REQUEST FOR NEW COURSE

1. **General Information.**

a. Submitted by the College of: Agriculture | Today's Date: 01/15/2010

b. Department/Division: Plant & Soil Sciences

c. Contact person name: Ole Wendroth | Email: owendroth@uky.edu | Phone: 257-4768

d. Requested Effective Date: ☒ Semester following approval OR ☐ Specific Term/Year[1]: _____

2. **Designation and Description of Proposed Course.**

a. Prefix and Number: PLS 655

b. Full Title: Spatial and Temporal Statistics

c. Transcript Title (if full title is more than 40 characters): _____

d. To be Cross-Listed[2] with (Prefix and Number): _____

e. Courses must be described by <u>at least one</u> of the meeting patterns below. Include number of actual contact hours[3] for each meeting pattern type.

2 Lecture	_____ Laboratory[1]	_____ Recitation	_____ Discussion	_____ Indep. Study
_____ Clinical	_____ Colloquium	_____ Practicum	_____ Research	_____ Residency
_____ Seminar	_____ Studio	3 Other – Please explain:	Computer Lab	

f. Identify a grading system: ☒ Letter (A, B, C, etc.) ☐ Pass/Fail

g. Number of credits: 3

h. Is this course repeatable for additional credit? YES ☐ NO ☒

If YES: Maximum number of credit hours: _____

If YES: Will this course allow multiple registrations during the same semester? YES ☐ NO ☐

i. Course Description for Bulletin: Opportunities for spatial and temporal monitoring strategies, the diagnosis and analysis of spatial and temporal agricultural and ecosystem processes are taught. Methodology is based on Statistical Time Series Analysis and Geostatistics.

j. Prerequisites, if any: STA 570 or other prerequisite in agreement with the instructor

k. Will this course also be offered through Distance Learning? YES[4] ☐ NO ☒

l. Supplementary teaching component, if any: ☐ Community-Based Experience ☐ Service Learning ☐ Both

3. **Will this course be taught off campus?** YES ☐ NO ☒

4. **Frequency of Course Offering.**

a. Course will be offered (check all that apply): ☒ Fall ☐ Spring ☐ Summer

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[1] Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received.

[2] The chair of the cross-listing department must sign off on the Signature Routing Log.

[3] In general, undergraduate courses are developed on the principle that one semester hour of credit represents one hour of classroom meeting per week for a semester, exclusive of any laboratory meeting. Laboratory meeting, generally, represents at least two hours per week for a semester for one credit hour. (from SR 5.2.1)

[4] You must *also* submit the Distance Learning Form in order for the proposed course to be considered for DL delivery.

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b.	Will the course be offered every year?		YES ☐ NO ☒

	If NO, explain:	In every other year (even-numbered years), this course is offered alternatingly with the Soil Physics courses (PLS 575, 576) that I am teaching in fall of odd-numbered years.

5.	**Are facilities and personnel necessary for the proposed new course available?**	YES ☒ NO ☐

	If NO, explain:	_____

6.	**What enrollment (per section per semester) may reasonably be expected?**	5-10

7.   Anticipated Student Demand.

a.	Will this course serve students primarily within the degree program?	YES ☒ NO ☐
b.	Will it be of interest to a significant number of students outside the degree pgm?	YES ☒ NO ☐

	If YES, explain:	When this course was taught in the past (fall 2006, fall 2008) while it was offered as a Special Topics Course (PLS 597), students from Biosystems and Ag Engineering, Forestry, and Civil Engineering took it besides students in the Plant & Soil Sciences and Soil Sciene graduate programs.

8.   Check the category most applicable to this course:

☐ Traditional – Offered in Corresponding Departments at Universities Elsewhere

☐ Relatively New – Now Being Widely Established

☒ Not Yet Found in Many (or Any) Other Universities

9.   Course Relationship to Program(s).

a.	Is this course part of a proposed new program?	YES ☐ NO ☒

	If YES, name the proposed new program: _____

b.	Will this course be a new requirement[5] for ANY program?	YES ☐ NO ☒

	If YES[5], list affected programs: _____

10.   Information to be Placed on Syllabus.

a.	Is the course 400G or 500?	YES ☐ NO ☒

If YES, the *differentiation for undergraduate and graduate students must be included* in the information required in *10.b*. You must include: (i) identification of additional assignments by the graduate students; and/or (ii) establishment of different grading criteria in the course for graduate students. (See *SR 3.1.4.*)

b.	☒	The syllabus, including course description, student learning outcomes, and grading policies (and 400G-/500-level grading differentiation if applicable, from *10.a* above) are attached.

