

## Project and Teaching Assistant: Full-time Temporary Position – from Summer 2020

**Project Title:** Fundamental Concepts and Applications in Energy and Biotechnology, Real-time Process Monitoring and Data Analytics, and Automation engineering

**Position Context:** As a Science or Engineering graduate, you have learned how to solve technological problems and these skills have lead previous graduates to go into fields of study such as the development of clean energy resources, materials, pulp and paper manufacturing, pharmaceuticals, plastics, personal care products, synthetic fibers, food processing, waste treatment, pollution abatement, public health and biotechnology. All these fields have been captured in the lab courses offered in our Department and yours, over the years.

The position will support projects and experiments supporting courses 10.26 (Capstone Project Lab), 10.28 (Chemical-Biological Engineering Lab) and contribute to the development of a new course on automation engineering, for offering in 2021.

The candidate will have the opportunity to interact closely with industry experts (e.g. at local Takeda, BiogenIdec) and to experience commercial operations during on-site working sessions focusing on real-time data analytics, for example. The new automation engineering course will be developed with support from a process control company, eager to work with us, and will follow up the work of a Course X senior focusing on foundational concepts of traditional and predictive process controls, this Spring.

### The Lab Environment:

The lab includes a bioprocess-based infrastructure in which bioreactors are interfaced online with advanced analytical instrumentation, including biochemical analyzers, RAMAN spectroscopy and mass spectrometer.

The above integrated equipment is interfaced to a Data Historian, the PI system (Figure 1), enabling users to monitor the processes in real-time, in the lab or at home. You will learn about the Data Historian (OSIsoft PI) directly from the OSIsoft's Program Manager of Academic Learning, who has taught our 10.28 students for the last few years.

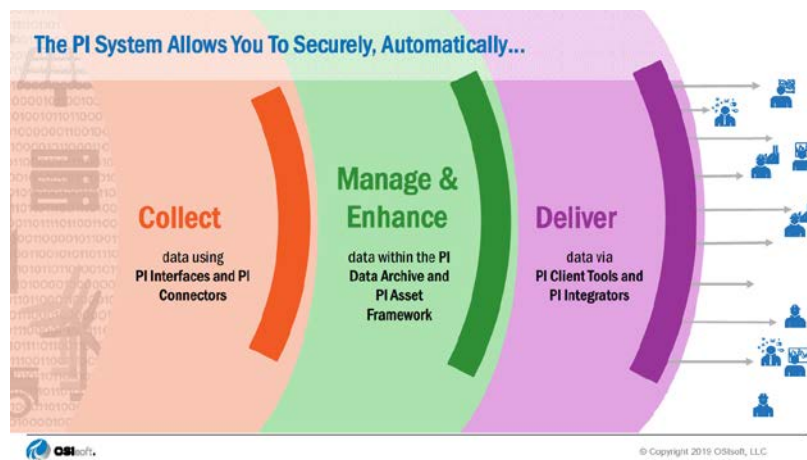


Figure 1. The PI system (Presented to 10.28 Class, Fall 2019)

This lab infrastructure allows us to study important concepts relevant to the pharmaceutical and biotechnology industries, such as mixing, gas transport, kinetics and mass balances. Bioreactors

can be operated in the batch, fed-batch (= semi-batch) or continuous culture modes.

Examples of projects and experiments offered or being offered in the lab with this platform include:

1. Scaling up cultured meat (10.26, Spring 2020)
2. Integrating online analytics and virtual sensors to develop a real-time mass balance (10.26, Spring 2020)
3. Production of a sustainable palm oil alternative from oleaginous yeast: impact of extraction method on oil yield (10.26, Spring 2019)
4. Bioprocessing Strategies: Assessing the comparative productivity, energy use and economics for making useful, sustainable products (10.26, Spring 2018)
5. Experimental and computational studies of mixing in a stirred-tank reactor at the bench and industrial scales (10.28, Fall 2018)
6. Real-time monitoring of mammalian cell culture using online RAMAN spectroscopy and multi-analyte analysis (10.28, from 2018)

**Position Responsibilities:** As a project assistant, your duties will include helping implement experiments and evaluate proof-of-concepts for lab courses (10.26 and 10.28) and assist in developing a new course (automation engineering). Your work will include working with companies that have provided technologies closely. In this role, you will also help in overseeing the chemical-biological engineering undergraduate lab to ensure it is maintained and run in a safe manner. As a teaching assistant, you will contribute to deliver material to students in the lab and the classroom, based on your areas of expertise. In addition to teaching, there are opportunities to work on an independent project that often lead to conference posters and presentations.

Perhaps you are interested to take a break before joining the corporate world or going to grad school. Two recent straight Course 10 graduates followed this path and joined us to contribute to the lab. They are now in graduate school at Johns Hopkins University (Medical School) and Columbia University (Biomedical Engineering).

**Requirements:**

- High motivation
- Ability to work independently, and within a team
- Well-organized, responsible, dedicated, self-motivated, and good communicators.
- Teaching/ tutoring experience or willing to learn from MIT teaching lab

**Recommended Additional Skills or Interests:**

- Process and analytical instrumentation
- Practical knowledge of the bioreactor platform (microbial or mammalian cells) (Preferred but not essential)
- Course 10.28 graduate

Contact:

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