

SUBCOMMITTEE A – AGENDA

Via Zoom
March 24, 2022
1:30 p.m.

PART I – NEW ACADEMIC PROGRAMS AND PROGRAM CHANGES

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

1. Request to change the requirements for the **Bachelor of Science** degree in **Food Science** in the Department of Food Science and Human Nutrition.

The concentrations in the Bachelor of Science degree in Food Science 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 Food Science** make the following changes:

- (1) In item 1., replace paragraph three with the following:

Students who are enrolled in the Food Science major leading to the Bachelor of Science degree in the Department of Food Science and Human Nutrition may complete an alternative track to Integrative Studies in Biological and Physical Sciences that consists of the following courses: Biological Science 161, Chemistry 161 and 162, and Physics 221, 231, 241 or Lyman Briggs 273. The completion of Chemistry 161 and 162 satisfies the laboratory requirement. Biological Science 161, Chemistry 161 and 162 and Physics 221, 231, 241 or Lyman Briggs 273 may be counted toward both the alternative track and the requirements for the major referenced in item 3. below.

- (2) In item 3. a. delete the following course:

PHY	231	Introductory Physics I	3
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- (3) In item 3. a. change the total credits from '54' to '51'.

- (4) Add the following new item 3. b. and reletter items 3. b., 3. c., and 3. d. respectively:

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

LB	273	Physics I	4
PHY	221	Studio Physics for Life Scientists I	4
PHY	231	Introductory Physics I	3
PHY	241	Physics for Cellular and Molecular Biologists I	4

- (5) In item 3. e. under the **Basic Food Science** concentration, item (2) add the following course:

LB	274	Physics II	4
PHY	222	Studio Physics for Life Scientists II	4
PHY	242	Physics for Cellular and Molecular Biologists II	4

Only one physics course (LB 274, PHY 222, PHY 232, PHY 242) can be counted towards the 9 credits.

- (6) In item 3. e. under the **Food Business and Industry** concentration, in item (2) delete the following courses:

ABM	100	Decision-making in the Agri-Food System	3
ABM	222	Agribusiness and Food Industry Sales	3
ABM	435	Financial Management in the Agri-Food System	3
FI	311	Financial Management	3
FIM	335	Food Marketing Management	3

Add the following courses:

AFRE	100	Decision-making in the Agri-Food System	3
AFRE	222	Agribusiness and Food Industry Sales	3
AFRE	435	Financial Management in the Agri-Food System	3

or

FI	320	Introduction to Finance	3
AFRE	440	Food Marketing Management	3

- (7) In item 3. e. under the **Food Packaging** concentration, change the credits of PKG 221 from '3' to '2' and the total credits from '26' to '25'.

Effective Fall 2022.

2. Request to change the requirements for the **Master of Science** degree in **Nutrition and Dietetics** in the Department of Food Science and Human Nutrition. The University Committee on Graduate Studies (UCGS) will consider this request at its March 21, 2022 meeting.

- a. Under the heading **Requirements for the Master of Science Degree in Nutrition and Dietetics** make the following changes:

- (1) In item 1., change the credits of HNF 898 from '4' to '1'.
- (2) In item 1., change the total credits from '21' to '18'.
- (3) In item 2., change the credits from '9' to '12'.

Effective Fall 2022.

3. Request to change the requirements for the **Bachelor of Science** degree in **Horticulture** in the Department of Horticulture.

The concentrations in the Bachelor of Science degree in Horticulture 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 Horticulture** make the following changes:

- (1) In item 3. a. delete the following course:

HRT	205	Plant Mineral Nutrition	1
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Add the following course:

HRT	494	Horticulture Career Development II	1
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- (2) In item 3. b. under **Horticultural Science** make the following changes:

- (a) Change the total credits from '30' to '29'.

- (b) Replace item (1) with the following:

Both of the following courses (8 credits):

ENT	404	Fundamentals of Entomology	4
PLP	405	Plant Pathology	4

- (c) In item (2) delete the following course:

HRT	405	Sustainable Practices for Horticultural Food Crop Production	1
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Add the following courses:

HRT	351	Hydroponic Food Production	2
HRT	351L	Hydroponic Food Production Lab	2

- (d) In item (3) add the following course:

CSS	441	Biotechnology and Plant Breeding	3
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(3) In item 3. b. under **Sustainable and Organic Horticulture** make the following changes:

(a) Change the total credits from '31' to '32'.

(b) In item (1) change the credits of PLP 405 from '3' to '4'.

(c) In item (2) delete the following courses:

CSS	221	Greenhouse Structures and Management	3
HRT	405	Sustainable Practices for Horticultural Food Crop Production	1

Add the following courses:

HRT	351	Hydroponic Food Production	2
HRT	351L	Hydroponic Food Production Lab	2

(d) In item (3) delete the following course:

CSS	451	Biotechnology Applications for Plant Breeding and Genetics	3
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(4) In item 3. b. under **Horticulture Landscape Design, Construction, and Management** make the following changes:

(a) In item (2) delete the following courses:

HRT	219	Landscape Computer Aided Design	2
LA	230	Site Construction Materials and Methods	4

Effective Fall 2022.

4. Request to establish a **Agricultural Technology Certificate** in **Forest Technology** in the Institute of Agricultural Technology. The University Committee on Undergraduate Education (UCUE) will consider this request at its February 3, 2022 meeting.

a. **Background Information:**

Certificate programs and workshops in the areas of production agriculture and horticulture were developed and launched in 1894 as campus-based programs. In 1994, the Institute of Agricultural Technology started to offer programs in collaboration with community colleges. There is currently no certificate program available for individuals interested in Forest Technology within the state of Michigan.

