

MICHIGAN STATE UNIVERSITY

Report of
THE UNIVERSITY COMMITTEE ON CURRICULUM
to the Faculty Senate
September 10, 2019

The effective date for new programs subject to Statewide Academic Program review is implemented in accordance with the Statewide Academic Program Review calendar.

MICHIGAN STATE UNIVERSITY
University Committee on Curriculum

September 10, 2019

TO: Faculty Senate

This report is prepared and distributed for the following purposes:

1. To report new academic programs, changes in academic programs, discontinuations of academic programs, new courses, permanent changes in courses, and deletions of courses.
2. To notify the initiating colleges, schools, and departments of approval by the University Committee on Curriculum of their requests for new academic programs, changes in academic programs, discontinuations of academic programs, new courses, permanent changes in courses, and deletions of courses. Any items not approved by the Faculty Senate will be reported to the appropriate college and department or school.
3. To provide information to members of the faculty in each department about academic programs and courses in all colleges, departments, and schools of the University.

Reports of the University Committee on Curriculum to the Faculty Senate are organized as follows:

PART I - NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES:

Organized by colleges in alphabetical order. For a given college, academic units are organized in alphabetical order. For a given academic unit, degrees, majors, and specializations are organized in alphabetical order.

PART II - NEW COURSES:¹

Organized by academic units in alphabetical order; All-University courses appear last. For a given academic unit, courses are organized according to the names associated with course subject codes, in alphabetical order. Courses with the same subject code are in numerical order.

PART III - COURSE CHANGES:¹

Organized by academic units in alphabetical order; All-University courses appear last. For a given academic unit, courses are organized according to the names associated with course subject codes, in alphabetical order. Courses with the same subject code are in numerical order.

Not all of the above categories, and not all of the colleges and academic units, will necessarily appear in any given Senate Report.

¹One or more of the abbreviations that follow may be included in a course entry:

- P: = Prerequisite monitored in SIS
- C: = Corequisite
- R: = Restriction
- RB: = Recommended background
- SA: = Semester Alias

MICHIGAN STATE UNIVERSITY

September 10, 2019

TO: Faculty Senate
FROM: University Committee on Curriculum
SUBJECT: New Academic Programs and Program Changes:
New Courses and Course Changes

PART I - NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

1. Change the requirements for the **Bachelor of Science** degree in **Animal Science** in the Department of Animal Science.

The concentrations in the Bachelor of Science degree in Animal Science are noted on the student's academic record when the requirements for the degree have been completed.

*The concentration in **Production Animal Scholars** will no longer be available. Students who have not completed the requirements for this concentration by Fall 2021 will have to switch to a different concentration.*

- a. Under the heading **Requirements for the Bachelor of Science Degree in Animal Science** replace the entire entry with the following:

The University requirements for bachelor's degrees as described in the *Undergraduate Education* section of this catalog; 120 credits, including general elective credits, are required for the Bachelor of Science degree in Animal Science.

The University's Tier II writing requirement for the Animal Science major is met by completing one of the following courses: Animal Science 301, 314, or 409. Those courses are referenced in item 3. below.

Students who are enrolled in the Animal Science major leading to the Bachelor of Science degree in the Department of Animal Science may complete an alternative track to Integrative Studies in Biological and Physical Sciences that consists of the following courses: Biological Science 161 and 171, Chemistry 141, and Chemistry 143 or 251. The completion of Biological Science 171 satisfies the laboratory requirement. Biological Science 161 and 171, Chemistry 141, and Chemistry 143 or 251 may be counted toward both the alternative track and the requirements for the major referenced in item 3. below.

The completion of the College of Agriculture and Natural Resources mathematics requirement may also satisfy the University mathematics requirement.

The requirements of the College of Agriculture and Natural Resources for the Bachelor of Science degree.

Certain courses referenced in requirement 3. below may be counted toward College requirements as appropriate.

The following requirements for the major:

			CREDITS
a.	All of the following courses (21 credits):		
	ANS 101	Professional Development in Animal Science I	1
	ANS 110	Introductory Animal Agriculture	3
	ANS 110L	Introductory Animal Agriculture Laboratory	1
	ANS 210	Introduction to Disciplines in Animal Agriculture	3
	ANS 301	Professional Development in Animal Science II (W)	3
	ANS 401	Issues in Animal Agriculture	1

	BS	161	Cell and Molecular Biology	3	
	BS	171	Cell and Molecular Biology Laboratory	2	
	CEM	141	General Chemistry	4	
b.	One of the following courses (3 or 4 credits):				
	STT	200	Statistical Methods	3	
	STT	201	Statistical Methods	4	
	STT	231	Statistics for Scientists	3	
	STT	421	Statistics I	3	
	STT	464	Statistics for Biologists	3	
c.	One of the following courses (3 or 4 credits):				
	CEM	143	Survey of Organic Chemistry	4	
	CEM	251	Organic Chemistry I	3	
d.	Two of the following introductory species management courses (6 credits):				
	ANS	201	Animal Products	3	
	ANS	222	Introductory Beef Cattle Management	3	
	ANS	232	Introductory Dairy Cattle Management	3	
	ANS	242	Introductory Horse Management	3	
	ANS	252	Introduction to Management of Avian Species	3	
	ANS	262	Introductory Sheep Management	3	
	ANS	272	Introductory Swine Management	3	
	ANS	282	Companion Animal Biology and Management	3	
e.	A minimum of 14 credits from the following introductory discipline courses: (14 to 16 credits):				
	ANS	305	Applied Animal Behavior	3	
	ANS	305L	Applied Animal Behavior Laboratory	1	
	ANS	307	Animal Reproduction	3	
	ANS	309	Animal Health and Disease Management	3	
	ANS	313	Principles of Animal Feeding and Nutrition (W)	4	
	ANS	314	Genetic Improvement of Domestic Animals	4	
	ANS	315	Anatomy and Physiology of Farm Animals	4	
	ANS	407	Food and Animal Toxicology	3	
f.	One of the following advanced management courses (3 credits):				
	ANS	422	Advanced Beef Cattle Feedlot Management	3	
	ANS	432	Advanced Dairy Cattle Management	3	
	ANS	442	Advanced Horse Management	3	
	ANS	472	Advanced Swine Management	3	
	ANS	482	Advanced Companion Animal Management	3	
	FSC	432	Food Processing: Dairy Foods	3	
	FSC	433	Food Processing: Muscle Foods	3	
g.	A minimum of 2 credits in experiential learning (2 to 6 credits):				
	ANS	300A	Advanced Livestock Judging	2	
	ANS	300C	Advanced Dairy Cattle Judging	2	
	ANS	300D	Advanced Horse Judging	2	
	ANS	300E	Animal Welfare Judging	2	
	ANS	300F	Advanced Dairy Farm Evaluation	2	
	ANS	480	Animal Systems in International Development	3	
	ANS	492	Undergraduate Research in Animal Science	3	
	ANS	493	Professional Internship in Animal Science	3	
	A minimum of 2 credits in a department-approved Education Abroad program.			2 to 6	
h.	One of the following concentrations (23 to 33 credits):				
	Animal Industry (20 to 23 credits):				
	1.	Both of the following course (5 credits):			
		ANS	201	Animal Products	3
		CSS	110	Computer Applications in Agronomy	2
		ANS 201 may not be used to fulfill requirement 3. d. above.			
	2.	One of the following courses (3 credits):			
		ABM	100	Decision-making in the Agri-Food System	3
		ABM	130	Farm Management I	3
	3.	One of the following advanced management courses (3 credits):			
		ANS	422	Advanced Beef Cattle Feedlot Management	3
		ANS	432	Advanced Dairy Cattle Management	3
		ANS	442	Advanced Horse Management	3
		ANS	472	Advanced Swine Management	3

	ANS	482	Advanced Companion Animal Management	3
	FSC	432	Food Processing: Dairy Foods	3
	FSC	433	Food Processing: Muscle Foods	3
	Courses used to fulfill this requirement may not be used to fulfill requirement 3. f. above.			
4.	A minimum of 9 credits from the following courses (9 to 12 credits):			
	ANS	211	Animal and Product Evaluation	3
	ANS	305	Applied Animal Behavior	3
	ANS	305L	Applied Animal Behavior Laboratory	1
	ANS	307	Animal Reproduction	3
	ANS	309	Animal Health and Disease Management	3
	ANS	404	Introduction to Quantitative Genetics	3
	ANS	407	Food and Animal Toxicology	3
	ANS	409	Problems, Controversies and Advancements in Reproduction (W)	4
	ANS	413	Non-Ruminant Nutrition	4
	ANS	418	Animal Agriculture and the Environment	3
	ANS	425	Animal Biotechnology	3
	ANS	435	Mammary Physiology	4
	ANS	445	Equine Exercise Physiology	4
	ANS	455	Avian Physiology	4
	ANS	483	Ruminant Nutrition	3
	Courses used to fulfill this requirement may not be used to fulfill requirement 3. e. above.			
	Animal Biology and Preveterinary (32 to 39 credits):			
1.	All of the following courses (11 credits):			
	BS	162	Organismal and Population Biology	3
	BS	172	Organismal and Population Biology	2
	CEM	161	Chemistry Laboratory I	1
	CEM	252	Organic Chemistry II	3
	CEM	255	Organic Chemistry Laboratory	2
2.	One of the following courses (4 credits):			
	BMB	200	Introduction to Biochemistry	4
	BMB	401	Comprehensive Biochemistry	4
3.	A minimum of 9 credits from the following courses (9 to 12 credits):			
	ANS	404	Introduction to Quantitative Genetics	3
	ANS	409	Problems, Controversies and Advancements in Reproduction (W)	4
	ANS	413	Non-Ruminant Nutrition	4
	ANS	418	Animal Agriculture and the Environment	3
	ANS	425	Animal Biotechnology	3
	ANS	427	Environmental Toxicology and Society	3
	ANS	435	Mammary Physiology	4
	ANS	445	Equine Exercise Physiology	4
	ANS	455	Avian Physiology	4
	ANS	483	Ruminant Nutrition	3
4.	A minimum of 8 credits from the following courses (8 to 12 credits):			
	IBIO	313	Animal Behavior	3
	IBIO	341	Fundamental Genetics	4
	MMG	301	Introductory Microbiology	3
	MMG	302	Introductory Laboratory for General and Allied Health Microbiology	1
	MMG	409	Eukaryotic Cell Biology	3
	PHM	450	Introduction to Chemical Toxicology	3
	PHY	231	Introductory Physics I	3
	PHY	232	Introductory Physics II	3
	PHY	251	Introductory Physics Laboratory I	1
	PHY	252	Introductory Physics Laboratory II	1
	Companion and Exotic Animal Biology (30 to 33 credits)			
1.	All of the following courses (17 credits):			
	ANS	482	Advanced Companion Animal Management	3
	BS	162	Organismal and Population Biology	3
	BS	172	Organismal and Population Biology Laboratory	2

	CEM	252	Organic Chemistry II	3
	CEM	255	Organic Chemistry Laboratory	2
	IBIO	328	Comparative Anatomy and Biology of Vertebrates	4
	ANS 482 cannot be used to fulfill requirement 3. f. above.			
2.	One of the following courses (4 credits):			
	BMB	200	Introduction to Biochemistry	4
	BMB	401	Comprehensive Biochemistry	4
3.	A minimum of 9 credits from the following courses (9 to 12 credits):			
	ANS	305	Applied Animal Behavior	3
	ANS	305L	Applied Animal Behavior Laboratory	1
	ANS	307	Animal Reproduction	3
	ANS	309	Animal Health and Disease Management	3
	ANS	313	Principles of Animal Feeding and Nutrition (W)	4
	ANS	314	Genetic Improvement of Domestic Animals	4
	ANS	315	Anatomy and Physiology of Farm Animals	4
	ANS	404	Introduction to Quantitative Genetics	3
	ANS	407	Food and Animal Toxicology	3
	ANS	409	Problems, Controversies and Advancements in Reproduction (W)	4
	ANS	413	Non-Ruminant Nutrition	4
	ANS	418	Animal Agriculture and the Environment	3
	ANS	425	Animal Biotechnology	3
	ANS	427	Environmental Toxicology and Society	3
	ANS	435	Mammary Physiology	4
	ANS	445	Equine Exercise Physiology	4
	ANS	455	Avian Physiology	4
	ANS	483	Ruminant Nutrition	3
	IBIO	313	Animal Behavior	3
	IBIO	341	Fundamental Genetics	4
	IBIO	355	Ecology	3
	IBIO	369	Introduction to Zoo and Aquarium Science	3
	Courses used to fulfill this requirement may not be used to fulfill requirement 3. e. above.			

