جامعة أم القرى

كلية العلوم التطبيقية

الدكتوراه في الرياضيات

- **مسار رياضيات بحتة**
- **مسار رياضيات تطبيقية**

4. Learning and Teaching

4/1 Learning Outcomes and Graduate Specifications

4/1/1 Main tracks or specializations covered by the program:

(a) Pure Mathematics

(b) Applied Mathematics

4/1/2 Curriculum Study Plan Table (PhD in Pure Mathematics)

Level	Course Code	Course Title	Required or Elective	Prerequisite Courses	Credit Hours
Level 1	4047401-4	Lie Algebras	Required	--	4
	4047101-4	Topological Vector Spaces	Required	--	4
	4047601-4	Riemannian Geometry	Required	--	4
Level 2	4047402-4	Commutative Algebra	Required	4046402-4	4
	4047102-4	Advanced Complex Analysis	Required	4046602-4	4
Level 3	4047403-4	Representation theory (1)	Elective	4046411-4, 4046412-4, 4046413-4	4
	4047405-4	Infinite Dimensional Lie Algebras (1): (Kac-Moody algebras)	Elective	4047401-4	4
	4047407-4	Block Theory (1)	Elective	4046412-4	4
	4047409-4	Subnormal Subgroups	Elective	4046401-4	
	4047103-4	Von Neumann Algebras	Elective	4046101-4-, 4046103-4	4
	4047105-4	Approximation Theory	Elective		4
	4047107-4	Curves and Singularities	Elective	---	4
	4047603-4	Differential topology	Elective	4046602-4, 4046603-4	4
Level 4	4047404-4	Representation theory (2)	Elective	4047403-4	4
	4047406-4	Infinite Dimensional Lie Algebras (2)	Elective	4047401-4	4
	4047408-4	Block Theory (2)	Elective	4047407-4	4
	4047410-4	Soluble and Locally Nilpotent Groups	Elective	4046401-4, 4047409-4	
	4047104-4	Local Spectral Theory	Elective	4046101-4, 4046103-4	4
	4047106-4	Distribution Theory and Fourier Analysis: An Introduction	Elective	4046601-4	4
	4047108-4	Singularities of Caustics and Wave Fronts	Elective	4047107-4	4
	4047604-4	Algebraic topology	Elective	4046601-4	4
	4047200-4	Reading and Research	Required	----	4
From the beginning of Level 3		Thesis			12
From the beginning of Level 5		Research seminar			2
Total					54

General Requirements:

- **To successfully pass the first year (level 1 + level 2) of the programme, the student should obtain a Grade Point Average (GPA) corresponding to at least 80% in the five mandatory courses.**
- **In view of the first year results, a thesis supervisor will be assigned to the student.**
- **In the second year of the programme (level 3 + level 4), the student will study two sequences of courses, each of which consists of two courses, one in level 3 called "Head" and the other in level 4 called "Tail". The sequences of courses are explained in the table below.**
- **In level 4, one more course (4047200-4) is mandatory and is called "Reading and research". It will be recommended by the supervisor and graduate committee and its contents should be approved by the department council.**
- **The supervision committee will be appointed to the student after the student completed 50% of the courses, including the compulsory courses.**
- **The student is required to pass a two subjects areas comprehensive examination. The contents of three subjects areas are identified below. The student is required to perform the examination in two of. The student may do that starting from level 3.**
- **The student may give a seminar starting from semester 6 of the programme.**
- **The student should have (at least) an accepted or a published paper in an SIS journal before**

Table of sequences for PURE mathematics:

Sequence #	Course code and name in level 3	Course code and name in level 3
1	(4047403-4) Representation theory (1)	(4047404-4) Representation theory (2)
2	(4047405-4) Infinite Dimensional Lie Algebras (1)	(4047406-4) Infinite Dimensional Lie Algebras (2)
3	(4047407-4) Block Theory (1)	(4047408-4) Block Theory (2)
4	(4047409-4) Subnormal Subgroups	(4047410-4) Soluble and Locally Nilpotent Groups
5	(4047103) Von Neumann Algebras	(4047104) Local Spectral Theory
6	(4047105) Approximation Theory	(4047106) Distribution Theory and Fourier Analysis: An Introduction
7	(4047107) Curves and Singularities	(4047108) Singularities of Caustics and Wave Fronts
8	(4047603-4) Differential topology	(4047604-4) Algebraic topology

Details of subjects areas of pure mathematics qualifying examination include:

Subjects area	Description
Algebra	Coverage is roughly the material covered in the undergraduate courses of group theory, ring theory and fields, and linear algebra. The following are the detailed subjects: (1) **GROUP THEORY**: Groups –Cyclic groups- subgroups – normal subgroups – Quotient groups – Isomorphism theorems of groups – Sylow theorems – direct sum of groups - finitely generated Abelian groups – Soluble and nilpotent groups – Jordan-Holder's Theorem. (2) **RINGS AND FIELDS:** Rings –Subrings – Ideals – Ring homomorphisms – Quotient rings – Isomorphism theorems for rings – Integral domains – Principle ideal rings – Euclidean rings – UFD – The structure of polynomial rings – Factorizations - Field extensions - finite and algebraic extensions, algebraic closure, splittingfields and normal extensions (3) **LINEAR ALGEBRA:** Solving System of Linear equations – Matrices – Determinants (Laplace expansion) – Invertible matrices – Cramer's Rule – Vector spaces – Subspaces – Spanning sets and bases – Quotient spaces – Linear maps – Eigenvalues and eigenvectors – Similarity - diagonalization of matrices – Jordan canonical and rational forms of matrices. Those subjects are contained in the books below (1) Chapters I-VII or (2) Chapters I, II, V,VII, XIII, XIV and XV: (1) T.W. Hungerford, "Algebra," Springer-Verlag (2) S. Lang, "Algebra," Springer-Verlag.
Analysis	Coverage is roughly the material covered in the undergraduate courses of measure theory and functional analysis. The following are the detailed subjects: **1. Measure theory:** (1) The basics of measure theory: sigma-algebra, outer measure, measure, Lebesgue measure on R, approximation by open and closed sets. (2) Measurable functions: measurability of inf, sup, lim inf, lim sup of sequences and algebraic operations, simple functions. (3) Integration: bounded convergence theorem, Fatou's lemma, monotone convergence theorem, absolute continuity of the integral. (4) Product measures: Fubini and Tonelli theorems. (5) Differentiation of measures: absolute continuity of measures, the Radon-Nykodim theorem, mutually singular measures, the Lebesgue decomposition, signed measures. (6) The Riesz representation theorem on Lp, $1 \leq p < \infty$, the Riesz-Markov theorem (dual of C_c). **2. Functional Analysis:** **(1)** Banach spaces: continuous linear maps, duals, direct sums and quotients, Hahn-Banach theorem, Baire's theorem, Banach-Steinhaus (uniform boundedness principle), open mapping theorem. (2) Topological spaces: bases for topologies, convergence, continuity, compactness, construction of weak topologies, weak and weak-* topologies on Banach spaces, Stone-Weierstrass theorem, Banach-Alaoglu theorem, Riesz-Markov theorem. (3) Hilbert spaces: direct sums, orthocomplements, Riesz' representation theorem, orthonormal bases in separable and non-separable cases. (4) Bounded operators on Banach spaces: adjoints, the spectrum, the resolvent, spectrum of bounded self-adjoint operators on Hilbert spaces, the spectral radius of operators, continuous functional calculus for bounded self-adjoint operators on Hilbert spaces. (5) Compact operators on Banach spaces: norm closure, composition and adjoint properties, approximability by finite rank operators in separable Hilbert spaces. **References:**

	1. Gerald B. Folland. Real Analysis: Modern Techniques and Their Applications. (1999) Edition:2 ISBN 10:0-471-31716-0 ISBN 13:9780471317166 Series: Pure and Applied Mathematics: A Wiley-Interscience Series of Texts, Monographs and Tracts 2. John B. Conway A Course in Functional Analysis. Second Edition Graduate Texts in Mathematics. Series Volume 96, Publisher: Springer-Verlag New York.
Topology	Coverage is roughly the material covered in the undergraduate courses of general topology and differential geometry. The following are the detailed subjects: (1) **General Topology:** Topological spaces-Accumulation points-Closed sets Closure of a set-Interior ,Exterior and Boundary of a set-Neighbourhoods-Bases for a given topology-Relativization-Continuity-Topological equivalent-Topological property-Separation axioms(T_0 − spaces ; T_1 − spaces ; Hausdorff spaces ; Regular spaces ; Normal spaces) - Hereditary property –Compactness-Compactness and Separation axioms-Compactness and Continuity-Paracompactness - Connectedness-Components - Path Connectedness – Locally connectedness . **(2) Differential Geometry:** Curves : Parametrized curves –Regula curves –Arc length –Frent formulas –Local theory of curves –Involutes – Evolutes –Bertrand curves –The four vertex theorem . Surfaces :Coordinate patch (Simple surface) –Coordinate transformation –Inverse function theorem –Tangent plane to a simple surface –Surfaces –The first fundamental form –Arc length –Area –Normal curvature –Geodesic curvature –Gauss formulas –The second fundamental form –Geodesics –Principal ,Gaussian ,Mean and Normal curvature –Spaces of constant Gaussian curvature These subjects are contained in the following text books (1) Manfredo Do Carmo ,Differential Geometry of curves and Surfaces, (Dover) , Second Edition ,December ,14 ,2016 . (2)James R. Munkres , General Topology ,Second Edition , Prentice Hall ,2000.

4/1/2 Curriculum Study Plan Table (PhD in Applied Mathematics)

Level	Course Code	Course Title	Required or Elective	Prerequisite Courses	Credit Hours
Level 1	4047701-4	Fluid Mechanics (2)	Required	---	4
	4047702-4	Tensor Calculus and Special Relativity	Required	---	4
	4047703-4	Numerical Solutions of Differential Equations (2)	Required	---	4
Level 2	4047704-4	Elasticity	Required	4046702-4	4
	4047705-4	Magnetohydrodynamics	Required	4047701-4	4
Level 3	4047707-4	Advanced Numerical Analysis (1)	Elective	4046703-4, 4047703-4	4
	4047709-4	Tensor Analysis	Elective	---	4
	4047711-4	Hydrodynamic stability (1)	Elective	4047701-1	4
	4047501-4	Mathematical Biology (1)	Elective	4046503-4	4
Level 4	4047708-4	Advanced Numerical Analysis (2)	Elective	4046703-4, 4047703-4, 4047707-4	4
	4047710-4	General theory of relativity	Elective	4047709-4	4
	4047712-4	Hydrodynamic stability (2)	Elective	4047701-4	4
	4047502-4	Mathematical Biology (2)	Elective	4046503-4, 4047501-4	4
	4047700-4	Reading and Research	Required		4
From the beginning of Level 3		Thesis			12
		Research seminar			2
Total					54

General Requirements:

- **To successfully pass the first year (level 1 + level 2) of the programme, the student should obtain a Grade Point Average (GPA) corresponding to at least 80% in the five mandatory courses.**
- **In view of the first year results, a thesis supervisor will be assigned to the student.**
- **In the second year of the programme (level 3 + level 4), the student will study two sequences of courses, each of which consists of two courses, one in level 3 called "Head" and the other in level 4 called "Tail". The sequences of courses are explained below.**
- **In level 4, one more course (4047700-4) is mandatory and is called "Reading and research". It will be recommended by the supervisor and graduate committee and its contents should be approved by the department council.**

- **The supervision committee will be appointed to the student after the student completed 50% of the courses, including the compulsory courses.**
- **The student is required to pass a two subjects areas comprehensive examination. The contents of three subjects areas are identified below. The student is required to perform the examination in two of. The student may do that starting from level 3.**
- **The student may give a seminar starting from semester 6 of the programme.**

Table of sequences for Applied mathematics:

Sequence #	Course code and name in level 3	Course code and name in level 3
1	(4047707-4) Advanced Numerical Analysis (1)	(4047708-4) Advanced Numerical Analysis (2)
2	(4047709-4) Tensor Analysis	(4047710-4) General theory of relativity
3	(4047711-4) Hydrodynamic stability (1)	(4047712-4) Hydrodynamic stability (2)
4	(4047713-4) Mathematical Biology (1)	(4047714-4) Mathematical Biology (2)

Details of subjects areas of APPLIED mathematics qualifying examination include:

Subjects area	Description
Differential Equations	Coverage is roughly the material covered in the undergraduate courses of ordinary differential equations and partial differential equations. The following are the detailed subjects: **1. Ordinary Differential Equations** ✓ First order ordinary differential equations with applications. ✓ Qualitative methods. ✓ Second order ordinary differential equations with applications. ✓ Systems of ordinary differential equations • Reduction to a system of linear equations. • Solution of higher order equations with constant coefficients. ✓ Applications: Projectile motion under a constant gravitational field. ✓ Eigenvalues and boundary value problems. **2. Partial Differential Equations** ✓ The derivations of Laplace's equation (elliptic), diffusion equation (parabolic) and the Wave Equation (hyperbolic). ✓ First order partial differential equations. The use of characteristic methods to solve nonlinear first order PDEs. ✓ Classification of second order linear partial differential equation. Classification by reduction to canonical form. Use of change of variable to find the general solution of second order linear partial differential equation in two variables. ✓ Fourier Series and applications ✓ Solution of linear partial differential equations by the method of separation of variables. The application of the method to the solution of boundary value problems for Laplace's equation in two dimensions and initial boundary value

	problems for the diffusion equation in one-dimension. ✓ Introduction to Some Special Functions including Bessel's equation and Legendre's equation in cylindrical and spherical polar coordinates. **References:** ✓ C. H. Edwards and D. E. Penney, Elementary Differential Equations with Applications, 1985, Prentice-Hall. ✓ W. A. Strauss, Partial Differential Equations: an Introduction, 2008, John Wiley & Sons.
Elasticity	Coverage is roughly the material covered in the undergraduate courses of vector calculus, tensor analysis, applications of tensors in continuum mechanics and introduction to elasticity. The following are the detailed subjects: **(1) Vector Calculus** ✓ Vector fields ✓ Green's theorem in the plane ✓ Gauss's divergence theorem ✓ Stokes's theorem ✓ Line, surface and volume integrals **(2) Tensors Analysis** ✓ Second order cartesian tensors ✓ Cartesian tensor calculus ✓ Inner products **(3) Application of tensors in Continuum Mechanics** ✓ Motion and deformation ✓ Transportation laws ✓ Conservation of (mass, momentum, energy) ✓ Equation of motion ✓ Constitutive equations **(4) Introduction to Elasticity** ✓ Strain analysis ✓ Compatibility Equations ✓ Stress analysis ✓ Equations of Equilibrium ✓ Stress-Strain relations **References:** These topics are contained in the Chapters referred to in the following books: ✓ A. Borisenko, Vector and Tensor Analysis with Applications, 2012, Dover Publications. (Chapters 1,2) ✓ H. Wu, Continuum Mechanics and Plasticity. Chapman & Hall/ CRC press. (Chapters 3,4) ✓ P. Verma, Theory of Elasticity. 1997, Vikas Publishing House Pvt Ltd. (Chapters 1,2,3)
Numerical Analysis	Coverage is roughly the material covered in the undergraduate courses of numerical analysis. The following are the detailed subjects: **1. Numerical solution of algebraic equations** ✓ Bisection Method ✓ Method of false position ✓ Secant method ✓ Fixed Point Method ✓ Newton's Method **2. Numerical interpolation** ✓ - Polynomial interpolation ✓ - Spline interpolation ✓ - Least square method

	3. Solutions of linear equations ✓ - Direct Methods ✓ - Iterative methods ✓ - Singular value decomposition ✓ - Method for solving eigenvalues and eigenvectors. **4. Approximation Theory** ✓ Polynomial approximation (Taylor's polynomial approximation, Lagrange interpolation, Hermite interpolation, least square approximation). ✓ Piecewise polynomial approximation (Continuous piecewise linear interpolation, cubic spline interpolation). **5. Numerical Differentiation and Integration** ✓ Numerical differentiation. ✓ Numerical integration (Newton Cotes, Gaussian Quadrature) **6. Numerical Solution to Ordinary Differential Equation** ✓ Taylor's series method. ✓ Runge-Kutta methods. ✓ Multi-step methods. ✓ Predicator-Corrector Method. ✓ Stiff Systems. **7. Linear Two-Point boundary value Problems** ✓ Finite difference method. ✓ Linear shooting method. **8. Finite Differences for ordinary differential equations** **9. Elliptic Equations in Two Dimensions** **10. Parabolic equations in one and two dimensions** **References** ✓ A. S. Ackleh, E. J. Allen, A. B. Hearfott, and P. Seshaiyer, Classical and Modern Numerical Analysis, Theory, Methods and Practice, 2010, CRC Press. ✓ R. L. Burden and J. D. Faires, Numerical Analysis, 1985, Prindle, Weber & Schmidt.

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

"Pure Mathematics Courses"

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Lie Algebras**

Course Code: **4047401-4**

Course Specifications

Institution:Umm Al-Qura University	Date: 14 November 2018
College/Department : College of Applied Science, Mathematical Science	

A. Course Identification and General Information

1. Course title and code: Lie Algebras **4047401-4**
2. Credit hours: 4 Credit 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. Falih A. Aldosray
5. Level/year at which this course is offered: PhD/ level Semester 1
6. Pre-requisites for this course (if any):
---
7. Co-requisites for this course (if any):
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8. Location if not on main campus:.
Main campus+Girls Sections
9. Mode of Instruction (mark all that apply):

a. traditional classroom	√	What percentage?	100
b. blended (traditional and online)		What percentage?	
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?

The course is designed to introduce the students to the basic concepts of finite dimensional Lie algebras .

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) Encourage students to use the most updated books.
   2) Advise students to submit the homework online and using internet.
   3) Encourage students to write their homework and essays using LaTeX.

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

Course Description:
This is a 4 credit hours course which comprises approximately 60 hours of lectures.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Definition and Basic Properties; Elementary Properties , Ideals and Quotient Algebras, Homomorphisms, and Isomorphisms,Centers, Centralizers, Normalizers, and Simple Lie Algebras, the adjointRepresentation.	2	8
Solvable Lie Algebras and Lie's Theorem	2	8
Nilpotent Lie Algebras and Engel's Theorem	2	8
Cartan's Criteria for Solvability and Semisimplicity : The Killing Form . The Complexification of a Real Lie Algebra. Cartan's Criterion for Solvability. Cartan's Criterion for Semi-simplicity	3	12
Semi-simple Lie Algebras: Basic Structure and Representations . The basic Structure of a Semi-simple Lie Algebra . Simple Lie Algebras over R . Basic Representation Theory.	2	8
Root Space Decomposition : Uniqueness of the Root Pattern	2	8
The Classical Simple Complex Lie Algebras : Types .Root Systems . Abstract Root Systems . Cartan matrices and Dynkin Diagrams .	2	8

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other: (self-Study)	Total
Contact Hours	Planed	60	-	-	-		60
	Actual						
Credit	Planed						
	Actual	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:** After successful completion of the course, the student should be able to		
1.1	Know the basic facts and definitions on Lie algebras and their properties	Lectures: • Build on what students already know. • present new concepts and principles • use questioning and encouraging students. • Doing practice and involving students in the class. • Draw facts and	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
1.2	Determine when a Lie algebra is solvable and apply Lie's and Engel 's Theorems		
1.3	Know and prove Cartan's criterion for solvability and semi simplicity		
1.4	Study and apply Killing form examples		
1.5	Classification of simple Lie algebras over a field of characteristic 0.		
1.6	Basic of the theory of representation of Lie algebra		

		doing responds.	
2.0	**Cognitive Skills**		
2.1	Planning rigorous proofs of different propositions and assertions in this context	• Request from students to do some preparations for the lectures. • Give students challenging exercise and problems. • Request from students via discussions to compare the lectures with other topics in the same level.	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
2.2	. Apply basic theorems Lie algebras		
2.3	Investigate particular examples of Lie algebras to which the theories under concern can be applied		
2.4	. Use lecture notes and other texts to solve challenging problems.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Demonstrate communication skills with the teacher and other students in the class.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in college and department committees. • Joint and use useful media for education.	
3.2	Analyze and illustrate basic facts.		
3.3	To show and exhibit ethical behavior.		
3.4	To show skills for judging basic facts.		
3.5	To write and work independently.		
3.6	To work effectively in teams.		
3.7	To manage time properly, meet deadlines.		
4.0	**Communication, Information Technology, Numerical**		
4.1	1) Ability to communicate in written and in oral. 2) Ability to write reports in English Ability to explain each step in the problem solving process. 3) Ability to apply course concepts to mathematical problem solving model.	Lectures tutorials brain storming	Periodic written and oral tests. Discussion. Observation.

	4) Ability to use information technology in communication and research projects. Interact with life problems using different methods of thinking and problem solving.		
5.0	**Psychomotor**		
5.1	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	Midterm 1	5th week	20 %
2	Midterm 2	10th week	20%
4	Homework + reports + Quizzes	During the semester	20%
5	Final exam	End of semester	40 %

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)

1- Office hours per week in the lecturer schedule (4 hours per week).

2- Contact with students by e-mail,SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks

K. Erdman and M. Wildon, Introduction to Lie Algebras, 2nd ed., Springer, New York, 2007.

2. List Essential References Materials (Journals, Reports, etc.)

1. K. Erdman and M. Wildon, Introduction to Lie Algebras, 2nd ed., Springer, New York, 2007.
2. J. Humphreys, Introduction to Lie Algebras and Representation Theory, 6th ed., Springer-Verlag, Berlin and Heidelberg, 1997.
3.N. Jacobson, Lie Algebras, Dover Publications, New York, 1979.
4. J.P. Serre, Complex Semisimple Lie Algebras, Springer, New York, 2001.
5.Ian Stewart ,Lie Algebras, Lecture notes in mathematics)vol.127, Springer(1970).

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

3. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

Microsoft Word, Latex

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.) Classroom with capacity of 30-students. - Library.
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) None

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching:

- Student feedback through electronic survey organized by the deanship of registration and acceptance.

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

- Evaluation of the teachers by internal & external faculty members.
- Visiting to the classrooms.
- Mutual visits between colleagues and giving advices to each other after each lecture

3 Processes for Improvement of Teaching

- Analysis of student course evaluation and feedback
- Peer evaluation and feedback
- Review of course portfolios
- Workshops on pedagogical methods

4. Processes for Verifying Standards of Student Achievement (eg. 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)

- Analysis of course assessments by other reviewers on a periodic basis.

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

- Material and learning outcomes are periodically reviewed internallyand externally.
- Comparing course content and teaching methodologies with similar coursesoffered at other departments and universities.
- Studying the outcomes of the students' evaluations of the course and useit to improve teaching strategies.

Name of Course Instructor: Prof. Falih A. Aldosray

Signature: _____Falih A. Aldosray___ Date Specification Completed: _____

Program Coordinator: _____

Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Topological vector spaces**

Course Code: **4047101-4**

Course Specifications

Institution: Umm Al-Qura University	Date: November 12, 2018
College/Department: Mathematics	

A. Course Identification and General Information

1. Course title and code: Topological vector spaces
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
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5. Level/year at which this course is offered: PHD/ level 1
6. Pre-requisites for this course (if any):
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7. Co-requisites for this course (if any):
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8. Location if not on main campus: Al-Abdia Campus / Al-Zahir campus
9. Mode of Instruction (mark all that apply):

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

Comments:

B Objectives

1. What is the main purpose for this cou
   This course is intended to serve as an introduction to the theory of topological vector spaces.

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) Updating references used in teaching process.
   2) Using e-learning facilities more efficiently.
   3) Encouraging students to collect problems from web-based reference material and supervise classroom discussions.

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

Course Description:
This is a 4 credit hours course comprising approximately 52 hours of lectures.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Typical topologies in Analysis Locally convex spaces Metrizability, Frechet Spaces Boundedness and Normability	3	12
Compactness and Sequential Compactness Linear and Bilinear Maps. Tensor Products	4	16
Barreled Spaces. Banach-Steinhaus Theorem. Consequences of Baire theorem. Dual Pairs and Weak Topologies, Polar Topologies. Topologies Compatible with Duality	4	16
Topologies on Spaces of Linear Mappings. Strict Inductive Limits, LF-spaces. Ideals of Operators. Nuclearity. Spaces of Distributions. Kernels	4	16

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

	Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total

Contact Hours	60	0		60
Credit	4	0		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:** At the end of the course the student will be able to:		
1.1	1) Determine whether a given topological vector space metrizable, normabe, barreled, nuclear 2) Distinguish compactness and sequential compactness of sets in locally convex spaces 3) Distinguish continuity and sequential continuity of mappings between locally convex spaces 4) Apply consequences of Baire's theorem to show the equivalence of topologies and the equicontinuity of families of operator 5) Characterize basic topological properties in weak topologies 6) Compare convergence, compactness and dual spaces for projective and	Lectures Tutorials Discussion Problem Solving	Exams Home work.

	inductive limits.		
2.0	**Cognitive Skills**		
2.1	7) Planning rigorous proofs of different propositions and assertions in this context. 8) Apply basic theorems for Banach algebras. 9) Investigate examples to which the theories under concern can be applied.	Lectures	Periodic written and oral tests. Discussion. Observation.
3.0	**Interpersonal Skills & Responsibility**		
3.1	1) Punctual attendance of classes is required. 2) Students should demonstrate their sense of responsibility for learning by completing both reading and writing assignments in due time. 3) Students learn to manage their time. 4) Students should act responsibly and ethically in carrying.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Work effectively in groups and independently.	Tasks assigned and homework.	Marking the assignments
	Solve problems concerning the topics of the course.	Homework	Evaluating the homework
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable
5.2	Not applicable	Not applicable	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	First periodic exam	6	20
2	Second periodic exam	10	20
4	Homework + reports + Quizzes	Over all weeks	20
5	Final exam	End	40

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)
1- Office hours per week in the lecturer schedule (4 hours per week).
2- Contact with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks • Introduction to Functional Analysis, R. Meise and D. Vogt, 1997, Oxford • Locally Convex Spaces, H.Jarchow , 1981, B.G.Teubner Stuttgart • An Introduction to Functional Analysis, Ch.Swartz, 1992, Marcel Deccer • V Bogachev and O Smolyanov, Topological vector spaces and their applications, Springer, 2017.
2. List Essential References Materials (Journals, Reports, etc.) • Functional Analysis, W. Rudin, 1973, McGraw-Hill Int.Editions • Topological Vector Spaces, A.P.Robertson and W.J.Robertson , 1964, Cambridge
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. Microsoft Word, Latex

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.) Classroom with capacity of 30-students. - Library.
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) None

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching:

• Student feedback through electronic survey organized by the deanship of registration and acceptance.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Evaluation of the teachers by internal & external faculty members. • Visiting to the classrooms. • Mutual visits between colleagues and giving advices to each other after each lecture
3 Processes for Improvement of Teaching • Analysis of student course evaluation and feedback • Peer evaluation and feedback • Review of course portfolios • Workshops on pedagogical methods
4. Processes for Verifying Standards of Student Achievement (eg. 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) • Analysis of course assessments by other reviewers on a periodic basis.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Material and learning outcomes are periodically reviewed internally and externally. • Comparing course content and teaching methodologies with similar courses offered at other departments and universities. • Studying the outcomes of the students' evaluations of the course and use it to improve teaching strategies.