The nation and state of Michigan face an overall shortage of trained graduates in the field of forestry, where aging demographics will result in a wave of retirements in the coming years. In addition, as evidenced in letters of support for our USDA Higher Education Challenge Grant, there is tremendous employer demand for trained foresters (e.g., Michigan Department of Natural Resources, Michigan Association of Timbermen and Lyme Great Lakes Timberlands). These agency and industry partners have consistently stressed concerns in regard to shortages of trained graduates. Despite growing societal recognition of the importance of forests and trees and the growing demand for trained professionals, undergraduate enrollments in forestry have been in decline for decades. At the same time, there are limited options, especially for postsecondary and non-traditional students who are place-bound and unable to enroll in a traditional 4-year bachelor's program. Given these issues, there is a need to reinvigorate forestry education programs to meet the changing needs of forestry practice and to train the upcoming generation of forestry professionals.

MSU is one of only two universities in the state that currently offers a Bachelor of Science degree in Forestry; therefore, the Institute of Agricultural Technology in partnership with the Department of

Forestry, has the experience and expertise to deliver a certificate in Forest Technology as well. If MSU can be the first university to offer such a program, we expect to bring in new students who would not otherwise consider our existing bachelor's degree program.

b. **Academic Programs Catalog Text:**

The Forest Technology program prepares graduates for a wide range of employment and career choices. Each student receives personal, one-on-one help in selecting their program of study, including a workplace internship. Students will collect and manage forestry-related data, plan and perform forest management activities, prepare timber for harvest and administer timber sales. They also support fire management activities and coordinate forestry workforce.

Requirements for Forest Technology

			CREDITS
Students must complete 63 credits from the following:			
1.	All of the following courses (33 courses):		
	AT 293	Professional Internship in Agricultural Technology	3
	CSS 143	Introduction to Soil Science	2
	ENT 110	Applied Entomology of Economic Plants	3
	FOR 115	Field Exploration of Topics in Forest Technology	1
	FOR 116	Career Development in Forestry Technology	1
	FOR 117	Natural Resources Equipment and Worker Safety	1
	FOR 130	Fundamentals of Forest Management Planning	1
	FOR 135	Forest Issues and Policy	1
	FOR 204	Forest Vegetation	3
	FOR 222	Forestry Field Methods	2
	FOR 250	Introduction to Forest Ecology and Silviculture	3
	FOR 260	Applied Forest Management	3
	FOR 265	Crew Leadership and Management of Forest Technology	2
	FOR 270	Forest Business Operations	2
	FOR 275	Timber Harvest Planning and Systems	3
	PLP 105	Fundamentals of Applied Plant Pathology	2
2.	Complete 30 credits of additional course work through Bay College. All course work must be approved by the program coordinator in the Institute of Agricultural Technology.		

Effective Fall 2022.

5. Request to establish a **Agricultural Technology Certificate** in **Urban Forest Management** in the Institute of Agricultural Technology. The University Committee on Undergraduate Education (UCUE) will consider this request at its February 3, 2022 meeting.

a. **Background Information:**

Certificate programs and workshops in the areas of production agriculture and horticulture were developed and launched in 1894 as campus-based programs. In 1994, the Institute of Agricultural Technology started to offer programs in collaboration with community colleges. There is currently no certificate program available for individuals interested in Urban Forest Management within the state of Michigan. The nation and state of Michigan face an overall shortage of trained graduates in the field of forestry, especially in urban forest management, where aging demographics will result in a wave of retirements in the coming years. In addition, as evidenced in letters of support for our USDA Higher Education Challenge Grant, there is tremendous employer demand for trained urban and community foresters (e.g., Michigan Department of Natural Resources and International Society of Arboriculture – Michigan). These agency and industry partners have consistently stressed concerns in regard to shortages of trained graduates. Despite growing societal recognition of the importance of urban forests and trees and the growing demand for trained professionals, undergraduate enrollments in forestry have been in decline for decades. At the same time, there are limited options, especially for post-secondary and non-traditional students who are place-bound and unable to enroll in a traditional 4-year bachelor's program. Given these issues, there is a need to reinvigorate forestry education programs to meet the changing needs of forestry practice and to train the upcoming generation of forestry professionals.

MSU is one of only two universities in the state that currently offers a Bachelor of Science degree in Forestry; therefore, the Institute of Agricultural Technology in partnership with the Department of Forestry, has the experience and expertise to deliver a certificate in Forest Technology as well. If MSU can be the first university to offer such a program, we expect to bring in new students who would not otherwise consider our existing bachelor's degree program.

b. **Academic Programs Catalog Text:**

The Urban Forest Management program prepares graduates for a wide range of employment and career choices. Each student receives personal, one-on-one help in selecting their program of study, including a workplace internship. Students will collect and analyze urban and community forestry data, coordinate planning activities, manage field operations, provide technical expertise and lead staff. Students also implement bidding and contracting processes and develop and maintain stakeholder relationships.

Requirements for Urban Forest Management

				CREDITS
Students must complete 60 to 61 credits from the following:				
1.	All of the following courses (36 courses):			
	AT	293	Professional Internship in Agricultural Technology	3
	CSS	143	Introduction to Soil Science	2
	ENT	110	Applied Entomology of Economic Plants	3
	FOR	111	Field Exploration of Urban and Community Forestry	1
	FOR	112	Career Development in Urban and Community Forestry	1
	FOR	113	Urban Tree Care Equipment and Worker Safety	2
	FOR	114	Introduction to Climbing and Aerial Tree Work	1
	FOR	120	Survey of Urban and Community Forestry	2
	FOR	125	Methods of Engagement in Urban and Community Forestry	2
	FOR	222	Forestry Field Methods	2
	FOR	225	Urban Forestry Information Technology	3
	FOR	235	Urban Tree Care Practicum	3
	FOR	240	Crew Leadership and Management in Arboriculture	2
	FOR	245	Capstone Experience in Urban and Community Forestry	2
	HRT	211	Landscape Plants I	3
	HRT	213	Landscape Maintenance	2
	PLP	105	Fundamentals of Applied Plant Pathology	2
2.	Complete 24 or 25 credits of additional course work through Muskegon Community College. All course work must be approved by the program coordinator in the Institute of Agricultural Technology.			

