indicators are driving this proposal? What type of employment outlook should these graduates expect? What resources will be provided to assist students with job placement?

This proposed program is in response to the growing animal sciences and technology industries. Jobs are readily available to students with this distinctive combination of skills and backgrounds. Some of the job opportunities that have increased in availability in recent years include: precision animal science, bioinformatics, computational biology, and web programming for animal-related companies. These career opportunities are certain to continue growing as the agriculture companies continue to advance and bring more technology into their practices. According to projections from the U.S. Department of Agriculture, there will be 60,000 job openings annually in the agriculture industry through 2020 with only 35,000 students graduating each year to fill these positions. Of these available job opportunities in the next five years, it is estimated that 27% will be in the technology, science, engineering, and mathematics areas of agriculture. “Agriculture is going through a transformation itself into more of that digital space,” said Melissa Harper, vice president of global talent acquisition at Monsanto. “Many of the roles that we need-and those in agriculture need - didn’t exist just five years ago.” Cargill has recently released a suite of digital tools across its animal nutrition business and is investing in computer vision technologies for animal health, such as animal facial recognition. AGCO just opened a center in the Research Park to advance data science, web and mobile development and machine learning for animal and crop sciences. As there are no other CS + ANSC degrees in the U.S., we expect graduates to be in high demand.

The students graduating from this program will receive support from both Computer Science and Animal Sciences advisors, as well as the career services resources provided by the College of ACES and by the University of Illinois.

- 5) If this is a proposed graduate program, please discuss the programs intended use of waivers. If the program is dependent on waivers, how will the unit compensate for lost tuition revenue?

Not applicable.

DESIRED EFFECTIVE DATE:

We are eager to admit students to this program for the term that is available, once we have received all the required approvals.

STATEMENT FOR PROGRAMS OF STUDY CATALOG:

Animal Sciences

www.ansc.illinois.edu/

Department Head: Rodney Johnson, Department Office: 116 Animal Sciences Laboratory, 1207 West Gregory Drive, Urbana, (217) 333-3131

Computer Science

<http://www.cs.illinois.edu>

Department Head: Vikram Adve, Department Office: 2232 Siebel Center, 201 N. Goodwin Avenue, Urbana, (217) 333-3373

Curriculum in Computer Science and Animal Sciences

www.cs.illinois.edu/ or www.ansc.illinois.edu/

This major is sponsored jointly by the Departments of Computer Science and Animal Sciences. The major in Computer Science and Animal Sciences is a program for undergraduate students who plan to pursue careers in the agricultural field that have a technology focus. The degree will prepare students for immediate entry into the workforce, as well as advanced study at the graduate level.

E-mail: academic@cs.illinois.edu or ansc@illinois.edu

Degree title: Bachelor of Science in Computer Science and Animal Sciences

This collaborative program in Computer Science and Animal Sciences is for undergraduate students who plan to pursue careers in the animal-related fields with a remote sensing technology, data handling and management focus and/or a genomics focus. This degree is unique in its integration of approached to collect and handle large data to animal science.

A Major Plan of Study Form must be completed and submitted to the Department of Computer Science Office of Undergraduate Affairs and to the Undergraduate Teaching

Office in Animal Sciences by the beginning of the fifth semester (60-75 hours). Students should contact the Computer Science advisor in 1210 Siebel Center, as well as the Animal Sciences Teaching Coordinator in the Animal Sciences Laboratory.

Students in the Computer Science + Animal Sciences degree will take core courses from each department to provide a foundation for each part of the degree. They will take specific Computer Science upper division courses, and can select from a variety of upper division Animal Sciences courses suited towards their career goals. This degree will prepare students for immediate entry into the workforce as well as advanced study at a graduate level. All Campus General Education and College of ACES foreign language requirements must be met. The minimum required major and supporting course work equates to 80 hours, including 33 in Computer Science and 38 in Animal Sciences. The minimum hours required for graduation is 126. At least forty hours of upper division (approved 200 or 300- and 400-level) coursework must be taken on this campus

To graduate from the Computer Science and Animal Sciences curriculum, a student must complete the following courses, all of which must be taken for a traditional letter grade.

(See Appendix A)

CLEARANCES: (Clearances should include signatures and dates of approval. These signatures must appear on a separate sheet. If multiple departments or colleges are sponsoring the proposal, please add the appropriate signature lines below.)

Signatures:



Animal Sciences Unit Representative:

12-19-18
Date:



College of ACES Representative:

12/19/18
Date:

see attached letter

Computer Sciences Unit Representative:

Date:

Graduate College Representative:

Date:

Council on Teacher Education Representative:

Date:



Department of Computer Science
201 North Goodwin Avenue
Urbana, IL 61801-2302 USA

November 14, 2018

Professor Rodney W. Johnson
Head, Dept. of Animal Sciences
University of Illinois

Dear Professor Johnson,

I am pleased to let you know that the Computer Science faculty enthusiastically approved the CS + Animal Sciences proposal that we have been jointly working on over the last several months, and is in full support of the new program. Based on the many overlaps outlined in the proposal we think that this is a very natural fit and an excellent opportunity for both departments, as well as for future students whose interests align with the program.

