

المركز الوطني للتقويم والاعتماد الأكاديمي

**National Center for Academic Accreditation and Evaluation**

### ATTACHMENT 5.

**T6. COURSE SPECIFICATIONS**

**(CS)**

MATH 676

 **(** Homotopy Theory**)**

01 /December / 2018

**Course Specifications**

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| Institution: **King Saud University** | Date:  |
| College/Department : **College of science\Mathematics Department** |

**A. Course Identification and General Information**

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| 1. Course title and code: Homotopy Theory  **(Math 676 )** |
| 2. Credit hours: 3 |
| 3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs)PhD Degree in Mathematics |
| 4. Name of faculty member responsible for the courseDr. |
| 5. Level/year at which this course is offered: |
| 6. Pre-requisites for this course (if any): none |
| 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? 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?* Introducing the concepts: The fundamental problems, extension, homotopy, and classification, maps of the n-sphere into itself . filtered spaces, fibrations, homotopy and the fundamental group, spaces with base points, groups of homotopy classes , H-spaces, H's spaces, exact sequences of mapping functions.
* Introducing the concepts: Relative homotopy groups, the homotopy sequence, the operations of the fundamental group on the homotopy sequence, the Hurewicz map, the homotopy addition theorem, the Hurewicz theorems.
* Introducing the concepts: Homotopy relations in fiber spaces, fibrations in which the base or fiber is a sphere, elementary homotopy theory of Lie groups and their coset groups.
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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) * Several web sites are already exists concerning topology, which are of great help in getting some lecture notes, examples and exercises.
* Exercises were reviewed more often to add new exercises to help the student understand the concepts under consideration.
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**C. Course Description** (Note: General description in the form used in Bulletin or handbook)

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| Course Description: |

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| 1. Topics to be Covered  |
| List of Topics | No. ofWeeks | Contact hours |
| The fundamental problems, extension, homotopy, and classification, maps of the n-sphere into itself . filtered spaces, fibrations, homotopy and the fundamental group, spaces with base points, groups of homotopy classes , H-spaces, exact sequences of mapping functions.. | 5 | 15 |
| Relative homotopy groups, the homotopy sequence, the operations of the fundamental group on the homotopy sequence, the Hurewicz map, the homotopy addition theorem, the Hurewicz theorems. | 5 | 15 |
| Homotopy relations in fiber spaces, fibrations in which the base or fiber is a sphere, elementary homotopy theory of Lie groups and their coset groups | 5 | 15 |

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

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

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| 4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy |
| **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.)  |
| **Code****#** | **NQF Learning Domains** **And Course Learning Outcomes** | **Course Teaching****Strategies** | **Course Assessment****Methods** |
| **1.0** | **Knowledge** |
| 1.1 | Understanding the concepts the fundamental problems, extension, homotopy, and classification, maps of the n-sphere into itself . filtered spaces, fibrations, homotopy and the fundamental group, spaces with base points, groups of homotopy classes , H-spaces, exact sequences of mapping functions. | 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 establish a link with the current lecture. | Hold Class discussion.  |
| 1.2 | Understanding the concepts relative homotopy groups, the homotopy sequence, the operations of the fundamental group on the homotopy sequence, the Hurewicz map, the homotopy addition theorem, the Hurewicz theorems.  | Encouraging students to contribute to the discussion of the proofs of the theorems, propositions and lemmas.  | Two midterm Exams and a final Exam. |
| 1.3 | Understanding the concepts homotopy relations in fiber spaces, fibrations in which the base or fiber is a sphere, elementary homotopy theory of Lie groups and their coset groups | Reminding the students of what they already studied in related courses to show them how the new concepts make them understand the old concepts and how some of them are generalization of those concepts. | Giving assignments. |
| **2.0** | **Cognitive Skills** |
| 2.1 | The ability of understanding the fundamental problems, extension, homotopy, and classification, maps of the n-sphere into itself . filtered spaces, fibrations, homotopy and the fundamental group, spaces with base points, groups of homotopy classes , H-spaces, exact sequences of mapping functions. | Give problem sheets to be discussed during tutorial sessions. | Having discussions during lecture times and tutorial sessions. |
| 2.2 | The ability of understanding Relative homotopy groups, the homotopy sequence, the operations of the fundamental group on the homotopy sequence, the Hurewicz map, the homotopy addition theorem, the Hurewicz theorems.  | Giving home works. | Discussing the student's assignment. |
| 2.3 | The ability of understanding Homotopy relations in fibre spaces, fibrations in which the base or fibre is a sphere, elementary homotopy theory of Lie groups and their coset groups |  | Having home works and discussing it with the students. Through mid term exams and final exam. |
| **3.0** | **Interpersonal Skills & Responsibility** |
| 3.1 | Work as part of a team and independently. | Conducting group projects and writing group essays. | Group discussion. |
| 3.2 | The ability of managing different knowledge resources and the ability of using and managing time. | Group problems solving during tutorial. | Assessment of the project essays. |
| 3.1 | Discussing results of work with others. |  | Giving homework assignments. |
| **4.0** | **Communication, Information Technology, Numerical** |
| 4.1 |  | Write project essays. | Evaluate the project essays. |
| 4.2 |  | Incorporating the use and utilization of computer in the course requirements**.** |  |
| **5.0** | **Psychomotor** |
| 5.1 |  | Writing essays. |  |
| 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 exam  | 6 | 25% |
| 2 | Second midterm exam  | 12 | 25% |
| 3 | Final exam | 16 | 50% |
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**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)Office hours: 6 hr/week |

**E Learning Resources**

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| 1. List Required Textbooks1) George W. Whitehead ; *Elements Of Homotopy Theory*. Springer-Verlag Berlin Heidelberg New York 1978. |
| 2. List Essential References Materials (Journals, Reports, etc.) |
| 3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.Several web sites are already exists concerning topology, which are of great help in getting some lecture notes, examples and exercises. Some of these sites are exists on the web page of the course teacher. |
| 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.) * Lecture room to accommodate 30 students
* Overhead projector for the use of computer.
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| 2. Technology resources (AV, data show, Smart Board, software, etc.) Computer lab with at least 30 internet point. |
| 3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) * Securing the text books in the university book stores.
* Securing the book references in the university central libraries.
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**G Course Evaluation and Improvement Processes**

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| 1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching* Through evaluating the midterm exams, quizzes, and final exam.
* Dedicating last lecture for open discussion with the students about all aspects concerning the course.
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| 2. Other Strategies for Evaluation of Teaching by the Instructor or by the DepartmentGive a questionnaire and analysing the outcomes. |
| 3. Processes for Improvement of TeachingThrough personal readings. |
| 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)Check marking by an independent faculty member of a sample of student work. |
| 5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. Periodically reviewing terminology of the course, and reviewing the department plan in general in order to achieve the aims planed for the course. |

Name of Course Instructor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date Specification Completed: \_\_\_\_\_\_\_\_\_\_\_\_

Program Coordinator: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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