Effective Fall 2022.

COLLEGE OF NATURAL SCIENCE

1. Request to change the requirements for the **Doctor of Philosophy** degree in **Neuroscience** in the Program in Neuroscience. The University Committee on Graduate Studies (UCGS) will consider this request at its March 21, 2022 meeting.

a. Under the heading **Requirements for the Doctor of Philosophy Degree in Neuroscience** make the following changes:

(1) In item 1. delete the following course:

NEU	815	Quantitative Skills in Neuroscience Research	3
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Add the following courses:

CMSE	890	Selected Topics in Computational Mathematics, Science, and Engineering	3
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or

FOR 875 R Programming for Data Sciences 3
Students who choose CMSE 890 must complete three separate enrollments in a specific topic approved by the student's guidance committee.

(2) Replace item 3. with the following:

Complete in the first year of enrollment in the program, a minimum of 2, and no more than 3 laboratory rotations (NEU 890) with each of two or three members of the faculty. Each rotation is established by mutual agreement of the faculty member and the student.

Effective Fall 2022.

2. Request to establish a **Graduate Certificate in Sports Analytics** in the Department of Mathematics. The University Committee on Graduate Studies (UCGS) will consider this request at its January 24, 2022 meeting.

a. **Background Information:**

The proposed certificate is a natural outgrowth of the experiential and teamwork-based course MTH 491B offered in the Actuarial Science major. Traditionally, students in MTH 491B learn to work in teams towards product delivery (code and documentation) using insurance data, making use of tools in mathematics, statistics, and coding. Since the early 2010's, the department has added a section that leverages these tools and adapts them to problems in sports analytics. This has been very successful, and one of the results are students who have minimal or no background in sports, but have technical skills in math, statistics, and coding and can be quickly trained in sports analytics. The proposed certificate seeks to offer the same experiential, hands-on approach to learning tools in sports analytics, tailored to the needs of those working in the sports management and coaching fields. It introduces them to quantitative and risk-management tools that address challenges in sports modeling and data analysis.

In terms of accreditation, because of the overall novelty of the field of sports analytics, there aren't many accrediting agencies. One that does exist is the International Society of Performance Analysis in Sports (ISPAS) which is connected to the University of Canberra's sports analytics certificate. Graduates of the Canberra program are eligible to apply for Level 2 accreditation in the ISPAS. More information on the Canberra program can be found at <https://www.canberra.edu.au/course/363JA/1/2022>. Beyond the Canberra program, there are a few, but not many, similar certificate programs. These are listed at <https://www.datascienceprograms.org/online/sports-analytics> and include Certificate programs and concentrations/specializations within master's programs offered by American University, the University of West Alabama, Northwestern University, and Temple Universities. Detailed information on the curricula and timeline for completion for these programs can be found at the link.

There are many strong points that the proposal addresses. First, there is the overall lack of programs offered in this space, especially one that combines the approach combining training in mathematics, statistics, and machine learning with sports analysis, including guest lectures from alumni and others working in the field of professional and amateur sports. Second, the flexibility of online training, combined with on-campus training with MSU Hockey, is a definite benefit. Third, very few universities can compete with the strength in quantitative pedagogy that MSU possesses, and we believe that our reputation in this area will be attractive to graduates and professionals seeking to elevate their skill-sets in sports analytics in the two semester program duration, compared to 20 months required for the American University's Master's Program.

Upon completion of this certificate, students will use advanced mathematics and statistics to address issues in sports analytics, individually and in groups, and develop further areas of inquiry that bring value to their organization. They will develop code comprehension and communication skills that will allow them to direct the analytics teams that are rapidly developing within sports organizations, and communicate their findings to the balance of the organization.

b. **Academic Programs Catalog Text:**

The Sports Analytics graduate certificate provides students with quantitative and applicable skills in support of the analysis of sports performance. Students develop analytic techniques in stochastic and statistical analysis with written and verbal communication skills. They will be able to transfer

data on player performance into metrics, develop analytical models to differentiate player performance, and communicate effectively with non-quantitative decision makers. The applications draw from quantitative issues in management of day-to-day operations, player developing and assessment, and player recruitment. The certificate is targeted at professionals in the sports industry or college athletics, former athletes transitioning into sports analytics, and quantitatively literate people who are transitioning into sports analytics. The certificate is available online only.

Admission

Students must:

1. Complete an application with approval from both the Department of Mathematics and Department of Statistics and Probability.
2. Have background in mathematical and statistical foundations normally acquired through course work in multivariable calculus, linear algebra, and statistics and probability.

Requirements for the Graduate Certificate in Sports Analytics

			CREDITS
Students must complete 12 credits from the following:			
MTH	801	Machine Learning Algorithms: Mathematical Analysis	3
MTH	803	Sports Decision Analytics	3
STT	832	Data Visualization and Programming in R	3
STT	834	Sports Analytics Capstone	3

Effective Fall 2022.

3. Request to change the requirements for the **Graduate Certificate in Accelerator Science and Engineering** in the Department of Physics and Astronomy. The University Committee on Graduate Studies (UCGS) will consider this request at its March 21, 2022 meeting.

The Graduate Certificate in Accelerator Science and Engineering is a Type 2 graduate certificate and will appear on the transcript as "Graduate Certificate Program in Accelerator Science and Engineering".

