**DENIN Environmental Scholars Internships**

Dates of internship: Spring 2020 and Summer 2020

Location: ISE Harker Laboratory

Number of positions available: 1-2

Faculty Mentor: Dr. Deb Jaisi

Graduate Student Mentor: Gulcin Tosun

Professional Staff Mentor: Dr. Yuriy Sakhno

**Project Title:** Extraction of phosphorus from soils and agricultural wastes

**Research Description:**

Phosphorus (P) is a nonrenewable resource and an essential element for agriculture. The increase in agricultural activities needed to meet the food demand of the expanding global population has generated animal waste as well as lost P from agro-system to surrounding water bodies and caused water quality problems such as eutrophication. The research project aims to identify an optimal method to extract P from agricultural wastes and P-rich soils. The method development will adopt a series of wet chemistry techniques, including chemical treatment, enrichment, and chromatographic separation. The bulk of the tasks for the intern will be on the pre-preparation and separation methods. Specific tasks include grinding of manure, litter, and soil to facilitate P extraction. The phase separation tasks include solid solution separation using centrifugation, gravity settling, and column extraction. The nature and specifics of the tasks during the internship can change. The intern will be trained on necessary protocols and aided on completing necessary EHS training.

**Research Questions:**

1. What are the optimal methods to extract P from agricultural wastes?
2. How do different impurities on source materials and extracted solutions (at different stages of purification) impact the purity of P?
3. What are the major chemical reactions optimal for the precipitation of P minerals from waste-derived P sources?

**Student Learning Objectives: Professional and Research Skills**

This internship focuses on the development of the following professional and scientific skills:

1. Learning of general soil chemistry and phosphorus chemistry including chemical reactions with soil matrices
2. Interpersonal skills working in a research lab with members with diverse backgrounds and projects
3. Day-to-day interaction with graduate student and staff mentors involved in the project and biweekly interaction with the faculty mentor
4. Learning conceptualization of research project, selecting methods to achieve goals, and executing project
5. Data generation and analysis
6. Presentation to the scientific community (such as DENIN undergraduate or UD undergraduate research symposium)