Effective Fall 2020.

2. Change the requirements for the **Bachelor of Science** degree in **Nutritional Sciences** in the Department of Food Science and Human Nutrition.

The concentrations in the Bachelor of Science degree in Nutritional Sciences are noted on the student's academic record when the requirements for the degree have been completed.

- a. Under the heading **Requirements for the Bachelor of Science Degree in Nutritional Sciences** make the following changes:

- (1) In item 3. b. under the **Biomedical and Molecular Nutrition** concentration, make the following changes:

- (a) In item (7) delete the following course:

IBIO	408	Histology	4
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Add the following courses:

IBIO	450	Cancer Biology (W)	3
MMG	451	Immunology	3
PHL	344	Ethical Issues in Healthcare	4
PSY	333	The Neurobiology of Food Intake and Overeating	3

(2) In item 3. b. under the **Global Nutrition and Health** concentration, make the following changes:

(a) Change the total credits from '42 to 47' to '42 to 49'.

(b) In item (1) change the credits from '23' to '17' and delete the following courses:

CSUS	215	International Development and Sustainability	3
SOC	362	Developing Societies	3

(c) In item (3) change the credits from '2 to 4' to '2 or 3' and delete the following courses:

ANP	370	Culture, Health, and Illness	3
COM	391	Topics in Verbal, Intercultural, or Gender Communication	4
GSAH	230	Values, Experience, and Difference in Global Contexts	3

(d) Renumber item (7) to item (8) and replace with the following:

Two of the following courses (6 to 8 credits):

ANP	270	Women and Health: Anthropological and International Perspectives	3
ANP	370	Culture, Health, and Illness	3
CSS	431	International Agricultural Systems	3
CSUS	215	International Development and Sustainability	3
CSUS	463	Food Fight: Politics of Food	3
EEM	260	World Food Population and Poverty	3
GEO	235	Geography of Environment and Health	3
GEO	435	Geography of Health and Disease	3
GLG	446	Ecosystems Modeling, Water and Food Security	3
GSAH	230	Values, Experience, and Difference in Global Contexts	3
MC	337	Global Public Health	4
MC	430	Applied International Development	4
PHL	452	Ethics and Development	3
PHL	453	Ethical Issues in Global Public Health	3
SOC	161	International Development and Change	3
SOC	362	Developing Societies	3

A course used to fulfill requirement (7) in this concentration may not be used to fulfill this requirement.

(e) Add the following item (7):

One of the following courses (3 or 4 credits):

CSUS	215	International Development and Sustainability	3
MC	430	Applied International Development	4
SOC	161	International Development and Change	3
SOC	362	Developing Societies	3

(3) In item 3. b. under the **Public Health Nutrition** concentration, make the following changes:

(a) Change the total credits from '40 to 43' to '40 to 44'.

(b) In item (5) change the total credits from '6 or 7' to '6 to 8' and delete the following course:

EPI	240	Epidemiological Investigations in Nutrition and Health	3
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Add the following courses:

CSUS	463	Food Fight: Politics of Food	3
MC	337	Global Public Health	4

Effective Fall 2019.

3. Change the requirements of the **Bachelor of Science** degree in **Packaging** in the School of Packaging.

The concentrations in the Bachelor of Science degree in Packaging are noted on the student's academic record when the requirements for the degree have been completed.

- a. Under the heading **Requirements for the Bachelor of Science Degree in Packaging** make the following changes:

- (1) Replace item 1., paragraph two, with the following:

The University's Tier II writing requirement for the Packaging major is met by completing Packaging 485. That course is referenced in item 3. below.

- (2) In item 3. a. make the following changes:

- (a) Change the total credits from '57' to '55'.

- (b) Delete the following courses:

PKG	485	Packaging Development	3
PKG	486	Packaging Senior Capstone (W)	3

Add the following course:

PKG	485	Packaging Development (W)	4
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Effective Summer 2020.

COLLEGE OF ARTS AND LETTERS

1. Change the requirements for the **Minor in Creative Writing** in the Department of English. The University Committee on Undergraduate Education (UCUE) approved this request at its meeting on April 25, 2019.

- a. Add the following **Admission** section:

Admission

Students who are interested in the minor are eligible to apply if:

1. they have attained sophomore standing (at least 28 credits).
2. have completed the introductory course requirement (ENG 210, ENG 226, or FLM 230 if in screenwriting track).

To apply, students must:

1. submit a creative writing sample.
2. submit an application packet available online at the program website <http://www.english.msu.edu/undergraduate/program-options/creative-writing/> or through the Department of English.

Applications are due January 30 of each year. Applications will be reviewed prior to annual enrollment.

- b. Under the heading **Requirements for the Minor in Creative Writing** replace the entire entry with the following:

Students must complete a minimum of 17 credits from the following:

			CREDITS
1.	One of the following introductory courses (3 or 4 credits):		
	ENG 210	Foundations of Literary Study I	3
	ENG 226	Introduction to Creative Writing	3
	FLM 230	Introduction to Film	4
	Students who choose the Script Writing for Stage and Screen track below must complete FLM 230 to fulfill this requirement.		
2.	Both of the following core courses (5 credits):		
	ENG 200	Creative Writing Community	1
	ENG 320D	Methodologies in Literary History: History and Theory of Creative Writing	4
3.	One of the following tracks in a single genre (9 credits):		
	Creative Nonfiction Writing		
	ENG 223	Introduction to Creative Non-Fiction Writing	3
	ENG 323	Readings in Nonfiction	3
	ENG 423	Advanced Creative Nonfiction Writing	3
	Fiction Writing		
	ENG 228	Introduction to Fiction Writing	3
	ENG 328	Readings in Novel and Narrative	3
	ENG 428	Advanced Fiction Writing	3
	Poetry Writing		
	ENG 229	Introduction to Poetry Writing	3
	ENG 329	Readings in Poetry and Poetics	3
	ENG 429	Advanced Poetry Writing	3
	Script Writing for Stage and Screen		
	ENG 227	Introduction to Playwriting	3
	ENG 326	Readings in Drama and Performance	3
	FLM 334	Introduction to Screenwriting (W)	3

Effective Summer 2019.

COLLEGE OF COMMUNICATION ARTS AND SCIENCES

1. Change the requirements for the **Master of Arts** degree in **Health and Risk Communication** in the College of Communication Arts and Sciences. The University Committee on Graduate Studies (UCGS) approved this request at its April 15, 2019 meeting.

- a. Under the heading **Admission** replace the entire entry with the following:

To be considered for admission to the Master of Arts degree program in health and risk communication, an applicant must have a bachelor's degree from an approved institution and a grade-point average of 3.0 in the last two years of undergraduate study. Students must submit:

1. an academic statement of purpose outlining academic and professional goals.
2. a personal statement, including background and life experiences, social, economic, cultural, familial, education, or other challenges or opportunities that motivated the decision to pursue graduate study.
3. two letters of reference from persons who are familiar with the applicant's academic and professional work.
4. the Graduate Record Examination General Test scores.
5. for international applicants only, the Test of English Language Fluency (TOEFL).
6. one transcript from each college and university attended.

Application materials should be received by April 1.

For additional information please visit our Web site at
<https://comartsci.msu.edu/academics/academic-departments/masters-health-risk-communication>.

- b. Under the heading **Requirements for the Master of Arts Degree in Health and Risk Communication** replace the entire entry with the following:

The program is available under Plan A (with thesis) or Plan B (without thesis), and a total of 33 credits is required for the degree. The student must meet the requirements specified below:

				CREDITS
1.	All of the following courses (9 credits):			
	CAS	825	Mass Communication and Public Health	3
	CAS	826	Health Communication for Diverse Populations	3
	EPI	810	Introductory Epidemiology	3
2.	The following course (3 credits):			
	COM	803	Introduction to Quantitative Research Methods	3
3.	One of the following courses (3 credits):			
	ADV	860	Media Relations	3
	JRN	873	Environment, Science and Health Journalism Seminars	3
4.	The following course (3 credits):			
	COM	893	Practicum	3

Additional Requirements for Plan A

- | | | | | |
|----|---|-----|-----------------------------------|---|
| 1. | The following courses (7 credits): | | | |
| | CAS | 899 | Master's Thesis Research | 4 |
| | COM | 830 | Applied Communication Research II | 3 |
| 2. | Electives (8 credits). Additional credits in courses related to health communication that have been approved by the student's academic advisor. | | | |
| 3. | Pass a thesis examination defense during the final semester. | | | |

Additional Requirements for Plan B

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|----|--|--|--|--|
| 1. | Electives (15 credits). Additional credits in courses related to health communication that have been approved by the student's academic advisor. | | | |
| 2. | Pass a written comprehensive examination during the final semester. | | | |

Effective Fall 2019.

2. Establish a **Minor in Media Photography** in the School of Journalism. The University Committee on Undergraduate Education (UCUE) recommended approval of this request at its February 7, 2019 meeting.

a. **Background Information:**

The Minor in Media Photography will attract students who want to pursue significant experience that they can connect to their major field of study. It consists of 15 credits of course work that instill theory and practice and spans traditional to innovative techniques. It is unique from other MSU programs because it focuses on creating images for personal pleasure, community engagement, and media consumption and distribution through communication channels and needs. When students have completed the Minor, they will understand how to use powerful images to enhance whatever field they decide to engage in across all types of distribution platforms. As the world becomes increasingly connected through images, the need to understand and to create effective photographs for any career or field of interest, whether for documentation or communication, are integral to success. Students across the MSU campus who are enrolled in a major program could benefit greatly from photography and visual communication courses that provide a foundation for visual literacy, stimulate critical thinking and analysis, and impart knowledge on how to effectively create images which can be used in a multitude of ways while they are pursuing academic degrees, as well as for their future careers. The School of Journalism has been offering courses in photography for more than 80 years, which are very popular, and would like to gather these courses into a formal minor program that can be offered to a larger pool of students. The Minor in Media Photography is unique from other MSU programs because it focuses on creating images for

media consumption and distribution through digital and print platforms, advertising content, public relations materials and overall communication needs.

