هيئة تقويم التعليم
Education Evaluation Commission
المركز الوطني للتقويم والاعتماد الأكاديمي
National Center for Academic Accreditation and Evaluation

**ATTACHMENT 5.**

# T6. COURSE SPECIFICATIONS (CS)

## Math 380
## Stochastic Processes

هيئة تقويم التعليم
Education Evaluation Commission

# Course Specifications

| | |
|---|---|
| Institution: King Saud University | Date: 18/5/1439H (4/2/2018G) |
| College/Department :College of Science, Math. Dept. | |

## A. Course Identification and General Information

1. Course title and code:Math 380Stochastic Processes
2. Credit hours:4(3+2+0)
3. Program(s) in which the course is offered.
(If general elective available in many programs indicate this rather than list programs)
Bachelor of Science in Actuarial and Financial Mathematics
4. Name of faculty member responsible for the course: Dr/ Emad E. Elmahdy
5. Level/year at which this course is offered:6th level
6. Pre-requisites for this course (if any):Math 280, Stat 215
7. Co-requisites for this course (if any):None
8. Location if not on main campus:
9. Mode of Instruction (mark all that apply):

| | | | |
|---|---|---|---|
| a. traditional classroom | | What percentage? | |
| b. blended (traditional and online) | √ | What percentage? | 100% |
| c. e-learning | | What percentage? | |
| d. correspondence | | What percentage? | |
| f. other | | What percentage? | |

Comments:

## B Objectives

1. What is the main purpose for this course?

(1) Student knows the standard concepts and different methods of stochastic modeling

(2) Student be able to illustrate the rich diversity of applications of stochastic processes in the sciences

(3) Student can do more exercises in the application of simple stochastic analysis to appropriate problems.

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

(1) Encouraging students to read certain books about some applications of stochastic processes.

(2) Encouraging students to use internet to look for related websites and references.

## C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:
Basic probabilistic problems and methods in operations research and Applied Mathematics. Methods of problem formulation and solution. The course will cover basicstochastic processes such as simple random walk, Markov chains, Martingales, Poisson processes,and Brownian motion.

1. Topics to be Covered

| List of Topics | No. of Weeks | Contact hours |
|---|---|---|
| Definition ofStochastic Processes- **Probability Review** - Discrete Distributions - Continuous Distributions - Conditional Probability and Conditional Expectation. | 5 | 15 |
| **Markov chains in discrete**: Definitions, Transition Probability Matrices, and Some Markov Chain Models: Random Walks, Branching Processes, Long Run Behavior of Markov Chains and Poisson Processes. | 5 | 15 |
| **ContinuousTime Markov Chains**: Birth and Death Processes, Weiener Process(Brownian Motion) and Poisson Processeswith a Markov Intensity | 4 | 12 |
| **General** Applications inStochastic Processes | 1 | 3 |

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

| | | Lecture | Tutorial | Laboratory/ Studio | Practical | Other: | Total |
|---|---|---|---|---|---|---|---|
| Contact Hours | Planed | | | | | | |
| | Actual | 45 | 30 | | | | 75 |
| Credit | Planed | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Actual | 3 | 2 | | | | 4 |

| 3. Additional private study/learning hours expected for students per week. | 6 |
|---|---|

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

Course Learning Outcomes, Assessment Methods, and Teaching Strategy work together and are aligned. They are joined together as one, coherent, unity that collectively articulate a consistent agreement between student learning, assessment, and teaching.

The ***National Qualification Framework*** provides five learning domains. Course learning outcomes are required. Normally a course has should not exceed eight learning outcomes which align with one or more of the five learning domains. Some courses have one or more program learning outcomes integrated into the course learning outcomes to demonstrate program learning outcome alignment. The program learning outcome matrix map identifies which program learning outcomes are incorporated into specific courses.

On the table below are the five NQF Learning Domains, numbered in the left column.

**First**, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. **Fourth**, if any program learning outcomes are included in the course learning outcomes, place the @ symbol next to it.

Every course is not required to include learning outcomes from each domain.

| | **NQF Learning Domains And Course Learning Outcomes** | **Course Teaching Strategies** | **Course Assessment Methods** |
|---|---|---|---|
| **1.0** | **Knowledge&Cognitive Skills**<br><br>**After studying this course, the student will able to** | | |
| | • Axiomatic definition of a Probability Space,; random variables and their distributions; examples of distribution functions; Expectation, Conditional Expectation w. r.t a familyofrandom variables; Characteristic (and moment generating) functions.<br><br>• Stochastic Processes; joint finite-dimensional distributions; equivalent processes; isonomous processes. | •At the beginning of studying each topic some examples will be laid out and discussed with the students encouraging them to discover the relevant concepts.<br><br>•At the beginning of each lecture a discussion is conducted with the students about what have been done in the previous lecture in order to | •Hold Class discussion and quizzes<br><br>•Have discussions during lectures and tutorial sessions.<br><br>•Discuss the students' homework assignments.<br><br>•Give quizzes, mid-term exams and final exam. |

