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TRIAL COURSE OR NEW COURSE PROPOSAL

SUBMITTED BY: Juan Andres Soria

<table>
<thead>
<tr>
<th>Department</th>
<th>College/School</th>
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<tr>
<td>Forest Sciences</td>
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Prepared by

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<th>Email Contact</th>
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<tr>
<td><a href="mailto:ffjas3@uaf.edu">ffjas3@uaf.edu</a></td>
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Phone

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<tr>
<th>Faculty Contact</th>
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See [http://www.uaf.edu/utagov/faculty/cd/cdman.html](http://www.uaf.edu/utagov/faculty/cd/cdman.html) for a complete description of the rules governing curriculum & course changes.

1. ACTION DESIRED (check one):
   - [ ] Trial Course
   - [x] New Course

2. COURSE IDENTIFICATION:
   - Dept: NRM
   - Course #: 394
   - No. of Credits: 3

   Justify upper/lower division status & number of credits:
   - Combines principles of agronomy, forestry, chemistry and utilization, requiring 3 hours to cover the topics and provide a good baseline in the principles and practice subject, consistent with an upper division course.

3. PROPOSED COURSE TITLE:
   - Biomass and Bio-energy

4. CROSS LISTED?
   - YES/NO
   - It yes, Dept:

   (Requires approval of both departments and deans involved. Add lines at end of form for such signatures.)

5. STACKED?
   - YES/NO
   - It yes, Dept:

6. FREQUENCY OF OFFERING:
   - Alternate Spring
   - (Every other or Alternate) Fall, Spring, Summer -- or As Demand Warrants

7. SEMESTER & YEAR OF FIRST OFFERING (if approved):
   - Spring 2009

8. COURSE FORMAT:
   - NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, any core course compressed to less than six weeks must be approved by the core review committee.
   - COURSE FORMAT:
     - [ ] 1
     - [ ] 2
     - [ ] 3
     - [ ] 4
     - [ ] 5
     - [x] 6 weeks to full semester

   OTHER FORMAT
   - Mode of delivery
     - Specify lecture, field trips, labs, etc
   - Lecture two times per week, and two day long laboratories on two separate weekends

9. CONTACT HOURS PER WEEK:
   - Lecture hours/weeks: 16
   - Lab hours/week: 24
   - Practicum hours/week

   Note: # of credits are based on contact hours. 800 minutes of lecture-1 credit. 2400 minutes of lab in a science course=1 credit. 1600 minutes in non-science lab=1 credit. 2400-4800 minutes of practicum=1 credit. This must match with the syllabus. See [http://www.uaf.edu/utagov/faculty/cd/credits.html](http://www.uaf.edu/utagov/faculty/cd/credits.html) for more information on number of credits.

   OTHER HOURS (specify type)

10. COMPLETE CATALOG DESCRIPTION including dept., number, title and credits (50 words or less, if possible):
   - NRM 394. Biomass and Bioenergy, 3 credits. An examination of the composition, processing and utilization of biomass resources for sustainable energy use. Topics include an overview of biomass resource base, including waste and dedicated crops; principles of thermodynamics; production and harvesting practices of differing biomass; biomass chemistry and composition; products and processes for energy use for stationary power, transportation fuels and chemicals; environmental impact of biomass utilization and brief economic impact of incorporating the
11. **COURSE CLASSIFICATIONS:** (undergraduate courses only. Use approved criteria found on Page 10 & 17 of the manual. If justification is needed, attach on separate sheet.)

   H = Humanities  
   N = Natural Science  
   S = Social Sciences

   Will this course be used to fulfill a requirement for the baccalaureate core?  
   YES  
   NO

   IF YES, check which core requirements it could be used to fulfill:
   O = Oral Intensive,  
   W = Writing Intensive,  
   Natural Science,  

12. **COURSE REPEATABILITY:**

   Is this course repeatable for credit?  
   YES  
   NO

   Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).

   How many times may the course be repeated for credit?  
   TIMES

   It the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course?  
   CREDITS

13. **GRADING SYSTEM:**

   LETTER  
   PASS/FAIL

14. **RESTRICtIONS ON ENROLLMENT (if any)**

   **PREREQUISITES**
   NRM 101, CHEM 105X and CHEM 106X
   These will be required before the student is allowed to enroll in the course.