Name of Course Instructor:

Signature: _____ Date Specification Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Riemannian Geometry**

Course Code: **4047601-4**

COURSE SPECIFICATIONS

Institution Umm Al-Qura University
College/Department Faculty of Applied Science/ Department of Mathematical Science

A. Course Identification and General Information

1. Course title and code Riemannian geometry (4047601-4)			
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 Dr. Elsaid lashin			
5. Level/year at which this course is offered Level 1			
6. Pre-requisites for this course (if any) ---			
7. Co-requisites for this course (if any) ----			
8. Location if not on main campus Male and female sections (Al-Abdiya and alzaher)			
9. Mode of Instruction (mark all that apply)			
a. Traditional classroom	✓	What percentage?	100
b. Blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. Correspondence		What percentage?	
f. Other		What percentage?	

B Objectives

What is the main purpose for this course?

- **Be able to understand the cocepts of parallel transport, connections, covariant derivative and curvature .**
- **Be able to find Levi-Civita connections .**
- **Understanding the concepts of Geodesics and considering first and second variations of arc length .**
- **Deal with Jacobi fields, conjugate points and comparison theorems .**
- **Studying the existence theorems of geodesics .**
- **Be familiar with spaces of curves in Riemannian manifolds .**

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 collect problems from web based reference material and supervise classroom discussions.
2. Update references used in teaching process.

3. Use e-learning facilities more efficiently.

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		
List of Topics	No. of Weeks	Contact Hours
Warming-Up: **Riemannian metric and Covariant differentiation .**	2	8
Geodisics and Parallel transport(theory and examples) .	4	16
Theory of surfaces , Curvature tensor and Spaces of constant Gaussian curvature .	4	16
Triangulation of surfaces , Euler characteristic and Gauss-Bonnet theorem .	5	20

2. Course components (total contact hours and credits per semester):							
	Contact Hours				Self-Study	Other	Total
	Lecture	Tutorial	Laboratory	Practical			
Contact Hours	60						60
Credit	4						4

3. Additional private study/learning hours expected for students per week.	5

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

	NQF Learning Domains And Course Learning Outcomes	**Course Teaching Strategies**	**Course Assessment Methods**
1.0	**Knowledge**		
	After successful completion of the course, the student should be able to (a)State the definition of a Riemannian manifold M and calculate the length of a curve and the area of a domain in M ; (b)Calculate the Riemannian metric on surfaces embeddedin the3-dimensional Euclidean space ; ©Define a connection on a manifold, state the Levi-Civita theorem and calculate the connection for different surfaces; (e)State the properties of geodesics on a Riemannian manifold and calculate the parallel transport of vectors	Lectures Tutorials Discussion Problem Solving	Exams Home work.

	along geodesics for different manifolds .		
2.0	**Cognitive Skills**		
2.1	(i)State the definition of the Riemann curvature tensor and calculate the Riemann curvature tensor for some 2-dimensional manifolds. (ii)Define the various geometrical concepts that are introduced in the course, be able to use and interpret them in specific examples . (iii)Use the theory , methods and techniques of the course to solve problems .	Homework consisting in solving selected exercises. Encourage and develop self - education	Homework Oral and written tests. Research projects.
3.0	**Interpersonal Skills & Responsibility**		
3.1	Punctual attendance of classes is required. Students should demonstrate their sense of responsibility for learning by completing both reading and writing assignments in due time. Students learn to manage their time. Accustom students to take responsibility of self –learning Students should act responsibly and ethically in carrying	Discussion. Explanation. Guidance and supervision of the group Assignments for research projects.	Home work. Reports. Quizzes. Discussion
4.0	**Communication, Information Technology, Numerical**		
4.1	Ability to communicate in written and in oral. Ability to write reports in English Ability to explain each step in the problem solving process. Ability to apply course concepts to mathematical problem solving model. Ability to use information technology in communication and research projects. Interact with life problems using different methods of thinking and problem solving.	Lectures tutorials brain storming	Periodic written and oral tests. Discussion. Observation.
5.0	**Psychomotor**		
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	Midterm 1	6th week	20%
2	Midterm 2	10th week	20%
4	Homework + reports + Quizzes	During the semester	20%
5	Final exam	End of semester	40%

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) 1- Office hours per week in the lecturer schedule (4 hours per week). 2- Contact with students by e-mail,SMS, and e-learning facilities.

E. Learning Resources

1. Required Text(s): Jost,Jurgen (2002), Riemannian Geometry and Geometric Analysis, Berlin: Springer-Verlag,ISBN3-540-42627-2.
2. Essential References :Petersen,Peter(2006),Riemannian Geometry,Berlin:Springer-Verlag,ISBN0-387-98212-4. ,
3. Recommended Books and Reference Material (Journals, Reports, etc) (Attach List): Use previous list
4.Electronic Materials, Web Sites etc http://ebookee.org/
5. Other learning material such as computer-based programs/CD, professional standards/regulations: Microsoft Word

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.) -Classroom with capacity of 30-students. - Library.
2. Computing resources: Not available
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: • Student feedback through electronic survey organized by the deanship of registration and acceptance.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Evaluation of the teachers by internal & external faculty members. • Visiting to the classrooms. • Mutual visits between colleagues and giving advices to each other after each lecture
3 Processes for Improvement of Teaching • Analysis of student course evaluation and feedback • Peer evaluation and feedback • Review of course portfolios • Workshops on pedagogical methods

4. Processes for Verifying Standards of Student Achievement (eg. 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) • Analysis of course assessments by other reviewers on a periodic basis.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Material and learning outcomes are periodically reviewed internallyand externally. • Comparing course content and teaching methodologies with similar coursesoffered at other departments and universities. • Studying the outcomes of the students' evaluations of the course and useitto improve teaching strategies.

Faculty or Teaching Staff: _____
Signature: ___ _____ Date Report Completed: _____
Received by: _____ Dean/Department Head
Signature: _____ Date_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Commutative Algebra**

Course Code: **4047402-4**

Course Specifications

Institution:Umm Alqura University, Makkah Date of Report: 14 November 2018
College/Department: College of Applied Science, Mathematical Science

A. Course Identification and General Information

1. Course Title and Code: **Commutative Algebra** 4047402-4
2. Credit hours: **4 Credit 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. Dr. Ahmad Mohammed Ahmad Alghamdi**
5. Level/year at which this course is offered: **PhD/ Semester 2**
6. Pre-requisites for this course (if any) Modules and Homological Algebra
7. Co-requisites for this course (if any) Reading and Research course
8. Locations: **Main campus+Girls Sections**
9. Mode of Instruction (mark all that apply) a. Traditional classroom √ What percentage? 100 b. Blended (traditional and online) What percentage?- c. e-learning What percentage? d. Correspondence What percentage? f. Other What percentage? Comments: Mainly traditional classroom will dominant the mode on instruction.

B Objectives

1. What is the main purpose for this course?

The aim of the course is to introduce graduate students into commutative algebra.
In particular, we shall cover the following topics:

- Some revision of modules, rings and fields.
- Noetherian rings.
- A ffine algebraic set.
- Radical and affine varieties.
- The prime spectrum of a ring.
- Hilbert Basis Theorem.
- The Nullstellensatz Theorem
- Noether Normalization Lemma.
- Relationship between affine varieties and commutative Algebra.
- Localization,
- Primary decomposition.
- Discrete valuation rings.
- Dedekind Domain.
- Dimension Theory

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- Encourage students to use the most updated books.
2- Advise Students to use : MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia and ORCID.
3- Advise students to submit the homework online and using internet.
4- Encourage students to write their homework and essays using LaTeX.

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

Course Description:
There are 4 credit hours for this course which are comprising approximately 60 hours of lectures.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact Hours
- Some revision of modules, rings and fields. - Noetherian rings.	2	8
- A ffine algebraic set. - Radical and affine varieties.	2	8
- The prime spectrum of a ring. - Hilbert Basis Theorem.	2	8

- The Nullstellensatz Theorem - Noether Normalization Lemma.	3	12
- Relationship between affine varieties and commutative Algebra. - Localization,	2	8
- Primary decomposition. - Discrete valuation rings.	2	8
- Dedekind Domain. - Dimension Theory	2	8

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

	Lecture	Tutorial	Laboratory	Practical /Clinical	Other: PBL	Total
Contact Hours	60	0	--	N/A	N/A	60
Credit	4	0				4

3. Additional private study/learning hours expected for students per week. 8

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**		
1.1	To revise and recognize modules, rings and fields as well as Noetherian rings.	Lectures: • Build on what students already know. • present new concepts and principles • use questioning and encouraging students. • Doing practice and involving students in the class. • Draw facts and doing responds.	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
1.2	To describe Affine algebraic set and Radical and affine varieties.		
1.3	To give an explanation The prime spectrum of a ring as well as Hilbert Basis Theorem.		
1.4	To describe and recognize the relationship between affine varieties and commutative Algebra and Localization,		
1.5	To know and recognize primary decomposition and discrete valuation rings.		
1.6	To recognize and state The Nullstellensatz Theorem as well as Noether Normalization Lemma.		
1.7	To know and recognize Dedekind Domain and Dimension Theory.		
2.0	**Cognitive Skills**		
2.1	1-To interpret and criticize as well as construct Blocks and vertices, an do characterization of defect groups of blocks. Structure of blocks of p-soluble groups..	• Request from students to do some preparations for the lectures. • Give students challenging exercise and problems. • Asking students for doing generalizations and extensions for the theoretical parts of the lectures. • Request from students via discussions to	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
2.2	To explain Brauer Theorems of blocks.		
2.3	To reorganize Blocks with normal defect groups. Block with cyclic defect groups.		
2.4	To interpret Blocks and vertices, and do characterization of defect groups of blocks. Structure of blocks of p-soluble groups.		
2.5	To explain and interpret relative free modules, relative projective modules and Green Correspondence.		
2.6	To evaluate and calculate vertices of some well known modules		
2.7	To prove and develop new formulations of some well known conjectures such as Alperin's conjecture and Dade conjectures.		

		compare the lectures with other topics in the same level. • Doing extensive discussions • Doing Quizzes.	
3.0	**Interpersonal Skills & Responsibility**		
3.1	Demonstrate communication skills with the teacher and other students in the class.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in college and department committees. • Joint and use useful media for education.	
3.2	Analyze and illustrate basic facts.		
3.3	To show and exhibit ethical behavior.		
3.4	To show skills for judging basic facts.		
3.5	To write and work independently.		
3.6	To work effectively in teams.		
3.7	To manage time properly, meet deadlines.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Demonstrate mathematics to others in oral form.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in	
4.2	illustrate mathematics to others in others in written form.		
4.3	Evaluate mathematics in a well-organized form.		
4.4	Research library in an excellent way.		
4.5	Research MathSciNet and good databases.		
4.6	Operate and use the university facilities in a good manner.		
4.7	Criticize and evaluate as well as express a judgment on the art of mathematics in this field.		

		college and department committees. • Joint and use useful media for education. • To use emails and internet evocatively. • Give presentations • Doing competitions and participate in mathematical discussions.	
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable

Suggested Guidelines for Learning Outcome Verb, Assessment, and Teaching

NQF Learning Domains	Suggested Verbs
Knowledge	list, name, record, define, label, outline, state, describe, recall, memorize, reproduce, recognize, record, tell, write
Cognitive Skills	estimate, explain, summarize, write, compare, contrast, diagram, subdivide, differentiate, criticize, calculate, analyze, compose, develop, create, prepare, reconstruct, reorganize, summarize, explain, predict, justify, rate, evaluate, plan, design, measure, judge, justify, interpret, appraise
Interpersonal Skills & Responsibility	demonstrate, judge, choose, illustrate, modify, show, use, appraise, evaluate, justify, analyze, question, and write
Communication, Information Technology, Numerical	demonstrate, calculate, illustrate, interpret, research, question, operate, appraise, evaluate, assess, and criticize
Psychomotor	demonstrate, show, illustrate, perform, dramatize, employ, manipulate, operate, prepare, produce, draw, diagram, examine, construct, assemble, experiment, and reconstruct

Suggested ***verbs not to use*** when writing measurable and assessable learning outcomes are as follows:

Consider Maximize Continue Review Ensure Enlarge Understand
Maintain Reflect Examine Strengthen Explore Encourage Deepen

Some of these verbs can be used if tied to specific actions or quantification.

Suggested assessment methods and teaching strategies are:

According to research and best practices, multiple and continuous assessment methods are required to verify student learning. Current trends incorporate a wide range of rubric assessment tools; including web-based student performance systems that apply rubrics, benchmarks, KPIs, and analysis. Rubrics are especially helpful for qualitative evaluation. Differentiated assessment strategies include: exams, portfolios, long and short essays, log books, analytical reports, individual and group presentations, posters, journals, case studies, lab manuals, video analysis, group reports, lab reports, debates, speeches, learning logs, peer evaluations, self-evaluations, videos, graphs, dramatic performances, tables, demonstrations, graphic organizers, discussion forums, interviews, learning contracts, antidotal notes, artwork, KWL charts, and concept mapping.

Differentiated teaching strategies should be selected to align with the curriculum taught, the needs of students, and the intended learning outcomes. Teaching methods include: lecture, debate, small

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	Continuous Assessment Evaluation	Weekly	20%
2	First Periodic Exam	6	20 %
3	Second Periodic Exam	10	20%
4	Final Examination (written Exam)	End of the semester	40%

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) -Each group of students is assigned to a particular faculty where he or she will provide academic advising during specific academic hours. Each staff will provide at least one session/week. -There will be an academic advisor how will be a responsible for helping the student by doing the general supervision . - The people in the library will support the students during the time of the course.

