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| For Academic Affairs and Research Use Only | |
| CIP Code: |  |
| Degree Code: |  |

**New Course Proposal Form**

**[X] Undergraduate Curriculum Council**

**[ ] Graduate Council**

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| --- |
| **[X] New Course or [ ]Experimental Course (1-time offering) (Check one box)** |

Signed paper copies of proposals submitted for consideration are no longer required. Please type approver name and enter date of approval.

Email completed proposals to [curriculum@astate.edu](mailto:curriculum@astate.edu) for inclusion in curriculum committee agenda.

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| --- | --- |
| Hong Zhou 10/23/2019 **Department Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **COPE Chair (if applicable)** |
| Amanda Lambertus 10/23/2019  **Department Chair:** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Head of Unit (If applicable)** |
| John Hershberger 10/25/2019 **College Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Undergraduate Curriculum Council Chair** |
| Lynn Boyd 10/25/2019 **College Dean** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Graduate Curriculum Committee Chair** |
| |  |  | | --- | --- | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Enter date |   **General Education Committee Chair (If applicable)** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Vice Chancellor for Academic Affairs** |

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

Mohamed Milad, [mmilad@astate.edu](mailto:mmilad@astate.edu) , 870-680-8126

Amanda Lambertus, [alambertus@astate.edu](mailto:alambertus@astate.edu) , 870-972-3090

2. Proposed Starting Term and Bulletin Year

Fall 2020

3. Proposed Course Prefix and Number (Confirm that number chosen has not been used before. For variable credit courses, indicate variable range. *Proposed number for experimental course is 9*. )

STAT 3243

4. 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).

Regression Analysis and Analysis of Variance

Short Title: Regression Analysis and ANOVA

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

Theory and practice of regression analysis and analysis of variance (ANOVA). Introduction of simple and multiple linear regression, inferences about model parameters, regression diagnostics, variable selection, and model adequacy checking and regression approaches to ANOVA.

6. Prerequisites and major restrictions. (Indicate all prerequisites. 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).

1. Yes Are there any prerequisites?
2. If yes, which ones?

STAT 3233, Applied Statistics I

1. Why or why not?

The student should possess the requisite math and stat introduction skills gained through college algebra and Applied Statistics I in order to place students appropriately and in order to design an efficient and effective pathway to data analysis.

1. No Is this course restricted to a specific major?
   1. If yes, which major? Enter text...

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

Spring

8. 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, student exchange, occupational learning credit, or course for fee purpose only (e.g. an exam)? Please choose one.

Lecture

9. What is the grade type (i.e. standard letter, credit/no credit, pass/fail, no grade, developmental, or other [please elaborate])

Standard letter

10. No Is this course dual listed (undergraduate/graduate)?

11. No Is this course cross listed?

*(If it is, all course entries must be identical including course descriptions. Submit appropriate documentation for requested changes. It is important to check the course description of an existing course when adding a new cross listed course.)*

**11.1** – If yes, please list the prefix and course number of cross listed course.

Enter text...

**11.2** – **Yes / No** Are these courses offered for equivalent credit?

Please explain. Enter text...

12. Yes Is this course in support of a new program?

a. If yes, what program?

Undergraduate Certificate in Statistics

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

a. If yes, what course?

Enter text...

14. No Will this course be equivalent to a deleted course?

a. If yes, which course?

Enter text...

15. Yes Has it been confirmed that this course number is available for use?

16. No Does this course affect another program?

If yes, provide confirmation of acceptance/approval of changes from the Dean, Department Head, and/or Program Director whose area this affects.

Enter text...

**Course Details**

17. 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. **CHAPTER 2: SIMPLE LINEAR REGRESSION**

Week #1

* SIMPLE LINEAR REGRESSION MODEL
* LEAST-SQUARES ESTIMATION OF THE PARAMETERS
* HYPOTHESIS TESTING ON THE SLOPE AND INTERCEPT

Week #2

* INTERVAL ESTIMATION IN SIMPLE LINEAR REGRESSION
* PREDICTION OF NEW OBSERVATIONS
* COEFFICIENT OF DETERMINATION
* USING SAS® AND R FOR SIMPLE LINEAR REGRESSION