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[5] In order to change a program, a program change form must also be submitted.

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Signature Routing Log

General Information:

Course Prefix and Number: PLS 655

Proposal Contact Person Name: Ole Wendroth   Phone: 257-4768   Email: owendroth@uky.edu

INSTRUCTIONS:

Identify the groups or individuals reviewing the proposal; note the date of approval; offer a contact
person for each entry; and obtain signature of person authorized to report approval.

Internal College Approvals and Course Cross-listing Approvals:

Reviewing Group	Date Approved	Contact Person (name/phone/email)	Signature
Soils Faculty	2/25/2010	Mark Coyne 17-4202/ mscoynbg@email.uky.edu	Mark Coyne
Department	3/12/2010	Todd Pfeiffe 17-5020/ tpfeiffe@uky.edu	see attached
College	3/5/2010	Larry Graban 17-885 lgraban@email.uky.edu	Larry Graban
		/ /	
		/ /	

External-to-College Approvals:

Council	Date Approved	Signature	Approval of Revision[6]
Undergraduate Council			
Graduate Council			
Health Care Colleges Council			
Senate Council Approval		University Senate Approval	

Comments:

[6] Councils use this space to indicate approval of revisions made subsequent to that council's approval, if deemed necessary by
the revising council.

Rev 8/09

From:	Pfeiffer, Todd
Sent:	Friday, March 12, 2010 2:48 PM
To:	Grabau, Larry
Subject:	PLS 655 course proposal

Larry,

You may indicate March 12 as the date for departmental approval of the PLS 655 course proposal. The approval was by passive consent.

Thanks for your suggestion,

Todd Pfeiffer

859-257-5020

Spatial and Temporal Statistics
PLS 655 – 3 credits
FALL SEMESTER - 2010
Syllabus

Lecture Schedule: 2:00 – 3:50PM, Wednesdays Room A-5, Agricultural Science
Building North
5:30 – 7:00PM, Wednesdays, Computer Exercise (Formal Lab period)
Plus 90 minutes of open lab period.
Computer Lab in the Ag. Information Center (Library in Ag North)

Instructor: Ole Wendroth (257-4768, owendroth@uky.edu)
Room N-122M Agricultural Science Building North

Office Hours: 11:00AM – 12:45PM, Tuesdays and Thursdays (no appointment
necessary) or at other times with prior appointment.

Student Learning Outcomes:

- Students from different academic backgrounds demonstrate knowledge of basic concepts of spatial and temporal statistics as analytical tools for a better understanding of processes in agricultural landscapes and in the environment.
- Students will use a variety of analytical tools applicable to on-site observations from experimental fields with or without treatments.
- Students will analyze real-world situations manifested in observations taken across landscapes, in watersheds, in farmers' fields, and other spatio-temporal domains at different scales.
- Students will identify and appraise questions that do not demand an experiment with randomized replicates of treatments.
- Students will prepare experiments and sampling designs focused on the analysis of spatial or temporal processes without randomized replicates of treatments.
- Students complete exercises in computing spatial dependence between observations of one or several variables, spatial interpolations of variables, and uncertainty components in process models.
- Students will apply concepts of spatial and temporal statistics in their specific fields and disciplines.

Course Goals/Objectives

In agricultural sciences, the design of experiments and the analysis of data are usually based on mean values that are randomly collected in a plot after prior imposing of a treatment that differs from the treatment in the neighboring plot. Without any doubt, this approach is often used for a good reason, has helped to improve soil and crop management, and contributed to the increase in agricultural production and food quality. However, there is strongly increasing demand for analytical opportunities focused on the analysis of bio-geochemical and physical processes in ecosystems, landscapes, watersheds, across all spatial and temporal scales of the environment. Techniques focused on the diagnosis of processes in these domains do not necessarily require but on the other hand do not exclude treatments. They are rather based on the analysis of spatial and temporal covariances, variability structure and representativity of observations and therefore provide broad perspectives and research opportunities in the environmental disciplines. These methods are usually not taught at agricultural colleges.