| | | | |
|---|---|---|---|
| | • Discrete Markov Chains; transition probabilities; Kolmogorov's equations; recurrence; long run and stationery distributions; examples.<br>• Derivation of Poisson Process;inter-arrival and waiting times. Birth-death processes, queuing. Introduction to Weiener processes; Martingale property and Markov Property. | establish a link with the current lecture<br>•Discussion during lecture.<br>•Giving extensive examples during lecture.<br>•Giving homework assignments.<br>• Giving problem sheets to be discussed during tutorial sessions | |
| **2.0** | **Interpersonal Skills & Responsibility**<br>**After studying this course, the student is expected to;** | | |
| 2.1 | Study, learn and work independently | • Homework assignments<br>• Discussions in the classes<br>• The use of available information technology | • Instructor's assessment of student's<br>• Performance through discussions during lectures<br>• Follow up the homework assignments. |
| 2.2 | • Work effectively in teams. | | |
| 2.3 | • Meet deadlines and manage time properly. | | |
| 2.4 | • Exhibit ethical behaviour and respect different points of view. | | |
| **3.0** | **Communication, Information Technology, Numerical**<br>**After studying this course, the student is expected to be able to:** | | |
| 3.1 | • Present mathematics to others, both in oral and written form clearly and in a well-organized manner. | • Assignments.<br>• Discussions in the classes<br>• The use of available information technology | •Follow up the homework assignments and discussing it with students. Homework |
| 3.2 | • Use IT facilities as an aid to mathematical processes and for acquiring available information. | | |
| 3.3 | • Use library to locate mathematical information. | | |
| 4.0 | **Psychomotor** | | |
| 4.1 | Not applicable | | |

5. Schedule of Assessment Tasks for Students During the Semester

| | Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.) | Week Due | Proportion of Total Assessment |
|---|---|---|---|
| 1 | Quizzes and homework. | weekly | 10% |
| 2 | Mid-term exam. I | 5 | 25% |
| 3 | Mid-term exam. II | 10 | 25% |
| 4 | Final exam. | 16 | 40% |

## D. Student Academic Counseling and Support

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| 1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)<br><br>•Office hours: 10 hr/week |

## E Learning Resources

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| 1. List Required Textbooks<br><br>1. An Introduction to Stochastic Modeling, Mark A. Pinsky and Samuel Karlin, 4th ed. (2011), Academic Press, Elsevier Publishing Inc.<br>2. A First Course in Stochastic Processes, Howard M. Taylor and Samuel Karlin, 2nd ed. (1975), Academic Press, Inc. |
| 2. List Essential References Materials (Journals, Reports, etc.)<br><br>1. Probability and Statistical Inference, Robert V. Hogg, Elliot A. Tanis and Dale Zimmerman, 9th ed., (2015) (Chap. 1—5)<br>2. Probability for risk management, Matthew J. Hassett and Donald G. Stewart. 2nd ed. , (2006) (all chapters)<br>3. Introduction to Probability Models, Sheldon M. Ross. Tenth Edition, (2010) (Chp. 3—6). |
| 3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.<br><br>**Internet sites relevant to the course:**<br><br>http://fac.ksu.edu.sa/eelmahdy//<br>www.math.uiff.edu/matlabhttp://<br>http://www.khayma.com/education-technology/<br>http://www.siam.org/<br>http://www.math.psu.edu/mathlists/contents,htm// |
| 4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.<br><br>SPSS- MATLAB- MAPLE-MINITAB- SCIENTIFIC WORK PLACE (SWP)-MATHEMATICA-OFFICE-ANTIVIRUS. |

## F. Facilities Required

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| Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access,etc.) |
| 1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)<br>A classroom which accommodates 25 students equipped with usual blackboard and smart board |
| 2. Computing resources (AV, data show, Smart Board, software, etc.) |

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| Computer lab equipped with relevant software |
| 3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)<br>Securing the text books in the university book stores |

## G Course Evaluation and Improvement Processes

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| 1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching<br>• Through evaluating the midterm exams, quizzes, and final exam.<br>• Dedicating last lecture for open discussion with the students about all aspects concerning the course.<br>• An evaluation sheet for the course to be filled by the students at the end of each semester |
| 2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department<br>•Colleagues' opinions about students' performance in this course. |
| 3. Processes for Improvement of Teaching<br>• Workshops on teaching and learning methods conducted by the deanship of skills development.<br>• Discussing the teaching methods by the group of faculty members teaching the course at the beginning of each semester.<br>• Encouraging students to get involved in the lecture.<br>• Encouraging the students to read about the subject. |
| 4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution)<br>• Colleagues' opinions about students' performance in this course. |
| 5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.<br><br>Reviewing the course contents every five years by doing the following:<br>• Providing reviews to develop the assigned text books contents.<br>• Providing a discussion for the course subject by a specialized committee in the department (internally)<br>Providing reviewers and referees from other math departments in well-known universities (externally) to improve the curriculum. |

Faculty or Teaching Staff: Dr/ Emad E. Elmahdy

Signature: _EmadElmahdy Date Specification Completed: 11/2/2018

Program Coordinator:

Signature: