DATA SCIENCES, B.S. (ENGINEERING)

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Learning Objectives

1. **Knowledge:** Understand the technical fundamentals of data sciences with a focus on developing the knowledge and skills needed to manage and analyze data to solve problems in our world.
   a. Integrate statistical concepts/methods and computational/machine learning methods to discover the structure of data and build predictive models.
   b. Apply the principles of data management to organize and use different types of data, both structured and unstructured.
2. **Problem-Solving and Evaluation:** Identify, formulate and solve data science problems that arise in various applications.
   a. Identify and incorporate relevant abstraction and domain knowledge to formulate data science problems in different application contexts.
   b. Design or adapt appropriate statistical, machine learning, and other data science methods for solving specific problems.
   c. Compare, contrast, and evaluate competing data science methods appropriate to the context of the problem.
   d. Employ modern computing infrastructure to scale up data science methods for massive and complex data.
   e. Integrate data from multiple sources while considering the best practices, challenges, and pitfalls of using heterogeneous data to solve problems.
3. **Communication:** Articulate the benefits, risks, formulation, solution, and results of data science projects to diverse stakeholders, including fellow data scientists, collaborators with subject matter expertise, and the general public, using written, verbal, and visual forms.
4. **Teamwork:** Participate effectively on teams in order to accomplish the goals of a project containing data science components.
5. **Data Ethics:** Critically evaluate and conscientiously respond to the ethical and societal implications of data science practice.
   a. Analyze the potential human impacts of data-driven technologies, especially for marginalized communities.
   b. Develop strategies to solve data science problems that reflect shared social and ethical values, such as privacy, security, fairness, and accountability.
   c. Interpret and apply the ethical responsibilities of computing professionals.
   d. Ensure reproducibility of data science analyses.
6. **Lifelong Learning:** Recognize the importance of continued learning beyond graduation.
   a. Demonstrate readiness to join an evolving professional community by participating in professional development, such as reading trade journals and engaging with appropriate professional organizations.
   b. Demonstrate readiness for independent learning by performing literature reviews and staying abreast of current trends within the field of data science.
7. **Option Objectives:**
   a. Applied Data Sciences Option: Gain in-depth knowledge in a chosen application focus area and demonstrate skills to formulate and solve data science problems in the context of applications in that area.
   b. Computational Data Sciences Option: Design, development, and analysis of software (computational solutions) for data science problems.
   c. Statistical Modeling Data Sciences Option: Demonstrate facility with common regression-based inferential modeling techniques including analysis of variance, generalized linear models, multiple regression, and logistic regression, as well as proficiency in basic statistical optimization and simulation techniques.