We have evaluated our current course offerings and how they might be affected by the influx of the anticipated CS+ANSC majors, and do not anticipate any problems in ensuring that they will have access. Moreover, the impact on course enrollments should be minimal, as these new majors will represent only a very small fraction relative to the current size of those courses. Finally, the CS Department is in a growth phase, having added seven new faculty (tenure track plus instructional) last year, and plans to hire additional this year. The addition of these faculty should allow us to grow our course offerings where most needed.

Sincerely,

A handwritten signature in cursive script that reads 'Elsa L. Gunter'.

Elsa L. Gunter
Research Professor
Director of Undergraduate Programs
Department of Computer Science
University of Illinois at Urbana – Champaign
Phone: 217-265-6118
Email: egunter@illinois.edu



COLLEGE OF AGRICULTURAL, CONSUMER AND ENVIRONMENTAL SCIENCES

Academic Programs
128 Mumford Hall, MC-710
1301 W. Gregory Drive
Urbana, IL 61801

November 21, 2018

To Whom it May Concern:

This letter serves as a support document for the proposal to Establish a New Major in Computer Science and Animal Sciences for the Bachelor of Science in the Department of Animal Sciences in the College of Agricultural, Consumer and Environmental Sciences. The Department of Animal Sciences will be applying for the standard CS+X tuition rate for this program at the next opportunity. The department is not requesting any additional funding from the College of ACES to implement this proposal. In addition, the College Courses and Curricula Committee has reviewed the proposal and agrees that no funding in excess of what the department will be able to provide is needed to support the program. If there are any questions, please contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'David Rosch', with a long, sweeping underline.

David Rosch
Associate Dean

CC: R. Chappell

UNIVERSITY OF ILLINOIS
AT URBANA - CHAMPAIGN

University Library

Office of University Librarian and Dean of Libraries
230 Main Library, MC-522
1408 West Gregory Drive
Urbana, IL 61801



December 3, 2018

Mary Lowry
Assistant Dean for Student Success
College of ACES
128 Mumford
1301 West Gregory Dr.
M/C 710

Dear Dean. Lowry:

The University Library recently received a proposal from you outlining the plans of the departments of Animal Sciences and Computer Science to Establish a New Major in Computer Science and Animal Sciences for the Bachelor of Science in the Department of Animal Sciences in the College of Agricultural, Consumer and Environmental Sciences.

Based upon the documents received and reviewed by Erin Kerby in the Funk ACES Library, it is our belief that there will be no impact on the University Library. We are already supporting services in this area and see no meaningful changes in our operations as a result of this move.

If additional services or materials are required as the program further develops, we will be happy to discuss those needs as they emerge.

Sincerely,

A handwritten signature in black ink, appearing to read "John P. Wilkin".

John P. Wilkin
Juanita J. and Robert E. Simpson
Dean of Libraries and University Librarian

e-c: Elsa Gunter, Research Professor and Director of Undergraduate Programs, Computer Science
Erin Kerby
David J. Miller, Professor and Undergraduate Teaching Coordinator, Department of Animal
Sciences
Thomas Teper

Appendix A:

Course Rubric and Number	Course Title	Credit hrs
Composition and Speech		
RHET 105 & CMN 101 OR CMN 111 & CMN 112	Writing and Public Speaking OR Oral & Written Communication I & II	6-7
Advanced Composition	Students select from approved list	3-4
Cultural Studies		
Western Culture	Students select from approved list	3
Non-Western Culture	Students select from approved list	3
US Minority Culture	Students select from approved list	3
Language other than English (at or above 3 rd level)		
Natural Sciences and Technology		
Chem 102 and 103	General Chemistry I and Lab	4
Chem 104 and 105	General Chemistry II and Lab	4
Humanities and the Arts	Students select from approved list	6
Social and Behavioral Sciences		
ECON 102 or ACE 100		3-4
Student's Choice	Students select from approved list	3
Mathematical Foundations (fulfills Quantitative Reasoning I & II)		
CS 361	Probability & Statistics for Computer Science	3
MATH 220 or MATH 221	Calculus or Calculus I	4-5
MATH 225	Introductory Matrix Theory	2
MATH 231	Calculus II	3
Computer Sciences Core		
CS 100	Freshman Orientation (Recommended)	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 OR CS 421	Numerical Methods I OR Programming Languages & Compilers	3
Computer Science Technical Track (two options)		8-9
CS 233* and 241*	Computer Architecture and System Programming	
OR CS 240* plus CS 400 level courses listed on CS website	Introduction to Computer Systems and 2 others	
Animal Sciences Core		
ANSC 100	Intro to Animal Sciences	4
ANSC 221	Cells, Metabolism and Genetics	3
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
Three Applied ANSC Courses	Students select from approved list (see below)	9
Three Basic ANSC Courses	Students select from approved list (see below)	9
Electives to total 126 hours		3-5
Total hours		126

*Have been approved as upper division courses, based on the number of prerequisites.