- a. Under the heading **Requirements for the Graduate Certificate in Accelerator Science and Engineering** make the following changes:

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

ECE	835	Advanced Electromagnetic Fields and Waves I	3
ME	814	Convective Heat Transfer	3
ME	840	Computational Fluid Dynamics and Heat Transfer	3
ME	842	Advanced Turbomachinery	3
ME	940	Selected Topics in Thermal Science	3

- (2) Replace the note following item 2. with the following:

Students who enroll in ME 940 and PHY 905 must obtain approval of the Physics and Astronomy Graduate Program Director to ensure appropriate content. PHY 905 may be taken more than once as long as the topic taken is different.

Effective Fall 2022.

4. Request to establish a **Graduate Certificate in Computational Plant Science** in the Department of Plant Biology. The University Committee on Graduate Studies (UCGS) will consider this request at its January 24, 2022 meeting.

c. **Background Information:**

Integrated training Model in Plant and Computational Sciences (IMPACTS) is an NSF funded program for training doctoral students to employ advanced computational/data science approaches to address grand challenges in plant biology. This National Science Foundation Research Traineeship (NRT) was awarded to Michigan State University to address the demand for next-generation scientists with both an understanding of plant biology and computational skills. By training doctoral students to employ advanced computational and data science approaches to address grand challenges in plant biology this critical need could be addressed.

The training program offers three courses as part of the curriculum which is a requirement for getting the fellowship. The creation of this proposed graduate certificate will broaden participation from graduate students in diverse departments and promote interdisciplinary approaches to research and problem-solving in complex and real-world contexts. In addition, the program's focus on computational skills is consistent with broader initiatives in STEM nationally and at MSU to promote quantitative and computational approaches as a core component of STEM training.

Although graduate training in genomics and bioinformatics is widespread, the advanced training in computation and modeling required to handle increasingly heterogeneous, multiscale data from the molecular to ecosystem levels, is lacking. The ability to understand and integrate these diverse types of data is key to modeling complex cellular system functions, relationships between genotypes, environment, and phenotypes, and impacts of global change on ecosystems. The program will be distinct from other biological science graduate programs or from what is provided by most bioinformatics training programs in the United States which emphasize predominantly molecular level problems. The goal of this program certification will be aligned with MSU's mission to advance life science research and training with a focus on –omics and computation. Cross-disciplinary applications and collaboration between biologists and computational scientists will lessen disciplinary boundaries and enable students to leverage methodological advances in the data revolution for solving complex, multi-system problems in life science. The highly interdependent, multi-dimensional, noisy, and sparse datasets typical of biological observations provide unique challenges to stimulate the development of novel computational tools and models.

Beyond training a cadre of highly skilled computational plant scientists, the pedagogical approaches developed will broadly inform training practices for infusing computational/data science in any biological discipline. The pedagogical approaches developed as part of this training grant will broadly inform training practices for interdisciplinary education and infuse computational/data science in numerous biological disciplines.

d. **Academic Programs Catalog Text:**

The Graduate Certificate in Computational Plant Science provides interdisciplinary training that intersects plant biology and computational and data sciences. The certificate address pressing problems in their respective fields and synthesizes these disciplines to address vast challenges in plant biology.

Requirements for the Graduate Certificate in Computational Plant Science

CREDITS

Students must complete a minimum of 9 credits from the following:

1. All of the following courses (7 credits):

CSS	844	Frontiers in Computational and Plant Sciences	3
HRT	841	Foundation in Computational and Plant Sciences	3
PLB	843	Forum in Computational and Plant Sciences	1
2. Complete a minimum of 2 credits from the following courses:

Biologists relevant courses:

CMSE	491	Selected Topics in Computational Mathematics, Science, and Engineering	1 to 4
CMSE	801	Introduction to Computational Modeling	3
CMSE	820	Mathematical Foundations of Data Science	3

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CMSE	822	Parallel Computing	3
CMSE	823	Numerical Linear Algebra	3
CMSE	890	Selected Topics in Computational Mathematics, Science, and Engineering	1 to 4
<i>Non-Biologists relevant courses:</i>			
BMB	801	Molecular Biology	3
BMB	978	Seminar in Biochemistry	1
HRT	894	Horticulture Seminar	1
IBIO	445	Evolution (W)	3
PLB	400	Introduction to Bioinformatics	3
PLB	801	Foundations of Plant Biology	3
PLB	812	Principles and Applications of Plant Genomics	3

Effective Summer 2022.

