Biomass and Bioproducts Initiative

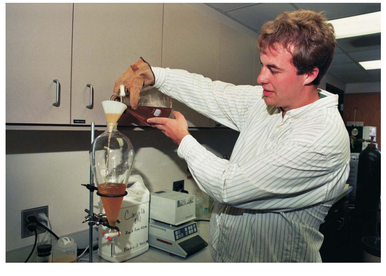
Biofuels Class

Collaborating Instructors

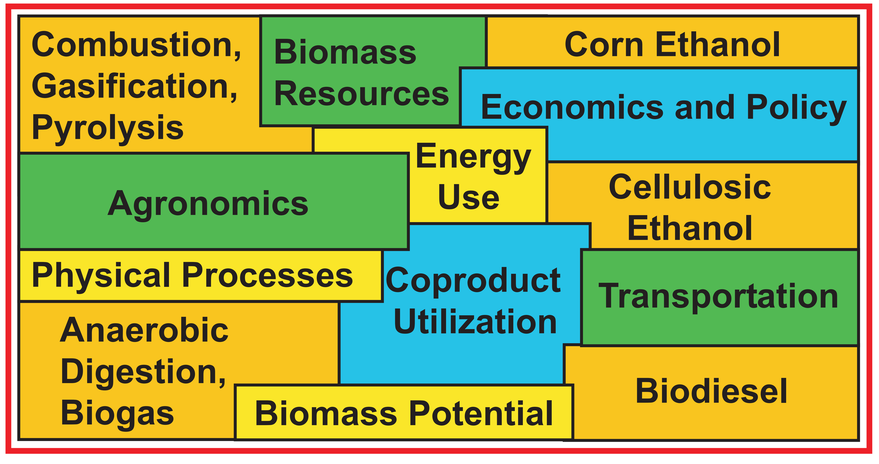
- **Scott Pryor (Lead Instructor)**
  (Agricultural and Biosystems Engineering)
- Dwight Aakre (NDSU Extension - Farm Management Specialist)
- Cole Gustafson (Agribusiness and Applied Economics)
- Mark Lofgren (Upper Great Plains Transportation Institute)
- Burton Johnson (Plant Science)
- Dennis Wiesenborn (Agricultural and Biosystems Engineering)
- Greg Lardy (Animal and Range Sciences)

Outline

- Current energy consumption/resources
- Chemistry/engineering background
- Biomass energy markets
- Biomass resources
  - Virgin biomass
  - Waste biomass
  - Land use
- Biomass potential
- Harvesting and storage
- Current policies, economic factors, transportation issues
- Agronomics
- Farm level impacts
- Physical conversion
  - Drying
  - Size reduction
  - Densification
- Thermochemical conversion
  - Combustion
  - Pyrolysis/liquefaction
  - Gasification
- Corn ethanol
  - Dry grind/wet milling processes
  - Coproducts
  - Energy balance
- Cellulosic ethanol/liquid fuels
  - Process overview
  - Enzymatic hydrolysis
  - Syngas fermentation
  - Fischer-Tropsch synthesis fuels
- Biodiesel
  - Conversion processes
  - Alternative feedstocks
- Anaerobic digestion
  - Manure utilization
  - Landfill gas



ABEN 499/696 - Biofuels



Course Objectives

At the end of the course, students will be able to:

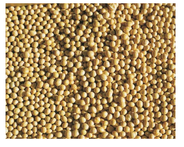
- Explain the economic, environmental and political importance of biobased fuels
- Explain options and challenges for biomass production, harvest, transportation and storage
- Explain the individual steps involved in producing corn ethanol, cellulosic ethanol, biodiesel, biogas and thermochemical platform fuels, including the importance and challenges in those processing steps

Students enrolled from these majors

- Agricultural and Biosystems Engineering
- Agricultural Systems Management
- Biology
- Biotechnology
- Crop and Weed Science
- Electrical Engineering
- Mechanical Engineering
- Plant Science

Student Project Topics

- Biodiesel production from algae
- Biochemical production
- Alternative biodiesel oilseed crops
- Biomass harvesting equipment
- Analysis of the Brazilian ethanol industry
- Nitrogen fixation and corn
- Switchgrass production, harvest and storage
- Using wind power for hydrogen and nitrogen fertilizer production
- Waste vegetable oil use in diesel engines
- Biological hydrogen production
- Effect of crop residue on soil with regard to removal for biomass ethanol production



BioOpportunities

NDSU North Dakota State University