

# BIORENEWABLE RESOURCES AND TECHNOLOGY (BRT)

Courses primarily for graduate students, open to qualified undergraduates:

## **BRT 501: Fundamentals of Biorenewable Resources**

(3-0) Cr. 3. S.

*Prereq: Previous coursework in introductory physics and chemistry is recommended.*

Introduction to the science and engineering of converting biorenewable resources into bioenergy and biobased products. Survey of biorenewable resource base and properties; description of biofuels and biobased products; production of biorenewable resources; processing technologies for fuels, chemicals, materials, and energy; environmental impacts; technoeconomic analysis of production and processing; and biofuels policy.

## **BRT 506C: Biobased Products Seminar: Research Presentations**

(1-0) Cr. 1. F.S.

Research presentations throughout the semester as part of the course seminar series and during the course. Research Poster Symposium at the end of the semester. Typically taken in the last semester(s) when completing degree program. Offered on a satisfactory-fail basis only.

## **BRT 507: Technology-Led Entrepreneurship in Biorenewables**

(Cross-listed with BR C). (1-0) Cr. 1. S.

*Prereq: Graduate Standing or Permission of Instructor.*

Develop an understanding of the relationship between discovery research entrepreneurship and innovation in biorenewables. Understand critical techno-commercial analyses and intellectual property. Learn critical skills needed to found a company, including how to define key assets, write a business plan, leverage local resources, and secure funding.

## **BRT 515: Biorenewables Law and Policy**

(Cross-listed with POL S). (3-0) Cr. 3. F.

Evaluation of the biorenewables field as it relates to the areas of law and policy. Primary emphasis on the following topics: concerns that motivated the development and expansion of the biorenewables field, a history of the interactions between biorenewable pathways. U.S. law and policy and controversies that have arisen from these interactions and their effects.

## **BRT 516: International Biorenewables Law & Policy**

(Cross-listed with POL S). (3-0) Cr. 3. S.

Evaluation of the international biorenewables field as it relates to the areas of law and policy. Primary emphasis on the following topics: concerns that motivated the development and expansion of the field by adopting countries, a history of the interactions between biorenewable pathways. Law and policy in adopting countries and international controversies that have arisen from these interactions and their effects.

## **BRT 535: Thermochemical Processing of Biomass**

(Cross-listed with M E). (3-0) Cr. 3. S.

*Prereq: Undergraduate course work in thermodynamics and transport phenomena*

Introduction to thermal and catalytic processes for the conversion of biomass to biofuels and other biobased products. Topics include gasification, fast pyrolysis, hydrothermal processing, syngas to synfuels, and bio-oil upgrading. Application of thermodynamics, heat transfer, and fluid dynamics to bioenergy and biofuels.

## **BRT 540: Bioprocessing and Bioproducts**

(Cross-listed with C E, FS HN). (3-0) Cr. 3. F.

*Prereq: C E 326 or equivalent, MATH 160 or MATH 165, CHEM 167 or higher, BIOL 173 or BIOL 211 or higher, senior or graduate classification*  
Sustainability, cleaner production. Taxonomy, kinetics, metabolism, microbial cultivation, aerobic and anaerobic fermentation. Antibiotics, food supplements, fermented foods, vitamin production. Biofuels, bioenergy and coproducts. Mass/energy balances, process integration, pretreatment, separation. Membrane reactors, bioelectrolysis, microbial fuel cells, nanotechnology, genetic engineering, mutagenesis.

## **BRT 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Investigation/study of an approved barrier area(s) topic on an individual basis. Course content and requirements designed and developed in consultation with the student's major professor/instructor to determine barrier areas covered, but in all cases a formal report should be written.

## **BRT 592L: Biorenewable Resources Laboratory**

(0-3) Cr. 1. F.S.SS.

*Prereq: Graduate student status. Undergraduates with instructor approval*

An introduction to hands-on experimental laboratory techniques including laboratory safety, calibration, proper usage of chemistry apparatus, chemicals, analytical equipment, and fundamental techniques to ensure successful research.

Courses for graduate students:

## **BRT 610: Food & Bioprocessing Enzymology**

(Cross-listed with FS HN). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: FS HN 311 or FS HN 411 or FS HN 502 or BBMB 404*

Properties and applications of industrial enzymes important in food, feed, and bioprocessing, including biofuels and bioproducts. Characterization of enzyme catalytic mechanisms, kinetics, isolation, mutagenesis, and operating conditions, including evaluation of substrates, products, immobilization, enzyme inhibitors, pH, pressure, and temperature.

## **BRT 699: Research**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of student's major professor*