Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Probability and statistics for Engineers and scientists (STAT-324)

Course Specification

Institution: King Saud University
College/Department: Department of Statistics and Operations Research

A) Course Identification and General Information

1. Course title and code: Probability and Statistics for Engineers STAT 324
2. Credit hours: 3 (2+0+1)
3. Program(s) in which the course is offered. Bachelor of Engineering.
4. Name of faculty member responsible for the course: Dr. Mamdouh Montaser
5. Level/year at which this course is offered: Fourth level (2nd year)
6. Pre-requisites for this course : None
7. Co-requisites for this course : None
8. Location if not on main campus:

B) Objectives

1. Summary of the main learning outcomes for students enrolled in the course.

Students enrolled in this course will be able to:

- Determine the Sample space for any trial
- Define the Random variables (Discrete and Continuous distributions.
- Find the mean (mathematical expectation) and the variance of a random variable. Mean and variance of a linear combination of independent random variables.
- Know the properties of the famous Discrete distributions (Uniform, Binomial, Hyper geometric, Poisson).
- Know the properties of the famous of Continuous distributions (Uniform, Exponential, Normal).
- Find the unknown population parameters by Estimation methods: Point estimation, Confidence interval estimation.
- Conduct the Hypotheses Testing (single Population parameter (mean, proportion, difference between two means and difference between two proportions of independent populations)

2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field)

- Using the latest edition of the book for this course:
  - Probability and Statistics for Engineers and Scientists, by R. E. Walpole and R. H. Myers
- Using several references
- Encouraging students to search for the information related to the subjects of the course through the Internet.

C) Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached)

1. Topics to be covered		
Topics	No. of weeks	Contact hours
Introduction and some simple discussion related to sample space, events	1	4
Definition of sample space, counting sample points, random events, Probability rules and additive rule.	1	4
Conditional probability, multiplication rule, independent events.	1	4
Total probability rule, Baye's rule	1	4
Random variables, Discrete and continuous distributions.	1	4
Mean and variance of a random variable. Mean of linear combination of random variables.	1	4
Some of the common Discrete Distributions: Uniform, Binomial, Hyper geometric, Poisson distributions.	1	4
Some of the common Continuous Distributions: Uniform, Exponential, Normal distributions.	1	4
Applications of the normal distribution. Random sampling, Some important sample statistics.	1	4
Sampling distribution of the mean from normal distribution with known and unknown variance, t-distribution, Statistical inference, Classical estimation, Estimation of a single population mean, Standard error of a point estimate.	1	4

Estimating a confidence interval for: single population mean, the difference between two independent samples means, a single population proportion.	1	4
Estimating confidence interval for the difference between two proportions. Introducing the principles of Testing Hypothesis- The first and the second type of errors, Testing hypothesis about : Single population mean, Difference between two independent populations' means.	1	4
Testing hypothesis about: Single population proportion, Difference between two populations' proportions.	1	4
Simple Linear correlation, Simple Linear Regression, Least square method for estimating and getting inference about regression coefficients.	1	4
Any leftover materials and general review.	1	4

2. Course components (total contact hours per semester):

Lecture: 30 hours	Tutorial: 30 hours	Practical/Fieldwork/Internship:	Other:

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week): 4 (laboratory reports, homework, take home exams and other assignments)

4. Development of Learning Outcomes in Domains of Learning For each of the domains of learning shown below indicates:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;
- The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

a. Knowledge

(i) Description of the knowledge to be acquired

- Knowledge of probability rules, independent random events.
- Knowledge of random variables and their probability distribution.
- Knowledge of the most common discrete probability distributions and their relationships.
- Knowledge of the most common continuous probability distributions and their applications.
- Knowledge of sampling distribution of the some important sample statistics.
- Knowledge of principals of estimation, estimation of some important population parameters.
- Knowledge of principals of estimation of the simple linear regression.

(ii) Teaching strategies to be used to develop that knowledge

- Textbook
- References

(iii) Methods of assessment of knowledge acquired

- Mid-term exams
- Home works
- Final exam

b. Cognitive Skills

(i) Cognitive skills to be developed

- Knowledge of basic principles of estimation

(ii) Teaching strategies to be used to develop these cognitive skills

- Using in-class Lectures
- Home works
- Exams

(iii) Methods of assessment of students cognitive skills

- Home works
- Exams

c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed : Not applicable

(ii) Teaching strategies to be used to develop these skills and abilities

- Lectures

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility: Not applicable

d. Communication, Information Technology and Numerical Skills

(i) Description of the skills to be developed in this domain.

- Internet
- E-mail
- The teacher's web-site

(ii) Teaching strategies to be used to develop these skills

- Using computers to solve estimation problems

(iii) Methods of assessment of students numerical and communication skills

- Using computers to solve estimation problems

e. Psychomotor Skills (if applicable)

(i) Description of the psychomotor skills to be developed and the level of performance required: Not applicable

(ii) Teaching strategies to be used to develop these skills: Not applicable

(iii) Methods of assessment of students psychomotor skills: Not applicable

5. Schedule of Assessment Tasks for Students During the Semester

Assessment	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	First mid-term exam	7th	15%
2	Second mid-term exam	12th	15%
3	Home works	1-15	20%
4	Final exam	After 15th Week	50%

D) Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)
   - 6 office hours per week

E) Learning Resources

1. Required Text(s)

• Probability and Statistics for Engineers and Scientists. By: R.E.Walpole and R.H.Myers
2. Essential References • Introduction to Theory of Statistics by A. Mood, F. Graybill & B. Boes • Mathematical Statistics by Steven Arnold • Mathematical Statistics by Hogg & Craig
3. Recommended Books and Reference Material (Journals, Reports, etc) (Attach List) • See above
4. Electronic Materials, Web Sites etc • Encouraging students to obtain related information from the Internet.
5. Other learning material such as computer-based programs/CD, professional standards/regulations Not required.

F) Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Lecture rooms, laboratories, etc.) • Class room • Computers Laboratory
2. Computing resources • Computers
3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list) : None

G) Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Questionnaires completed by students

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Home works
- Exams
- Projects

3. Processes for Improvement of Teaching

- New textbook and references
- Using newly computational techniques.
- Using newly teaching methods and techniques.

4. Processes for Verifying Standards of Student Achievement (e. g. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution):

Check the marking of a sample of student answer sheets in the final exam by an independent faculty member

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

Reviewing the course contents every five years in coordination with the departments in which the course is offered in their programs.