ADVANCED COURSE: MULTIDISCIPLINARY APPROACHES TO STUDY DIABETES (GBS VTC 788)

SHEL Bldg. 1215, 10 a.m.-noon, Wednesdays, January 15, 2025 – April 16, 2025

Drs. Sasanka Ramanadham (sramvem@uab.edu) and Sushant Bhatnagar (sushantb@uab.edu) offer this course designed for graduate students in their second year or beyond, as well as postdoctoral and clinical fellows.

Course Description: This Advanced Diabetes course is designed to provide PhD students with a comprehensive understanding of the complex biology underlying diabetes, encompassing diabetes pathophysiology, molecular mechanisms, and evolving therapeutic strategies. Emphasis will be placed on critical thinking, data interpretation, and recent research-driven learning to prepare students for groundbreaking discoveries in diabetes and metabolic disease research.

Course Objectives:

1. **Pathophysiological Understanding**: Students will examine the cellular and molecular mechanisms that drive Type 1 and Type 2 diabetes, including beta-cell dysfunction, insulin resistance, immune-mediated beta-cell destruction, and dysregulated lipid metabolism.
2. **Advanced Insights into Glucose Homeostasis**: In-depth discussions will delve into glucose regulation pathways, focusing on tissue-specific mechanisms influenced by muscle, heart, liver, brain, eyes, kidneys, beta-cells, and adipose tissues.
3. **Molecular and Genetic Drivers**: The course will examine the role of genetic mutations, epigenetic modifications, and metabolic disruptions contributing to diabetes risk, examining complex interactions in the insulin signaling pathways and beta-cell survival.
4. **Emerging Research**: Students will be introduced to groundbreaking research areas, such as the role of GPCRs, autocrine feedback loops, and other regulatory networks influencing body weight, appetite, and metabolic adaptation.
5. **Therapeutic Innovations and Translational Approaches**: In-depth discussions of current and potential therapies, such as GLP-1 receptor agonists, SGLT2 inhibitors, and gene-based therapies, will bridge the gap from basic research to clinical application.
6. **Experimental Design and Data Analysis**: Through interactive sessions and discussions, students will enhance their skills in experimental design, statistical analysis, and interpretation of primary research data in the context of diabetes studies.

Course Format:

1. **Lectures**: Core concepts will be presented through lectures paired with case studies to demonstrate real-world applications and problem-solving in diabetes research.
2. **Discussions**: Students are encouraged to discuss recent high-impact journal articles, fostering critical analysis and debate on current research findings and methodologies.
3. **Guest Lectures from Leading Experts**: Renowned researchers and clinicians specializing in diabetes will present seminars, offering students a chance to engage with experts and explore emerging research directions.

Expected Outcomes: Upon completing this course, students will:

1. Demonstrate an advanced understanding of diabetes pathophysiology and be able to analyze current research critically.
2. Apply molecular and genetic factors knowledge to interpret complex metabolic data.
3. Design and propose research experiments that address gaps in current diabetes knowledge.
4. Understand and evaluate modern therapeutic approaches and assess their translational potential for diabetes management.

This course will uniquely prepare the students for impactful careers in diabetes research, promoting the development of innovative solutions to address the growing global burden of diabetes and related metabolic diseases.