

Bovi-Analytics

Digital Dairy Management and Data Analytics

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1 Course description and aims

This course introduces students to the principles and applications of data analytics in modern dairy herd management. Students will learn how to collect, clean, analyze, and interpret farm-level data from the Cornell University Research Dairy. Through hands-on labs, students will apply statistical and computational tools to evaluate herd performance in key management areas, including nutrition, reproduction, animal health, and farm economics. By the end of the course, students will integrate these data into a digital management framework and engage in a managerial decision-making exercise, including a SWOT analysis with farm stakeholders.

This course emphasizes data literacy, statistical reasoning, and ethical interpretation of agricultural data. It satisfies the **CALS Data Literacy (Statistics)** requirement by developing student competencies in data manipulation, analysis, interpretation, and communication within the context of dairy science.

1.0.1 Course Aims

- To provide students with knowledge and practical skills in the use of data for dairy herd management.

- To train students in statistical and computational methods relevant to agricultural datasets.
- To encourage critical evaluation of data quality, limitations, and biases in animal production systems.
- To develop students' ability to communicate data-driven insights to both scientific and farm management audiences.

2 Course instructor

Miel Hostens, Robert and Anne Everett Endowed Associate Professor ([mmh292](#))

3 Credits

This course accounts for 3 credits.

4 Prerequisites

A statistical course such one of the following is not required but advised:

- STSCI 2150/5150 Introductory Statistics for Biology
- BTRY3010/STSCI2200 & BTRY5010/STSCI5200: Biological Statistics I
- ILRST/STSCI 2100: Introductory Statistics

5 Learning outcomes

Upon successful completion of the course, students will be able to:

1. Collect, organize, and clean dairy farm datasets from herd management.
2. Apply statistical and computational methods (e.g., Excel, R, Python, or similar tools) to analyze dairy performance data.
3. Identify strengths, weaknesses, and limitations of different data types used in dairy management.
4. Interpret and critique dairy datasets in relation to biological, economic, and management contexts.

5. Create visualizations, written reports or presentations to communicate data-driven insights with consideration for ethical use of data.
6. Synthesize herd-level data into a decision support framework and contribute to a SWOT analysis in collaboration with herd managers.

(Outcomes 2, 3, 4, and 5 directly address Data Literacy: Statistics competencies.)

6 Outline

See [this link](#) for details on course outline. As this course is the first of its kind, expect updates to happen to this course outline during the fall semester of 2024.

7 Format

This course will consist of a combination of lectures, hands-on practical lab sessions, group discussions, and guest lectures from domain experts. Students will have the opportunity to work with data from the Cornell University Research Centre (CURC).

7.1 General week format

	Monday	Tuesday	Wednesday	Thursday	Friday
10:10-11:00 am		Lecture		Lecture	
1:25-4:25 pm				Lab - Project	

7.2 Lectures

The goal of the lectures is to have them as interactive as possible (which requires your attendance and participation). My role as instructor is to introduce you new tools and techniques, but it is up to you to take them and make use of them.

7.3 Labs

Labs will use real-world datasets from the Cornell University Research Centre. Students will work individually and in teams to:

- Work with herd management software across the different management domains.
- Clean and curate datasets (Excel, R, Python and Tableau).
- Conduct statistical analyses on herd-level data.
- Develop visualizations, reports and presentations for practical decision-making.
- Interact with students and herd managers to interpret results in a farm management context.

8 Capstone management meeting

The course culminates in a capstone management meeting in which student teams present a comprehensive SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of the Cornell University Research Dairy to farm managers and invited stakeholders. Drawing on data from across the semester—including feeding, reproduction, health, and economics—students will synthesize their findings into a decision-support framework that highlights both current performance and future strategies for improvement. The meeting emphasizes not only technical accuracy and analytical depth but also clarity of communication, professional presentation, and the ability to translate complex datasets into actionable insights for practical dairy management. This exercise mirrors real-world decision-making processes and challenges students to engage directly with farm leaders in a professional, evidence-based dialogue, but within a safe environment of CURC.

9 Textbook

While there is no official textbook for the course yet, we will be assigning readings from some of the following textbooks.

- [Large Dairy Herd Management](#)

10 Website

All lecture notes, assignment instructions, an up-to-date schedule, and other course materials may be found on the course website at [Digital Dairy Management and Data Analytics](#).

Although I will try to avoid last minute changes to the schedule this might happen given this challenged based learning course. I will send course announcements via email.