E. Learning Resources

Text books: 1. Reid, Miles. Undergraduate Commutative Algebra: London Mathematical Society Student Texts. Cambridge, UK: Cambridge University Press, April 26, 1996. ISBN: 9780521458894. 2. Atiyah, Michael, and Ian Macdonald. Introduction to Commutative Algebra. Reading, MA: Addison-Wesley, 1994. ISBN: 9780201407518. 3. Eisenbud, David. Commutative Algebra: With a View Toward Algebraic Geometry. New York, NY: Springer-Verlag, 1999. ISBN: 9780387942698. 4. Kaplansky I. Commutative Rings, Boston, 1970. 5. Larson M P. J. Mccarthy, Mutiplicative Theory of Ideals, 1971. 6. Zarazki and Samuel, Commutative Algebra, ISBN: 978-37900896 and ISBN: 0387900896. 7. Thomas W. Hungerford: Algebra, Springer, 1974, ISBN: 978-4612-6101-8. 8. David Dummit and Richard Foote: Abstract Algebra, Wily, July 14, 2003, ISBN: 978-0471433347 & 0471433349. 9. N. Bourbaki, Commutative Algebra, Chapters 1-7, ISBN: 987-3540642398 and ISBN: 978-3540642390.
2. List Essential References Materials (Journals, Reports, etc.)) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID.
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID.
4. List Electronic Materials(eg. Web Sites, Social Media, Blackboard, etc.) - https://en.wikipedia.org/wiki/BlockTheory -) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. -LaTeX and Latexbeamer. -Magma -Gap

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.)
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) - Lecture classroom which can accommodate 15 students for lectures (normal and classical classroom)

2. Computing resources (AV, data show, Smart Board, software, etc.) **Data Show (projector): sometimes shall be used.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **This course is a basic and fundamental course in commutative algebra.**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Following completion of the prescribed course study in Pediatrics module, an evaluation should be conducted through the following: - A student questionnaire feedback should be carried out on the quality & effectiveness of teaching and evaluation
2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor - A staff questionnaire feedback about course
3 Processes for Improvement of Teaching - Submission of a final evaluation report at the end of the course - A review of the recommended teaching strategies should be submitted after evaluation.
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) - Compare the standards of students achievements' with standards archived elsewhere (inside KSA or students from outside the kingdom) by checking the marking of a sample of some student work : tests, course work - Assignment by an independent member of teaching staff either from the UQU or other universities

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Reviewing feedback on the quality of course report from staff members, other university' staffs. - Looking for strengthen and weak points gathered at the end of the course and working on it. - Plan to introduce updating material and technology that could improve the quality

Faculty or Teaching Staff: Prof. Dr. Ahmad Mohammed Ahmad Alghamdi
Signature: ___Ahmad Mohammed Ahmad Alghamdi____
Date Report Completed: 14 November 2018_____
Received by: _____ Dean/Department Head
Signature: _____ Date: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title**: Advanced Complex Analysis**

Course Code: **4047102-4**

Course Specifications

Institution: Umm Al-Qura University	Date: Nov 10, 2018
College/Department : Faculty of Applied Science – Department of Mathematical Sciences	

A. Course Identification and General Information

1. Course title and code: Advanced Complex Analysis 4047102-4
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 Dr. A. Alahmari
5. Level/year at which this course is offered: First Year/ level 2
6. Pre-requisites for this course (if any):
Differential Manifolds (4046602-4)
7. Co-requisites for this course (if any):
8. Location if not on main campus: Al-Abdia Campus and Al-Zahir campus
9. Mode of Instruction (mark all that apply):

a. traditional classroom	√	What percentage?	100
b. blended (traditional and online)		What percentage?	
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
   The purpose of this course is to cover some basic material on both the geometric and analytic aspects of complex analysis in one variable.

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) Updating references used in teaching process.
   2) Using e-learning facilities more efficiently.
   3) Encouraging students to collect problems from web-based reference material and supervise classroom discussions.

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

Course Description:
This is a 4 credit hours course comprising approximately 52 hours of lectures.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
The simply-connected Riemann surfaces	3	12
Entire and meromorphic functions	4	16
Conformal mapping	4	16
Elliptic functions and elliptic curves	4	16

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

	Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	60	0				60
Credit	4	0				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:** At the end of the course the student will be able to:		
1.1	1) reproduce definitions and results, together with their proofs, within the scope of the syllabus of the course 2) apply these results to examples 3) formulate and present definitions, proofs and computations in a mathematically rigorous way	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	4) Planning rigorous proofs of different propositions and assertions in this context. 5) Apply basic theorems for Banach algebras. 6) Investigate examples to which the theories under concern can be applied. 7) Use lecture notes and other texts to solve challenging problems.	Lectures	Periodic written and oral tests. Discussion. Observation.
3.0	**Interpersonal Skills & Responsibility**		
3.1	1) Punctual attendance of classes is required. 2) Students should demonstrate their sense of responsibility for learning by completing both reading and writing		

	assignments in due time. 3) Students learn to manage their time. 4) Students should act responsibly and ethically in carrying.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Work effectively in groups and independently.	Tasks assigned and homework.	Marking the assignments
4.2	Solve problems concerning the topics of the course.	Homework	Evaluating the homework
5.0	**Psychomotor**		
5.1	Not Applicable	Not Applicable	Not Applicable
5.2	Not Applicable	Not Applicable	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	First periodic exam	6	20
2	Second periodic exam	10	20
4	Homework + reports + Quizzes	Over all weeks	20
5	Final exam	End	40

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)

1- Office hours per week in the lecturer schedule (4 hours per week).

2- Contact with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks

J. E. Marsden and M. J. Hoffman. Basic Complex Analysis. W. H. Freeman, 1999.
R. Remmert. Classical Topics in Complex Function Theory. Springer, 1998.

2. List Essential References Materials (Journals, Reports, etc.)

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. Microsoft Word, Latex

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.) Classroom with capacity of 30-students. - Library.
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) None

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching:
• Student feedback through electronic survey organized by the deanship of registration and acceptance.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department
• Evaluation of the teachers by internal & external faculty members. • Visiting to the classrooms. • Mutual visits between colleagues and giving advices to each other after each lecture
3 Processes for Improvement of Teaching
• Analysis of student course evaluation and feedback • Peer evaluation and feedback • Review of course portfolios • Workshops on pedagogical methods

4. Processes for Verifying Standards of Student Achievement (eg. 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) • Analysis of course assessments by other reviewers on a periodic basis.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Material and learning outcomes are periodically reviewed internally and externally. • Comparing course content and teaching methodologies with similar courses offered at other departments and universities. • Studying the outcomes of the students' evaluations of the course and use it to improve teaching strategies.

Name of Course Instructor: Dr. A. Alahmari

Signature: _____ Date Specification Completed: Nov 15, 2018

Program Coordinator: _____

Signature: _____ Date Received: _____

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 (2nd 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

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Infinite Dimensional Lie Algebras (Kac-Moody algebras)**

Course Code: **4047405-4**

Course Specifications

Institution:Umm Alqura University, Makkah Date of Report: 11 November 2018
College/Department: College of Applied Science, Mathematical Science

A. Course Identification and General Information

1. Course Title and Code: **Infinite Dimensional Lie Algebras (Kac-Moody algebras) 4047405-4**
2. Credit hours: **4 Credit 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. Dr. Falih Aldosray**
5. Level/year at which this course is offered: **PhD/ Semester 3**
6. Pre-requisites for this course (if any) **Lie algebra 4047401-4**
7. Co-requisites for this course (if any): ---
8. Locations: **Main campus+Girls Sections**
9. Mode of Instruction (mark all that apply) a. Traditional classroom √ What percentage? 100 b. Blended (traditional and online) What percentage?- c. e-learning What percentage? d. Correspondence What percentage? f. Other What percentage? Comments: Mainly traditional classroom will dominant the mode on instruction.

B Objectives

1. What is the main purpose for this course? The course is designed to introduce the students to the basic concepts of infinite dimensional Lie algebras(**Kac-Moody algebras)**.
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) 3- Encourage students to use the most updated books. 4- Advise students to submit the homework online and using internet. 5- Encourage students to write their homework and essays using LaTeX.

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

(**Kac–Moody algebra** is a Lie algebra defined by generators and relations through a generalized Cartan matrix. These algebras form a generalization of finite-dimensional semisimple Lie algebras, and many properties related to the structure of a Lie algebra such as its root system, irreducible representations.)

Course Description: There are 4 credit hours for this course which are comprising approximately 60 hours of lectures.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact Hours
Definition and Basic Properties;	2	8
- The invariant bilinear form and the generalized Casimir operator	2	8
- Integrable representations and the Weyl group of a Kac-Moody algebras.	2	8
. Some properties of generalized Cartan matrices	3	12
- Real and imaginary roots	2	8
Affine Lie algebras: the normalized invariant bilinear form, the root system and the Weyl group.	2	8
Affine Lie algebras:the realization(case k=1)	2	8

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

	Lecture	Tutorial	Laboratory	Practical /Clinical	Other: PBL	Total
Contact Hours	60	0	--	N/A	N/A	60
Credit	4	0				4

3. Additional private study/learning hours expected for students per week.	8

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:** After successful completion of the course, the student should be able to		
1.1	Know the basic facts and definitions of infinite dimensional Kac=Moody Lie algebras and their properties	Lectures: • Build on what students already know. • present new concepts and principles • use questioning and encouraging students. • Doing practice and involving students in the class. • Draw facts and doing responds.	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
1.2	know invariant bilinear form and the generalized Casimir operator		
1.3	know Integrable representations and the Weyl group		
1.4	Know Some properties of generalized Cartan matrices		
1.5	Affine Lie algebras: the normalized invariant bilinear form, the root system		
1.6	Affine Lie algebras:the realization(case k=1)		
2.0	**Cognitive Skills**		
2.1	Planning rigorous proofs of different propositions and assertions in this context	• Request from students to do some preparations for the lectures. • Give students challenging exercise and problems. • Request from students via discussions to compare the lectures with other topics in the same level.	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
2.2	. Apply basic theorems Lie algebras		
2.3	Investigate particular examples of Lie algebras to which the theories under concern can be applied		
2.4	. Use lecture notes and other texts to solve challenging problems.		

3.0	**Interpersonal Skills & Responsibility**		
3.1	Demonstrate communication skills with the teacher and other students in the class.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in college and department committees. • Joint and use useful media for education.	
3.2	Analyze and illustrate basic facts.		
3.3	To show and exhibit ethical behavior.		
3.4	To show skills for judging basic facts.		
3.5	To write and work independently.		
3.6	To work effectively in teams.		
3.7	To manage time properly, meet deadlines.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Demonstrate mathematics to others in oral form.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in college and department committees. • Joint and use useful media for education. • To use emails and internet evocatively.	
4.2	illustrate mathematics to others in others in written form.		
4.3	Evaluate mathematics in a well-organized form.		
4.4	Research library in an excellent way.		
4.5	Research MathSciNet and good databases.		
4.6	Operate and use the university facilities in a good manner.		
4.7	Criticize and evaluate as well as express a judgment on the art of mathematics in this field.		

		• Give presentations • Doing competitions and participate in mathematical discussions.	
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable

Suggested Guidelines for Learning Outcome Verb, Assessment, and Teaching

NQF Learning Domains	Suggested Verbs
Knowledge	list, name, record, define, label, outline, state, describe, recall, memorize, reproduce, recognize, record, tell, write
Cognitive Skills	estimate, explain, summarize, write, compare, contrast, diagram, subdivide, differentiate, criticize, calculate, analyze, compose, develop, create, prepare, reconstruct, reorganize, summarize, explain, predict, justify, rate, evaluate, plan, design, measure, judge, justify, interpret, appraise
Interpersonal Skills & Responsibility	demonstrate, judge, choose, illustrate, modify, show, use, appraise, evaluate, justify, analyze, question, and write
Communication, Information Technology, Numerical	demonstrate, calculate, illustrate, interpret, research, question, operate, appraise, evaluate, assess, and criticize
Psychomotor	demonstrate, show, illustrate, perform, dramatize, employ, manipulate, operate, prepare, produce, draw, diagram, examine, construct, assemble, experiment, and reconstruct

Suggested ***verbs not to use*** when writing measurable and assessable learning outcomes are as follows:

Consider Maximize Continue Review Ensure Enlarge Understand
Maintain Reflect Examine Strengthen Explore Encourage Deepen

Some of these verbs can be used if tied to specific actions or quantification.

Suggested assessment methods and teaching strategies are:

According to research and best practices, multiple and continuous assessment methods are required to verify student learning. Current trends incorporate a wide range of rubric assessment tools; including web-based student performance systems that apply rubrics, benchmarks, KPIs, and analysis. Rubrics are especially helpful for qualitative evaluation. Differentiated assessment strategies include: exams, portfolios, long and short essays, log books, analytical reports, individual and group presentations, posters, journals, case studies, lab manuals, video analysis, group reports, lab reports, debates, speeches, learning logs, peer evaluations, self-evaluations, videos, graphs, dramatic performances, tables, demonstrations, graphic organizers, discussion forums, interviews, learning contracts, antidotal notes, artwork, KWL charts, and concept mapping.

Differentiated teaching strategies should be selected to align with the curriculum taught, the needs of students, and the intended learning outcomes. Teaching methods include: lecture, debate, small

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	Continuous Assessment Evaluation	Weekly	20%
2	First Periodic Exam	6	20 %
3	Second Periodic Exam	10	20%
4	Final Examination (written Exam)	End of the semester	40%

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) -Each group of students is assigned to a particular faculty where he or she will provide academic advising during specific academic hours. Each staff will provide at least one session/week. -There will be an academic advisor how will be a responsible for helping the student by doing the general supervision . - The people in the library will support the students during the time of the course.