The School of Journalism has offered regular photography courses that predate the 1940s, as well as a successful Photography Education Abroad experience annually since the 1980s. It is appropriate to offer the Minor in the School of Journalism because photographic images tell a story, engage audiences and communicate news and information in many forms. MSU's Journalism program has a well-established and award-winning visual communication and media program taught by internationally-known professionals and scholars with robust connections throughout a variety of international media-related industries: journalism, advertising, broadcast, public relations, communications and many more. These high-profile faculty members are experts in the field of media production and research and can effectively lead students enrolled in the Minor in Media Photography to understand the why's and how's around creating powerful visual content for a multitude of uses. They employ communication theory and message systems as they consider messages, audiences, transmission processes, media production and intervening variables. The School of Journalism is positioned as a top-tier journalism program in the local market, nationally and globally. The promotion of this Minor will attract new enrollments to MSU.

b. **Academic Programs Catalog Text:**

The Minor in Media Photography, which is administered by the School of Journalism, provides the opportunity to gain extended knowledge around the history, approaches, tools, outlets and possibilities for creating engaging visual content that can be used in a variety of media outlets. Students will gain the marketable skills necessary to analyze, conceive of, create and distribute powerful images, as well as have a clear understanding of how they can use photography to support their career objectives.

The minor is available as an elective to students enrolled in bachelor's degree programs at Michigan State University. With the approval of the department and college that administer the student's degree program, the courses that are used to satisfy the minor may also be used to satisfy the requirements for the bachelor's degree.

Students who plan to apply to the program should consult the undergraduate advisor in the School of Journalism.

Requirements for the Minor in Media Photography

Complete 15 credits from the following:

			CREDITS
1.	All of the following core courses (9 credits):		
	JRN 310	Photojournalism	3
	JRN 345	Images and Messages	3
	JRN 410	Advanced Photojournalism: Documentary	3
2.	Complete 6 credits from the following courses:		
	CAS 110	Creative Thinking	3
	CAS 111	Design and Layout	3
	CAS 112	Story, Sound and Motion	3
	JRN 203	Visual Storytelling	3
	JRN 206	Video Storytelling with Cell Phones	3
	JRN 336	Designing for Media	3
	JRN 483	Photo Communication in Europe	6
	JRN 492	Journalism Special Topics	3

Students enrolling in JRN 492 must have advisor approval to ensure appropriate content.

COLLEGE OF EDUCATION

1. Change the requirements for the **Master of Arts** degree in **Applied Behavior Analysis** in the Department of Counseling, Educational Psychology and Special Education. The University Committee on Graduate Studies (UCGS) approved this request at its April 15, 2019 meeting.

- a. Under the heading **Admission**, in the last paragraph, replace the last two sentences with the following:

Students will be admitted only during fall semester. Applications must be submitted by January 15th.

- b. Under the heading **Requirements for the Master of Arts in Applied Behavior Analysis** make the following changes:

- (1) Change the total credits required for the degree from '37' to '38'.

- (2) In item 1., change the total credits from '21' to '24' and add the following course:

CEP	848	Supervision in Applied Behavior Analysis	3
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- (3) Change item 3. to the following:

The following course (4 credits):

CEP	899	Master's Thesis Research	4
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Effective Fall 2019.

2. Change the requirements for the **Graduate Certificate in Applied Behavior Analysis in Special Education** in the Department of Counseling, Educational Psychology and Special Education. The University Committee on Graduate Studies (UCGS) approved this request at its April 15, 2019 meeting.

- a. Under the heading **Admission**, replace the last paragraph with the following:

The certificate requires completion of eight courses. All courses are offered online only. Students are required to have access to high-speed internet and the appropriate technologies. A student who, in the judgment of the faculty, has not completed appropriate courses in exceptional children or behavior management may be required to complete such courses in addition to the requirements below.

- b. Under the heading **Requirements for the Graduate Certificate in Applied Behavior Analysis** make the following changes:

- (1) Change the total credits required for the certificate from '9 to 19' to '24'.

- (2) Change the credits of CEP 845 from '3 or 4' to '3'.

- (3) Add the following courses:

CEP	848	Supervision in Applied Behavior Analysis	3
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CEP	851	Concepts and Principles of Applied Behavior Analysis	3
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- (4) Delete the following statement:

Students currently enrolled in the Master of Arts Degree in Special Education pursuing an Autism Spectrum Disorder Endorsement will complete CEP 844, 845, and 846 as part of these requirements.

Effective Fall 2019.

3. Change the requirements for the **Bachelor of Science** degree in **Kinesiology** in the Department of Kinesiology. The University Committee on Undergraduate Education (UCUE) approved this request at its April 11, 2019 meeting.
 - a. Under the heading **Admission** add 'Kinesiology 173' to the list of courses required for Admission.
 - b. Under the heading **Requirements for the Bachelor of Science Degree in Kinesiology** make the following changes:
 - (1) In item 2. a. change the total credits from '18 to '21' and add the following course:

KIN	173	Foundations of Kinesiology	3
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 - (2) In item 2. b. change the total credits from '18' to '15' and delete the following course:

KIN	173	Foundations of Kinesiology	3
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 - (3) In item 2. f. add the following course:

KIN	496	Internship: Athletic Training-Based	3
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Effective Spring 2020.

4. Change the requirements for the **Master of Science** degree in **Sport Coaching and Leadership** in the Department of Kinesiology. The University Committee on Graduate Studies (UCGS) approved this request at its April 15, 2019 meeting.

The concentrations in the Master of Science degree in Sport Coaching and Leadership will be noted on the student's academic record when the requirements for the degree have been completed.

- a. Under the heading **Requirements for the Master of Science Degree in Sport Coaching and Leadership** replace the entire entry with the following:

The program is available only under Plan B (without thesis) and only available online. The student must complete 30 credits distributed as follows:

1. All of the following courses (9 credits):

KIN	852	Ethics in Sport Coaching and Leadership	1
KIN	872	Coaching Science: Applied Research	3
KIN	880	Sport Leadership Practicum	3
KIN	896	Integrative Capstone in Sport Coaching and Leadership	2
2. Complete 21 credits from one of the following concentrations:

Coaching

 1. Both of the following courses (6 credits):

KIN	856	Physical Bases of Coaching Athletes	3
KIN	868	Skill Development in Athletes	3
 2. Both of the following courses (6 credits):

KIN	849	Theory and Practice of Modern Sport Leadership	3
KIN	855	Psychosocial Bases of Coaching Athletes	3
 3. One of the following courses (3 credits):

KIN	829	Safety and Injury Control	3
KIN	854	Legal and Administrative Issues for Administrators and Coaches	3
 4. One of the following courses (3 credits):

KIN	857	Promoting Positive Youth Development Through Sport	3
KIN	865	Stages of Athlete Development	3
 5. One of the following courses (3 credits):

KIN	815	Principles of Strength and Conditioning	3
KIN	850	Special Topics in Sport Coaching and Leadership	3

	KIN	859	Scholastic Athletic Administration	3
	Leadership			
1.	One of the following courses (3 credits):			
	KIN	856	Physical Bases of Coaching Athletes	3
	KIN	868	Skill Development in Athletes	3
2.	Both of the following courses (6 credits):			
	KIN	849	Theory and Practice of Modern Sport Leadership	3
	KIN	855	Psychosocial Bases of Coaching Athletes	3
3.	Both of the following courses (6 credits):			
	KIN	829	Safety and Injury Control	3
	KIN	854	Legal and Administrative Issues for Administrators and Coaches	3
4.	One of the following courses (3 credits):			
	KIN	857	Promoting Positive Youth Development Through Sport	3
	KIN	865	Stages of Athlete Development	3
5.	One of the following courses (3 credits):			
	KIN	815	Principles of Strength and Conditioning	3
	KIN	850	Special Topics in Sport Coaching and Leadership	3
	KIN	859	Scholastic Athletic Administration	3
3.	Completion of a final examination or evaluation.			

Effective Summer 2019.

5. Change the requirements for the **Graduate Certificate in Sport Coaching and Leadership** in the Department of Kinesiology. The University Committee on Graduate Studies (UCGS) approved this request at its April 15, 2019 meeting.

- a. Under the heading **Requirements for the Graduate Certificate in Sport Coaching and Leadership** replace the entire entry with the following:

1.	The following course (1 credit):			
	KIN	852	Ethics in Sport Coaching and Leadership	1
2.	One course from at least three of the following areas (9 credits):			
	Physical			
	KIN	856	Physical Bases of Coaching Athletes	3
	KIN	868	Skill Development in Athletes	3
	Psychosocial			
	KIN	849	Theory and Practice of Modern Sport Leadership	3
	KIN	855	Psychosocial Bases of Coaching Athletes	3
	Legal, Safety, and Administration			
	KIN	829	Safety and Injury Control	3
	KIN	854	Legal and Administrative Issues for Administrators and Coaches	3
	Human Development			
	KIN	857	Promoting Positive Youth Development Through Sport	3
	KIN	865	Stages of Athlete Development	3

Effective Summer 2019.

COLLEGE OF ENGINEERING

1. Establish a **Bachelor of Science** degree in **Computational Data Science** in the Department of Computer Science and Engineering. The University Committee on Undergraduate Education (UCUE) recommended approval of this request at its February 21, 2019 meeting.

- a. **Background Information:**

Data science is an interdisciplinary field whose purpose is the extraction of actionable insights from data in its many forms. Data science employs theories and techniques drawn from various disciplines, including statistics, mathematics, computer science, and information science. Working data scientists use computational and analytical skills to do many things: to integrate, process, and interpret data from rich and diverse sources, or from large and potentially distributed data sets; to build mathematical models that can infer meaningful relationships in the data and can in turn be used for interpretation and prediction purposes; to create visualizations to aid in the understanding of their data and models; and to communicate their findings and insights to a variety of audiences so that decisions can be made and actions taken. Given the exponential increase in the size and complexity of datasets in virtually all industries, there is a rapidly growing demand for students with these skills (see, e.g., <https://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century> and <https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/big-data-the-next-frontier-for-innovation>).

A practicing data scientist needs these skills to have a long and successful career and additionally must learn to think critically about the process of understanding and interpreting data. It is impractical for individual students to acquire all of the requisite skills using existing majors at Michigan State University, and a challenge to students and advisors alike is to determine the educational experiences that will be most important in maximizing their long-term job prospects. As a result, the Department of Computer Science and Engineering, working with the Departments of Statistics and Probability, and Computational Mathematics, Science and Engineering, proposes a new degree program, a Bachelor of Science in Computational Data Science. This major will provide students with an understanding of, and practical experience with, the key aspects of computer science, information science, statistics, and mathematics that are required to manipulate, analyze, and visualize large and complex datasets. The program will emphasize the algorithmic concepts necessary to build software systems for these operations. Additionally, students in this major will learn to think critically about the data and processes they are working with and to communicate their analysis and results to a variety of audiences.

The degree program is based on courses administered by the Department of Computer Science and Engineering, the Department of Computational Mathematics, Science and Engineering, and the Department of Statistics and Probability. Due to the different needs of the student populations in the Colleges of Natural Science and Engineering, there is a plan to offer two related, but different, bachelor's degrees – a Bachelor of Science in Computational Data Science led by the Department of Computer Science and Engineering in the College of Engineering and a Bachelor of Science in Data Science led by the Department of Computational Mathematics, Science and Engineering in the College of Natural Science. The Departments of Computer Science and Engineering, Computational Mathematics, Science and Engineering, and Statistics and Probability each have faculty with unique expertise that is required to create these degree programs and sharing core courses will ensure that all three departments have a strong stake in the success of implementing, maintaining, and improving both degree programs.

Data science is rapidly becoming a popular program at many institutions. There are more than 100 active Data Science degree programs worldwide. Example programs include a B.S. degree in Data Analytics at Ohio State University and the B.S. and B.A. degrees in Data Science at the University of Rochester. The concept of multiple/parallel degree programs that share a common core has numerous precedents. The University of Michigan offers two B.S. degrees in Data Science, one administered by Statistics in the College of Literature, Science, and the Arts and the other administered by the Department of Electrical Engineering and Computer Science in the College of Engineering. Pennsylvania State University offers a B.S. in Data Science with specializations in Applied Data Sciences, Computational Data Sciences, and Statistical Modeling Data Sciences, each administered by a different department.

