

**TO:** The Engineering Faculty  
**FROM:** The Faculty of the Agricultural and Biological Engineering Department  
**RE:** New Engineering Concentration

The Faculty of the Agricultural and Biological Engineering Department has approved the following new Concentration from the College of Engineering. This action is now submitted to the Engineering Faculty with a recommendation for approval.


**TITLE: DATA SCIENCE FOR AGRICULTURE AND BIOLOGICAL ENGINEERING (DSABE)**

**DESCRIPTION:**

This concentration is aimed to address the United States Department of Agriculture (USDA) priorities for developing the next generation of highly skilled workforce in Data Science for the food, agricultural, natural resources, and human sciences (FANH) as outlined in the USDA Strategic Plan (2018- 2022) and the USDA Research, Education, and Economics (REE) Action Plan. It also aligns very well with the College of Agriculture's strategic vision and emphasis on data science and data-driven agriculture.

**RATIONALE:**

The increasing use of digital technologies in agriculture has created a need for graduates with skills in extracting useful information from data for decision-making. Purdue University regards “Embedding Data Science into Domain Curricula” as an essential component of a comprehensive educational Data Science initiative. Several Data Science-related initiatives in the College of Agriculture at Purdue, funded by the USDA-National Institute of Food and Agriculture (NIFA), Foundation for Food and Agricultural Research (FFAR), and the agricultural machinery and data science industry, are led by ABE faculty. Notable among them include, The Open Ag Technology and Systems (OATS) Center, Wabash Heartland Innovation Network (WHIN; <http://whinsmartregion.org/>) program, the summer experiential learning program “Experiential learning with Data Tools for Digital Agriscience and FACT”, and a higher education challenge (HEC) award that has enabled the development of new data science modules that have been integrated with two existing courses and two new semester-long on agricultural informatics. The department wants to harness the momentum built through these Purdue initiatives and NIFA-National Needs Fellowship (NNF) funding to launch a new graduate concentration in the Agricultural and Biological Engineering department titled “Data Science for Agricultural and Biological Engineering (DSABE).” Purdue University’s focus on being a national leader in preparing graduates equipped with skills to apply Data Science to solve real-world problems is expected to ensure the sustainability of this concentration.



---

Nathan Mosier, Head of the Agricultural and Biological Engineering Department

Link to Curriculog entry: <https://purdue.curriculog.com/proposal:17906/form>

**Participating faculty, including name, academic rank, and departmental affiliation**

Dr. Ankita Raturi, Assistant Professor, ABE

Dr. Dennis Buckmaster, Professor, ABE

Dr. Dharmendra Saraswat, Associate Professor, ABE

Dr. John Evans, Assistant Professor, ABE

Dr. Keith Cherkauer, Professor, ABE

Dr. Somali Chaterji, Assistant Professor, ABE

Dr. James Krogmeier, Professor, ECE (courtesy appointment in ABE)

Dr. Mark Ward, Professor, Statistics (courtesy appointment in ABE)

**Currently enrolled or expected number of students:** 5-10, but likely more.

**List all required courses for the Concentration. A minimum of 9 credits of unique courses for the core of this concentration.**

Core courses are to be selected from each of the following categories:

- **Statistics/Math** [3 credits] (STAT 51100 – Statistical Methods, STAT 51200 – Applied Regression Analysis, STAT 51400 – Design of Experiments, MATH 51100 - Linear Algebra with Applications, MATH 52700 Advanced Mathematics for Engineers and Physicists I, MATH 51400 Numerical Analysis, CS 51500 – Numerical Linear Algebra, AGRY 64100 - Statistical Hydrology)
- **Computational thinking, data structures and management** [6 credits] (ABE 65100 – Environmental Informatics, ABE 59100 - Machine Learning and Vision for IoT, MGMT 58100 - Big Data Technologies, ASM 59100 - Introduction to Agricultural Informatics, STAT 50600 – Statistical Programming and Data Management, MGMT 54400 – Database Management Systems)
- **Data acquisition and visualization** [3 credits] (ABE 46000 – Sensors and Process Controls, ASM 42000 – Electric Power and Controls, ABE 53100 – Instrumentation and Data Acquisition, AGRY 54500 – Remote Sensing of Land Resources, FNR 55800 - Remote Sensing Analysis And Applications, CGT 57500/ASM 59100 - Data Visualization Tools And Applications)
- **Applications/domain expertise courses** [3 credits] (ASM 42200 - Advanced Machine Technology For Agricultural Crop Production, ABE 52700 - Computer Models In Environmental And Natural Resources Engineering, ASM 54000 - Geographic Information System Application, HORT 53100 - Applied Plant Genomics, ABE 53000 - Plant Phenotyping Technologies)

**Describe how courses fit into and support the program.**

Students select 15 credits from the core courses suggested above to complete this graduate concentration. Students must complete the requirements of their selected graduate program to earn a graduate degree and should consult with their academic or program advisor to make sure that they are meeting requirements to complete their graduate degree.

**List the Learning Outcomes.**

The overall goals for the DSABE concentration are as follows:

Students pursuing this concentration will develop competency in the:

**Digital citizenship:** access, communication, security, etc.

**Data ethics** in generating, using, and re-using data

**Data management** skills:

- Data documentation: file naming, metadata
- Data organization: storage, backup, data management planning
- Data visualization: basic concepts, graphical analysis, presentation graphics
- Data sharing: data repositories, data publication