Femeena was born and raised in Kerala (India), also known as 'God's own country'. She received her Bachelor's degree from College of Engineering Trivandrum in 2011 and Master's degree from Indian Institute of Technology Madras in 2013. She worked for 2 years as a consultant for WS Atkins and International Water Management Institute before joining for PhD in Fall 2015. Femeena got interested in ecohydrological modeling during her Master's and continued to work on improving model representations for enhanced water quality predictions. Her Master's work won her the prestigious Green Talents Award from German Federal Ministry in 2014. While at Purdue, Femeena served as the ABE GSA Recruitment Chair in 2016-2017 and was an active member of Purdue Indian Dance Club and Dance 2XS Purdue. She was selected to the Class of 2019 'New Faces of ASABE' and is the recipient of 2019 College of Engineering Outstanding Graduate Research Award. In her free time, she enjoys dancing, cooking and listening to music.

Agricultural & Biological ENGINEERING

Dissertation Defense

Speaker: **Femeena Pandara Valappil**

Title: **Improving Nutrient Transport Simulation in SWAT by Developing a Reach-Scale Water Quality Model**

Major Professor: **Dr. Indrajeet Chaubey**

Date: **Tuesday, April 30, 2019**

Time: **09:00 AM**

Location: **Lily 2-102**

Abstract:

Soil and Water Assessment Tool (SWAT) is often regarded as one of the most widely used hydrological models and is used to study the interactions between land, surface and groundwater systems, and to predict and manage water quantity and quality. In the past, in-stream solute transport module of SWAT has been minimally revised, even though inadequate in-stream process representation has been acknowledged as one of the reasons for relatively weaker water quality predictions. In this study, we developed an enhanced process-based stream water quality model by merging two existing and popular water quality models-OTIS and QUAL2E. The developed model has an improved user interface and performed reasonably well when tested for nutrient uptake predictions for both experimental and literature data. A regression-based approach was also used to derive simple equations for certain model parameters to avoid the need for extensive calibration. The algorithms from this new model was in turn incorporated into SWAT to obtain the modified SWAT model (Mir-SWAT) and subsequently evaluated for a study catchment in Germany. Compared to existing SWAT model, Mir-SWAT yielded better dissolved oxygen and phosphate predictions. On a monthly scale, Mir-SWAT performed better than SWAT model in terms of Chlorophyll-a content particularly during winter months.

Application:

The newly developed water quality model with improved user interface and modeling options is expected to improve our understanding of nutrient dynamics in the stream and make it universally applicable even in data-scarce conditions. With the model improvements in SWAT, we aim to increase confidence in the in-stream component of the model and to extend its applicability for reach-scale analysis and management.