Michigan State University is an ideal setting to create a new degree in data science. There are faculty in several departments, such as Computer Science and Engineering (CSE) and Statistics and Probability (STT), whose research expertise lie in aspects of the computational and

mathematical algorithms that are key to data science - in statistical analysis, machine learning, database systems, data mining, information retrieval, network analysis, signal processing, computer vision, and high performance computing - and MSU has been aggressively hiring faculty that apply these techniques to applications in a wide range of subject areas. This is further exemplified by the creation of the new Department of Computational Mathematics, Science and Engineering, which explicitly brings together faculty whose interests are in the algorithms and applications of computational modeling and data science techniques, as well as the Social Science Data Analytics initiative, which applies the tools of data science to topics outside of the traditional STEM fields. Additionally, several relevant courses in data science-related subjects have already been developed in these units, providing a base upon which to build a degree program.

There is significant student demand for these skills: MSU students have self-organized into an MSU Data Science student organization (see <http://msudatascience.com/>; this organization sees approximately 100 attendees at its events) and has been inviting speakers, hosting workshops, and distributing job postings to its members. Data Science-related elective offerings in the Department of Computer Science and Engineering are in high demand. These institutional trends support the creation of a degree in data science and ensure that the resources to maintain a thriving degree program will continue to exist far into the future.

b. Academic Programs Catalog Text:

The Bachelor of Science degree in Computational Data Science focuses on the computational foundations of data science, providing an in-depth understanding of the algorithms and data structures for storing, manipulating, visualizing, and learning from large data sets. Students in the program have unique access to a wide range of fundamental computer science courses in topics ranging from mobile application and web development to theory of computation and fundamental algorithms. Students can tailor their degree to their own unique interests and requirements, with an emphasis on computational foundations.

The Bachelor of Science degree program in Computational Data Science is accredited by the Computing Accreditation Commission of ABET, www.abet.org.

Requirements for the Bachelor of Science Degree in Computational Data Science

1. The University requirements for bachelor's degrees as described in the *Undergraduate Education* section of this catalog; 120 credits, including general elective credits, are required for the Bachelor of Science degree in Computational Data Science.

The University's Tier II writing requirement for the Computational Data Science major is met by completing Computational Mathematics, Science and Engineering 495, referenced in item 3. b. below.

Students who are enrolled in the College of Engineering may complete the alternative track to Integrative Studies in Biological and Physical Sciences that is described in item 1. under the heading **Graduation Requirements for All Majors** in the College statement.

2. The requirements of the College of Engineering for the Bachelor of Science degree.

The credits earned in certain courses referenced in requirement 3. below may be counted toward College requirements as appropriate.

3. The following requirements for the major:

				CREDITS
a.	Bioscience (4 to 6 credits)			
	(1)	One of the following courses:		
		BS	161 Cell and Molecular Biology	3
		ENT	205 Pests, Society and Environment	3
		IBIO	150 Integrating Biology: From DNA to Populations	3
		MMG	141 Introductory Human Genetics	3
		MMG	201 Fundamentals of Microbiology	3
		PLB	105 Plant Biology	3
		PSL	250 Introductory Physiology	4

	(2)	One of the following courses:			
		BS	171	Cell and Molecular Biology Laboratory	2
		CEM	161	Chemistry Laboratory I	1
		CEM	162	Chemistry Laboratory II	1
		PHY	191	Physics Laboratory for Scientists, I	1
		PHY	192	Physics Laboratory for Scientists, II	1
		PLB	106	Plant Biology Laboratory	1
b.		All of the following courses (43 credits):			
		CMSE	201	Introduction to Computational Modeling	4
		CMSE	381	Fundamentals of Data Science Methods	4
		CMSE	382	Optimization Methods in Data Science	4
		CMSE	495	Experiential Learning in Data Science (W)	4
		CSE	232	Introduction to Programming II	4
		CSE	331	Algorithms and Data Structures	3
		CSE	404	Introduction to Machine Learning	3
		CSE	482	Big Data Analysis	3
		CSE	480	Database Systems	3
		MTH	314	Matrix Algebra with Computational Applications	3
		STT	180	Introduction to Data Science	4
		STT	380	Probability and Statistics for Data Science	4
c.		Two courses selected from the following (6 credits):			
		CSE	402	Biometrics and Pattern Recognition	3
		CSE	415	Introduction to Parallel Computing	3
		CSE	431	Algorithm Engineering	3
		CSE	440	Introduction to Artificial Intelligence	3
		Computer Science and Engineering 415 and Computational Science, Mathematics and Engineering 401 may not be used to fulfill both requirements c. and d.			
d.		Two courses selected from the following (6 credits):			
		CMSE	401	Methods for Parallel Computing	4
		CMSE	402	Visualization of Scientific Datasets	3
		CSE	402	Biometrics and Pattern Recognition	3
		CSE	415	Introduction to Parallel Computing	3
		CSE	431	Algorithm Engineering	3
		CSE	440	Introduction to Artificial Intelligence	3
		CSE	471	Media Processing and Multimedia Computing	3
		CSE	472	Computer Graphics	3
		MTH	451	Numerical Analysis I	3
		MTH	468	Predictive Analysis	3
		STT	464	Statistics for Biologists	3
		STT	465	Bayesian Statistical Methods	3
		Computer Science and Engineering 415 and Computational Science, Mathematics and Engineering 401 may not be used to fulfill both requirements c. and d.			

Effective Fall 2019.

COLLEGE OF NATURAL SCIENCE

1. Change the **Graduation Requirements** for the **Bachelor of Arts and Bachelor of Science** degrees in the College of Natural Science. The University Committee on Undergraduate Education approved this request at its April 11, 2019 meeting.
 - a. Under the heading **Graduation Requirements** make the following change in paragraph two, following item 3.:
 - (1) Replace item 2. c. with the following:

A minimum of 30 credits in courses numbered 300 and above.

Effective Fall 2019.

2. Establish a **Bachelor of Science** degree in **Data Science** in the Department of Computational Mathematics, Science, and Engineering. The University Committee on Undergraduate Education (UCUE) recommended approval of this request at its February 21, 2019 meeting.

- a. **Background Information:**

Data science is an interdisciplinary field whose purpose is the extraction of actionable insights from data in its many forms. Data science employs theories and techniques drawn from various disciplines, including statistics, mathematics, computer science, and information science. Working data scientists use their computational and analytical skills to do many things: to integrate, process, and interpret data from rich and diverse sources, or from large and potentially distributed data sets; to build mathematical models that can infer meaningful relationships in the data and can in turn be used for interpretation and prediction purposes; to create visualizations to aid in the understanding of their data and models; and to communicate their findings and insights to a variety of audiences so that decisions can be made and action can be taken. Given the exponential increase in the size and complexity of datasets in virtually all industries, there is a rapidly growing demand for students with these skills (see <https://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century> and <http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/big-data-the-next-frontier-for-innovation>).

A practicing data scientist needs all of the skills described above in order to have a long and successful career, and additionally must learn to think critically about the process of understanding and interpreting data. It is impractical for individual students to acquire all of these skills using existing majors at Michigan State University. A challenge to students and advisors alike is to determine the educational experiences that will be most important to maximize their long-term job prospects. As a result, the Departments of Computer Science and Engineering, Statistics and Probability, and Computational Mathematics, Science, and Engineering jointly will provide resources to create a new Bachelor of Science in Data Science. The Department of Computational Mathematics, Science, and Engineering will be the administrative unit. This major will provide students with an understanding of, and practical experience with, the key aspects of statistics, mathematics, computer science, and information science that are required to manipulate, analyze, and visualize large and complex datasets. Additionally, students in this major will learn to think critically about the data and processes they are working with and to communicate their analysis and results to a variety of audiences.

Each of these departments have faculty with unique expertise that is required to create such a degree, and jointly managing the program will ensure that all three departments have a strong stake in the success of implementing, maintaining, and improving the degree program. Due to the different needs of the student populations in the Colleges of Natural Science and Engineering, MSU plans to offer two related, but different, bachelor's degrees - one led by the Department of Computational Mathematics, Science, and Engineering in the College of Natural Science, and the other led by the Department of Computer Science and Engineering in the College of Engineering.

Michigan State University is an ideal setting to create a new degree in data science. With key faculty in across departments whose research expertise is in aspects of the computational and mathematical algorithms that are key to data science - in statistical analysis, machine learning,

database systems, data mining, information retrieval, network analysis, signal processing, computer vision, and high performance computing - MSU has been aggressively hiring faculty that apply these techniques to applications in a wide range of subject areas. This is further exemplified by the creation of the new Department of Computational Mathematics, Science, and Engineering (CMSE), which explicitly brings together faculty whose interests are in the algorithms and applications of computational modeling and data science techniques, as well as the Social Science Data Analytics initiative, which applies the tools of data science to topics outside of the traditional STEM fields. Additionally, several relevant courses in data science-related subjects have already been developed in these units, providing a base upon which to build a degree program. Furthermore, there is significant student demand for these skills: MSU students have self-organized into an MSU Data Science student organization. See <http://msudatascience.com/>. This organization sees approximately 100 attendees at its events, and has been inviting speakers, hosting workshops, and distributing job postings to its members. These institutional trends support the creation of a degree in data science and ensure that the resources to maintain a thriving degree program will continue to exist far into the future.

A substantial number of universities have created data science degrees in the last few years. In the Big 10, Penn State, Ohio State, and the University of Michigan have all developed a Bachelor of Science degree in Data Science with learning goals and course progressions that are similar to those outlined below. Interestingly, all of these programs are collaborative efforts between multiple departments: typically some combination of computer science, electrical engineering, and/or statistics. Nationwide, there are approximately twenty bachelor programs in data science available, and a comparable number of master's programs in data science, data analytics, or business analytics.

Broadly speaking the goals of this degree are to provide a solid foundation in the core principles, methods, and tools of data science, as well as to be able to apply these to solve important data-centric problems in a wide variety of disciplines by application of the scientific method. More specifically, a student graduating with a Bachelor's of Science in Data Science from MSU will be able to: (1) Understand and be able to apply mathematical and statistical models and concepts to detect patterns that exist in datasets, and to draw inferences and conclusions supported by that data; (2) Understand and be able to apply computer science principles relating to algorithm analysis, software design, data representation and retrieval, and programming; (3) Demonstrate critical thinking skills associated with the concepts and practices described above by using the scientific methods to reason effectively with data to identify and solve problems, to inform decision making, and to generate a logical synthesis of information from disparate sources of data; and (4) Clearly communicate their findings and the implications of those findings both orally and in writing, and to do so effectively in a variety of organizational contexts.

b. **Academic Programs Catalog Text:**

The Bachelor of Science degree in Data Science is designed to provide students with a strong background in data science using a broad range of computational techniques, practice in statistical thinking, as well as in-depth exposure to topics in data science.