11 Alignment with CALS Data Literacy (Statistics)

This course fulfills the Data Literacy: Statistics (DLS-AG) requirement by focusing on:

- Data Manipulating & Analysis (primary competency): applying statistical methods to agricultural data.
- Data Reading, Cleaning, Curating, Securing: preparing and standardizing raw dairy datasets.
- Data Interpretation & Critique: understanding strengths, limitations, and biases in farm data.
- Communicating & Arguing with Data: visualizing and presenting data ethically to support arguments.

At least 75% of course content is centered on these competencies, and Learning Outcomes 2, 3, 4, and 5 explicitly support them.

12 Assessment & grading

Assessment methods will include peer evaluation by other students, a multiple choice exam and a grade based on the capstone management meeting.

Component	Remark	Weight
Peer evaluation by team members	Students will provide structured feedback on their peers' lab presentations throughout the semester. These evaluations will focus on clarity of communication, accuracy of data analysis, and effectiveness of visualizations. Peer feedback is intended to promote critical thinking, collaborative learning, and improvement of individual presentation skills. A portion of each student's grade for lab assignments and presentations will reflect both the quality of their own work and the thoughtfulness of their peer evaluations.	40%
Multiple-choice exam	A cumulative multiple-choice exam will be administered at the end of the course to assess students' understanding of key concepts in digital dairy management, data analytics, and data literacy. The exam will evaluate knowledge of statistical methods, data interpretation, ethical use of data, and application of analytical insights to herd management scenarios. Questions are designed to test both conceptual understanding and practical reasoning based on course content and lab experiences.	40%
Capstone management meeting	The course concludes with a group-based capstone management meeting, in which students present a comprehensive SWOT analysis of the Cornell University Research Dairy. Students will synthesize data from across all management areas—feeding, reproduction, health, and economics—into actionable insights for herd management. Evaluation will consider data accuracy and analysis, clarity and professionalism of presentation, teamwork, and ability to communicate effectively with farm managers and stakeholders. This exercise emphasizes real-world decision-making and the ethical, practical use of data in dairy management.	20%

12.1 Final grading scale

Grade	Low	High
A+	99.80	100.0
A	93.33	99.80
A-	90.00	93.33
B+	86.66	90.00
B	83.33	86.66
B-	80.00	83.33
C+	76.66	80.00
C	73.33	76.66
C-	70.00	73.33
D+	66.66	70.00

Grade	Low	High
D	63.33	66.66
D-	60.00	63.36
F	0.00	60.00

Each grade range includes the score on the left, and excludes the score on the right. For example, a 90.0 is an A-, and not a B+. An 89.99 is a B+, not an A-.

13 Policies

13.1 Inclusive community

I grew up in a family in which values as diversity, equity and inclusion were at the core of our everyday life. My parents were both involved taking care of people struggling with equity and inclusion, and as a result these values are deeply embedded in my character.

I aim to ensure that students from all diverse backgrounds and perspectives are well-served by this course. I strive to address students' learning needs both in and out of class, and to view the diversity that students bring as a resource, strength, and benefit. My goal is to present materials and activities that respect diversity and align with Cornell University's core values. Sometimes it might fade during busy times, don't be afraid to recall someone, we're all humans after all. "*Your suggestions are truly encouraged and appreciated*". Please let me know how I can improve the course's effectiveness for you personally, or for other students or student groups.

Additionally, I aim to foster a learning environment that embraces a diversity of thoughts, perspectives, and experiences, and respects your identities. If your experiences outside of class are affecting your performance, please feel free to talk with me. Alternatively, your academic dean is a great resource if you prefer to speak with someone outside the course.

13.2 Academic Integrity

Absolute integrity is expected of every Cornell student in all academic undertakings. Integrity entails a firm adherence to a set of values, and the values most essential to an academic community are grounded on the concept of honesty with respect to the intellectual efforts of oneself and others, and free and open inquiry and discussion in the classroom. Academic integrity is expected not only in formal coursework situations, but in all University relationships and interactions connected to the educational process, including the use of University resources. While both students and faculty of Cornell assume the responsibility of maintaining and furthering these values, this document is concerned specifically with the conduct of students.

A Cornell student's submission of work for academic credit indicates that the work is the student's own. All outside assistance should be acknowledged, and the student's academic position truthfully reported at all times. In addition, Cornell students have a right to expect academic integrity from each of their peers.

This a [guideline for students](#) offered through the [Office of the Dean of Faculty](#).