E. Learning Resources

Text books: 1. Kac, Victor G. (1994). Infinite dimensional Lie algebras (3rd ed.). New York: Cambridge University Press. ISBN 0-521-46693-8. 2. Wakimoto, Minoru (2001). Infinite dimensional Lie algebras. Providence, Rhode Island: American Mathematical Society. ISBN 0-8218-2654-9 3.Wan, Zhe Xian. Introduction to Kac-Moody algebra. World Scientific Publishing Co., Inc., Teaneck, NJ, 1991.
2. List Essential References Materials (Journals, Reports, etc.)) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID.
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID.
4. List Electronic Materials(eg. Web Sites, Social Media, Blackboard, etc.) - https://en.wikipedia.org/wiki/BlockTheory -) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. -LaTeX and Latexbeamer. -Magma -Gap

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.)
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) - Lecture classroom which can accommodate 15 students for lectures (normal and classical

classroom)

2. Computing resources (AV, data show, Smart Board, software, etc.) **Data Show (projector): sometimes shall be used.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **This course is a basic and fundamental course in commutative algebra.**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Following completion of the prescribed course study in Pediatrics module, an evaluation should be conducted through the following: - A student questionnaire feedback should be carried out on the quality & effectiveness of teaching and evaluation
2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor - A staff questionnaire feedback about course
3 Processes for Improvement of Teaching - Submission of a final evaluation report at the end of the course - A review of the recommended teaching strategies should be submitted after evaluation
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) - Compare the standards of students achievements' with standards archived elsewhere (inside KSA or students from outside the kingdom) by checking the marking of a sample of some student work : tests, course work - Assignment by an independent member of teaching staff either from the UQU or other universities

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Reviewing feedback on the quality of course report from staff members, other university' staffs. - Looking for strengthen and weak points gathered at the end of the course and working on it. - Plan to introduce updating material and technology that could improve the quality

Faculty or Teaching Staff: Prof. Dr. Ahmad Mohammed Ahmad Alghamdi

Signature: ___Ahmad Mohammed Ahmad Alghamdi____

Date Report Completed: 14 November 2018_____
Received by: _____ Dean/Department Head
Signature: _____ Date: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

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

Course Code: **4047407-4**

Course Specifications

Institution:Umm Alqura University, Makkah Date of Report: 14 November 2018
College/Department: College of Applied Science, Mathematical Science

A. Course Identification and General Information

1. Course Title and Code: Block Theory (1) 4047407-4
2. Credit hours: **4 Credit 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. Dr. Ahmad Mohammed Ahmad Alghamdi**
5. Level/year at which this course is offered: **PhD/ Semester 3**
6. Pre-requisites for this course (if any) **Modular representation of finite groups 4046412-4**
7. Co-requisites for this course (if any) **---**
8. Locations: **Main campus+Girls Sections**
9. Mode of Instruction (mark all that apply) a. Traditional classroom √ What percentage? 100 b. Blended (traditional and online) What percentage?- c. e-learning What percentage? d. Correspondence What percentage? f. Other What percentage? Comments: Mainly traditional classroom will dominant the mode on instruction.

B Objectives

1. What is the main purpose for this course?

The aim of the course is to introduce graduate students into the structure of blocks of group algebras and the decomposition of a finite dimensional algebra into blocks.

In particular, we shall cover the following topics:

- Some revision of modules, rings and fields.
  Introduction Brauer Theorems of blocks (Defect Theory)
- Blocks and normal subgroups.
- Group graded algebras and crossed products.
- Blocks with normal defect groups.
- Block with cyclic defect groups.
- Blocks and vertices, a characterization of defect groups of blocks.
- Structure of blocks of p-soluble groups.
- Structure of blocks with extra-special defect groups.
- Uni-serial blocks.
- G-Algebras and interior G-algebras:
- Pointed groups and Puig theory.
- Blocks of endomorphism algebras.
- Some open problems: Alperin's conjecture, Dade's conjecture and Brauer's k(B)-conjecture.

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- Encourage students to use the most updated books.
2- Advise Students to use : MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia and ORCID.
3- Advise students to submit the homework online and using internet.
4- Encourage students to write their homework and essays using LaTeX.

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

Course Description:
There are 4 credit hours for this course which are comprising approximately 60 hours of lectures.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact Hours
Some revision of modules, rings and fields. Introduction to Brauer Theorems of blocks (Defect Theory)	2	8
Blocks and normal subgroups. Group graded algebras and crossed products	2	8

Blocks with normal defect groups. Block with cyclic defect groups.	2	8
Blocks and vertices, a characterization of defect groups of blocks. Structure of blocks of p-soluble groups.	2	8
Structure of blocks with extra-special defect groups. Uni-serial blocks.	3	12
G-Algebras and interior G-algebras. Pointed groups and Puig theory.	2	8
Blocks of endomorphism algebras. Some open problems: Alperin's conjecture, Dade's conjecture and Brauer's k(B)-conjecture.	2	8

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

	Lecture	Tutorial	Laboratory	Practical /Clinical	Other: PBL	Total
Contact Hours	60	0	--	N/A	N/A	60
Credit	4	0				4

3. Additional private study/learning hours expected for students per week. 8

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**		
1.1	To revise and recognize modules over a ring and module homomorphism.	Lectures: • Build on what students already know. • present new concepts and principles • use questioning and encouraging students. • Doing practice and involving students in the class. • Draw facts and doing responds.	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
1.2	To describe Brauer theorems of blocks (introduction) as well as some special classes of blocks with normal and cyclic defect groups		
1.3	To give an explanation of defect group in deferent context.		
1.4	To describe Group graded algebras and crossed products		
1.5	To state and label and defect groups of blocks. Structure of blocks of p-soluble groups.		
1.6	To recognize G-Algebras and interior G-algebras. Pointed groups and Puig theory.		
1.7	To state and know blocks of endomorphism algebras. As well some open problems: Alperin's conjecture, Dade's conjecture and Brauer's k(B)-conjecture.		
2.0	**Cognitive Skills**		
2.1	1-To interpret and criticize as well as construct Blocks and vertices, an do characterization of defect groups of blocks. Structure of blocks of p-soluble groups..	• Request from students to do some preparations for the lectures. • Give students challenging exercise and problems. • Asking students for doing generalizations and extensions for the theoretical parts of the lectures. • Request from students via discussions to compare the lectures with other topics in the same	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
2.2	To explain Brauer Theorems of blocks.		
2.3	To reorganize Blocks with normal defect groups. Block with cyclic defect groups.		
2.4	To interpret Blocks and vertices, and do characterization of defect groups of blocks. Structure of blocks of p-soluble groups.		
2.5	To explain and interpret relative free modules, relative projective modules and Green Correspondence.		
2.6	To evaluate and calculate vertices of some well known modules		
2.7	To prove and develop new formulations of some well known conjectures such as Alperin's conjecture and Dade conjecture.		

		level. • Doing extensive discussions • Doing Quizzes.	
3.0	**Interpersonal Skills & Responsibility**		
3.1	Demonstrate communication skills with the teacher and other students in the class.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in college and department committees. • Joint and use useful media for education.	
3.2	Analyze and illustrate basic facts.		
3.3	To show and exhibit ethical behavior.		
3.4	To show skills for judging basic facts.		
3.5	To write and work independently.		
3.6	To work effectively in teams.		
3.7	To manage time properly, meet deadlines.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Demonstrate mathematics to others in oral form.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in college and department committees. • Joint and use useful media for education. • To use emails and internet evocatively. • Give presentations • Doing competitions	
4.2	illustrate mathematics to others in others in written form.		
4.3	Evaluate mathematics in a well-organized form.		
4.4	Research library in an excellent way.		
4.5	Research MathSciNet and good databases.		
4.6	Operate and use the university facilities in a good manner.		
4.7	Criticize and evaluate as well as express a judgment on the art of mathematics in this field.		

		and participate in mathematical discussions.	
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable

Suggested Guidelines for Learning Outcome Verb, Assessment, and Teaching

NQF Learning Domains	Suggested Verbs
Knowledge	list, name, record, define, label, outline, state, describe, recall, memorize, reproduce, recognize, record, tell, write
Cognitive Skills	estimate, explain, summarize, write, compare, contrast, diagram, subdivide, differentiate, criticize, calculate, analyze, compose, develop, create, prepare, reconstruct, reorganize, summarize, explain, predict, justify, rate, evaluate, plan, design, measure, judge, justify, interpret, appraise
Interpersonal Skills & Responsibility	demonstrate, judge, choose, illustrate, modify, show, use, appraise, evaluate, justify, analyze, question, and write
Communication, Information Technology, Numerical	demonstrate, calculate, illustrate, interpret, research, question, operate, appraise, evaluate, assess, and criticize
Psychomotor	demonstrate, show, illustrate, perform, dramatize, employ, manipulate, operate, prepare, produce, draw, diagram, examine, construct, assemble, experiment, and reconstruct

Suggested ***verbs not to use*** when writing measurable and assessable learning outcomes are as follows:

Consider Maximize Continue Review Ensure Enlarge Understand
Maintain Reflect Examine Strengthen Explore Encourage Deepen

Some of these verbs can be used if tied to specific actions or quantification.

Suggested assessment methods and teaching strategies are:

According to research and best practices, multiple and continuous assessment methods are required to verify student learning. Current trends incorporate a wide range of rubric assessment tools; including web-based student performance systems that apply rubrics, benchmarks, KPIs, and analysis. Rubrics are especially helpful for qualitative evaluation. Differentiated assessment strategies include: exams, portfolios, long and short essays, log books, analytical reports, individual and group presentations, posters, journals, case studies, lab manuals, video analysis, group reports, lab reports, debates, speeches, learning logs, peer evaluations, self-evaluations, videos, graphs, dramatic performances, tables, demonstrations, graphic organizers, discussion forums, interviews, learning contracts, antidotal notes, artwork, KWL charts, and concept mapping.

Differentiated teaching strategies should be selected to align with the curriculum taught, the needs of students, and the intended learning outcomes. Teaching methods include: lecture, debate, small group work, whole group and small group discussion, research activities, lab demonstrations,

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	Continuous Assessment Evaluation	Weekly	20%
2	First Periodic Exam	6	20 %
3	Second Periodic Exam	10	20%
4	Final Examination (written Exam)	End of the semester	40%

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) -Each group of students is assigned to a particular faculty where he or she will provide academic advising during specific academic hours. Each staff will provide at least one session/week. -There will be an academic advisor how will be a responsible for helping the student by doing the general supervision . - The people in the library will support the students during the time of the course.

E. Learning Resources

Text books: 1. G. Navarro, Characters and blocks of finite groups, Volume 250 of London Mathematical Society Lecture Notes Series. Cambridge University Press, Cambridge 1998. 2. H. Nagao and Y. Tsushima, Representation of finite groups, Academic Press Inc., Boston, MA, Translated from Japanese, (1989). 3. John L. Alperin, Local Representation Theory, Cambridge University Press, Cambridge, 1986. 4. Charles W. Curtis and Irving Reiner, Representation Theory of Finite Groups and Associative Algebras, American Mathematical Society, New York, 1962. 5. Charles W. Curtis and Irving Reiner, Methods of Representation Theory with Applications to Finite Groups and Orders, Volume I, John Wiley and Sons, New York, 1981. 6. Charles W. Curtis and Irving Reiner, Methods of Representation Theory with Applications to Finite Groups and Orders, Volume II, John Wiley and Sons, New York, 1987. 7. Charles W. Curtis, Pioneers of Representation Theory AMS and LMS, Volume 15, 1999. 8. I. Martin Isaac, Character Theory of Finite Groups, Dover, ISBN: 0486-68014-2. 9. Peter Schmid, The Solution of the k(GV)-Problem, ICP Advanced Texts in Mathematics- Vol. 4, Imperial College Press, 2007. 10. Walter Feit, The representation Theory of Finite groups, North-Holand Mathematical Library, September 1980. 11. Serre, Jean-Pierre, Linear Representations of Finite Groups, New York: Springer-Verlag, (1977), ISBN: 0387-90190-6. 12. Peter Webb, A Course in Finite Group Representation Theory, Cambridge University Press, Cambridge, 2016. 13. Burkhard Kulshammer, Lectures on Block Theory, Cambridge University Press, Cambridge, 1991. 14. 9- J. Thevenaz, G-Algebras and Modular Representation Theory, Oxford Science Publications, Oxford, (1995).
2. List Essential References Materials (Journals, Reports, etc.)) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID
4. List Electronic Materials(eg. Web Sites, Social Media, Blackboard, etc.) - https://en.wikipedia.org/wiki/BlockTheory -) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. -LaTeX and Latexbeamer. -Magma -Gap

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.)
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) - Lecture classroom which can accommodate 15 students for lectures (normal and classical classroom)

2. Computing resources (AV, data show, Smart Board, software, etc.) **Data Show (projector): sometimes shall be used.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **This course is a basic and fundamental course in Block Theory of finite groups.**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Following completion of the prescribed course study in Pediatrics module, an evaluation should be conducted through the following: - A student questionnaire feedback should be carried out on the quality & effectiveness of teaching and evaluation
2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor - A staff questionnaire feedback about course
3 Processes for Improvement of Teaching - Submission of a final evaluation report at the end of the course - A review of the recommended teaching strategies should be submitted after evaluation.
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) - Compare the standards of students achievements' with standards archived elsewhere (inside KSA or students from outside the kingdom) by checking the marking of a sample of some student work : tests, course work - Assignment by an independent member of teaching staff either from the UQU or other universities

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Reviewing feedback on the quality of course report from staff members, other university' staffs. - Looking for strengthen and weak points gathered at the end of the course and working on it. - Plan to introduce updating material and technology that could improve the quality

Faculty or Teaching Staff: Prof. Dr. Ahmad Mohammed Ahmad Alghamdi
Signature: ___Ahmad Mohammed Ahmad Alghamdi____
Date Report Completed: 14 November 2018_____
Received by: _____ Dean/Department Head
Signature: _____ Date: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Subnormal subgroups**

Course Code: **4047409-4**

Course Specifications

Institution:Umm Alqura University, Makkah Date of Report: 14 November 2018
College/Department: College of Applied Science, Mathematical Science

A. Course Identification and General Information

1. Course Title and Code: **Subnormal subgroups** **4047409-4**
2. Credit hours: **4 Credit 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. Dr. Falih Aldosray**
5. Level/year at which this course is offered: **Master/ Semester 1**
6. Pre-requisites for this course (if any) Groups and Rings 4046401-4
7. Co-requisites for this course (if any) ----
8. Locations: **Main campus+Girls Sections**
9. Mode of Instruction (mark all that apply) a. Traditional classroom √ What percentage? 100 b. Blended (traditional and online) What percentage?- c. e-learning What percentage? d. Correspondence What percentage? f. Other What percentage? Comments: Mainly traditional classroom will dominant the mode on instruction.

