Why should I consider getting the Engineering Data Analytics Certificate?
There is a huge demand from companies for engineers with data analytics skills. A 2016 McKinsey Global Institute report projected a shortfall of some 250,000 data scientists nationwide.[1] This report states that "companies report finding the right talent is the biggest hurdle they face in trying to integrate data and analytics into their existing operations."

Companies are willing to pay more for these skills. A 2017 IBM Report states that starting salaries are an average of $105,000 for data scientists, $114,000 for machine learning skills, and $117,000 for data engineering jobs.[2] These numbers are likely to have gone up substantially since 2017 as well.

Where can I find a list of classes for the Certificate?

	Domain	Class
1 - Foundations	Data Science Programming (choose one)	CEE 0109 - Computer Methods in Civil Engineering
		CS 1501 - Algorithms and Data Structures 2

[1] N. Henke, J. Bughin, M. Chui, J. Manyika, T. Saleh, B. Wiseman, G. Sethupathy, The age of analytics: competing in a data-driven world, McKinsey Global Institute, 2016. https://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/the-age-of-analytics-competing-in-a-data-driven-world.

[2] S. Miller and D. Hughes, "The quant crunch: How the demand for data science skills is disrupting the job market," *Burning Glass Technologies* (2017). https://www.bhef.com/sites/default/files/bhef_2017_quant_crunch.pdf

		ECE 1148 - Algorithmic Thinking
		IE 0015 - Introduction to Data Analytics
		STAT 1060 - Data Science Foundations
	Inferential Statistics (choose one)	BioE 1000 - Statistics For Bioengineering
		ECE 0402 - Signals, Systems, and Probability
		ENGR0021 - Probability and Statistics for Engineers
		IE 1071 - Statistical Testing and Regression
		STAT 1000 - Applied Statistical Methods
		STAT 1152 - Intro to Mathematical Statistics
		STAT 1361 - Statistical Learning and Data Science
2 - Expertise	Exploratory Applied Data Science (choose one)	ECE 1147 - Algorithms for Big Data
		ECE 1395 - Intro to Machine Learning
		ENGR 1451/2451 - Exploratory Data Science
		INFSCI 0510 - Data Analysis
		MEMS1300 - Linear Algebra for Machine Learning
		CS 1675 - Intro to Machine Learning
	Modeling and Prediction (choose one)	IE 1072 - Design of Experiments & Quality Assurance
		INFSCI 1530 - Data Mining
		MEMS 1069 - Data Driven Modeling for Engineers
		MEMS 1120 - Applied Engineering Simulation in Design
		ENGR 1453/2453 - Data Science: Statistical Learning, Modeling and Prediction
		CEE 1370 - Nondestructive Testing and Evaluation
		IE 1187 - Introduction to Optimization for Machine Learning
		IE 1062 - Fundamentals of Data Analytics
		IE 1171 - Data for Social Good
3 - Specialization	Engineering Data Analytics Project (choose one)	Senior Design
		ENGR1099 - Special Project
		CEE 1323 - Practical Data Science and Machine Learning
		IE1099 - Special Project
		IE2064 - Data Science
		Any Semester-Long Project-Based Class
		ENGR 2451 - Exploratory Data Science (if ENGR 1451 not taken)

		ENGR 2453 - Data Science: Statistical Learning, Modeling and Prediction (if ENGR 1453 not taken)

Where can I find more detailed information about the Certificate?
Please check it out on our Department website here.

What is the difference between the Engineering Data Analytics Certificate and the Data Analytics Concentration?
The Certificate can be obtained by anyone–engineering students in any department and even non-engineering students. The Data Analytics Concentration is for IE students only.
The Certificate requires 15 credits of classes, of which 9 credits must be beyond courses required for your major, while the Concentration only requires 9 credits.

One of key differences is the "Specialization" requirement for the Certificate, where students need to work on a semester-long Engineering Data Analytics project. This could be a senior design project or an undergraduate research project.

How do I make sure I satisfy the Specialization requirement in my Senior Design Project or Undergraduate Research Project for the Certificate?
It is up to the student to communicate with their Senior Design instructor or Undergraduate Research Project advisor that they want to work on a project with a significant data analytics component. This means that the student is writing code (R, python,...) and not just using Spreadsheets or existing software to analyze data. The project should have the following components:

- 1. What is the problem
    - Why is it interesting?
- 2. Describe your dataset
    - What does it look like?
    - How did you get the data?
    - What are the variables?
        - How many levels of factors for factor variables
        - Continuous? Non-negative? Etc.
    - How many observations are there?
- 3. Data Exploration
    - Describe any cleaning of the data
    - Create pairwise correlation plots of the data? Make other plots of the data?
- 4. Modeling
    - What model did you select and why?

    - Did you do cross-validation?
    - Interpret the results
    - Challenge the results
    - Discussion of answers to questions answered
- 5. Conclusion

Students need to write up their work in a report and we will be reviewing the reports to ensure it meets this requirement.

The semester-long project in the following classes can also be used
CEE 1323 - Practical Data Science and Machine Learning
ENGR 2451 - Exploratory Data Science
ENGR 2453 - Data Science: Statistical Learning, Modeling and Prediction
IE 2064 - Data Science
Independent research

Can this new course be part of the certificate?
Data science is a rapidly growing area and we are getting new courses at Pitt all the time. If there is a specific class that you would like to be part of the Data Science Certificate, please send the course number and course description to Dr. Leu (pleu@pitt.edu) and Dr. Bursic (kbursic@pitt.edu). We plan to update the courses associated with the certificate once a year.

How do I apply for the certificate?
SSOE now has a form that you can use to add minors and certificates to their plans of study. Ask your undergraduate program coordinator or administrator for the link to this form. Please wait until your final semester before graduating to add any minors or certificates to your plan as these plans often change.

Is there a Engineering Data Analytics Certificate for graduate students?
Not yet! But we are working on it.

Who can I ask if I have other specific questions?
Please feel free to reach out to Dr. Leu (pleu@pitt.edu) or Dr. Bursic (kbursic@pitt.edu).