   **RECOMMENDED**
   NRM 453
   Courses, etc. that student is strongly encouraged to complete prior to this course.

15. **SPECIAL RESTRICTIONS, CONDITIONS**

   Ability to travel to Palmer Research Station for laboratory work twice during the semester

16. **PROPOSED COURSE FEES**

   $150  
   Has a memo been submitted through your dean to the Provost & VCAS for fee approval?  
   Yes/No  
   YES

17. **PREVIOUS HISTORY**

   Has the course been offered as special topics or trial course previously?  
   Yes/No  
   NO

   If yes, give semester, year, course #, etc.:  

18. **ESTIMATED IMPACT**

   WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

   The course will require the distance delivery facilities/classroom at the Palmer Research Center, as well as Arctic Health Bld room 183 or similarly equipped room in Fairbanks, restricting its use for the two hours lecture each week. There will be an increase in workload to the faculty, as he has a research appointment course topic is directly related with current research focus and is seen as a good way of attracting student graduate programs related with bio-fuels and biomass utilization and management.

19. **LIBRARY COLLECTIONS**

   Have you contacted the library collection development officer (ffk1j@uaf.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course?  
   If so, give date of contact and resolution.  
   If not, explain why not.

20. **IMPACTS ON PROGRAMS/DEPTS**

   What programs/departments will be affected by this proposed action?  
   Include information on the Programs/Departments contacted (e.g., email, memo)
Forestry Science Department: A new topic will be available for students in forestry, utilizing and managing resources to alleviate high energy costs. Agriculture, Animal and Plant sciences students will have the ability applying field related crop management practices to use waste products and specific crops for energy use. Resource management students will have the chance of applying scientific principles to issues related to energy and sustainable use of natural resources.

21. POSITIVE AND NEGATIVE IMPACTS
Please specify positive and negative impacts on other courses, programs and departments resulting from the proposed action.

The course does not overlap materials with other courses, providing a positive impact to students in SNRA other colleges and departments interested in the subject area that can choose the course as an elective, in line with current worldwide topics of interest. The course will introduce multidisciplinary topics, ranging from engineering, chemistry, socio-economics, policy, and biology, exposing students to scientific principles not often covered in a single applied science course that can complement their overall science background. This is seen as positive across all majors. The negative impact is the introduction of a new course that can attract students away from other established courses, in particular for elective courses.

JUSTIFICATION FOR ACTION REQUESTED
The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. Use as much space as needed to fully justify the proposed course.

There is no course in the UA system that addresses this topic, it is a new, relevant and emerging field of research and development which attracts the interest of all sectors of society, and that likely will play a major role in future resource utilization, requiring future professionals in the natural resources, forestry and agricultural fields to have a clear understanding of the challenges, limitations, successful applications and technical framework of utilizing biomass for energy and related products.

APPROVALS:

Signature, Chair, Program Department of: ____________________________ Date 4/15/05

Signature, Chair, College/School Curriculum Council for: ____________________________ Date 4-10-06

Signature, Dean, College/School of: SNRSA ____________________________ Date 4-10-08

Signature of Provost (if applicable)
Offerings above the level of approved programs must be approved in advance by the Provost.

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

Signature, Chair, UAF Faculty Senate Curriculum Review Committee Date ____________________________
Biomass and Bio-Energy
NRM 394, 3 credits
Class Syllabus, Spring 2009

Pre-requisites: NRM 101, Chem 105x and Chem 106x

Lecture: TBA, lecture twice a week
Arctic Health Building 183 & Palmer Research Station

Laboratory: TBA- 2 weekends in Palmer Research Station

Instructor: Andy Soria, Palmer Research Station, 746-9484, ffjas3@uaf.edu

Office hours: TBA. By appointment.

Course Materials:
Handouts will be placed electronically in Blackboard as needed. http://classes.uaf.edu/

Course Description:
An examination of the composition, processing and utilization of biomass resources for sustainable energy use. Topics include an overview of biomass resource base, including waste and dedicated crops; principles of thermodynamics; production and harvesting practices of differing biomass; biomass chemistry and composition; products and processes for energy use for stationary power, transportation fuels and chemicals; environmental impact of biomass utilization and brief economic impact of incorporating the technologies into mainstream use.

Course Objectives:
After completion of the course, students should be able to understand and engage in active discussions regarding the techniques and utilization of plant biomass for energy production. The specific goals for students after completing the course include the following:

1. Discuss the relationship between biomass properties and products/uses.
2. Gain understanding of the techniques and equipment used in the processing and utilization of biomass in different conversion technologies
3. Understand the impacts that using biomass for energy has on the socio-economic and biosphere environment.
4. Understand the principle scientific constraints of using biomass for fermentation, gasification, liquefaction, pyrolysis and other techniques discussed.
5. Discuss the impact of waste-streams produced by bio-fuel applications.
6. Discuss the impact on resources and economy.

Instructional Methods:
Formal lecture twice a week will be complimented with two weekend long laboratories which will explore the conversion of biomass into different biofuels, including biodiesel, bio-oil, caloric value (heat), and the characterization of biomass for composition. While the course will be distance delivered to Fairbanks, it will rely on Blackboard to update and upload lecture notes, assignments and announcements.

Exams:
Two exams will be administered during the course including one Final exam. There will be no quizzes. Chances for extra credit will be limited to review papers. Due to the distance learning component of this class, exam dates cannot be changed without prior permission of the instructors.

Homework:
The frequency of homework is every-other-week (7 homeworks total). These are to be review papers of published scientific journals in conjunction with other industry related resources (including web pages) dealing with a topic of your choosing within the area covered by lecture for that week. The review should include a bibliography (3 pts), an overview of the article and topic (5 pts) and how it affects the industry/economy (2 pts). There is no limit to the number of pages of the homework as long as it abides by the 3 requirements above.

Homework will be presented at the start of every-other class by each student as an ORAL PRESENTATION limited to 5 minutes. The written portions should be e-mailed to the instructor prior to the class.

Grading Policy:

Your final grade will be based on the following parameters:

<table>
<thead>
<tr>
<th>Task</th>
<th>Points</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Mid term exam</td>
<td>50</td>
<td>23</td>
</tr>
<tr>
<td>Final exam</td>
<td>50</td>
<td>23</td>
</tr>
<tr>
<td>Homework</td>
<td>70</td>
<td>31</td>
</tr>
<tr>
<td>Laboratory Reports</td>
<td>50</td>
<td>23</td>
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<tr>
<td>Total</td>
<td>220</td>
<td>100</td>
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# Lecture

## Tentative Schedule

**THESE CHAPTERS ARE BASED ON THE 1st EDITION BOOK**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Book Chapter</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Introduction, class overview, terminology, definitions.</td>
<td>1</td>
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<tr>
<td>Week 2</td>
<td>Physics and Chemistry of biomass and energy use</td>
<td>2</td>
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<tr>
<td></td>
<td>HW1- topic definitions, physics/chem</td>
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<tr>
<td>Week 3</td>
<td>Physics and Chemistry of biomass and energy use (cont)</td>
<td>2</td>
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<tr>
<td>Week 4</td>
<td>Biomass resource base. Sources of biomass and production</td>
<td>3,4</td>
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<tr>
<td></td>
<td>HW2- topic physics/chemistry</td>
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<td>Week 5</td>
<td>Heat and Power- gasification, combustion, digestion</td>
<td>5,6</td>
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<tr>
<td>Week 6</td>
<td>Heat and Power- gasification, combustion, digestion (cont.)</td>
<td>6</td>
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<tr>
<td></td>
<td>HW3- topic Heat and Power</td>
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<td>Week 7</td>
<td>Liquid fuels- biodiesel, fermentation, liquefaction.</td>
<td>5,7</td>
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<td>Mid term exam</td>
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<td>Week 8</td>
<td>SPRING BREAK</td>
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<tr>
<td>Week 9</td>
<td>Liquid fuels- biodiesel, fermentation, liquefaction (cont)</td>
<td>7</td>
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<td></td>
<td>HW4- liquid fuels</td>
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<tr>
<td>Week 10</td>
<td>Liquid fuels- biodiesel, fermentation, liquefaction (cont)</td>
<td>7</td>
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<td>Week 11</td>
<td>Waste stream utilization- biobased specialty products</td>
<td>8</td>
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<td></td>
<td>HW5- Liquid fuels, waste utilization</td>
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<tr>
<td>Week 12</td>
<td>Environmental impacts- production, processing, utilization</td>
<td>9</td>
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<td>Week 13</td>
<td>Resource economics</td>
<td>10</td>
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<td>HW6- Environmental impacts</td>
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<tr>
<td>Week 14</td>
<td>Review of concepts and class summary</td>
<td>Handouts</td>
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<td></td>
<td>HW7- Economics</td>
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Laboratory
Tentative Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Weekend 1</td>
<td>Biomass characterization (MC, makeup, caloric value)</td>
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<tr>
<td>April 4-5</td>
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<tr>
<td>Weekend 2</td>
<td>Biodiesel &amp; Bio-oil manufacturing, characterization &amp; testing.</td>
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<tr>
<td>April 11-12</td>
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Disabilities Services:
The instructor will work with the Office of Disabilities Services (203 Whit, 474-7043) to provide reasonable accommodation to students with disabilities.