4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title**: Representation Theory (1)**

Course Code: **4047403-4**

Course Specifications

Institution: Umm Al-Qura University	Date: November 2018
College/Department : College of Applied Science / Department of Mathematical Sciences	

A. Course Identification and General Information

1. Course title and code: **4047403-4 REPRESENTATIO THEORY (1)**			
2. Credit hours: 4 hours			
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) PhD in mathematics			
4. Name of faculty member responsible for the course : Prof. Ahmed A Khammash			
5. Level/year at which this course is offered (2^{nd} Year)			
6. Pre-requisites for this course (if any) 4046411-4, 4046412-4, 4046413-4			
7. Co-requisites for this course (if any)			
8. Location if not on main campus Main Campus + Girls sections			
9. Mode of Instruction (mark all that apply)			
a. traditional classroom	√	What percentage?	70
b. blended (traditional and online)		What percentage?	
c. e-learning	√	What percentage?	20
d. correspondence	√	What percentage?	10
f. other		What percentage?	
Comments:			

B Objectives

1. What is the main purpose for this course? To introduce the students to the finite dimensional algebras and their representations. This includes the concept of quivers and algebras defined by quivers. The tools of studying the structure of the indecomposable modules of algebras will be introduced such as the endomorphism ring of a module as well as the related theorems such as Schur's lemma and Artin-Wedderburn theorem. The last part of the course will be devoted to study representation types algebra with concentration on the group algebra case and Higman's criterion and its consequences.
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) In certain stage of the course the students will be introduced to certain computer packages which deal with modular representation such as MATLAB, GAP … etc

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

Course Description: This is a 4 credit hours and represents the head of a sequence of two courses comprising approximately 60 contact hours.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
(1) Algebras and modules Associative algebras – Modules – Quivers – Representation of quivers	2	8
(2) Semisimple modules Simple and semisimple modules – Endomorphism algebra - Schur's Lemma – Artin-Wedderburn theorem	3	12
(3) Jacobson radical – Artin algebras - The Krull-Schmidt theorem	3	12
(4) Projective and Injective modules Projective covers – Injective hulls – Idempotents and decompositions – Symmetric and Frobenius algebras	3	12

(5) Representation type of algebras Indecomposable modules – Algebras of finite representation type – Group algebra of finite representation type – Higman Critereon – Tame and Wild algebras – Examples – Gabriel's theorem	4	16

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

	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	60					60
Credit	4					4

3. Additional private study/learning hours expected for students per week.
Four hours weekly for homework and revision

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	Knowing the concept of modules over finite dimensional algebras as well as representation of quivers and algebras defined by quivers	Lectures and tutorials	Quizzes, periodical and final exams
1.2	The student will also learn how to analyze the structure of indecomposable modules ,	Lectures and tutorials	Quizzes, periodical and final exams

	algebras of finite , tame and wild representations		
2.0	**Cognitive Skills**		
2.1	Determining the non-isomorphic classes of indecomposable modules as well as the construction of algebras from quivers	Lectures and tutorials	Quizzes, periodical and final exams
2.2	Develop practical skills on dealing with different operations on indecomposable modules and quivers	Lectures and tutorials	Quizzes, periodical and final exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Develop the students ability towards working in small teams and discuss matters loudly and critically	Working in small groups	Oral Presentations
3.2	Develop independent thinking and judging	Working in small groups	Oral Presentations
4.0	**Communication, Information Technology, Numerical**		
4.1	Knowing and getting used to the exixting computer packages such as GAP, MATLAB	Directions and Homework	Homeworks
5.0	**Psychomotor** NOT APPLIED		

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	First periodical	6	20
2	Mid term exam	9	20
3	Final exam	15	50
5	An oral presentation given by a student or small group of students	8 , 10, 12	10

D. Student Academic Counseling and Support

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) The instructor is available during office hours for at least six hours per week. He is also available on appointments

E Learning Resources

1. List Required Textbooks [1] M. Auslander, I. Reiten and S. Smalo, Representation theory of Artin algebras , Cambridge studies in advanced math. , Vol.36, Cambridge, 1994 [2] J. Alperin, Local representation theory, Cambridge studies in advanced math. Vol.11, Cambridge 1986 [3] C. Curtis, I. Reiner, Methods of representation theory with applications to finite groups and orders , Vol.2 , WILEY , New York 1985. [4] D.J. Benson , Representation and cohomology , Vol. I&II, Cambridge University Press , Cambridge 1991.
2. List Essential References Materials (Journals, Reports, etc.) According to the needs along the semester
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) 1- W. Feit, Representation of finite groups 1982. 2- L. Dornhoff, Group Representation Theory, Part B: Modular representation theory. Marcel Dekker Inc., New York, (1972).
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. GAP (groups , algorithms and programming) Website
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. The algebra computer package GAP as well as other packages such as MATLAB

F. Facilities Required

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 class of capacity 15 as well as computer lab of the same capacity
2. Computing resources (AV, data show, Smart Board, software, etc.) The computer lab should be equipped with the following packages GAP , MATLAB and MATHEMATICA
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Regular polls as well as direct discussions
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department
3 Processes for Improvement of Teaching Updating knowledge of new trends in teaching beside peer consultations and reviews
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) Peer consultations and reviews
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. By regulations, the whole study plan as well as individual courses should be reviewed , revised and updated for improvement and this is done on a regular basis

Name of Instructor: Prof Ahmed Khammash

Signature:_ *Ahmed Khammash* _Date Report Completed:_____

Name of Field Experience Teaching Staff Algebra (Representation Theory)

Program Coordinator:_____

Signature: _____ Date Received: 20/2/2018