Requirements for the Bachelor of Science Degree in Data Science

1. The University requirements for bachelor's degrees as described in the *Undergraduate Education* section of this catalog; 120 credits, including general elective credits, are required for the Bachelor of Science degree in Data Science.
The University's Tier II writing requirement for the Data Science major is met by completing Computational Mathematics, Science and Engineering 495, referenced in item 3. below.
2. The requirements of the College of Natural Science for the Bachelor of Science degree.
3. The following requirements for the major:

				CREDITS
a.	One course from each of the following groups (8 or 10 credits):			
(1)	CEM	141	General Chemistry	4
	CEM	151	General and Descriptive Chemistry	4
	CEM	181H	Honors Chemistry I	4
	LB	171	Principles of Chemistry I	4
(2)	CEM	142	General and Inorganic Chemistry	3
	CEM	152	Principles of Chemistry	3
	CEM	182H	Honors Chemistry II	4

	LB	172	Principles of Chemistry II	3
(3)	CEM	161	Chemistry Laboratory I	1
	CEM	185H	Honors Chemistry Laboratory I	2
	LB	171L	Introductory Chemistry Laboratory I	1
b.	One course from each of the following groups (8 credits):			
(1)	LB	273	Physics I	4
	PHY	183	Physics for Scientists and Engineers I	4
(2)	LB	274	Physics II	4
	PHY	184	Physics for Scientists and Engineers II	4
c.	One course from each of the following groups (14 or 15 credits):			
(1)	LB	118	Calculus I	4
	MTH	132	Calculus I	3
	MTH	152H	Honors Calculus I	3
(2)	LB	119	Calculus II	4
	MTH	133	Calculus II	4
	MTH	153H	Honors Calculus II	4
(3)	LB	220	Calculus III	4
	MTH	234	Multivariable Calculus	4
	MTH	254H	Honors Multivariable Calculus	4
(4)	MTH	314	Matrix Algebra with Computational Applications	3
d.	One of the following groups (4 or 6 credits):			
(1)	STT	380	Probability and Statistics for Data Science	4
(2)	STT	441	Probability and Statistics I: Probability	3
	STT	442	Probability and Statistics I: Statistics	3
e.	All of the following courses (31 credits):			
	CMSE	201	Introduction to Computational Modeling and Data Analysis	4
	CMSE	202	Computational Modeling Tools and Techniques	4
	CMSE	381	Fundamentals of Data Science Methods	4
	CMSE	382	Optimization Methods in Data Science	4
	CMSE	495	Experiential Learning in Data Science (W)	4
	CSE	232	Introduction to Programming II	4
	CSE	331	Algorithms and Data Structures	3
	STT	180	Introduction to Data Science	4
f.	A minimum of 12 credits of approved 400-level courses or above. The following courses are eligible to fulfill this requirement. Other may be substituted with advisor approval.			
	CMSE	401	Methods for Parallel Computing	4
	CMSE	402	Data Visualization Principles and Techniques	3
	CMSE	410	Computational Biology and Bioinformatics	3
	CMSE	411	Computational Medicine	3
	CMSE	492	Special Topics in Data Science	1 to 4
	CSE	402	Biometrics and Pattern Recognition	3
	CSE	440	Introduction to Artificial Intelligence	3
	CSE	480	Database Systems	3
	CSE	482	Big Data Analysis	3
	MTH	468	Predictive Analytics	3
	STT	464	Statistics for Biologists	3
	STT	465	Bayesian Statistical Methods	3
	A maximum of 12 credits may count towards the degree for enrollments in CMSE 492 with advisor approval.			

3. Establish a **Minor in Data Science** in the Department of Computational Mathematics, Science, and Engineering. The University Committee on Undergraduate Education (UCUE) recommended approval of this request at its February 21, 2019 meeting.

- a. **Background Information:**

Data science is an interdisciplinary field whose purpose is the extraction of actionable insights from data in its many forms. Data science employs theories and techniques drawn from various disciplines, including statistics, mathematics, computer science, and information science. Working data scientists use their computational and analytical skills to do many things: to integrate, process, and interpret data from rich and diverse sources, or from large and potentially distributed data sets; to build mathematical models that can infer meaningful relationships in the data and can in turn be used for interpretation and prediction purposes; to create visualizations to aid in the understanding of their data and models; and to communicate their findings and insights to a variety of audiences so that decisions can be made and action can be taken. Given the exponential increase in the size and complexity of datasets in virtually all industries, there is a rapidly growing demand for students with these skills (see <https://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century> and <http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/big-data-the-next-frontier-for-innovation>).

A practicing data scientist needs all of the skills described above in order to have a long and successful career, and additionally must learn to think critically about the process of understanding and interpreting data. It is impractical for individual students to acquire all of these skills using existing minors at Michigan State University. A challenge to students and advisors alike is to determine the educational experiences that will be most important to maximize their long-term job prospects. As a result, the Department of Statistics and Probability, and Computational Mathematics, Science, and Engineering jointly will provide resources to create a new Minor in Data Science. The Department of Computational Mathematics, Science, and Engineering will be the administrative unit. This minor will provide students with an understanding of, and practical experience with, the key aspects of statistics, mathematics, computer science, and information science that are required to manipulate, analyze, and visualize large and complex datasets. Additionally, students in this minor will learn to think critically about the data and processes they are working with and to communicate their analysis and results to a variety of audiences.

Each of these departments have faculty with unique expertise that is required to create such the minor, and jointly managing the program will ensure that both departments have a strong stake in the success of implementing, maintaining, and improving the program.

Michigan State University is an ideal setting to create a minor in data science. With key faculty in across departments whose research expertise is in aspects of the computational and mathematical algorithms that are key to data science - in statistical analysis, machine learning, database systems, data mining, information retrieval, network analysis, signal processing, computer vision, and high performance computing - MSU has been aggressively hiring faculty that apply these techniques to applications in a wide range of subject areas. This is further exemplified by the creation of the new Department of Computational Mathematics, Science, and Engineering (CMSE), which explicitly brings together faculty whose interests are in the algorithms and applications of computational modeling and data science techniques, as well as the Social Science Data Analytics initiative, which applies the tools of data science to topics outside of the traditional STEM fields. Additionally, several relevant courses in data science-related subjects have already been developed in these units, providing a base upon which to build a degree program. Furthermore, there is significant student demand for these skills: MSU students have self-organized into an MSU Data Science student organization. See <http://msudatascience.com/>. This organization sees approximately 100 attendees at its events, and has been inviting speakers, hosting workshops, and distributing job postings to its members. These institutional trends support the creation of a degree in data science and ensure that the resources to maintain a thriving degree program will continue to exist far into the future.

A substantial number of universities have created data science degrees in the last few years. In the Big 10, Penn State, Ohio State, and the University of Michigan have all developed a Bachelor of Science degree in Data Science with learning goals and course progressions that are similar to those outlined below. Interestingly, all of these programs are collaborative efforts between multiple departments: typically some combination of computer science, electrical engineering, and/or statistics. Nationwide, there are approximately twenty bachelor programs in data science available,

and a comparable number of master's programs in data science, data analytics, or business analytics. Many of these programs also offer minors.

Broadly speaking the goals are to provide a solid foundation in the core principles, methods, and tools of data science, as well as to be able to apply these to solve important data-centric problems in a wide variety of disciplines by application of the scientific method. More specifically, a student graduating with a Minor in Data Science from MSU will be able to: (1) Understand and be able to apply mathematical and statistical models and concepts to detect patterns that exist in datasets, and to draw inferences and conclusions supported by that data; (2) Understand and be able to apply computer science principles relating to algorithm analysis, software design, data representation and retrieval, and programming; (3) Demonstrate critical thinking skills associated with the concepts and practices described above by using the scientific methods to reason effectively with data to identify and solve problems, to inform decision making, and to generate a logical synthesis of information from disparate sources of data; and (4) Clearly communicate their findings and the implications of those findings both orally and in writing, and to do so effectively in a variety of organizational contexts.

b. **Academic Programs Catalog Text:**

The Minor in Data Science, which is administered by the Department of Computational Mathematics, Science, and Engineering, is designed to provide students with a strong background in data science using a broad range of computational techniques, practice in statistical thinking, as well as in-depth exposure to topics in data science.

The minor is available as an elective to students enrolled in bachelor's degree programs at Michigan State University with the exception of the Bachelor of Science degree in Data Science and the Bachelor of Science Degree in Computational Data Science. With the approval of the department and college that administer the student's degree program, the courses that are used to satisfy the minor may also be used to satisfy the requirements for the bachelor's degree.

Students who plan to apply to the program should consult the undergraduate advisor in the Department of Computational Mathematics, Science, and Engineering.

Requirements for the Minor in Data Science

Complete a minimum of 23 credits from the following:

			CREDITS
1.	All of the following courses (19 credits):		
	CMSE 180	Introduction to Data Science	4
	CMSE 201	Introduction to Computational Modeling and Data Analysis	4
	CMSE 202	Computational Modeling Tools and Techniques	4
	CMSE 381	Fundamentals of Data Science Methods	4
	MTH 314	Matrix Algebra with Computational Applications	3
2.	One of the following groups (4 or 6 credits):		
	(a) STT 380	Probability and Statistics for Data Science	4
	(b) STT 441	Probability and Statistics I: Probability	3
	STT 442	Probability and Statistics I: Statistics	3

Effective Fall 2019.

COLLEGE OF NURSING

1. Change the requirements for the **Master of Science in Nursing** degree in **Nursing**. The University Committee on Graduate Studies (UCGS) approved this request at its April 15, 2019 meeting.

The concentrations in the Master of Science in Nursing degree in Nursing are noted on the student's academic record when the requirements for the degree have been completed.

- a. Under the heading **Admission** make the following changes:

- (1) In item 8., add the following second sentence:

Recommendations for admission are made by the faculty committee to the Dean of the college based on the requirements for admission and the personal interview.

- b. Under the heading **Requirements for the Master of Science in Nursing Degree in Nursing** make the following changes:

- (1) Change the total credits required from '45 to 48' to '54'

- (2) In item 1., add the following courses:

NUR	903	Healthcare Informatics	3
NUR	904	Health Policy and Advocacy	3
NUR	906	Leadership in Complex Health Systems	3

- (3) Add the following concentration:

NURSE PRACTITIONER – PSYCHIATRIC MENTAL HEALTH (30 credits)			
EPI	840	Clinical Epidemiology for Healthcare Practice	3
NUR	952	Psychopharmacology and Neuropathological Basis of Mental Illness	3
NUR	953	Clinical Diagnosis and Management I – Psychiatric Assessment and Diagnosis	6
NUR	954	Clinical Diagnosis and Management II – Evidence Based Therapeutic Interventions	6
NUR	955	Clinical Diagnosis and Management III – Special Populations and Group	6
NUR	956	Clinical Diagnosis and Management IV – Complex and Collaborative Mental Health Care	6

- (4) In the **ADULT-GERONTOLOGY CLINICAL NURSE SPECIALIST** concentration make the following changes:

- (a) Change the total credits from '33' to '30'.

- (b) Add the following course:

EPI	840	Clinical Epidemiology for Healthcare Practice	3
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Delete the following courses:

NUR	904	Health Policy and Advocacy	3
NUR	906	Leadership in Complex Health Systems	3

2. Change the requirements for the **Doctor of Nursing Practice** degree in **Nursing Practice**. The University Committee on Graduate Studies (UCGS) approved this request at its April 15, 2019 meeting.

The concentrations in the Doctor of Nursing Practice degree in Nursing Practice are noted on the student's academic record when the requirements for the degree have been completed.