PART II - NEW COURSES AND CHANGES

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

- HNF 250 Contemporary Issues in Human Nutrition
Fall of every year. ~~3(2-2)~~ 3(4-0) P: (HNF 150) and completion of Tier I writing requirement R:
Open to students in the Nutritional Sciences Major or in the Lyman Briggs Nutritional Sciences
Coordinate Major.
Current topics and controversies in nutrition, health, and chronic disease. Concepts of
health. Credible sources of nutrition information and research. Governing agencies and
policy. Ethical issues related to nutrition.
~~Effective Fall 2018~~ Effective Fall 2022
- HNF 250L Professional Development and Career Planning in Nutrition
Fall of every year. Spring of every year. 1(0-2) P: HNF 150 R: Open to students in the Nutritional
Sciences Major and open to students in the Lyman Briggs Nutritional Sciences Coordinate Major.
Experiential learning and career opportunities in nutrition. Skills for professional and
career development.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 1
semester after the end of the semester of enrollment.
DELETE COURSE
Effective Spring 2022
- HNF 255 Professional Development and Career Planning in Nutrition
Fall of every year. Spring of every year. 1(1-0) P: HNF 150 R: Open to students in the Nutritional
Sciences Major or in the Lyman Briggs Nutritional Sciences Coordinate Major.
- NEW Experiential learning and career opportunities in nutrition. Skills for professional and
career development.
SA: HNF 250L
Effective Fall 2022
- HNF 415 Global Nutrition
Fall of every year. Spring of every year. ~~3(3-0)~~ ~~P: HNF 350~~ P: HNF 250 R: Open to seniors or
 juniors in the Nutritional Sciences Major or in the Lyman Briggs Nutritional Sciences Coordinate
Major.
Burdens, causes, and consequences of undernutrition globally. Interaction of nutrition
with illness, obesity, and reproductive health. Approaches, policies, and programs to
prevent undernutrition.
~~Effective Spring 2021~~ Effective Fall 2022
- HNF 822 Nutrition for Human Performance and Sport
Fall of every year. 3(3-0) RB: Undergraduate degree in Dietetics R: Open to master's students in
the Nutrition and Dietetics Major or approval of department.
- NEW Nutritional guidelines to optimize performance of athletes.
Effective Fall 2022
- FOR 115 Field Exploration of Topics in Forest Technology
Summer of every year. 1 credit. R: Open to agricultural technology students.
- NEW Introduction to forest technology careers and opportunities in Michigan. Offered in
summer.
Effective Summer 2022
- FOR 116 Career Development in Forest Technology
Spring of every year. 1(1-0) P: FOR 115 R: Open to agricultural technology students.
- NEW Preparation for academic success and professional careers in forest technology.
Effective communication, problem solving, and time management.
Effective Fall 2022

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FOR 117	Natural Resources Equipment and Worker Safety Fall of every year. 1(0-3) R: Open to agricultural technology students.
NEW	Introduction to the power equipment commonly used in the field of Natural Resources. Effective Fall 2022
FOR 130	Fundamentals of Forest Management Planning Spring of every year. 1(1-0) R: Open to agricultural technology students.
NEW	Introductory course to emerging elements of forest technology and the forest management plan. Effective Fall 2022
FOR 135	Forest Issues and Policy Fall of every year. 1(1-0) R: Open to agricultural technology students.
NEW	Ethical and legal issues, policy, and law from a scientific view-point, with emphasis on the environmental, ecological, social, and economic factors of a working forest. Effective Fall 2022
FOR 250	Introduction to Forest Ecology & Silviculture Spring of every year. 3(3-0) P: FOR 204 and FOR 222 R: Open to agricultural technology students.
NEW	Biological principles and environmental factors governing the natural establishment, development, care, and harvesting of forest trees and stands. Field trips required. Effective Fall 2022
FOR 260	Applied Forest Management Fall of every year. 3(1-4) P: FOR 130 and FOR 250 R: Open to agricultural technology students. Hands on experience working with field data and databases, inventories, mapping, and drone technology to manage forest resources. Effective Fall 2022
FOR 265	Crew Leadership & Management in Forest Technology Spring of every year. 2(1-3) P: FOR 260 or approval of department R: Open to agricultural technology students.
NEW	Aspects of crew leadership in forest technology. Effective Fall 2022
FOR 270	Forest Business Operations Spring of every year. 2(1-2) P: FOR 260 and (FOR 265 or concurrently) or approval of department R: Open to agricultural technology students.
NEW	Basic human relations, business structures, and accounting practices used in forest management. Effective Fall 2022
FOR 275	Timber Harvest Planning & Systems Spring of every year. 3(1-4) P: FOR 260 and (FOR 270 or concurrently) R: Open to agricultural technology students.
NEW	Preparation for, and administration of, timber harvest and sales. Effective Fall 2022
HRT 205	Plant Mineral Nutrition Spring of every year. 1(3-0) P: CSS 210 RB: HRT 203 Mineral elements required by plants. Essential elements, effect of soil and potting media on nutrient availability, absorption and function in plant physiology, and nutrient deficiency and toxicity symptoms. Methods of monitoring and managing plant nutrient levels. Class meets first five weeks of semester. <u>DELETE COURSE</u> Effective Fall 2022

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HRT 219	Landscape Computer Aided Design Spring of even years. 2(3-0) RB: CSE 101 or CSS 110 Computer Aided Design (CAD) for landscape design. Calculations, take offs, perspective drawings using AutoCAD software. Offered first ten weeks of semester. <u>DELETE COURSE</u> Effective Fall 2022
HRT 351 NEW	Hydroponic Food Production Fall of every year. 2(2-0) P: HRT 203 and HRT 204 R: Open to juniors or seniors. Principles and practices of commercial controlled environment hydroponic production. Nutrient solution chemistry and management, system design and operation, crop physiology, and environmental and cultural management. Effective Fall 2022
HRT 351L NEW	Hydroponic Food Production Lab Fall of every year. 2(0-4) P: HRT 203 and HRT 204 and (HRT 351 or concurrently) R: Open to juniors or seniors in the Horticulture Major. Greenhouse hydroponic production of leafy greens, microgreens, and fruiting crops. Hands-on experience with monitoring and managing nutrient solutions, scouting, and identifying pests, disease, and physiological disorders, measuring environmental parameters, and food safety practices. Effective Fall 2022
HRT 361	Applied Plant Physiology Fall of every year. 3(3-0) P: PLB 105 or BS 161 or BS 171 RB: HRT 203 and HRT 204 Whole plant physiological and growth responses of plants to light, temperature, and gases during commercial plant production. Coordination and management of growth for optimum production and quality. Fundamental aspects of whole plant physiology (i.e. anatomy, water and solute movement, mineral nutrition, photosynthesis, respiration, hormones, and responses to the environment) as well as the application of these principles in plant systems. Effective Fall 2014 <u>Effective Fall 2022</u>
HRT 494 NEW	Horticulture Career Development II Fall of every year. 1(1-0) P: Completion of Tier I Writing Requirement RB: HRT 207 R: Open to seniors in the Department of Horticulture. Development of critical professional skills, including critical research and professional writing skills, resume/curriculum vitae, letters of application, communication and presentation skills. Effective Fall 2022
PKG 450 REINSTATEMENT	Automotive and Industrial Packaging Fall of every year. 2(2-0) P: MTH 124 or MTH 132 or LB 118 or MTH 152H Returnable and expendable packaging for part shipments to assembly plants, cost justification, service parts packaging, logistical systems, and material handling. SA: PKG 440 Effective Summer 2022