The objective of this course is that students learn about concepts, theory and application of statistical approaches that are focused on identifying spatial and temporal processes, their association with underlying factors at various scales. Aspects of observational noise, model uncertainty, spatial and temporal variability structure will be learned in this course. Co-regionalization techniques applied in the geosciences that are known from the field of geostatistics will be covered. But stronger emphasis will be put on applied statistical time series analysis, a set of techniques widely known in economy, hydrology that has been applied successfully for spatial data series in soil science, agronomy and other disciplines. These methods provide opportunities for decomposing ecosystem variability in the space, time and frequency domains. The wide field of autoregressive state-space models more powerful than common interpolation techniques provide ample opportunity for identifying process relationships across spatial and temporal domains. They are part of our daily life in GPS technology, aircraft steering control, forecasts etc., and their application in diagnosing agricultural and environmental systems and relevant processes across different scales has by far not fully been explored yet. Physically-based state-space models in combination with stochastic filters allow distinguishing between measurement and model uncertainty and help improving experimental designs and sampling schemes.

The goal of this course is to introduce these analytical opportunities to graduate students for possible consideration in the design and analysis of their own experiments.

Requested Texts:

> **Textbook:** Spatial and Temporal Statistics - Sampling Field Soils and their Vegetation. By Nielsen, D.R. and O. Wendroth. 2003. Geoecology textbook, Catena Verlag, Reiskirchen, Germany, 408pp.

One copy is available (not specifically on reserve; first come first serve) at the library of the Ag Information Center, ASC North. Additional required readings (e.g., journal articles, book chapters) will be made available. Reading is essential to be able to understand the course material and to solve problems in homework assignments and exams.

Class Organization:

The course is arranged by topic areas. See the lecture schedule for a listing of topics to be covered. Material presented in the lecture is closely related to the textbook. Additional material will be made available to the students. During lectures, time will be given to ask questions, and to discuss the material. Reading assignments will be announced.

Reading assignments in the textbook and additional readings (recent journal articles on the topic) supplement the lecture material. Students are responsible for material in the text whether it is covered or not. Some questions in the exams will come from the text.

During the formal computer lab period, students are taught the practical use of computer software for analysing spatial and temporal data. Example data sets will be analyzed. In the additional open computer lab period, students have the time to practice and improve their data analysis skills.

Course Grading:

This class will require good efforts from students. An A is given for excellent work, a C for average work. Homework and exams will be graded.

Two take-home exams and a final in-class exam will be given. These exams are cumulative. If students do not understand material from one exam, it may make the others difficult. Exams are a mixture of problem-solving, answer, interpretation, and multiple choice. If a student misses an exam for a legitimate reason (see page 3), an extra exam will be scheduled and given. Exams missed for non-legitimate reasons will be scored as 0.

Three **Homework** problem sets will be assigned during the semester, and will be due on the same day of the following week. **Homework being turned in late will not be accepted.** Some of the homework will be computer-based exercises. These exercises can be worked out on the computers in the Ag Information Center in the ASC North

Building, which are reserved for this class. Since the computers are not available all the time, students are responsible to make arrangements in due time ahead. The homework sets will contribute 15 % of the final grade.

Participation points will be based on active participation in class discussion and responding to questions during the lecture. Moreover, points will be based on random in-class assignments. "Random" means that anybody in the class can be chosen regardless of previous selection. These assignments will be short oral summaries on the reading requested for that particular lecture. In addition, questions will be asked regarding the respective reading assignment.

Grading Categories:

Category	Percent
First exam	25
Second exam	25
Final exam	25
Homework problem sets	15
Participation	10

Grading Scale:

Graduate Level	Grade
90 – 100 %	A
80 – 89 %	B
70 – 79 %	C
< 70 %	E

Absence
The guidelines for this class will be: Notify the instructor as soon as possible before a scheduled exam or homework if you cannot make it for a valid reason. Valid reasons include participation in scheduled UK events or emergencies (illness, accident, family crisis), or legal obligations. For UK events, you have to provide a written notice signed by the instructor or coach informing me of the event and your participation before the scheduled exam. For emergencies, documentation of the event proving the student's need to be absent is expected.