- a. Under the heading **Requirements for the Doctor of Nursing Practice Degree in Nursing Practice** make the following changes:

- (1) In item 2., add the following concentration:

NURSE PRACTITIONER – PSYCHIATRIC MENTAL HEALTH (42 credits)			
NUR	907	Advanced Pathophysiology for the Advanced Practice Registered Nurse	3
NUR	908	Advanced Physical Assessment for the Advanced Practice Registered Nurse	3
NUR	909	Advanced Pharmacology for the Advanced Practice Registered Nurse	3
NUR	952	Psychopharmacology and Neuropathological Basis of Mental Illness	3
NUR	953	Clinical Diagnosis and Management I – Psychiatric Assessment and Diagnosis	6
NUR	954	Clinical Diagnosis and Management II – Evidence Based Therapeutic Interventions	6
NUR	955	Clinical Diagnosis and Management III – Special Populations and Group	6
NUR	956	Clinical Diagnosis and Management IV – Complex and Collaborative Mental Health Care	6
NUR	957	Clinical Diagnosis and Management V – Clinical Immersion – Psychiatric Mental Health	6

- b. Under the section **Guidance Committee**, replace the paragraph with the following:

Students will receive advisement throughout the D.N.P. Project.

- c. Under the heading **Comprehensive Examinations** change the credits for the synthesis project from '6' to '10'.

Effective Fall 2019.

COLLEGE OF OSTEOPATHIC MEDICINE

1. Change the requirements for the **Professional Program in Osteopathic Medicine** leading to the Doctor of Osteopathic Medicine degree the College of Osteopathic Medicine. The University Committee on Graduate Studies (UCGS) approved this request at its April 15, 2019 meeting.

- a. Under the heading **Clerkship Curriculum** replace the entire entry with the following:

The clinical clerkship curriculum includes 83 weeks of clinical training in community hospitals, clinics, and private practice offices affiliated with the college from across the State of Michigan.

The third year curriculum consists of 51 weeks, transition from classroom to bedside, ambulatory family medicine, ambulatory internal medicine, ambulatory or in-patient pediatrics, in-patient internal medicine, neurology, psychiatry, obstetrics/gynecology, general surgery, and emergency medicine each in 4-week blocks. In addition, anesthesia and radiology each in 2-week blocks.

The fourth year curriculum consists of 32 weeks. Of those 32 weeks, 12 are required to be completed within our Statewide Campus System hospitals. The remaining 20 weeks are required to be completed within either the Statewide Campus System or any institution approved by the College of Osteopathic Medicine with advanced planning and scheduling on the part of the student. Within the 32 weeks, students will be required to complete 8 weeks in a surgical field and 12 weeks in a medicine related field. A list of possible rotations for each field is available from the College of Osteopathic Medicine.

Effective Fall 2019.

COLLEGE OF SOCIAL SCIENCE

1. Change the requirements for the **Master of Science** degree in **Forensic Science** in the School of Criminal Justice. The University Committee on Graduate Studies (UCGS) approved this request at its April 15, 2019 meeting.
 - a. Under the heading **Requirements for the Master of Science Degree in Forensic Science** make the following changes:
 - (1) In item 2. delete the **Forensic Biology** concentration.
 - (2) In item 2., change the total credits for the **Forensic Anthropology** concentration from '16' to '15'.
 - (3) In item 2., under the **Forensic Anthropology** concentration, change the credits of ANP 842 from '5' to '4'.
 - (4) Change item 3. to the following:

Complete an additional 8 to 11 credits of electives chosen in consultation with the student's academic advisor.

Effective Fall 2019.

2. Change the requirements for the **Master of Science** degree in **Law Enforcement Intelligence and Analysis** in the School of Criminal Justice. The University Committee on Graduate Studies (UCGS) approved this request at its April 15, 2019 meeting.
 - a. Under the heading **Requirements for the Master of Science Degree in Law Enforcement Intelligence and Analysis** make the following changes:
 - (1) In item 1. change the credits from '9' to '12' and delete the following course:

CJ	887	Quantitative Methods in Criminal Justice Research	3
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Add the following courses:

CJ	837	The Intelligence Process and Counterterrorism	3
CJ	870	Introduction to Crime Analysis	3
 - (2) In item 2. delete the following courses:

CJ	837	Counterterrorism and Intelligence	3
CJ	856	Advanced Topics in Policing	3

Add the following courses:

CJ	871	Advanced Crime Analysis	3
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- | | | | | |
|-----|--|-----|--|---|
| | CJ | 872 | Open Source Information Analysis | 3 |
| (3) | In item 3. Delete the following course: | | | |
| | CJ | 896 | Policy Analysis under Conditions of Change | 3 |
| | Add the following course: | | | |
| | CJ | 897 | Comprehensive Threat Assessment | 3 |
| (4) | Delete item 4. and renumber item 5. to item 4. | | | |

Effective Fall 2019

PART II - NEW COURSES

- ANS 110L Introductory Animal Agriculture Laboratory
Fall of every year. Spring of every year. 1(0-2)
Hands on experience in working with farm and companion animals. Field trip required.
Effective Fall 2019
- ANS 210 Introduction to Disciplines in Animal Agriculture
Fall of every year. Spring of every year. 3(3-0) P: ANS 110 or concurrently
Problem solving and literature searches with realistic examples to demonstrate multi-
disciplinary scientific solutions in Animal Science.
Effective Fall 2019
- ANS 305L Applied Animal Behavior Laboratory
Fall of every year. 1(0-2) P: ANS 305
Biological basis of behavior to improve animal health, productivity and welfare.
Effective Fall 2019
- ANS 307 Animal Reproduction
Fall of every year. 3(3-0) P: ANS 210
Reproductive physiology of farm and companion animals. Comparative reproduction in
human and laboratory animals.
Effective Fall 2019
- ANS 404 Introduction to Quantitative Genetics
Fall of every year. 3(3-0) P: (ANS 314) and (STT 200 or STT 201 or STT 231 or STT 421 or STT
464)
Theories and applications of quantitative genetics and their roles in breeding.
Effective Fall 2019
- ANS 482 Advanced Companion Animal Management
Spring of every year. 3(2-2) P: ANS 282 and ANS 210 RB: ANS 305 or IBIO 313
Companion animal behavior, welfare, anatomy, physiology, nutrition and health. Careers
in the companion animal industry. Experiential learning projects. Field trip required.
Effective Spring 2020

DEPARTMENT OF COMMUNITY SUSTAINABILITY

- CSUS 821 Indigenous Peoples, Sustainability and Environmental Justice
Fall of even years. 3(3-0) Interdepartmental with Philosophy. R: Open to graduate students.
Indigenous peoples as major architects of environmental sustainability movements and
environmental justice. Climate change adaptation, resilience, food sovereignty, and
ecological restoration. Environmental movements, cooperative environmental and climate
science, and coalitions for environmental advocacy. Case studies of Great Lakes and
global Indigenous peoples in dialogue.
Effective Fall 2020

DEPARTMENT OF COMPUTATIONAL MATHEMATICS, SCIENCE, AND ENGINEERING

- CMSE 381 Fundamentals of Data Science Methods
Fall of every year. Spring of every year. 4(4-0) Interdepartmental with Statistics and Probability. P:
(STT 180 and MTH 314 and CMSE 201 and STT 380) or (STT 180 and MTH 314 and CMSE 201
and STT 441 and STT 442)
Data science methods, including unsupervised learning and supervised learning, feature
extraction, dimension reduction, clustering, regression and classification.
Effective Fall 2019

- CMSE 382 Optimization Methods in Data Science
Fall of every year. Spring of every year. 4(4-0) P: CMSE 202 and CMSE 381
Concepts, mathematical foundations, methods, and algorithms of optimization in data modeling, all applied to modeling real-world data.
Effective Fall 2019
- CMSE 492 Selected Topics in Data Science
Fall of every year. Spring of every year. 1 to 4 credits. Interdepartmental with Computer Science and Engineering and Statistics and Probability. A student may earn a maximum of 12 credits in all enrollments for this course. R: Approval of department.
Topics selected to supplement and enrich existing courses in Data Science.
Effective Fall 2019
- CMSE 495 Experiential Learning in Data Science (W)
Fall of every year. Spring of every year. 4(2-4) Interdepartmental with Computer Science and Engineering and Statistics and Probability. P: (CSE 232 and CMSE 382) and completion of Tier I writing requirement R: Open to seniors.
Team-based data science projects on realistic, large-scale data.
Effective Fall 2019

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

- CSE 404 Introduction to Machine Learning
Fall of every year. 3(3-0) Interdepartmental with Computational Mathematics, Science, and Engineering and Statistics and Probability. P: (CSE 331) and (STT 351 or STT 380 or STT 430 or STT 441) RB: Basic linear algebra R: Open to juniors or seniors in the College of Engineering or in the Computer Science Minor or in the Lyman Briggs Computer Science Coordinate Major or in the Lyman Briggs Computer Science Major.
Core principles and techniques of all machine learning including model design and programming algorithms.
Effective Fall 2019

DEPARTMENT OF COUNSELING, EDUCATIONAL PSYCHOLOGY AND SPECIAL EDUCATION

- CEP 848 Supervision in Applied Behavior Analysis
Summer of every year. 3(3-0) R: Open to students in the Applied Behavior Analysis Major or in the Applied Behavior Analysis in Special Education Graduate Certificate.
Effective supervision strategies in behavior analytic practice.
Effective Summer 2019

DEPARTMENT OF FORESTRY

- FOR 804 Forest Ecology
Fall of odd years. 3(3-0) RB: FOR 404
- REINSTATEMENT Processes controlling population, community, ecosystem, landscape, and global ecology of forested systems. Extrapolation across scales, succession, spatial models of forest dynamics, causes and consequences of biodiversity, nutrient cycling, sustainability of managed ecosystems and human-accelerated environmental change.
Effective Fall 2019

DEPARTMENT OF KINESIOLOGY

- KIN 496 Internship: Athletic Training-Based
Fall of every year. Spring of every year. 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P: KIN 125 and KIN 126 and KIN 127 R: Open to seniors in the Department of Kinesiology. Approval of department.
Professional internship in Athletic Training under faculty supervision. Observation and prevention of athletic injury in high school and collegiate athletes.
Effective Fall 2019

- KIN 849 Theory and Practice of Modern Sport Leadership
Spring of every year. 3(3-0) R: Open to graduate students in the Sport Coaching and Leadership Graduate Certificate or in the Sport Coaching and Leadership Major or approval of department.
Theories of management and organizational behavior in a sport context. Practical strategies and methods for management, development, and advancement of sport professionals, athletes, and stakeholders.
Effective Spring 2020
- KIN 850 Special Topics in Sport Coaching and Leadership
Fall of every year. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. R: Open to graduate students in the Sport Coaching and Leadership Graduate Certificate or in the Sport Coaching and Leadership Major or approval of department.
Issues in sport coaching and leadership.
Effective Summer 2019
- KIN 852 Ethics in Sport Coaching and Leadership
Spring of every year. Summer of every year. 1(1-0) R: Open to graduate students in the Sport Coaching and Leadership Graduate Certificate or in the Sport Coaching and Leadership Major or approval of department.
Ethical decision-making processes and moral obligations of the sport coach and leaders.
Effective Summer 2019
- KIN 859 Scholastic Athletic Administration
Fall of every year. 3(3-0) R: Open to graduate students in the Sport Coaching and Leadership Graduate Certificate or in the Sport Coaching and Leadership Major or approval of department.
Skills to direct athletic programs in secondary educational settings. Athletic policies and guidelines of facilities, equipment, budget, and structure.
Effective Fall 2019

MSU COLLEGE OF LAW

- LAW 537V Blockchain Technology, Law, and Policy
Fall of every year. 0 to 6 credits. R: Open to Law students or law advanced students or law lifelong students or law non-degree students.
Blockchain technology, the laws affecting applications of the technology, and anticipated effects on contemporary legal practice.
Effective Fall 2019
- LAW 566T Marijuana Law
Fall of every year. Spring of every year. 0 to 6 credits. R: Open to Law students or law advanced students or law lifelong students or law non-degree students.
Historical and current legal developments at the state and federal levels relating to the regulation of marijuana.
Effective Fall 2019
- LAW 811B Special Topics in Global Food Law
Summer of odd years. 0 to 6 credits. R: Open to law advanced students.
Emerging, controversial and general developments in national and international food law and policy.
Effective Summer 2019