COLLEGE OF ENGINEERING

- CSE 802 Pattern Recognition and Analysis
Spring of every year. 3(3-0) ~~P: CSE 840~~ RB: (CSE 331 and MTH 314 and STT 441) or CSE 331 and MTH 314 and STT 441 ~~R: Open to graduate students in the Department of Computer Science and Engineering or in the Department of Electrical and Computer Engineering.~~ R: Open to graduate students in the Department of Computer Science and Engineering or approval of department.
~~Algorithms for classifying and understanding data. Statistical and syntactic methods, supervised and unsupervised machine learning. Cluster analysis and ordination. Exploratory data analysis. Methodology for design of classifiers. This course will introduce a graduate audience to salient topics in statistical pattern recognition. These include concepts in Bayesian decision theory, parametric and non-parametric density estimation schemes, linear discriminant functions, perceptrons and unsupervised clustering. Topics in feature selection, data projection, and ensemble classifiers will also be visited. The project component of this course will test the student's ability to design and evaluate classifiers on datasets.~~
~~Effective Spring 2010~~ Effective Fall 2023
- CSE 803 Computer Vision
Fall of every year. 3(3-0) ~~P: CSE 840~~ RB: CSE 331 and MTH 314 and STT 351 ~~R: Open only to Computer Science or Electrical Engineering majors.~~ R: Open to graduate students in the Department of Computer Science and Engineering or approval of department.
Visual information processing problems. Human and machine vision systems. Image formation and transforms. Encoding, enhancement, edge detection, segmentation. 2D and 3D object description and recognition. Scene analysis. Applications.
SA: CPS 803
~~Effective Summer 2000~~ Effective Fall 2023
- CSE 814 ~~Formal Methods in Software Development~~
Computer Aided Verification
~~Fall of odd years.~~ Spring of every year. 3(3-0) ~~RB: MTH 472~~ RB: CSE 260 ~~R: Open only to majors in the Department of Computer Science and Engineering or approval of department.~~ R: Open to graduate students in the Department of Computer Science and Engineering or approval of department.
Formal specification languages, integrating verification with development. Design and the implementation of term project.
SA: CPS 814
~~Effective Fall 2024~~ Effective Fall 2022
- CSE 841 Artificial Intelligence
Fall of every year. 3(3-0) ~~P: CSE 840~~ RB: CSE 440 ~~R: Open only to Computer Science or Electrical Engineering majors.~~ R: Open to graduate students in the Department of Computer Science and Engineering.
Types of intelligence, knowledge representation, cognitive models. Goal-based systems, heuristic search and games, expert systems. Language understanding, robotics and computer vision, theorem proving and deductive systems, and learning.
SA: CPS 841
~~Effective Summer 1999~~ Effective Fall 2023
- CSE 847 Machine Learning
Spring of every year. 3(3-0) ~~P: CSE 844~~ P: CSE 840 RB: Algorithms, programming in C or equivalent, probability and statistics, artificial intelligence. ~~R: Open only to students in the Department of Computer Science and Engineering or approval of department.~~ R: Open to graduate students in the Department of Computer Science and Engineering or approval of department.
Computational study of learning and data mining. Strengths and limitations of various learning paradigms, including supervised learning, learning from scalar reward, unsupervised learning, and learning with domain knowledge.
~~Effective Fall 2002~~ Effective Fall 2023

- CSE 849 Deep Learning
Spring of every year. 3(3-0) P: CSE 840 and CSE 847 RB: MTH 314 and STT 441 or equivalent
CSE 841 or 842 or 847 R: Open to graduate students in the Department of Computer Science and
Engineering or approval of department.
Overview of both the foundational ideas and the recent advances in deep neural network
algorithms and applications.
~~Effective Fall 2022~~ Effective Fall 2023
- CSE 881 Data Mining
~~Fall of every year.~~ Spring of every year. 3(3-0) P: CSE 840 or CSE 482 RB: Programming skills in
C, C++, Java and Matlab. Basic knowledge in calculus, probability and statistics. R: Open to
graduate students in the Department of Computer Science and Engineering or approval of
department.
Techniques and algorithms for knowledge discovery in databases, from data
preprocessing and transformation to model validation and post-processing. Core
concepts include association analysis, sequential pattern discovery, anomaly detection,
predictive modeling, and cluster analysis. Application of data mining to various
application domains.
~~Effective Fall 2004~~ Effective Fall 2023

COLLEGE OF HUMAN MEDICINE

- HM 845 Informatics and Information Technology
Spring of odd years. 3(3-0) P: HM 842 and HM 843 RB: Academic or professional background in
public health and/or public health related discipline, experience with databases R: Open to
students in the Public Health major or approval of college.
- REINSTATEMENT Information technology for health informatics systems, principles of relational database
systems, operations, information systems, data sets, data standards and classification
systems.
Effective Spring 2023

COLLEGE OF NATURAL SCIENCE

- BLD 805 Communication in the Sciences
~~Fall of every year.~~ Summer of every year. 2(2-0)
Professional communication in clinical laboratory science, including article and proposal
writing, thesis writing, posters, and presentations.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3
semesters after the end of the semester of enrollment.
~~Effective Spring 2022~~ Effective Fall 2022
- BLD 811 Fundamentals of Scientific Research
~~Fall of every year.~~ Spring of every year. 1(1-0) R: Open to master's students in the Biomedical
Laboratory Diagnostics Program.
Best practices for the research enterprise. Ethical conduct of research. Critical
evaluation of scientific literature.
SA: MT 810
~~Effective Fall 2016~~ Effective Spring 2021