Academic Integrity:
Scholastic dishonesty is not tolerated. Forms of scholastic dishonesty include, but are not limited to: plagiarism (copying or using someone else's work as your own), utilization of unauthorized materials during academic evaluations, and giving or receiving unauthorized assistance during evaluations, including exams, homework and in-class evaluations. The first offense will result in a grade of 0 for that particular assignment. A second offense will result in disciplinary action.
For further details, see Part II of "The code of Student Conduct" under
http://www.uky.edu/StudentAffairs/Code/part2.html

Academic Accommodations due to Disability:
If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities.

Anticipated Topic Schedule (Fall 2010, this schedule may be adjusted during the semester):

<div align="center">

Topic

</div>

Aug	Introduction
	Course outline
	Why spatial and temporal statistics?
Sep	Review of descriptive statistics
	Autocorrelation
*	Cross correlation
	Semivariograms
Oct	**Exam1**
	Instructor absent for Annual Tri-Society (ASA-SSSA-CSSA) meetings
	Kriging
*	Crossvariograms and cokriging
	Spectral analysis
Nov	**Exam 2**
	Cross spectral analysis and coherency
	Autoregressive and moving average functions
	NO CLASS – ONE DAY PRIOR TO THANKSGIVING
*Dec	Autoregressive state-space analysis
	Physical state-space models; Outlook
	Final Exam

* Approximate schedule for homework sets (will be adjusted according to progress in material).

Looks like that time has come around again. Please submit any relevant references to Penny ASAP. Thanks.

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R

The Only Non-Impostor is **GOD.**

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Dear DGSs, Directors of Grad Certificates, and Staff Assistants,

Over past several years, the Graduate School has collected citations for refereed publications, proceedings, presentations and juried projects produced by graduate students. This assessment began in response to strategic indicator #6 of the 1998 University Strategic Plan:

> *Increase by 15% the number of graduate student publications in refereed journals, presentations at professional meetings, and/or earned recognition for juried creative products.*

This assessment continues in response to the 2009-2014 Strategic Plan, Goal 2, Objective 2.1: *Increase research and scholarly productivity.* This information is one method by which to assess graduate programs.

Summary reports from this collection of citations are available at: Graduate School Productivity Reports.

Citations are now requested for Calendar Year 2009. The following types of citations should be included:

a. Refereed publications in which at least one graduate student was author or co-author. Book and book chapters are included in this list.

b. Peer-reviewed proceedings - written abstracts or short articles on papers or poster presentations from a conference are submitted to the editors and are read and selected by an independent peer panel or reviewers.

c. Presentations at national or regional professional meetings involving at least one graduate student. At least one graduate student should be author or co-author on the presentation; it is not a requirement that the student make the presentation.

d. Juried creative projects involving at least one graduate student. Juried creative projects are typically unique to the College of Fine Arts.

Last year, a pilot test was conducted for an online survey method for collecting citation data. Based upon the success of that pilot, we now encourage all departments to use the online method. The Graduate Student Productivity Online Survey can be accessed by clicking this link: Graduate Student Productivity Survey.

This online survey is available throughout the year, so when a student completes an item it can be recorded in the survey at any time. If you wish, please feel free to forward this online survey link to students so that they can submit their own citations.

Using this online method is completely voluntarily. If you prefer to submit an electronic document (MS Word) as in the past, please feel free to do so. Guidelines for preparing an electronic document can be viewed by clicking this link: Guidelines for Electronic Document.

Please complete the online survey or submit an electronic document **(no hard copies, please)** to rs_gsSurvey2@uky.edu by the last day of classes each Spring semester.

If you have any questions or problems, please contact rs_gsSurvey2@uky.edu. Your assistance in providing this information is greatly appreciated.

If you have received this note in error, please accept my apologies. Please take a moment to reply, informing me of the error.

Thank you,

Onecia

Onecia M. Gibson, Ph.D.
Data Research Analyst

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University of Kentucky
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Lexington, KY 40506-0033
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****************** Please visit the Educational Psychology Program website at http://www.uky.edu/Education/EDP/edprogs.html

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