

Educational Goals of the Biofuels-Research Apprenticeship Program

The Biofuels-Research Apprenticeship Program (B-RAP) brings motivated High School level students into the Biomass Research Laboratory (BRL) at ODU, five days a week for a one month duration of introductory apprenticeship learning opportunity.

The objectives for the program are to introduce the following concepts and skills:

- Conducting experimental research for process development
- Sustainable production of bioproducts and biofuels from microalgae
- Nutrient recovery and recycling
- Use of water as green solvent – advantages of hydrothermal processes vs. conventional methods
- Undergraduate and graduate level research in academics
- Working with diverse scientific team on interdisciplinary research
- Algae cultivation, harvesting, and downstream processing
- Advanced analytical instruments (chromatography, spectroscopy, and surface area measurement) and research tools
- Water analysis such pH/conductivity measurement, Total Suspended Solids (TSS) method, Total Phosphorous (TP), Total Carbon/Total Nitrogen (TC/TN), and anions.
- Statistical analysis of experimental results and data reporting
- Growing algal biomass, including preparation of growth media, cell culture, construction and set-up of bench-scale photobioreactor
- Life-Cycle Analysis
- Design and implementation of a small research study with guidance and supervision by experienced researchers

The expected educational outcomes of the program are as follows. At completion of the program, Students will:

- Have learned about university-level research opportunities
- Have an idea of life as an undergraduate or graduate student
- Understand and demonstrate excellent and reliable lab safety in practice
- Have a basic understanding of key statistical concepts – accuracy, precision, variability of data, sample size, etc.
- Demonstrate basic data reporting skills – graphing, labelling, report-writing, preparing presentations, presenting results to an audience
- Be able to explain the advantages of biofuels vs. conventional fuels with respect to resource management, pollution, climate change
- Understand the importance of sustainable chemical processes and their role in reducing greenhouse gas emissions
- Have been introduced to several methods of biofuels preparation, including algae production, Flash Hydrolysis, Biodiesel production from oilseeds.
- Understand the basic principles involved in primary alternative energy resources and bioproducts
- Be aware of economic considerations in biofuels production and advantages of co-production e.g. biofuels/bioproducts
- Understand the concepts and methods of Life-Cycle Analysis
- Understand the importance of nutrient (nitrogen & phosphorous) recovery and recycling