- BLD 815 Cell Biology in Health and Disease I
~~Spring of every year.~~ Spring of even years. 2(2-0) RB: Undergraduate course in Biochemistry and Physiology.
Experience in a clinical laboratory
Principles and theories of cell biology and biochemistry are presented with a focus on applications to clinical pathology.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
~~Effective Summer 2017~~ Effective Spring 2021
- BLD 816 Cell Biology in Health and Disease II
~~Summer of every year.~~ Summer of even years. 2(2-0) P: BLD 815 RB: Undergraduate course in biochemistry and physiology. Experience in a clinical laboratory
Continuation of BLD 815.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
~~Effective Summer 2017~~ Effective Spring 2021
- BLD 831 Clinical Application of Molecular Biology
~~Spring of every year.~~ ~~Summer of every year.~~ 2(2-0) P: BLD 830 RB: Basic biochemistry, medical or research laboratory experience
Molecular diagnostic principles. Diagnostic outcomes in traditional and non-traditional laboratory disciplines.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
SA: MT 831
~~Effective Summer 2017~~ Effective Spring 2021
- BLD 832 Molecular Pathology Laboratory
~~Summer of every year.~~ Summer of even years. 2(0-4) P: BLD 831 or concurrently
Equipment operation, DNA extraction and measurement, electrophoresis, hybridization and transfers, amplification and detection including techniques and automated sequencing. Clinical applications.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
~~Effective Summer 2017~~ Effective Spring 2021
- BLD 835 Hemostasis, Thrombosis and Effective Resource Management
~~Fall of every year.~~ Fall of even years. 3(3-0) RB: Background in hemostasis, thrombosis and blood product management.
Theories of coagulation, thrombosis and effective blood product management. Needs and particular stresses during an active bleeding crisis.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
~~Effective Summer 2017~~ Effective Spring 2021
- BLD 836 Adverse Transfusion Outcomes: Detection, Monitoring and Prevention
~~Spring of every year.~~ Spring of odd years. ~~Summer of every year.~~ 2(2-0) RB: Medical technology and clinical laboratory sciences laboratory professionals.
Adverse transfusion outcomes (ATO) covering cause, methods of detection, monitoring paradigms and prevention.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
~~Effective Spring 2016~~ Effective Spring 2021

- BLD 837 Transfusion Service Operations and Management
~~Fall of every year.~~ Fall of even years. ~~Spring of every year.~~ 1(1-0) RB: Clinical transfusion service practical experience.
Management and operational practices needed to meet both the fiscal and regulatory oversight of a transfusion service.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
~~Effective Fall 2010~~ Effective Spring 2021
- BLD 838 Clinical Context of Blood Product Management
~~Fall of every year.~~ Fall of even years. 1(1-0) RB: Experience in transfusion medicine
Effective blood product management in the context of high use, high demand clinical settings.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
~~Effective Fall 2018~~ Effective Spring 2021
- BLD 842 Managing Biomedical Laboratory Operations
~~Fall of every year.~~ Fall of even years. ~~Spring of every year.~~ 2(2-0) R: Open to graduate students or lifelong graduate students or approval of department.
Integration of the roles of legislative, regulatory, technological and economic factors that influence the practice and management of biomedical laboratory operations.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
SA: MT 842
~~Effective Fall 2016~~ Effective Spring 2021
- BLD 844 Topics in Biomedical Laboratory Operations
~~Spring of every year.~~ Spring of odd years. 1(1-0) P: BLD 842 R: Open to graduate students or lifelong graduate students or approval of department.
Current issues relevant to biomedical laboratory operations from an interdisciplinary perspective with an emphasis on efficient laboratory operations.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
SA: MT 844
~~Effective Fall 2016~~ Effective Spring 2021
- BLD 846 Decision Processes for Biomedical Laboratory Operations
~~Fall of every year.~~ Fall of odd years. 2(2-0) P: BLD 842 R: Open to master's students or lifelong graduate students or approval of department.
Integrative case studies presented in a problem-based learning format. Strategies for decision-making in the operations of a biomedical laboratory. Cases integrate scientific principles, management principles and regulatory factors.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
SA: MT 846
~~Effective Summer 2010~~ Effective Spring 2021

- BLD 850 Concepts in Immunodiagnostics
~~Fall of every year. Spring of every year.~~ 2(2-0) RB: An undergraduate course in biochemistry or cell biology.
Immunology principles and theory applied to diagnostic evaluation of the host immune response during health and disease.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
SA: MT 850
~~Effective Summer 2017~~ Effective Spring 2021
- BLD 851 Clinical Application of Immunodiagnostic Principles
Spring of every year. ~~Summer of every year.~~ 2(2-0) P: BLD 850
Immunodiagnostic theories and principles applied to clinical assay development and method evaluation.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
SA: MT 851
~~Effective Summer 2017~~ Effective Spring 2021
- BLD 852 Immunodiagnostics Laboratory
~~Summer of every year.~~ Summer of even years. 2(2-0) P: BLD 850
Performance of immunopurifications, in vitro diagnostic assays and basic flow cytometry. Data analysis and quality control evaluation.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
~~Effective Summer 2017~~ Effective Spring 2021
- BLD 853 Advanced Flow Cytometry
~~Summer of every year.~~ Summer of odd years. 2(2-0) P: BLD 850 and BLD 851 and (BLD 852 or concurrently) or approval of department
Flow cytometry systems, software and reagents. Data analysis and experimental design of complex flow cytometric assays. Flow cytometry applications in medicine and research.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
~~Effective Summer 2017~~ Effective Spring 2021
- BLD 854 Advanced Flow Cytometry Laboratory
~~Summer of every year.~~ Summer of odd years. 2(0-4) P: BLD 852 RB: Experience in Flow Cytometry R: Open to graduate students. C: BLD 853 concurrently.
Flow cytometry and analyses exercises that emphasize controls, reagent titrations, assay validation, determination of assay sensitivity, and assay development using 6 to 8 fluorochromes.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
~~Effective Summer 2018~~ Effective Spring 2021
- BLD 870 Clinical Mass Spectrometry Theory
~~Fall of every year.~~ Fall of odd years. 2(2-0) RB: One course in Biochemistry or concurrent.
The theory and principles of mass spectrometry. Principles of instrumentation, liquid and gas chromatography theory and data analysis as it applies to the clinical laboratory.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
~~Effective Spring 2015~~ Effective Spring 2021