B Objectives

1. What is the main purpose for this course? The course is designed to introduce the students to the basic concepts of finite dimensional Lie algebras .
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) 3- Encourage students to use the most updated books. 4- Advise students to submit the homework online and using internet. 5- Encourage students to write their homework and essays using LaTeX.

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

(Subnormal subgroups, and its basic properties. Join of Subnormal subgroups, The derived and lower central series, Permutability of Subnormal subgroups

Course Description: There are 4 credit hours for this course which are comprising approximately 60 hours of lectures.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact Hours
Definition , Basic Properties of subnormal subgroups and their join	2	8
The Join of Many Subnormal Subgroups: - Internal structure of joins of finitely many subnormal subgroups, Subnormal composition factors, Baer groups, The Commutator of two subnormal subgroups.	2	8
- The Derived and Lower Central Series of a Join of Subnormal Subgroups: - The derived series of a join of subnormal subgroups, the lower central series of a join of subnormal subgroups, some applications to the join problem.	2	8
- The Permutability of Subnormal Subgroups: Roseblade"s Permutabililty Theorem,Permutability properties of soluble an nilpotent residuals of subnormal subgroups	3	12

- The Join Problem - A Criterion: - Williams Join Theorem, Persistent properties of nilpotent groups.	3	12
Groups with Many Subnormal Subgroups: Groups in which every subgroup is subnormal	3	12

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

	Lecture	Tutorial	Laboratory	Practical /Clinical	Other: PBL	Total
Contact Hours	60	0	--	N/A	N/A	60
Credit	4	0				4

3. Additional private study/learning hours expected for students per week.	8

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:** After successful completion of the course, the student should be able to		
1.1	Know the basic facts and definitions of subnormal subgroups	Lectures: • Build on what students already know. • present new concepts and principles • use questioning and encouraging students. • Doing practice and involving students in the class. • Draw facts and doing responds.	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
1.2	Know Internal structure of joins of finitely many subnormal subgroups, Subnormal composition factors, Baer groups,		
1.3	Know the derived series of a join of subnormal subgroups, the lower central series of a join of subnormal subgroups.		
1.4	Know the Permutability of Subnormal Subgroups		
1.5	Know Williams Join Theorem,		
1.6	Know the structures of Groups in which every subgroup is subnormal		
2.0	**Cognitive Skills**		
2.1	Planning rigorous proofs of different propositions and assertions in this context	• Request from students to do some preparations for the lectures. • Give students challenging exercise and problems. • Request from students via discussions to compare the lectures with other topics in the same level.	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
2.2	. Apply basic theorems Lie algebras		
2.3	Investigate particular examples of Lie algebras to which the theories under concern can be applied		
2.4	. Use lecture notes and other texts to solve challenging problems.		

3.0	**Interpersonal Skills & Responsibility**		
3.1	Demonstrate communication skills with the teacher and other students in the class.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in college and department committees. • Joint and use useful media for education.	
3.2	Analyze and illustrate basic facts.		
3.3	To show and exhibit ethical behavior.		
3.4	To show skills for judging basic facts.		
3.5	To write and work independently.		
3.6	To work effectively in teams.		
3.7	To manage time properly, meet deadlines.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Demonstrate mathematics to others in oral form.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in college and department committees. • Joint and use useful media for education. • To use emails and internet evocatively. • Give presentations • Doing competitions and participate in mathematical discussions.	
4.2	illustrate mathematics to others in others in written form.		
4.3	Evaluate mathematics in a well-organized form.		
4.4	Research library in an excellent way.		
4.5	Research MathSciNet and good databases.		
4.6	Operate and use the university facilities in a good manner.		
4.7	Criticize and evaluate as well as express a judgment on the art of mathematics in this field.		
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable

Suggested Guidelines for Learning Outcome Verb, Assessment, and Teaching

NQF Learning Domains	Suggested Verbs

Knowledge	list, name, record, define, label, outline, state, describe, recall, memorize, reproduce, recognize, record, tell, write
Cognitive Skills	estimate, explain, summarize, write, compare, contrast, diagram, subdivide, differentiate, criticize, calculate, analyze, compose, develop, create, prepare, reconstruct, reorganize, summarize, explain, predict, justify, rate, evaluate, plan, design, measure, judge, justify, interpret, appraise
Interpersonal Skills & Responsibility	demonstrate, judge, choose, illustrate, modify, show, use, appraise, evaluate, justify, analyze, question, and write
Communication, Information Technology, Numerical	demonstrate, calculate, illustrate, interpret, research, question, operate, appraise, evaluate, assess, and criticize
Psychomotor	demonstrate, show, illustrate, perform, dramatize, employ, manipulate, operate, prepare, produce, draw, diagram, examine, construct, assemble, experiment, and reconstruct

Suggested ***verbs not to use*** when writing measurable and assessable learning outcomes are as follows:

Consider Maximize Continue Review Ensure Enlarge Understand
Maintain Reflect Examine Strengthen Explore Encourage Deepen

Some of these verbs can be used if tied to specific actions or quantification.

Suggested assessment methods and teaching strategies are:

According to research and best practices, multiple and continuous assessment methods are required to verify student learning. Current trends incorporate a wide range of rubric assessment tools; including web-based student performance systems that apply rubrics, benchmarks, KPIs, and analysis. Rubrics are especially helpful for qualitative evaluation. Differentiated assessment strategies include: exams, portfolios, long and short essays, log books, analytical reports, individual and group presentations, posters, journals, case studies, lab manuals, video analysis, group reports, lab reports, debates, speeches, learning logs, peer evaluations, self-evaluations, videos, graphs, dramatic performances, tables, demonstrations, graphic organizers, discussion forums, interviews, learning contracts, antidotal notes, artwork, KWL charts, and concept mapping.

Differentiated teaching strategies should be selected to align with the curriculum taught, the needs of students, and the intended learning outcomes. Teaching methods include: lecture, debate, small

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	Continuous Assessment Evaluation	Weekly	20%
2	First Periodic Exam	6	20 %
3	Second Periodic Exam	10	20%
4	Final Examination (written Exam)	End of the semester	40%

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) -Each group of students is assigned to a particular faculty where he or she will provide academic advising during specific academic hours. Each staff will provide at least one session/week. -There will be an academic advisor how will be a responsible for helping the student by doing the general supervision . - The people in the library will support the students during the time of the course.

E. Learning Resources

Text books: 1. John C. Lennox, Stewart E. Stonehewer: Subnormal subgroups of groups, Oxford , Clarendon Press ; New York : Oxford University Press, 1987. 2. Robinson, Derek, A Course in the Theory of Groups, Graduate Texts in Mathematics (1996). 3. J. S. Rose : "A course on group Theory" Cambridge University Press 1978
2. List Essential References Materials (Journals, Reports, etc.)) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID.
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID.
4. List Electronic Materials(eg. Web Sites, Social Media, Blackboard, etc.) - https://en.wikipedia.org/wiki/BlockTheory -) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. -LaTeX and Latexbeamer. -Magma -Gap

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.)
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) - Lecture classroom which can accommodate 15 students for lectures (normal and classical classroom)

2. Computing resources (AV, data show, Smart Board, software, etc.) **Data Show (projector): sometimes shall be used.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or

attach list) **This course is a basic and fundamental course in commutative algebra.**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Following completion of the prescribed course study in Pediatrics module, an evaluation should be conducted through the following: - A student questionnaire feedback should be carried out on the quality & effectiveness of teaching and evaluation
2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor - A staff questionnaire feedback about course
3 Processes for Improvement of Teaching - Submission of a final evaluation report at the end of the course - A review of the recommended teaching strategies should be submitted after evaluation.
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) - Compare the standards of students achievements' with standards archived elsewhere (inside KSA or students from outside the kingdom) by checking the marking of a sample of some student work : tests, course work - Assignment by an independent member of teaching staff either from the UQU or other universities

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Reviewing feedback on the quality of course report from staff members, other university' staffs. - Looking for strengthen and weak points gathered at the end of the course and working on it. - Plan to introduce updating material and technology that could improve the quality

Faculty or Teaching Staff: Prof. Dr. Ahmad Mohammed Ahmad Alghamdi

Signature: ___Ahmad Mohammed Ahmad Alghamdi____

Date Report Completed: 14 November 2018_____

Received by: _____ Dean/Department Head

Signature: _____ Date: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **von Neumann Algebras**

Course Code: **4047103-4**

Course Specifications

Institution: Umm Al-Qura University	Date: March 31, 2018
College/Department :	

A. Course Identification and General Information

1. Course title and code: von Neumann Algebras 4047103-4	
2. Credit hours: 4 Credit 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	Dr. M. Mabrouk
5. Level/year at which this course is offered: PhD - level 3	
6. Pre-requisites for this course (if any):	Introduction to functional analysis (4046101-4) Operator theory (4046103-4)
7. Co-requisites for this course (if any):	
8. Location if not on main campus: Al-Abdia Campus Al-Zahir campus	

9. Mode of Instruction (mark all that apply):

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

Comments:

B Objectives

1. What is the main purpose for this cou
   This course is intended to serve as an introduction to von Neumann algebras, specifically the theory and classification of II1 factors.

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) Updating references used in teaching process.
   2) Using e-learning facilities more efficiently.
   3) Encouraging students to collect problems from web-based reference material and supervise classroom discussions.

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

Course Description:
This is a 4 credit hours course comprising approximately 60 hours of lectures.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Basic theory of von Neumann algebras.	3	12
The double commutant theorem	3	12
The weak and Ultraweak topologies	3	12
Kaplansky density theorem	4	16
Abelian von Neumann algebras	2	8

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

	Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	60	0				60
Credit	4	0				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:** At the end of the course the student will be able to:		
1.1	1) reproduce definitions and results, together with their proofs, within the scope of the syllabus of the course 2) apply these results to examples 3) formulate and present definitions, proofs and computations in a mathematically rigorous way	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	4) Planning rigorous proofs of different propositions and assertions in this context. 5) Apply basic theorems for Banach algebras. 6) Investigate examples to which the theories under concern can be applied.	Lectures	Periodic written and oral tests. Discussion. Observation.
3.0	**Interpersonal Skills & Responsibility**		
3.1	1) Punctual attendance of classes is required. 2) Students should demonstrate their sense of responsibility for learning by completing both reading and writing assignments in due time.		

	3) Students learn to manage their time. 4) Students should act responsibly and ethically in carrying.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Work effectively in groups and independently.	Tasks assigned and homework.	Marking the assignments
	Solve problems concerning the topics of the course.	Homework	Evaluating the homework
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable
5.2	Not applicable	Not applicable	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	First periodic exam	6	20
2	Second periodic exam	10	20
4	Homework + reports + Quizzes	Over all weeks	20
5	Final exam	End	40

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)

1- Office hours per week in the lecturer schedule (4 hours per week).

2- Contact with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks

G.J. Murphy: C ∗ -algebras and operator theory, Academic Press, 1990.

2. List Essential References Materials (Journals, Reports, etc.)

- K Davidson: C ∗ -algebra by example. Providence, Rhode Island: American Mathematical Society, 1996.
- J Conway: A course in operator theory, Graduate studies in mathematics, Vol 21. Providence, Rhode Island: American Mathematical Society, 2000

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. Microsoft Word, Latex

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.) Classroom with capacity of 30-students. - Library.
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) None

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching: • Student feedback through electronic survey organized by the deanship of registration and acceptance.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Evaluation of the teachers by internal & external faculty members. • Visiting to the classrooms. • Mutual visits between colleagues and giving advices to each other after each lecture
3 Processes for Improvement of Teaching • Analysis of student course evaluation and feedback • Peer evaluation and feedback • Review of course portfolios • Workshops on pedagogical methods
4. Processes for Verifying Standards of Student Achievement (eg. 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) • Analysis of course assessments by other reviewers on a periodic basis.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Material and learning outcomes are periodically reviewed internally and externally. • Comparing course content and teaching methodologies with similar courses offered at other departments and universities. • Studying the outcomes of the students' evaluations of the course and use it to improve teaching strategies.

Name of Course Instructor:

Signature: _____ Date Specification Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Approximation Theory**

Course Code: **4047105-4**

Course Specifications

Institution: Umm Al-Qura University	Date: Nov 10, 2018
College/Department : Faculty of Applied Science – Department of Mathematical Sciences	

A. Course Identification and General Information

1. Course title and code: Approximation Theory 4047105-4
2. Credit hours: 4 Credit 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 Dr. A. Alahmari
5. Level/year at which this course is offered: Second Year
6. Pre-requisites for this course (if any
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7. Co-requisites for this course (if any):
8. Location if not on main campus: Main Campus and Girls sections
9. Mode of Instruction (mark all that apply):

a. traditional classroom	√	What percentage?	100
b. blended (traditional and online)		What percentage?	
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
   The purpose of this course is to approximate functions by simpler functions with interesting properties, e.g. by polynomials, splines, wavelets, etc.

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) Updating references used in teaching process.
   2) Using e-learning facilities more efficiently.
   3) Encouraging students to collect problems from web-based reference material and supervise classroom discussions.

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

Course Description:
This is a 4 credit hours course comprising approximately 60 hours of lectures.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Basic concepts (best approximations, degree of approximations,...), Weierstrass theorems	4	16
Existence and uniqueness of best approximation, Interpolation	4	16
Approximation by polynomials and by trig functions	4	16
Chebyshev polynominals	3	13

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

	Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	60	0				60
Credit	4	0				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:** At the end of the course the student will be able to:		
1.1	1) reproduce definitions and results, together with their proofs, within the scope of the syllabus of the course 2) apply these results to examples 3) formulate and present definitions, proofs and computations in a mathematically rigorous way	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	4) Planning rigorous proofs of different propositions and assertions in this context. 5) Apply basic theorems for Banach algebras. 6) Investigate examples to which the theories under concern can be applied. 7) Use lecture notes and other texts to solve challenging problems.	Lectures	Periodic written and oral tests. Discussion. Observation.
3.0	**Interpersonal Skills & Responsibility**		
3.1	1) Punctual attendance of classes is required. 2) Students should demonstrate their sense of responsibility for learning by completing both reading and writing assignments in due time. 3) Students learn to manage their time. 4) Students should act responsibly and ethically in carrying.		
4.0	**Communication, Information Technology, Numerical**		

4.1	Work effectively in groups and independently.	Tasks assigned and homework.	Marking the assignments
4.2	Solve problems concerning the topics of the course.	Homework	Evaluating the homework
5.0	**Psychomotor**		
5.1	Not Applicable	Not Applicable	Not Applicable
5.2	Not Applicable	Not Applicable	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	First periodic exam	6	20
2	Second periodic exam	10	20
4	Homework + reports + Quizzes	Over all weeks	20
5	Final exam	End	40

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)

1- Office hours per week in the lecturer schedule (4 hours per week).

2- Contact with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks
- A Course in Approximation Theory, by W. Cheney and W. Light (AMS)
- Approximation Theory and Methods, Powell M.J.D., 1981, Cambridge Un.Press
- H N Mhaskar and D V Pai, Fundamentals of approximation theory, Narosa (1st edition), 2000

2. List Essential References Materials (Journals, Reports, etc.)
Lioyd N Trefethen, Approximation theory and approximation practice, SIAM, 2012

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.
Microsoft Word, Latex

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.) Classroom with capacity of 30-students. - Library.
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) None

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching: • Student feedback through electronic survey organized by the deanship of registration and acceptance.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Evaluation of the teachers by internal & external faculty members. • Visiting to the classrooms. • Mutual visits between colleagues and giving advices to each other after each lecture
3 Processes for Improvement of Teaching • Analysis of student course evaluation and feedback • Peer evaluation and feedback • Review of course portfolios • Workshops on pedagogical methods
4. Processes for Verifying Standards of Student Achievement (eg. 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) • Analysis of course assessments by other reviewers on a periodic basis.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Material and learning outcomes are periodically reviewed internally and externally. • Comparing course content and teaching methodologies with similar courses offered at other departments and universities. • Studying the outcomes of the students' evaluations of the course and use it to improve teaching strategies.

Name of Course Instructor: Dr. A. Alahmari

Signature: _____ Date Specification Completed: Nov 15, 2018
Program Coordinator: _____
Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: Curves and Singularities

Course Code: 4047107-4

Course Specifications

Institution: Umm Al-Qura University	Date: March 31, 2018
College/Department : Faculty of Applied Science – Department of Mathematical Sciences	

A. Course Identification and General Information

1. Course title and code: **Curves and Singularities 4047107-4**
2. Credit hours **4 Credit 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
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course **Dr. Fawaz Allohaibi**
5. Level/year at which this course is offered**:** **PhD/ Level 3**
6. Pre-requisites for this course (if any) : **------**
7. Co-requisites for this course (if any) : **--**
8. Location if not on main campus **Al-Abdia Campus and Alzahir Campus**
9. Mode of Instruction (mark all that apply):

a. traditional classroom	√	What percentage?	100
b. blended (traditional and online)		What percentage?	
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? **The course is intended to give an introduction to the ideas of modern singularity theory, using curves, families of curves and families of surfaces.**
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) **a) The course material is posted on the Web (CT) that could be accessed by the students enrolled in the course only.** **b) Students are encouraged to use online programs as one of computing resources .** **c) Use e-learning facilities more efficiently.** **Use computer packages for solving exercises**

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

Course Description: This is a 4 credit hours course comprising approximately 60 hours of lectures.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Curves and functions on them	**3**	**12**
A_k singularities and change of variable.	**2**	**8**
Manifolds, diffeomorphisms, envelopes and Discriminants.	**5**	**20**
Versal unfoldings and pplications of unfoldings.	**5**	**20**

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

	Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	60	0				60
Credit	4	0				4

1. 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:** After successful completion of the course, the student should be able to		
1.1	Define the related basic scientific facts, concepts, principles and techniques calculus	**Lectures Tutorials Discussion Problem Solving**	**Exams Home work.**
1.2	Recognize the relevant theories and their applications in basic mathematics.		
2.0	**Cognitive Skills**		
2.1	Representing problems mathematically.	**Lectures Tutorials Solve Problem Brain Storming**	**Exams Quizzes. Homework. Discussion**
2.2	How to distinguish different rules in singularity theory		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Develop connections of singularity theory with other disciplines in Manifold theory	**Cooperative education Competitive education**	**Home work. Reports. Quizzes. Discussion**
3.2	Solve problems using a range of formats and approaches in basic science		
3.3	show the ability to work independently and within groups.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Learn how to summarize lectures or to collect materials of the course.	**Lectures tutorials brain storming**	**Home work. Reports. Discussion**
4.2	Learn how to solve difficulties in learning: **solving problems – enhance educational skills**		
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	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	First periodic exam	6	20
2	Second periodic exam	10	20

4	Homework + reports + Quizzes	Over all weeks	20
5	Final exam	End	40

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) **1- Office hours per week in the lecturer schedule (6 hours per week).** **2- Contact with students by e-mail,SMS, and e-learning facilities.**

E Learning Resources

1. Required Text(s) JW Bruce and P.J.Giblin, Curves and Singularities, Cambridge University Press, 1992
2. Essential References Shihoko Ishii, Introduction to singularities, Springer Japan (2nd edition), 2018.
3. Recommended Books and Reference Material (Journals, Reports, etc) (Attach List): ---
4.Electronic Materials, Web Sites etc **https://en.wikipedia.org/wiki/Singularity_theory**
5. Other learning material such as computer-based programs/CD, professional standards/regulations: **Maple**

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 (Lecture rooms, laboratories, etc.) -Classroom with capacity of 25-students. - Library.
2. Computing resources: **Online programs and computer laboratory**
3. Other resources (specify --eg. 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**:** **Student feedback through electronic facilities organized by the deanship of registration and acceptance.**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(i) Evaluation of the teachers by internal & external faculty members.** **(ii) Visiting to the classrooms.** **(iii) Mutual visits between colleagues and giving advices to each other after each lecture**
3 Processes for Improvement of Teaching **(i) Analysis of student course evaluation and feedback**

(ii) Peer evaluation and feedback **(iii) Review of course portfolios** (iv) **Workshops on pedagogical methods**
4. Processes for Verifying Standards of Student Achievement (eg. 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) **Analysis of course assessments by other reviewers on a periodic basis.**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **(i) Material and learning outcomes are periodically reviewed internally and externally.** **(ii) Comparing course content and teaching methodologies with similar courses offered at other departments and universities.** **(iii) Studying the outcomes of the students' evaluations of the course and use it to improve teaching strategies.**

Faculty or Teaching Staff: **Dr. Fawaz Alharbi** _____
Signature: _____ **Fawaz Alharbi** ___ Date Report Completed: _____
Received by: _____ Dean/Department Head
Signature: _____ Date_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title**: Differential topology**

Course Code: **4047602-4**

COURSE SPECIFICATIONS

Institution Umm Al-Qura University
College/Department Faculty of Applied Science/ Department of Mathematical Science

A. Course Identification and General Information

1. Course title and code Differential topology (4047602-4)				
2. Credit hours 4 Credit 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 Dr. Elsaid lashin				
5. Level/year at which this course is offered The third Level				
6. Pre-requisites for this course (if any) Differential Geometry (4046603-4)and Differentiable manifolds (4046602-4)				
7. Co-requisites for this course (if any)				
8. Location if not on main campus Main Campus and Girls sections				
9. Mode of Instruction (mark all that apply)				
a. Traditional classroom	✓	What percentage?	100	
b. Blended (traditional and online)		What percentage?		
c. e-learning		What percentage?		
d. Correspondence		What percentage?		
f. Other		What percentage?		

B Objectives

What is the main purpose for this course?

- **Be able to deal with Manifolds ,smooth maps, tangent space and tangent bundles . .**
- **Be Familiar with the concepts of immersions , embeddings and submersions (theory and examples) .**
- **Understand the concept of transversality and to deal with Sard theorem and Brouwer fix point theorem .**
- **Deal with Orientation and oriented intersection theory . .**
- **Studying the degree of a map and considering Hopf s degree theorem . .**
- **Be familiar with vector fields on manifolds and Poincare-Hopf s theorem . .**

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 collect problems from web based reference material and supervise classroom discussions.
2. Update references used in teaching process.
3. Use e-learning facilities more efficiently.

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		
List of Topics	No. of Weeks	Contact Hours
Warming-Up: **Manifolds ,submanifolds, smooth maps, tangent space, tangent bundles. .**	2	8
The constant rank theorem . Immersions,and embeddings, submersions. Transversality . Sard theorem.	4	16
Orientation . Oriented intersection theory. The degree of a map .	4	16
Vector fields on manifolds and Poincare-Hopf theorem . Morse functions . Classification of one and two – dimensional manifolds ..	5	20

2. Course components (total contact hours and credits per semester):							
	Contact Hours				Self-Study	Other	Total
	Lecture	Tutorial	Laboratory	Practical			
Contact Hours	60						60
Credit	4						4

3. Additional private study/learning hours expected for students per week.	5

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

	NQF Learning Domains And Course Learning Outcomes	**Course Teaching Strategies**	**Course Assessment Methods**
1.0	**Knowledge**		
	After successful completion of the course, the student should be able to (a)Give an account of central concepts and definitions in differential topology ; (b)State Sard theorem and some of its applications ; (c)Define and compute mapping degree and intersection number of two submanifolds . .	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	(i)To define index of a vector field and state the Poincare-Hopf theorem ; (ii)Define Morse function and outline a proof of existence ; (iii)State the classification of one and two-dimensional manifolds .	Homework consisting in solving selected exercises. Encourage and develop self - education	Homework Oral and written tests. Research projects.
3.0	**Interpersonal Skills & Responsibility**		

3.1	Punctual attendance of classes is required. Students should demonstrate their sense of responsibility for learning by completing both reading and writing assignments in due time. Students learn to manage their time. Accustom students to take responsibility of self –learning Students should act responsibly and ethically in carrying	Discussion. Explanation. Guidance and supervision of the group Assignments for research projects.	Home work. Reports. Quizzes. Discussion
4.0	**Communication, Information Technology, Numerical**		
4.1	Ability to communicate in written and in oral. Ability to write reports in English Ability to explain each step in the problem solving process. Ability to apply course concepts to mathematical problem solving model. Ability to use information technology in communication and research projects. Interact with life problems using different methods of thinking and problem solving.	Lectures tutorials brain storming	Periodic written and oral tests. Discussion. Observation.
5.0	**Psychomotor**		
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	Midterm 1	6th week	20%
2	Midterm 2	10th week	20%
4	Homework + reports + Quizzes	During the semester	20%
5	Final exam	End of semester	40%

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)
1- Office hours per week in the lecturer schedule (4 hours per week).
2- Contact with students by e-mail,SMS, and e-learning facilities.

E. Learning Resources

1. **Required Text(s):**
   Lee,John W. Introduction to smooth manifolds.Graduate Texts in Mathematics , 218. Springer.Verlag, New York, 2003.

2. Essential References :
Hirsch , Morris W.Differential topology .Graduate Texts in Mathematics , 33. Springer Verlag, New York, 1994.

3. Recommended Books and Reference Material (Journals, Reports, etc) (Attach List):
Use previous list

4.Electronic Materials, Web Sites etc http://ebookee.org/
5. Other learning material such as computer-based programs/CD, professional standards/regulations: Microsoft Word

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.) -Classroom with capacity of 30-students. - Library.
2. Computing resources: Not available
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: • Student feedback through electronic survey organized by the deanship of registration and acceptance.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Evaluation of the teachers by internal & external faculty members. • Visiting to the classrooms. • Mutual visits between colleagues and giving advices to each other after each lecture
3 Processes for Improvement of Teaching • Analysis of student course evaluation and feedback • Peer evaluation and feedback • Review of course portfolios • Workshops on pedagogical methods
4. Processes for Verifying Standards of Student Achievement (eg. 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) • Analysis of course assessments by other reviewers on a periodic basis.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Material and learning outcomes are periodically reviewed internallyand externally. • Comparing course content and teaching methodologies with similar coursesoffered at other departments and universities. • Studying the outcomes of the students' evaluations of the course and useitto improve teaching strategies.