** ANSC 398 only fulfills the degree requirements when taken for a standard letter grade.

Applied Animal Sciences Courses

<u>ANSC 201</u>	Principles of Dairy Production
<u>ANSC 204</u>	Intro Dairy Cattle Evaluation
<u>ANSC 205</u>	World Animal Resources
<u>ANSC 206</u>	Horse Management
<u>ANSC 211</u>	Breeding Animal Evaluation
<u>ANSC 219</u>	Meat Technology
<u>ANSC 250</u>	Companion Animals in Society
<u>ANSC 301</u>	Food Animal Production, Management, and Evaluation
<u>ANSC 305</u>	Human Animal Interactions
<u>ANSC 307</u>	Companion Animal Management
<u>ANSC 309</u>	Meat Production and Marketing
<u>ANSC 310</u>	Meat Selection and Grading
<u>ANSC 312</u>	Advanced Livestock Evaluation
<u>ANSC 313</u>	Horse Appraisal
<u>ANSC 314</u>	Adv Dairy Cattle Evaluation
<u>ANSC 322</u>	Livestock Feeds and Feeding
<u>ANSC 370</u>	Companion Animal Policy
<u>ANSC 400</u>	Dairy Herd Management
<u>ANSC 401</u>	Beef Production
<u>ANSC 402</u>	Sheep Production
<u>ANSC 403</u>	Pork Production
<u>ANSC 404</u>	Poultry Science
<u>ANSC 405</u>	Advanced Dairy Management
<u>ANSC 407</u>	Animal Shelter Management
<u>ANSC 424</u>	Pet Food & Feed Manufacturing

<u>ANSC 435</u>	Milk Quality and Udder Health
<u>ANSC 437</u>	Adv Reproductive Management
<u>ANSC 471</u>	ANSC Leaders & Entrepreneurs

Basic Animal Sciences Courses

<u>ANSC 251</u>	Epidemics and Infectious Diseases
<u>ANSC 306</u>	Equine Science
<u>ANSC 331</u>	Biology of Reproduction
<u>ANSC 350</u>	Cellular Metabolism in Animals
<u>ANSC 363</u>	Behavior of Domestic Animals
<u>ANSC 366</u>	Animal Behavior
<u>ANSC 406</u>	Zoo Animal Conservation Sci
<u>ANSC 409</u>	Meat Science
<u>ANSC 420</u>	Ruminant Nutrition
<u>ANSC 421</u>	Minerals and Vitamins
<u>ANSC 422</u>	Companion Animal Nutrition
<u>ANSC 431</u>	Advanced Reproductive Biology
<u>ANSC 438</u>	Lactation Biology
<u>ANSC 440</u>	Applied Statistical Methods I
<u>ANSC 441</u>	Human Genetics
<u>ANSC 444</u>	Applied Animal Genetics
<u>ANSC 445</u>	Statistical Methods
<u>ANSC 446</u>	Population Genetics
<u>ANSC 447</u>	Advanced Genetics and Genomics
<u>ANSC 448</u>	Math Modeling in Life Sciences
<u>ANSC 449</u>	Biological Modeling
<u>ANSC 450</u>	Comparative Immunobiology
<u>ANSC 451</u>	Microbes and the Anim Indust
<u>ANSC 452</u>	Animal Growth and Development
<u>ANSC 453</u>	Stem Cell Biology
<u>ANSC 467</u>	Applied Animal Ecology
<u>ANSC 509</u>	Muscle Biology
<u>ANSC 510</u>	Science of Animal Well-Being

<u>ANSC 520</u>	Protein and Energy Nutrition
<u>ANSC 521</u>	Regulation of Metabolism
<u>ANSC 522</u>	Advanced Ruminant Nutrition
<u>ANSC 523</u>	Techniques in Animal Nutrition
<u>ANSC 524</u>	Nonruminant Nutrition Concepts
<u>ANSC 525</u>	Topics in Nutrition Research
<u>ANSC 526</u>	Adv Companion Animal Nutrition
<u>ANSC 533</u>	Repro Physiology Lab Methods
<u>ANSC 541</u>	Regression Analysis
<u>ANSC 542</u>	Applied Bioinformatics
<u>ANSC 543</u>	Bioinformatics
<u>ANSC 545</u>	Statistical Genomics
<u>ANSC 554</u>	Immunobiological Methods
<u>ANSC 561</u>	Animal Stress Physiology