

المركز الوطني للتقويم والاعتماد الأكاديمي

**National Center for Academic Accreditation and Evaluation**

### 

**COURSE SPECIFICATIONS**

**Math 682**

**Ergodic Theory**

**Course Specifications**

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| Institution: **King Saud University** | Date: 3/13/2019 |
| College/Department : **College of Sciences/ Department of Mathematics.** | |

**A. Course Identification and General Information**

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| 1. Course title and code: : **Math 682, Ergodic Theory** |
| 2. Credit hours: **3** (3+0) |
| 3. Program(s) in which the course is offered.  (If general elective available in many programs indicate this rather than list programs)  Ph.D. Mathematics |
| 4. Name of faculty member responsible for the course  Houcine Guediri |
| 5. Level/year at which this course is offered: PHD students |
| 6. Pre-requisites for this course (if any): |
| 7. Co-requisites for this course (if any): |
| 8. Location if not on main campus:  **At Diriya, Main campus: College of Science, Building No. 4 for males**  **At Girls Section for females.** |
| 9. Mode of Instruction (mark all that apply):  **100%**  %  a. traditional classroom What percentage?  b. blended (traditional and online) What percentage?  c. e-learning What percentage?  d. correspondence What percentage?  f. other What percentage?  Comments: |

**B Objectives**

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| 1. What is the main purpose for this course?  **When studying this course, students learn and recognize insights into the mathematical foundations of the Ergodic theory.**  **-Grasping the the following important notions: Measure-preserving transformations, Recurrence, Ergodicity, The Ergodic Theorem, Mixing, Isomorphism and spectral invariants, Entropy, Bernoulli transformations, Topological Entropy.**  **- Reaching the frontiers of Research in the field of Ergodic Theory.** |

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| 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)  **Encouraging students to read related references about the course material.**  **●Exploring computers in teaching to support presenting the material.**  **● Providing a website for the material accessible for all students.**  **●Improving the content depending on the demand of the college of science.** |

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

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| Course Description:  General description in the form to be used for the Bulletin or Handbook should be attached. |

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| 1. Topics to be Covered | | |
| List of Topics | No. of  Weeks | Contact hours |
| Measure-preserving transformations Recurrence. | **3** | **9** |
| Ergodicity.The Ergodic Theorem. | **4** | **12** |
| Mixing. Isomorphism and spectral invariants. | **4** | **12** |
| Entropy. Bernoulli transformations. Topological Entropy. | **4** | **12** |

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| 2. Course components (total contact hours and credits per semester): | | | | | | | |
|  | | Lecture | Tutorial | Laboratory/  Studio | Practical | Other: | Total |
| Contact  Hours | Planed | **45 hours** | **30 hours** |  |  |  |  |
| Actual |  |  |  |  |  |  |
| Credit | Planed |  |  |  |  |  |  |
| Actual |  |  |  |  |  |  |

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| 3. Additional private study/learning hours expected for students per week.  **Office Hours: 8 hours for home-works and short tests** |

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| 4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy   * 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. | | | |
| **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. (Courses are not required to include learning outcomes from each domain.) | | | |
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| **Code**  **#** | **NQF Learning Domains**  **And Course Learning Outcomes** | **Course Teaching**  **Strategies** | **Course Assessment**  **Methods** |
| **1.0** | **Knowledge** | | |
| 1.1 | **When studying this course, students learn and recognize insights into the mathematical foundations of the Ergodic theory.** | **Requiring background reading by the students.** | **● Oral exams. Exams. Efforts in tutorial sessions. Quizzes.**  **● Discussions and approaches to deal with problems.** |
| 1.2 | **Grasping the the following important notions: Measure-preserving transformations, Recurrence, Ergodicity, The Ergodic Theorem, Mixing, Isomorphism and spectral invariants, Entropy, Bernoulli transformations, Topological Entropy.**  **Reaching the frontiers of Research in the field of Ergodic Theory.** | **-Canvassing, through discussion, the opinions of the students on formulating suitable mathematical models for the examples covered.** |  |
| **2.0** | **Cognitive Skills** | | |
| 2.1 | **Good understanding of the studied concepts.** |  |  |
| 2.2 | **Knowledge of analysis and discussion of mathematical problems in ergodic theory.** |  |  |
| **3.0** | **Interpersonal Skills & Responsibility** | | |
| 3.1 |  |  |  |
| 3.2 |  |  |  |
| **4.0** | **Communication, Information Technology, Numerical** | | |
| 4.1 |  |  |  |
| 4.2 |  |  |  |
| **5.0** | **Psychomotor** | | |
| 5.1 |  |  |  |
| 5.2 |  |  |  |

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| 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 | **First midterm** | **8th Week** | **25%** |
| 2 | **Second midterm** | **12th Week** | **25%** |
| 3 | **Seminar Activities, Homework, Quizzes** | **Over all weeks** | **10%** |
| 4 | **Final exam** | **By the end** | **40%** |
| 5 |

**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)  **10 office hours weekly.** |

**E Learning Resources**

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| 1. List Required Textbooks An introduction to Ergodic Theory (Graduate Texts in Mathematics), Peter Walters, Springer 2000. a- **Lectures on Ergodic Theory (AMS Chelsea Publishing), Paul R. Halmos, 2006**  **b- Ergodic Theory (Cambridge Studies in Advanced Mathematics), Karl E. Petersen, 1990.** |
| 2. List Essential References Materials (Journals, Reports, etc.)  **A great deal of books in the university library and many online internet resources.** |
| 3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. |
| 4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. |

**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.)  A maximum of 25 students in each classroom. |
| 2. Technology resources (AV, data show, Smart Board, software, etc.) |
| 3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)  **Computer labs equipped with sophisticated machines.**  **-Increasing the capacity of the internet network in order to accommodate more users.** |

**G Course Evaluation and Improvement Processes**

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| 1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching  **- Consultation and coordination among members of the faculty - Dialogue and discussion among students and faculty members** |
| 2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department  **- Meet and continuous coordination. - Do demonstrations related to scientific material and its related topics.** |
| 3. Processes for Improvement of Teaching  **Attend meetings and seminars** |
| 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)  **Oral test by a staff member working on the subject.** |
| 5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.  **Doing some tests for the graduating students and giving them questionnaires on their effectiveness on the after-study life.** |

Name of Course Instructor: Houcine Guediri

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date Specification Completed: 3/13/2019

Program Coordinator: Houcine Guediri

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date Received: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_