Code # AG04 (2014)

**New/Special Course Proposal-Bulletin Change Transmittal Form**

**Undergraduate Curriculum Council** - Print 1 copy for signatures and save 1 electronic copy.

**Graduate Council** - Print 1 copy for signatures and send 1 electronic copy to [pheath@astate.edu](mailto:pheath@astate.edu)

|  |
| --- |
| **New Course or**  **Special Course (Check one box)**  *Please complete the following and attach a copy of the catalogue page(s) showing what changes are necessary.* |

|  |  |
| --- | --- |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date… **Department Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **COPE Chair (if applicable)** |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date… **Department Chair:** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **General Education Committee Chair (If applicable)** |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date… **College Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Undergraduate Curriculum Council Chair** |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date… **College Dean** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Graduate Curriculum Committee Chair** |
|  | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Vice Chancellor for Academic Affairs** |

1. Proposed Course Prefix and Number (For variable credit courses, indicate variable range.)

AST 4013

2. Course Title – if title is more than 30 characters (including spaces), provide short title to be used on transcripts. Title cannot have any symbols (e.g. slash, colon, semi-colon, apostrophe, dash, and parenthesis). Please indicate if this course will have variable titles (e.g. independent study, thesis, special topics).

Precision Application Technology

3. Will this course be lecture only, lab only, lecture and lab, activity, dissertation, experiential learning, independent study, internship, performance, practicum, recitation, seminar, special problems, special topics, studio problems, student exchange, occupational learning credit, or course for fee purpose only (e.g. an exam)? Please choose one.

Lecture and lab

4. What is the grade type (i.e. standard letter, credit/no credit, pass/fail, no grade, developmental)?

Standard letter

5. Is this course dual listed (undergraduate/graduate)?

Yes

6. Is this course cross listed? (If it is, all course entries must be identical including course descriptions. It is important to check the course description of an existing course when adding a new cross listed course.)

No

7. Brief course description (40 words or fewer) as it should appear in the bulletin.

Techniques in soil and crop homogeneity detection and variable-rate precision application of crop inputs to increase productivity and enhance environmental sustainability.

8. Indicate all prerequisites and if this course is restricted to a specific major, which major. (If a student does not have the prerequisites or does not have the appropriate major, the student will not be allowed to register).

a. Are there any prerequisites?

CIT 2033, Programming Fundamentals or other programming experience; Requires instructor approval

b. Why?

Students should be able to apply fundamental principles of programming.

9. Course frequency(e.g. Fall, Spring, Summer). Not applicable to Graduate courses.

Spring

10. Contact Person (Name, Email Address, Phone Number)

Peter Ako Larbi, [plarbi@astate.edu](mailto:plarbi@astate.edu), 870-972-2263

11. Proposed Starting Term/Year

Spring 2015

12. Is this course in support of a new program? No

If yes, what program?

Enter text...

13. Does this course replace a course being deleted? No

If yes, what course?

Enter text...

Has this course number been used in the past? No

*Submit Course Deletion Proposal-Bulletin Change Transmittal Form.*

14. Does this course affect another program? No

If yes, provide contact information from the Dean, Department Head, and/or Program Director whose area this affects.

Enter text...

15. Justification should include:

a. Academic rationale and goals for the course (skills or level of knowledge students can be expected to attain)

Crop production inputs help ensure high yield but blanket application rates are not environmentally sustainable. Modern practice combines knowledge about soil and crop conditions to deliver precise site-specific variable-rate application rates. This course will expose students to the concepts, methods, and equipment employed in achieving precision application of fertilizers and pesticides.

b. How does the course fit with the mission established by the department for the curriculum? If course is mandated by an accrediting or certifying agency, include the directive.

One of the college’s mission is “to prepare young men and women for entry and career advancement in the food, fiber and natural resources industry, which involves production (farming), agribusiness and value-added processing, public service and rural leadership… within environmentally sound and sustainable systems”. In line with this mission, the course will equip students with the requisite skills in precision fertilizer and pesticide application in field crops and fruit trees.

c. Student population served.

Upper level students in the College of Agriculture and Technology, particularly agricultural systems technology students

d. Rationale for the level of the course (lower, upper, or graduate).

The course contains advanced level materials which require application of knowledge acquired in lower level courses.

16. Outline (The course outline should be topical by weeks and should be sufficient in detail to allow for judgment of the content of the course.)

1. Spatial heterogeneity of soil, crop, weeds, and pests and their implications

2. Sensing soil and crop properties using spectroscopy and optical remote sensing

3. Remote sensing for weed detection, identification, and precision crop protection;

4. Digital thermography for crop disease control

5. Introduction to decision support systems and spatial data handling and management

6. Modeling plant diseases for decision making in crop protection

7. Mid-semester exam; Decision rules applied to site-specific weed management

8. Model-based decision making in crop protection

9. Application technologies for site-specific crop protection; Mechanical weed control

10. Direct injection sprayer and delivery optimization

11. Autonomous systems for crop protection

12. Variable rate technology for herbicide and fungicide application

13. Precision disease control in bed-grown crops; Economic evaluation of precision crop protection measures

14. Final exam

17. Course requirements (e.g. research papers, projects, interviews, tests, etc.)

Quizzes, take-home assignments, Mid Semester exam, and research paper

18. Special features (e.g. labs, exhibits, site visitations, etc.)

Labs

19. Department staffing and classroom/lab resources (Will this require additional faculty, supplies, etc.?)

No additional resources required

20. What is the primary intended learning goal for students enrolled in this course?

To understand the principles of variable rate application and be able to apply the knowledge to real life problems in agriculture

21. Reading and writing requirements:

a. Name of book, author, edition, company and year

“Precision Crop Protection - the Challenge and Use of Heterogeneity”, by  [E. Oerke](http://www.amazon.com/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Erich-Christian+Oerke&search-alias=books&text=Erich-Christian+Oerke&sort=relevancerank), [R. Gerhards](http://www.amazon.com/s/ref=dp_byline_sr_book_2?ie=UTF8&field-author=Roland+Gerhards&search-alias=books&text=Roland+Gerhards&sort=relevancerank), [G. Menz](http://www.amazon.com/s/ref=dp_byline_sr_book_3?ie=UTF8&field-author=Gunter+Menz&search-alias=books&text=Gunter+Menz&sort=relevancerank), [R.A. Sikora](http://www.amazon.com/s/ref=dp_byline_sr_book_4?ie=UTF8&field-author=Richard+A.+Sikora&search-alias=books&text=Richard+A.+Sikora&sort=relevancerank). Springer 2010.

b. Number of pages of reading required per week: 30

c. Number of pages of writing required over the course of the semester: 10-15 per team

22. High-Impact Activities (Check all that apply)

Collaborative assignments

Research with a faculty member

Diversity/Global learning experience

Service learning or community learning

Study abroad

Internship

Capstone or senior culminating experience

Other Explain: Enter text...

23. Considering the indicated primary goal (in Box #20), provide up to three outcomes that you expect of students after completion of this course.

**Outcome #1:** (For example, what will students who meet this goal know or be able to do as a result of this course?)

Students will understand variable rate application concepts.

Learning Activity:(For example, what instructional processes do you plan to use to help students reach this outcome?)

Students will participate in lectures to acquire the basic knowledge and engage in lab activities involving spray calculations, computer programming and measurements of pressure, flow rate, droplet size, and weather parameters.

Assessment Tool: (For example, what will students demonstrate, represent, or produce to provide evidence of their learning?)

Students will demonstrate mastery of their knowledge through 3-5 quizzes and about 3-5 take-home assignments, prove their ability to follow steps in design and measurements through lab reports.

*(Repeat if needed for additional outcomes 2 and 3)*

**Outcome #2:**

Students will be able to apply their knowledge in selecting and designing an appropriate variable-rate application system for a given problem.

Learning Activity:

Students will form teams of 2-5 members to define a problem and develop a decision support computer program that will accept map-based or real-time field conditions as input and prescribe variable application rates as output.

Assessment Tool:

Student teams will submit a research paper and give an oral presentation on their results to the class.

**Outcome #3**:

Enter text...

Learning Activity:

Enter text...

Assessment Tool:

Enter text...

24. Please indicate the extent to which this course addresses university-level student learning outcomes:

* 1. Global Awareness

Minimally  
Indirectly  
Directly

* 1. Thinking Critically

Minimally  
Indirectly  
Directly

* 1. Using Technology

Minimally  
Indirectly  
Directly

**From the most current electronic version of the bulletin, copy all bulletin pages that this proposal affects and paste it to the end of this proposal.**

**To copy from the bulletin:**

1. Minimize this form.
2. Go to <http://registrar.astate.edu/bulletin.htm> and choose either undergraduate or graduate.
3. This will take you to a list of the bulletins by year, please open the most current bulletin.
4. Find the page(s) you wish to copy, click on the “select” button and highlight the pages you want to copy.
5. Right-click on the highlighted area.
6. Click on “copy”.
7. Minimize the bulletin and maximize this page.
8. Right-click immediately below this area and choose “paste”.
9. For additions to the bulletin, please change font color and make the font size larger than the surrounding text. Make it noticeable.
10. For deletions, strike through the text, change the font color, and enlarge the font size. Make it noticeable.

**Agricultural Systems Technology (AST)**

**AST 1003. Modern Agricultural Systems** Multidisciplinary introduction to various crop and animal production systems, system interactions, problems, and solutions that lead to a sustainable agricultural productivity. Prerequisite, First year students in the College of Agriculture and Technology. Fall, Spring.

**AST 3503. Agriculture Spatial Technologies I** Basic understanding and utilization of data collection and assessment using global position system receiver, direct and remote sensing, and geographic information system software related to crop production and nutrient management. Prerequisite, PSSC 2813. Fall.

**AST 3513. Agriculture Spatial Technologies II** The course will concentrate on a study of the electromagnetic properties of earth objects, vegetation, soils, water, and the principles and operations of different sensors used to measure this energy. Prerequisite, AST 3503. Spring.

**AST 4003. Modern Irrigation Systems** The course will cover methods, equipment, current issues and future directions of irrigation, irrigation design and scheduling, drainage systems, irrigation measurements, performance evaluation, and impact on productive and sustainable agriculture. Prerequisite, MATH 1033 and PSSC 2813. Spring.

**AST 4013. Precision Application Technology** Techniques in soil and crop homogeneity detection and variable-rate precision application of crop inputs to increase productivity and enhance environmental sustainability. Spring.

**AST 4543. Advanced GIS for Agriculture and Natural Resources** Principles and advanced techniques of using Geographic Information System (GIS) concepts, equipment, and software used in agricultural, environmental, and natural resource applications. Prerequisite, AST 3543 with a grade of B or better. Spring.