- BLD 871 Applied Clinical Mass Spectrometry
~~Spring of every year.~~ Spring of even years. 2(2-0) P: BLD 870 or approval of department RB: One course in protein chemistry or concurrent
Data interpretation and quality control in clinical mass spectrometry. Principles of sample preparation, platform selection, data analysis, and clinical applications as it applies to the clinical laboratory.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
~~Effective Summer 2015~~ Effective Spring 2021
- BLD 872 Clinical Mass Spectrometry Laboratory
~~Summer of every year.~~ Summer of even years. 2(1-2) P: BLD 870 and BLD 871 or approval of department RB: One course in protein chemistry or concurrent enrollment in same.
Sample preparation, instrument operation, data interpretation, and instrument maintenance as it relates to the clinical practice.
Request the use of ET-Extension to postpone grading.
The work for the course must be completed and the final grade reported within 3 semesters after the end of the semester of enrollment.
~~Effective Summer 2016~~ Effective Spring 2021
- 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.~~ Team-based data science projects working with real-world data in collaboration with client/company sponsors. Practice in software development, data collection, curation, modeling, scientific visualization and presentation of results. Topics related to professional skills such as teamwork, leadership, ethics, and communication. Students may be required to sign a non-disclosure agreement ("NDA") or an assignment of intellectual property rights ("IP Assignment") to work with some project sponsors.
~~Effective Fall 2019~~ Effective Spring 2023
- MTH 801 Machine Learning Algorithms: Mathematical Analysis
Fall of every year. Spring of every year. 3(3-0) R: Open to graduate students.
NEW Introduction to the mathematical basis of machine learning and predictive analytics. Linear and ridge regression, principal component analysis, classification methods, and neural networks. Convergence of algorithms.
Effective Fall 2022
- MTH 803 Sports Decision Analytics
Fall of every year. Spring of every year. 3(3-0) P: MTH 501 R: Open to graduate-professional students.
NEW Theories of sports decisions are developed and assessed through quantitative and stochastic techniques.
Effective Fall 2022
- MTHE 840 Critical Content of School Mathematics: Numbers and Operations
~~Spring of odd years.~~ On Demand. 3(3-0) R: Open to graduate students.
Mathematical foundations of numbers, number systems, and related algorithms. Historical development. Development in school curriculum. Research on teaching and learning.
SA: SME 840
~~Effective Summer 2013~~ Effective Spring 2022
- MTHE 841 Critical Content of School Mathematics: Algebra
~~Fall of odd years.~~ On Demand. 3(3-0) RB: MTH 310 and MTH 320 R: Open to graduate students.
Mathematical foundations of algebra. Historical development. Development in school curriculum. Research on teaching and learning.
SA: SME 841
~~Effective Summer 2013~~ Effective Spring 2022

MTHE 842	<p>Critical Content of School Mathematics: Geometry Spring of even years. On Demand. 3(3-0) RB: MTH 330 or MTH 432 R: Open to graduate students. Mathematical foundations of geometry. Instructional materials. Historical development. Development of geometry in school curriculum. Research on teaching and learning. SA: SME 842 Effective Summer 2013 <u>Effective Spring 2022</u></p>
PSL 475L	<p>Capstone Laboratory in Physiology Fall of every year. Spring of every year. Summer of every year. 2(1-3) P: (PSL 431) and completion of Tier I writing requirement <u>P: (PSL 431 and PSL 432) and completion of Tier I writing requirement</u> RB: (PSL 432) and anatomy and statistics <u>RB: anatomy and statistics</u> R: Open to juniors or seniors in the Physiology Major or in the Lyman Briggs Physiology Coordinate Major. <u>R: Open to seniors in the Physiology Major or in the Lyman Briggs Physiology Coordinate Major.</u> Laboratory exercises in human and animal physiology, including cardiovascular, respiratory, neural, muscle, sensory, and hormonal function, as well as systems physiology studies in exercise and systemic reflexes. Effective Spring 2014 <u>Effective Fall 2022</u></p>
STT 832	<p>Data Visualization and Programming in R Fall of every year. 3(3-0) A student may earn a maximum of 3 credits in all enrollments for this course. R: Open to students. Approval of department.</p>
NEW	<p>Development of sports data predictive models. Extraction and management of sport data, graphical and numerical summaries using visualization tools to model practical sports scenarios. Compilation of written reports on test results and performance outputs. Effective Fall 2022</p>
STT 834	<p>Sports Analytics Capstone Spring of every year. 3(3-0) P: MTH 501 and STT 502 and MTH 503 R: Open to students. Approval of department.</p>
NEW	<p>Development of quantitative models, based on complex sports-related data sets, to support personnel or revenue-based decision-making from the perspective of a coach, manager, or player agent. Reports, presentations, and code repositories will be delivered. Effective Fall 2022</p>