1. **CHAPTER 3: MULTIPLE LINEAR REGRESSION**

Week #3

* MULTIPLE REGRESSION MODELS
* ESTIMATION OF THE MODEL PARAMETERS
* HYPOTHESIS TESTING IN MULTIPLE LINEAR REGRESSION

Week #4

* CONFIDENCE INTERVALS IN MULTIPLE REGRESSION
* PREDICTION OF NEW OBSERVATIONS
* MULTIPLE REGRESSION MODEL FOR THE PATIENT SATISFACTION DATA
* USING SAS AND R FOR BASIC MULTIPLE LINEAR REGRESSION

1. **CHAPTER 4: MODEL ADEQUACY CHECKING**

Week #5

* + RESIDUAL ANALYSIS
  + DETECTION AND TREATMENT OF OUTLIERS
* LACK OF FIT OF THE REGRESSION MODEL

1. **CHAPTER 5: TRANSFORMATIONS AND WEIGHTING TO CORRECT MODEL INADEQUACIES**

Week #6

* VARIANCE-STABILIZING TRANSFORMATIONS
* TRANSFORMATIONS TO LINEARIZE THE MODEL
* ANALYTICAL METHODS FOR SELECTING A TRANSFORMATION

1. **CHAPTER 6: DIAGNOSTICS FOR LEVERAGE AND INFLUENCE**

Week #7

* IMPORTANCE OF DETECTING INFLUENTIAL OBSERVATIONS
* LEVERAGE
* MEASURES OF INFLUENCE: COOK'S D
* MEASURES OF INFLUENCE: DFFITS AND DFBETAS
* MEASURE OF MODEL PERFORMANCE

1. **CHAPTER 9: MULTICOLLINEARITY**

Week #8

* SOURCES OF MULTICOLLINEARITY
* EFFECTS OF MULTICOLLINEARITY
* MULTICOLLINEARITY DIAGNOSTICS

Week #9

* METHODS FOR DEALING WITH MULTICOLLINEARITY
* USING SAS TO PERFORM RIDGE AND PRINCIPAL-COMPONENT REGRESSION

1. **CHAPTER 10: VARIABLE SELECTION AND MODEL BUILDING**

Week #10

* + - * COMPUTATIONAL TECHNIQUES FOR VARIABLE SELECTION
      * STRATEGY FOR VARIABLE SELECTION AND MODEL BUILDING

1. **CHAPTER 11: VALIDATION OF REGRESSION MODELS**

Week #11

* + - * CASE STUDY: GORMAN AND TOMAN ASPHALT DATA USING SAS
* VALIDATION TECHNIQUES

1. **CHAPTER 15: OTHER TOPICS IN THE USE OF REGRESSION ANALYSIS**

Week #12

* DATA FROM PLANNED EXPERIMENTS
* THE LOGIC BEHIND AN ANALYSIS OF VARIANCE

Week #13

* ONE-FACTOR COMPLETELY RANDOMIZED DESIGNS
* RANDOMIZED BLOCK DESIGNS

Week #14

* TOW-FACTOR FACTORIAL EXPERIMENTS
* FOLLOW-UP ANALYSIS: TUKEY’S MULTIPLE COMPARISONS OF MEANs

Week #15

* CHECKING ANOVA ASSUMPTIONS
* Review

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

The course will be taught in the classroom equipped with SAS or an equivalent software package (such as R).

19. Department staffing and classroom/lab resources

Enter text...

1. Will this require additional faculty, supplies, etc.?

No

20. No Does this course require course fees?

*If yes: please attach the New Program Tuition and Fees form, which is available from the UCC website.*

**Course Justification**

21. Justification for course being included in program. Must include:

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

The objective is that by the end of this course the student will be able to: (1) choose and apply appropriate regression techniques to address research questions and hypotheses; (2) use SAS or an equivalent software package (such as R) for regression analyses or analyses of variance/covariance; (3) interpret findings; (4) communicate results clearly and effectively; (5) understand statistical assumptions and how to detect and address violations; and (6) recognize strengths and weaknesses in analyses and formulate constructive critiques

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.

This course fits in well with our department’s mission of providing a “quality education to students, graduates, undergraduates in variety majors and prepare students for a variety of future endeavors and careers in business, industry, government, research, and academia.” This course will require students to choose and apply appropriate techniques to address research questions and hypotheses and communicate results clearly and effectively.

c. Student population served.

Junior and Senior

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

Traditionally, students in applied science and mathematics spend their first two years of college training meeting requirements. As juniors they begin to transition into the portions of the curriculum where they gain knowledge and skills necessary to meet future credentialing.