COLLEGE OF NURSING

- NUR 952 Psychopharmacology and Neuropathological Basis of Mental Illness
Summer of every year. 3(3-0) R: Open to graduate students or lifelong graduate students in the College of Nursing.
Advanced pharmacology and psycho-pharmacotherapeutics and the putative neuropathophysiology of common psychiatric illnesses that occur across the lifespan.
Effective Spring 2020

- NUR 953 Clinical Diagnosis and Management I - Psychiatric Assessment and Diagnosis
Fall of every year. 6(3-9) P: NUR 907 and NUR 908 and NUR 909 and NUR 952 R: Open to graduate students in the College of Nursing.
Mental health assessment and diagnostic screening to formulate differential diagnoses for common mental health conditions/problems across the lifespan.
Effective Spring 2020
- NUR 954 Clinical Diagnosis and Management II – Evidence-Based Therapeutic Interventions
Spring of every year. 6(3-9) P: NUR 953 R: Open to graduate students in the College of Nursing.
Assessment and intervention strategies for health promotion and common mental health problems in the clinical setting across the lifespan.
Effective Spring 2020
- NUR 955 Clinical Diagnosis and Management III – Special Populations and Group
Summer of every year. 6(3-9) P: NUR 954 R: Open to graduate students in the College of Nursing.
Assessment, intervention, including group psychotherapy, and management strategies for special and vulnerable populations with mental health problems across the lifespan.
Effective Spring 2020
- NUR 956 Clinical Diagnosis and Management IV – Complex and Collaborative Mental Health Care
Fall of every year. 6(2-12) P: NUR 955 R: Open to graduate students in the College of Nursing.
Evidence-based strategies to deliver collaborative mental health care across the wellness/illness continuum with patients across the lifespan.
Effective Spring 2020
- NUR 957 Clinical Diagnosis and Management V – Clinical Immersion – Psychiatric Mental Health
Spring of every year. 6(2-12) P: NUR 956 R: Open to graduate students in the College of Nursing.
Evidence-based management of chronic stable and complex mental health problems within collaborative practice in complex health systems across the lifespan.
Effective Spring 2020

DEPARTMENT OF PHILOSOPHY

- PHL 225 Paradoxes
Fall of every year. 3(3-0)
Central philosophical paradoxes and possible solutions. Topics vary and may include paradoxes about existence, infinity, space and time, knowledge, rationality, and truth. Students develop solutions to paradoxes, and work out consequences and costs of those solutions.
Effective Fall 2020

DEPARTMENT OF STATISTICS AND PROBABILITY

- STT 180 Introduction to Data Science
Fall of every year. Spring of every year. 4(4-0) Interdepartmental with Computational Mathematics, Science, and Engineering. P: (MTH 124 or concurrently) or (MTH 132 or concurrently) or (MTH 152H or concurrently) or (LB 118 or concurrently) Not open to students with credit in STT 301.
Pervasiveness and utility of data in modern society. Obtaining and managing data. Summarizing and visualizing data. Ethical issues in data science. Communication with data. Fundamentals of probability and statistics.
Effective Fall 2019
- STT 380 Probability and Statistics for Data Science
Fall of every year. Spring of every year. 4(4-0) P: ((MTH 234 or concurrently) or (MTH 254H or concurrently) or (LB 220 or concurrently)) and (MTH 314 or concurrently)
Fundamental concepts and methods in probability and statistics from a data science perspective.
Effective Fall 2019

STT 804 Statistical Consulting and Practice
Fall of every year. 3(3-0) R: Open to master's students in the College of Natural Science. Approval
of department.
 Statistical consulting and the practical aspects of the consulting environment. Ethics.
 Communication skills. Data management, and statistical methods.
 Effective Fall 2019

PART III – COURSE CHANGES

DEPARTMENT OF ANIMAL SCIENCE

- ANS 110 Introductory Animal Agriculture
Fall of every year. Spring of every year. ~~4(3-2)~~ 3(3-0) R: Open to undergraduate students or agricultural technology students.
~~History of animal agriculture and its relationship to human needs, production systems, marketing, and environmental considerations. Current goals and limitations affecting U.S. farm animal production. Field trips required.~~ History of animal agriculture and its relationship to human needs, production systems, marketing, and environmental considerations. Current goals and limitations affecting U.S. farm animal production.
SA: ANS 112
~~Effective Spring 2014~~ Effective Fall 2020
- ANS 201 Animal Products
Fall of every year. Spring of every year. 3(3-0) RB: ANS 110 R: Not open to freshmen.
Edible animal products. Food safety. Preservation, storage and distribution of dairy, meat and egg products.
~~Effective Spring 2014~~ Effective Spring 2020
- ANS 262 Introductory Sheep Management
Fall of every year. ~~Spring of every year.~~ 3(2-2)
Principles of sheep management: genetics, reproduction, nutrition, marketing, and economics.
~~Effective Fall 2013~~ Effective Fall 2019
- ANS 301 ~~Professional Development in Animal Science II~~
Professional Development in Animal Science II (W)
Fall of every year. Spring of every year. ~~2(4-2)~~ 3(3-0) P: ~~(ANS 101 and ANS 110) and completion of Tier I writing requirement~~ P: (ANS 110) and completion of Tier I writing requirement RB: ANS 101
R: Open to juniors or seniors in the Department of Animal Science.
~~Career preparation in animal science. Job interviewing skills. Oral presentation, written communication, and critical evaluation of science literature.~~ Career preparation in animal science. Job interviewing, oral presentation, and written communication skills.
~~Effective Fall 2013~~ Effective Fall 2020
- ANS 305 Applied Animal Behavior
Spring of every year. Summer of every year. ~~3(2-2)~~ 3(3-0) P: ~~BS 161 or LB 145 or BS 181H~~ P: (ANS 210) and (BS 162 or LB 144 or BS 182H)
Techniques for assessing health and welfare of domestic animals based on their behavior.
~~Effective Fall 2013~~ Effective Fall 2020
- ANS 313 ~~Principles of Animal Feeding and Nutrition~~
Principles of Animal Feeding and Nutrition (W)
Fall of every year. 4(3-2) P: ((BS 161 or LB 145 or BS 181H) and completion of Tier I writing requirement) and ((CEM 143 or concurrently) or (CEM 251 or concurrently))
Comparative nutrition and metabolism for production, health, and stewardship of cattle, horses, swine, poultry, dogs and cats. Diet evaluation and formulation. Feeding management.
~~Effective Spring 2014~~ Effective Fall 2020
- ANS 314 ~~Genetic Improvement of Domestic Animals~~
Genetic Improvement of Domestic Animals (W)
~~Fall of every year.~~ Spring of every year. 4(4-0) P: ((BS 161 or BS 181H or LB 145) and completion of Tier I writing requirement) and (STT 200 or STT 201 or STT 421 or STT 464 or STT 231)
Molecular, Mendelian, population, and quantitative genetics of domestic animals.
~~Effective Spring 2014~~ Effective Fall 2020

- ANS 315 Anatomy and Physiology of Farm Animals
Spring of every year. 4(3-2) ~~P: (BS 161 or LB 145 or BS 181H) and completion of Tier I writing requirement~~ P: BS 161 or LB 145 or BS 181H
Gross and microanatomy of farm animals. Structure directed function of tissues.
Endocrine integration for homeostasis. Regulation of growth, lactation, and reproduction.
Homeorhesis.
~~Effective Spring 2014~~ Effective Fall 2020
- ANS 409 ~~Problems, Controversies and Advancements in Reproduction~~
Problems, Controversies and Advancements in Reproduction (W)
Fall of every year. ~~3(3-0)~~ 4(4-0) P: ~~BS 161 or PSL 250~~ P: (BS 161 or PSL 250) and completion of Tier I writing requirement RB: ANS 307
~~Selected topics in endocrine, cellular, molecular and genetic aspects of sex differentiation, gametogenesis, folliculogenesis, sexual cycles, behavior, fertilization, early embryo development, pregnancy, parturition, infertility, reproductive disorders, assisted reproductive technologies in humans, livestock and animal models.~~ Selected topics in endocrine, cellular, molecular and genetic aspects of reproduction in humans, livestock and animal models.
~~Effective Fall 2014~~ Effective Fall 2020
- ANS 435 ~~Mammary Physiology~~
Mammary Physiology (W)
Spring of every year. ~~4(3-2)~~ 3(3-0) P: ~~(BS 161 or LB 145 or BS 181H) and (ANS 313 and ANS 315)~~ P: ((BS 161 or LB 145 or BS 181H) and completion of Tier I writing requirement) and (ANS 313 and ANS 315) R: Not open to freshmen and not open to sophomores.
Anatomy of the mammary gland and physiology of lactation in domestic and laboratory mammals. Mammary gland health and factors affecting lactation. Dairy herd milking management. Field trips required.
~~Effective Spring 2014~~ Effective Fall 2020

DEPARTMENT OF BIOSYSTEMS AND AGRICULTURAL ENGINEERING

- TSM 331 Water Management in Agriculture and Food Systems
Spring of every year. 3(3-0) Interdepartmental with Crop and Soil Sciences. P: MTH 103 or MTH 124 or MTH 132 or LB 118
Principles of water management, use efficiency and conservation in agricultural production, natural resources and food processing facilities. Best agricultural water management practices, water rights, irrigation scheduling, irrigation systems selection, evaluation and management and drainage principles. Large scale water use, management and conservation in food processing.
SA: TSM 431
~~Effective Fall 2016~~ Effective Fall 2019

SCHOOL OF PACKAGING

- PKG 485 ~~Packaging Development~~
Packaging Development (W)
Fall of every year. Spring of every year. ~~3(3-0)~~ 4(4-0) P: ~~(PKG 410 and PKG 432) and (PKG 315 or EGR 102) and (PKG 411 or concurrently)~~ P: ((PKG 410 and PKG 432) and completion of Tier I writing requirement) and (PKG 315 or EGR 102) and (PKG 411 or concurrently) R: Open to seniors or graduate students in the School of Packaging.
Package development including selection, design and implementation of package systems for protection, distribution, merchandising, use and disposal.
~~Effective Fall 2016~~ Effective Summer 2020