**Assessment**

**Relationship with Current Program-Level Assessment Process**

22. What is/are the intended program-level learning outcome/s for students enrolled in this course? Where will this course fit into an already existing program assessment process?

Program-level Learning Outcomes:

This course will serve as a junior/senior elective option as well as a required course for the Undergraduate Certificate in Statistics.

23. Considering the indicated program-level learning outcome/s (from question #23), please fill out the following table to show how and where this course fits into the program’s continuous improvement assessment process.

*For further assistance, please see the ‘Expanded Instructions’ document available on the UCC - Forms website for guidance, or contact the Office of Assessment at 870-972-2989.*

*(Repeat if this new course will support additional program-level outcomes)*

**Course-Level Outcomes**

24. What are the course-level outcomes for students enrolled in this course and the associated assessment measures?

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| **Outcome 1** | Students will be able to use regression techniques in a more mathematical setting. |
| Which learning activities are responsible for this outcome? | Assigned readings, lecture, assignments using SAS or R, and activities with data sets, examples |
| Assessment Measure | Graded assignments and exams |
|  |  |
| **Outcome 2** | Students will be able to read and create SAS or R code to analyze data. |
| Which learning activities are responsible for this outcome? | Assigned readings, lecture, lab assignments using SAS or R, and activities with data sets, examples |
| Assessment Measure | Graded assignments and exams. |
|  |  |
| **Outcome 3** | Students will be able to utilize general linear models and multiple linear regression models to make inference and draw appropriate conclusions. |
| Which learning activities are responsible for this outcome? | Assigned readings, lecture, assignments using SAS or R, and activities with data sets, examples |
| Assessment Measure | Graded assignments and exams. |

*(Repeat if needed for additional outcomes)*

**Bulletin Changes**

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| **Instructions** |
| **Please visit** [**http://www.astate.edu/a/registrar/students/bulletins/index.dot**](http://www.astate.edu/a/registrar/students/bulletins/index.dot) **and select the most recent version of the bulletin. Copy and paste all bulletin pages this proposal affects below. Follow the following guidelines for indicating necessary changes.**  **\*Please note: Courses are often listed in multiple sections of the bulletin. To ensure that all affected sections have been located, please search the bulletin (ctrl+F) for the appropriate courses before submission of this form.**  - Deleted courses/credit hours should be marked with a red strike-through (~~red strikethrough~~)  - New credit hours and text changes should be listed in blue using enlarged font (blue using enlarged font).  - Any new courses should be listed in blue bold italics using enlarged font (***blue bold italics using enlarged font***)  *You can easily apply any of these changes by selecting the example text in the instructions above, double-clicking the ‘format painter’ icon 🡪 , and selecting the text you would like to apply the change to.*  *Please visit* [*https://youtu.be/yjdL2n4lZm4*](https://youtu.be/yjdL2n4lZm4) *for more detailed instructions.* |

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Statistics (STAT)

STAT 3033. Statistics for the Health Professions Introduction to data manipulation, analysis, and interpretation for health care professionals. Topics include Evidenced Based Practice, variables, and scales of measurement, descriptive statistics, regression, statistical and clinical significance, confidence intervals, hypothesis testing, and inferential statistics including ANOVA. Restricted to College of Nursing and Health Professions majors. Prerequisite, MATH 1023 or equivalent. Fall, Spring, Summer

***STAT 3243. Regression Analysis and analysis of variance (ANOVA). Theory and practice of regression analysis and ANOVA. Introduction of simple and multiple linear regression, inferences about model parameters, regression diagnostics, variable selection, and model adequacy checking and regression approaches to ANOVA. Prerequisite, STAT 3233. Spring.***

**STAT 3233. Applied Statistics** I for students in a variety of disciplines including the sciences, allied health fields, and education. Descriptive statistics for quantitative and qualitative data, normal distributions, correlation, linear regression, sample surveys, randomized comparative experiments, sampling distributions, estimation and hypothesis testing for means and proportions. Prerequisite, MATH 1023 or equivalent. Fall, Spring, Summer.

**STAT 4453. Probability and Statistics I** Set theory, random variables, probability laws and distributions, independence, conditioning, moment generating functions and the Central Limit Theorem. Prerequisite, MATH 3254. Fall.

**STAT 4463. Probability and Statistics II** Point and interval estimation, hypothesis testing, ANOVA, correlation, regression, and nonparametric methods. Prerequisite, STAT 4453. Spring.