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

- CSE 331 Algorithms and Data Structures
Fall of every year. Spring of every year. 3(3-0) ~~P: CSE 232 and CSE 260~~ P: (CSE 232) and (CSE 260 or CMSE 202) ~~R: Open to students in the Department of Computer Science and Engineering or in the Computer Engineering Major or in the Lyman Briggs Computer Science Coordinate Major or in the Lyman Briggs Computer Science Major or in the Computer Science Disciplinary Teaching Minor.~~ R: Open to students in the Department of Computer Science and Engineering or in the Computer Engineering Major or in the Lyman Briggs Computer Science Coordinate Major or in the Lyman Briggs Computer Science Major and open to juniors or seniors in the College of Engineering.
Linear data structures, trees, graphs and algorithms which operate on them. Fundamental algorithms for searching, sorting, string matching, graph problems. Design and analysis of algorithms.
~~Effective Spring 2014~~ Effective Fall 2019
- CSE 402 Biometrics and Pattern Recognition
Fall of every year. 3(3-0) ~~P: CSE 331 and STT 351~~ P: (CSE 331) and (STT 351 or STT 380 or STT 430 or STT 441) R: Open to juniors or seniors in the College of Engineering or in the Computer Science Minor or in the Lyman Briggs Computer Science Coordinate Major or in the Lyman Briggs Computer Science Major.
Automated techniques used for feature extraction and pattern matching focusing on face, fingerprint and iris recognition.
~~Effective Fall 2017~~ Effective Fall 2019
- CSE 415 Introduction to Parallel Computing
Spring of every year. 3(3-0) P: CSE 320 and CSE 331 R: Open to juniors or seniors in the College of Engineering or in the Computer Science Minor or in the Lyman Briggs Computer Science Coordinate Major or in the Lyman Briggs Computer Science Major. Not open to students with credit in CMSE 401.
~~Core principles and techniques of parallel computing. Parallel architectures. Parallel programming models. Principles of parallel algorithm design. Performance analysis and optimization. Use of parallel computers.~~ Core principles and techniques of parallel computing including architectures, parallel programming models and algorithm design. Performance analysis and optimization. Use of parallel computers.
~~Effective Fall 2017~~ Effective Fall 2019
- CSE 482 Big Data Analysis
Spring of every year. 3(3-0) ~~P: CSE 331 and CSE 335 and STT 351~~ P: (CSE 331) and (STT 351 or STT 380 or STT 430 or STT 441) R: Open to juniors or seniors in the College of Engineering or in the Lyman Briggs Computer Science Coordinate Major or in the Lyman Briggs Computer Science Major.
Data collection, storage, and preprocessing, and analysis techniques. Programming for large-scale data analysis. Case studies and applications.
~~Effective Spring 2017~~ Effective Fall 2019

DEPARTMENT OF ECONOMICS

- EC 401 Advanced Microeconomics
Fall of every year. Spring of every year. 3(3-0) ~~P: EC 251H or EC 304~~ P: (EC 251H or EC 301) and (MTH 124 or MTH 132 or MTH 152H or LB 118)
Economics of uncertainty and incomplete information. Game theory and theories of oligopoly. Transaction costs. Advanced topics in welfare economics, general equilibrium, externalities, and public goods.
~~Effective Fall 2014~~ Effective Fall 2019

DEPARTMENT OF EMERGENCY MEDICINE

- EM 632 Senior Clinical Elective in Emergency Medicine
Fall of every year. Spring of every year. Summer of every year. 6 credits. A student may earn a maximum of 24 credits in all enrollments for this course. ~~P: (FM 641 and MED 641 and PHD 641 and PSC 641 and OGR 641 and SUR 641) or (FM 608 and MED 608 and PHD 600 and PSC 608 and OGR 608 and SUR 608)~~ P: {(FM 641 or MED 641 or PHD 641 or PSC 641 or OGR 641 or SUR 641) and (FM 641 or MED 641 or PHD 641 or PSC 641 or OGR 641 or SUR 641) and (FM 641 or MED 641 or PHD 641 or PSC 641 or OGR 641 or SUR 641) and (FM 641 or MED 641 or PHD 641 or PSC 641 or OGR 641 or SUR 641)} or (FM 608 and MED 608 and PHD 600 and PSC 608 and OGR 608 and SUR 608) R: Open to graduate-professional students in the College of Human Medicine.
Four-week elective in clinical diagnosis and treatment of the undifferentiated patient in the emergency department setting. Intended for students planning to apply to an Emergency Medicine Residency.
Request the use of the Pass-No Grade (P-N) system.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 2 semesters after the end of the semester of enrollment.
~~Effective Fall 2018~~ Effective Summer 2019

DEPARTMENT OF ENGLISH

- FLM 200 Film Collective
Fall of every year. Spring of every year. ~~4(1-1)~~ 1(1-2)
Film Collective screening seminar.
Request the use of the Pass-No Grade (P-N) system.
~~Effective Fall 2016~~ Effective Fall 2019

SCHOOL OF HOSPITALITY BUSINESS

- HB 337 Hospitality Information Systems
Fall of every year. Spring of every year. 3(3-0) ~~P: HB 237 and CSE 101~~ P: (HB 237) and (CSE 101 or CSE 102) R: Open to juniors or seniors in the School of Hospitality Business.
Technology for gathering, analyzing, storing and communicating information within the hospitality industry.
~~Effective Spring 2013~~ Effective Spring 2020

SCHOOL OF HUMAN RESOURCES AND LABOR RELATIONS

- HRLR 999 Doctoral Dissertation Research
Fall of every year. Spring of every year. Summer of every year. ~~4 to 6 credits.~~ 1 to 9 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open to doctoral students or approval of school.
Doctoral dissertation research.
Request the use of the Pass-No Grade (P-N) system.
~~Effective Summer 2014~~ Effective Fall 2019.

JAMES MADISON COLLEGE

- MC 334 Rights, Advocacy, and Activism
Fall of odd years. 4(3-0) ~~P: MC 230 and MC 231 or approval of college~~ P: MC 230 or MC 231 or MC 280 or MC 281 or approval of college R: Open to undergraduate students in the James Madison College.
Global perspectives on human rights, non-governmental organization (NGO) advocacy, and grassroots activism as mechanisms of change. Case studies on racial and cultural discrimination, gender-based violence, sexuality and rights, environment and climate justice, refugees and immigration, and other topics.
~~Effective Fall 2016~~ Effective Fall 2019

DEPARTMENT OF KINSEIOLOGY

- KIN 126 Introduction to Athletic Training
Introduction to Athletic Injury
Fall of every year. Spring of every year. 3(3-0) ~~R: Open to undergraduate students in the Athletic Training Major or in the Kinesiology major.~~ R: Open to undergraduate students in the Kinesiology major.
Basic knowledge for the recognition and prevention of athletic injuries.
~~Effective Spring 2014~~ Effective Spring 2020
- KIN 127 Taping and Bracing in Athletic Training
Taping and Bracing in Athletic Injury
Fall of every year. Spring of every year. 1(0-2) R: Open to undergraduate students in the Department of Kinesiology.
~~Introduction to taping and bracing in Athletic Training.~~ Introduction to taping and bracing for athletic injuries.
~~Effective Spring 2014~~ Effective Spring 2020
- KIN 855 Psychosocial Bases of Coaching Athletes
Fall of every year. 3(3-0) ~~R: Open to students in the Education Major or in the Sport Coaching and Leadership Graduate Certificate or in the Sport Coaching and Leadership Major.~~ R: Open to students in the Education Major or in the Sport Coaching and Leadership Graduate Certificate or in the Sport Coaching and Leadership Major or approval of department.
~~Responsibilities of athletic administrators, directors of recreational programs and athletic coaches for the sociological, psychological, philosophical, developmental, and instructional principles for coaching amateur athletes. Development of a coaching philosophy and application of scientific findings to practical situations. Athlete motivation, motivational climates, and the social psychology of coaching and leadership. Communication skills and leadership behaviors. Mental skills that enhance an athlete's performance.~~
~~Effective Spring 2017~~ Effective Summer 2019
- KIN 896 Integrative Capstone in Sport Coaching and Leadership
Fall of every year. Spring of every year. Summer of every year. 3(3-0) 2(2-0) ~~P: (KIN 820 or concurrently) and KIN 854 and KIN 855 and KIN 856 and KIN 857 and KIN 865 and KIN 868 and KIN 872 and KIN 880~~ P: KIN 872 and KIN 880 or approval of department R: Open to master's students in the Sport Coaching and Leadership Major.
Integrative capstone in coaching science, best practices, leadership, and management in sport.
Request the use of the Pass-No Grade (P-N) system.
~~Effective Spring 2017~~ Effective Summer 2019

DEPARTMENT OF MEDICINE

- MED 628 Advanced Internal Medicine: Senior Medicine Sub-Internship
Fall of every year. Spring of every year. Summer of every year. 3 to 6 credits. A student may earn a maximum of 24 credits in all enrollments for this course. ~~P: MED 608 or MED 641~~ ~~RP: MED 608 or HM 556~~ R: Open to graduate-professional students in the College of Human Medicine.
Advanced clinical experiences to refine diagnostic and management skills in complicated general internal medicine patients.
Request the use of the Pass-No Grade (P-N) system.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 2 semesters after the end of the semester of enrollment.
Effective Summer 2019

COLLEGE OF NURSING

- NUR 434 ~~Nursing Care of Acute and Chronically Ill Patients III~~
Nursing Care of Acute and Critically Ill Patients
Fall of every year. Spring of every year. 4(2-6) P: NUR 337 and NUR 371 and NUR 342
Nursing process and clinical judgment to manage and evaluate care for acute and critically ill patients at an advanced level.
Effective Fall 2019

DEPARTMENT OF SURGERY

- SUR 615 Ophthalmology Clerkship
Fall of every year. Spring of every year. Summer of every year. 3 to 6 credits. A student may earn a maximum of 24 credits in all enrollments for this course. ~~P: SUR 608 or SUR 644~~ RB: SUR 608 or SUR 641 R: Open to graduate-professional students in the College of Human Medicine.
Medical and surgical treatment of eye diseases. Clinical experiences include private office practice, surgical observations, pre-and post-operative care.
Request the use of the Pass-No Grade (P-N) system.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 2 semesters after the end of the semester of enrollment.
~~Effective Fall 2018~~ Effective Summer 2019
- SUR 618 Anesthesia Clerkship
Fall of every year. Spring of every year. Summer of every year. 3 to 6 credits. A student may earn a maximum of 24 credits in all enrollments for this course. ~~P: SUR 608 or SUR 644~~ RB: SUR 608 or SUR 641 R: Open to graduate-professional students in the College of Human Medicine.
Common anesthetic agents and procedures. Operative and post-operative effects, complications, patient risk, cost. Performing anesthetic procedures under faculty supervision.
Request the use of the Pass-No Grade (P-N) system.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 2 semesters after the end of the semester of enrollment.
~~Effective Fall 2018~~ Effective Summer 2019
- SUR 630 Surgical Wound Care Clerkship
Fall of every year. Spring of every year. Summer of every year. 3 to 6 credits. A student may earn a maximum of 24 credits in all enrollments for this course. ~~P: SUR 608 or SUR 644~~ RB: SUR 608 or SUR 641 R: Open to graduate-professional students in the College of Human Medicine.
Evaluation, management and knowledge of wound care in surgical patients.
Request the use of the Pass-No Grade (P-N) system.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 2 semesters after the end of the semester of enrollment.
~~Effective Fall 2018~~ Effective Summer 2019
- SUR 632 Surgical Nutrition Clerkship
Fall of every year. Spring of every year. Summer of every year. 3 to 6 credits. A student may earn a maximum of 24 credits in all enrollments for this course. ~~P: SUR 608 or SUR 644~~ RB: SUR 608 or SUR 641 R: Open to graduate-professional students in the College of Human Medicine.
Evaluation, management and knowledge of nutrition in critically-ill surgical patients.
Request the use of the Pass-No Grade (P-N) system.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 2 semesters after the end of the semester of enrollment.
~~Effective Fall 2018~~ Effective Summer 2019

COLLEGE OF VETERINARY MEDICINE

VM 826

Creating a Food Safety Culture

Summer of odd years. 3(3-0) RB: Professional or graduate status with knowledge of food safety. ~~R:~~

~~Open to graduate students in the College of Veterinary Medicine or in the Department of Large~~

~~Animal Clinical Sciences or in the Food Safety Major or approval of college. R: Approval of college.~~

Explores proven, evidence-based ways to change or strengthen the food safety culture of an organization and influence employee behavior.

Request the use of ET-Extension to postpone grading.

The work for the course must be completed and the final grade reported within 2 semesters after the end of the semester of enrollment.

~~Effective Summer 2017~~ Effective Summer 2019