Faculty or Teaching Staff: _____
Signature: ___ _____ Date Report Completed: _____
Received by: _____ Dean/Department Head
Signature: _____ Date_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Representation Theory (2): Auslander-Reiten Theory**

Course Code: **4047404-4**

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: Representation Theory (2) : Auslander-Reiten Theory 4047404-4			
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) 4047403-4			
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 theory of almost split sequences and the Auslander-Reiten quiver. This includes the concept and main theorems of algebras given by quivers, irreducible maps , almost split sequences and (A-R)-translate.
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 optional course comprising approximately 60 contact hours.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Algebras given by quivers- Split monomrphisms and split epimprphisms - Irreducible maps	2	8
Almost split sequences - (A-R)-translate – Existence theorem for A-R sequence.	2	8
A-R quivers - Auslander algebras and their homological characterization	2	8
Hereditary algebras of finite type – The functorial approach of A-R theory – Tilting theory	2	8
A-R quiver for the group algebra of cyclic group kC_p	2	8
A-R quiver for the group algebra $kSL(2,p)$	2	8
The major open problems and conjectures in representation theory	3	12

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. 4 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 irreducible maps between indecomposable modules as well as the almost split sequences. The homological properties of almost split sequences will be discussed.	Lectures and tutorials	Quizzes, periodical and final exams
1.2	The student will also aware of the role played by the A-R quiver in the representation of f d algebras as well as how to construct such quivers for some concrete examples. Moreover, the student will gain some knowledge on conjectures and open problems in the subject.	Lectures and tutorials	Quizzes, periodical and final exams
2.0	**Cognitive Skills**		
2.1	Constructing almost split sequences and A-R quivers for finite dimensional algebras	Lectures and tutorials	Quizzes, periodical and final exams
2.2	Develop practical skills on dealing with different operations on indecomposable modules over finite dimensional algebras	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

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Infinite dimensional Lie Algebras(2)**

Course Code: **4047406-4**

Course Specifications

Institution:Umm Alqura University, Makkah Date of Report: 14 November 2018
College/Department: College of Applied Science, Mathematical Science

A. Course Identification and General Information

1. Course Title and Code: **Infinite dimensional Lie Algebras)** 4047406-4
2. Credit hours: **4 Credit 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. Dr. Falih Aldosray**
5. Level/year at which this course is offered: **PhD/ Semester 4**
6. Pre-requisites for this course (if any) Lie algebras (4047401-4)
7. Co-requisites for this course (if any) Reading and Research course
8. Locations: **Main campus+Girls Sections**
9. Mode of Instruction (mark all that apply) a. Traditional classroom √ What percentage? 100 b. Blended (traditional and online) What percentage?- c. e-learning What percentage? d. Correspondence What percentage? f. Other What percentage? Comments: Mainly traditional classroom will dominant the mode on instruction.

B Objectives

1. What is the main purpose for this course? The course is designed to introduce the students to the basic concepts of infinite dimensional Lie algebras .
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) 3- Encourage students to use the most updated books. 4- Advise students to submit the homework online and using internet. 5- Encourage students to write their homework and essays using LaTeX.

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

(Lie algebra, Soluble and nilpotent Lie algebras. Subideals, Derivations, Chain conditions , Coalesent Classes of Lie algebras, Locally nilpotent radicals}.

Course Description: There are 4 credit hours for this course which are comprising approximately 60 hours of lectures.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact Hours
Basic concepts; Nilpotency and solubility , Subideals, Derivations, Classes and closure operations,Series.	2	8
- Soluble subideals:The circle product, the Derived Join Theorem	2	8
- Coalescent Classes of Lie algebras: Coalescence Classes with minimal and maximal conditions	2	8
- Locally nilpotent radicals: The Hirsch-Plotkin radical, Baer, Fitting, and Gruenberg radicals, Baer and Fitting algebras .	2	8
Lie algebras in which every subalgebra is a subideal: Nilpotent subideals, Engel conditions	2	8
Chain conditions for subideals, Finiteness Conditions for Soluble Lie algebras.	3	12
Chain conditions on ascendant abelian subalgebras	2	8

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

	Lecture	Tutorial	Laboratory	Practical /Clinical	Other: PBL	Total
Contact Hours	60	0	--	N/A	N/A	60
Credit	4	0				4

3. Additional private study/learning hours expected for students per week. 8

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:** After successful completion of the course, the student should be able to		
1.1	Know the basic facts and definitions of subideals of Lie algebras and their properties	Lectures: • Build on what students already know. • present new concepts and principles • use questioning and encouraging students. • Doing practice and involving students in the class. • Draw facts and doing responds.	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
1.2	Know the circle product and its properties .The Join Problem.		
1.3	know Coalescence Classes with minimal and maximal conditions		
1.4	know Locally nilpotent radicals		
1.5	Know Lie algebras in which every sub algebra is a subideal		
1.6	know Chain conditions for subideals and their properties		
2.0	**Cognitive Skills**		
2.1	Planning rigorous proofs of different propositions and assertions in this context	• Request from students to do some preparations for the lectures. • Give students challenging exercise and problems. • Request from students via discussions to compare the lectures with other topics in the same level.	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
2.2	. Apply basic theorems of infinite dimensional Lie algebras		
2.3	Investigate particular examples of infinite dimensional Lie algebras to which the theories under concern can be applied		
2.4	. Use lecture notes and other texts to solve challenging problems.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Demonstrate communication skills with the teacher and other students in the class.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in college	
3.2	Analyze and illustrate basic facts.		
3.3	To show and exhibit ethical behavior.		
3.4	To show skills for judging basic facts.		
3.5	To write and work independently.		
3.6	To work effectively in teams.		
3.7	To manage time properly, meet deadlines.		

		and department committees. • Joint and use useful media for education.	
4.0	**Communication, Information Technology, Numerical**		
4.1	Demonstrate mathematics to others in oral form.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in college and department committees. • Joint and use useful media for education. • To use emails and internet evocatively. • Give presentations • Doing competitions and participate in mathematical discussions	
4.2	illustrate mathematics to others in others in written form.		
4.3	Evaluate mathematics in a well-organized form.		
4.4	Research library in an excellent way.		
4.5	Research MathSciNet and good databases.		
4.6	Operate and use the university facilities in a good manner.		
4.7	Criticize and evaluate as well as express a judgment on the art of mathematics in this field.		
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable

Suggested Guidelines for Learning Outcome Verb, Assessment, and Teaching

NQF Learning Domains	Suggested Verbs
Knowledge	list, name, record, define, label, outline, state, describe, recall, memorize, reproduce, recognize, record, tell, write
Cognitive Skills	estimate, explain, summarize, write, compare, contrast, diagram, subdivide, differentiate, criticize, calculate, analyze, compose, develop, create, prepare, reconstruct, reorganize, summarize, explain, predict, justify, rate, evaluate, plan, design, measure, judge, justify, interpret, appraise
Interpersonal Skills & Responsibility	demonstrate, judge, choose, illustrate, modify, show, use, appraise, evaluate, justify, analyze, question, and write
Communication, Information Technology, Numerical	demonstrate, calculate, illustrate, interpret, research, question, operate, appraise, evaluate, assess, and criticize
Psychomotor	demonstrate, show, illustrate, perform, dramatize, employ, manipulate, operate, prepare, produce, draw, diagram, examine, construct, assemble, experiment, and reconstruct

Suggested ***verbs not to use*** when writing measurable and assessable learning outcomes are as follows:

Consider	Maximize	Continue	Review	Ensure	Enlarge	Understand
Maintain	Reflect	Examine	Strengthen	Explore	Encourage	Deepen

Some of these verbs can be used if tied to specific actions or quantification.

Suggested assessment methods and teaching strategies are:

According to research and best practices, multiple and continuous assessment methods are required to verify student learning. Current trends incorporate a wide range of rubric assessment tools; including web-based student performance systems that apply rubrics, benchmarks, KPIs, and analysis. Rubrics are especially helpful for qualitative evaluation. Differentiated assessment strategies include: exams, portfolios, long and short essays, log books, analytical reports, individual and group presentations, posters, journals, case studies, lab manuals, video analysis, group reports, lab reports, debates, speeches, learning logs, peer evaluations, self-evaluations, videos, graphs, dramatic performances, tables, demonstrations, graphic organizers, discussion forums, interviews, learning contracts, antidotal notes, artwork, KWL charts, and concept mapping.

Differentiated teaching strategies should be selected to align with the curriculum taught, the needs of students, and the intended learning outcomes. Teaching methods include: lecture, debate, small group work, whole group and small group discussion, research activities, lab demonstrations, projects, debates, role playing, case studies, guest speakers, memorization, humor, individual presentation, brainstorming, and a wide variety of hands-on student learning activities.

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	Continuous Assessment Evaluation	Weekly	20%
2	First Periodic Exam	6	20 %
3	Second Periodic Exam	10	20%
4	Final Examination (written Exam)	End of the semester	40%

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) -Each group of students is assigned to a particular faculty where he or she will provide academic advising during specific academic hours. Each staff will provide at least one session/week. -There will be an academic advisor how will be a responsible for helping the student by doing the general supervision . - The people in the library will support the students during the time of the course.

E. Learning Resources

Text books: 1.R. Amayo and I. Stewart, Infinite Dimensional Lie Algebras Noordhoff International Publishing(1974). 2. K. Erdman and M. Wildon, Introduction to Lie Algebras, 2nd ed., Springer, New York, 2007. 3. I. Stewart, Lie algebras generated by finite-dimmensional ideals.Pitman Publishing (Reseach Note in Mathematics 2)1975
2. List Essential References Materials (Journals, Reports, etc.)) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID.
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID.
4. List Electronic Materials(eg. Web Sites, Social Media, Blackboard, etc.) - https://en.wikipedia.org/wiki/BlockTheory -) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. -LaTeX and Latexbeamer. -Magma -Gap

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.)
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) - Lecture classroom which can accommodate 15 students for lectures (normal and classical classroom)

2. Computing resources (AV, data show, Smart Board, software, etc.) **Data Show (projector): sometimes shall be used.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **This course is a basic and fundamental course in commutative algebra.**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching

Following completion of the prescribed course study in Pediatrics module, an evaluation should be conducted through the following: - A student questionnaire feedback should be carried out on the quality & effectiveness of teaching and evaluation
2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor - A staff questionnaire feedback about course
3 Processes for Improvement of Teaching - Submission of a final evaluation report at the end of the course - A review of the recommended teaching strategies should be submitted after evaluation.
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) - Compare the standards of students achievements' with standards archived elsewhere (inside KSA or students from outside the kingdom) by checking the marking of a sample of some student work : tests, course work - Assignment by an independent member of teaching staff either from the UQU or other universities

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Reviewing feedback on the quality of course report from staff members, other university' staffs. - Looking for strengthen and weak points gathered at the end of the course and working on it. - Plan to introduce updating material and technology that could improve the quality

Faculty or Teaching Staff: Prof. Dr. Ahmad Mohammed Ahmad Alghamdi

Signature: ___Ahmad Mohammed Ahmad Alghamdi____

Date Report Completed: 14 November 2018_____

Received by: _____ Dean/Department Head

Signature: _____ Date: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title**: Block Theory (2)**

Course Code: **4047408-4**

Course Specifications

Institution:Umm Alqura University, Makkah Date of Report: 14 November 2018
College/Department: College of Applied Science, Mathematical Science

A. Course Identification and General Information

1. Course Title and Code: Block Theory (2) 4047408-4
2. Credit hours: **4 Credit 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. Dr. Ahmad Mohammed Ahmad Alghamdi**
5. Level/year at which this course is offered: **PhD/ Level 4**
6. Pre-requisites for this course (if any) **Block Theory (1) 4047407-4**
7. Co-requisites for this course (if any) **---**
8. Locations: **Main campus+Girls Sections**
9. Mode of Instruction (mark all that apply) a. Traditional classroom [√] What percentage? [100] b. Blended (traditional and online) What percentage?- c. e-learning What percentage? d. Correspondence What percentage? f. Other What percentage? Comments:Mainly traditional classroom will dominant the mode on instruction.

B Objectives

1. What is the main purpose for this course?

The aim of the course is to introduce graduate students into the structure of blocks of group algebras and vertex theory of indecomposable (Green Theory) modules as well as fusion systems and related Puig Theory.

In particular, we shall cover the following topics:

- Some revision of representation theory and algebras and fusion of elements of groups.
- Green Correspondence of indecomposable modules.
- Puig's approach for G-algebras and interior G-algebras.
- Introduction of fusion systems and its local theory.
- Fusion and homotopy.
- Fusion and representation theory.
- Recent progress in this field and some open problems which are related to fusion systems.

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- Encourage students to use the most updated books.
2- Advise Students to use : MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia and ORCID.
3- Advise students to submit the homework online and using internet.
4- Encourage students to write their homework and essays using LaTeX.

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

Course Description:
There are 4 credit hours for this course which are comprising approximately 60 hours of lectures.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact Hours
Some revision of representation theory and algebras and fusion of elements of groups.	2	8
Green Correspondence of indecomposable modules (Vertex Theory)	3	12
Puig's approach for G-algebras and interior G-algebras.	2	8
Introduction of fusion systems and its local theory.	2	8
Fusion and homotopy.	2	8
Fusion and representation theory.	2	8
Recent progress in this field and some open problems which are related to fusion systems.	2	8

2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory	Practical /Clinical	Other: PBL	Total
Contact Hours	60	0	--	N/A	N/A	60
Credit	4	0				4

3. Additional private study/learning hours expected for students per week.	8

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**		
1.1	To revise and recognize representation theory and algebras and fusion of elements of groups.	Lectures: • Build on what students already know. • present new concepts and principles • use questioning and encouraging students. • Doing practice and involving students in the class. • Draw facts and doing responds.	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
1.2	To describe Green Correspondence of indecomposable modules (Vertex Theory)		
1.3	To give an explanation of Puig's approach for G-algebras and interior G-algebras.		
1.4	To describe fusion systems and its local theory.		
1.5	To describe and recognize the relationship between fusion in groups and homotopy.		
1.6	To describe and recognize the relationship between fusion in groups and representation theory.		
1.7	To state and open problems which are related to fusion systems.		
2.0	**Cognitive Skills**		
2.1	1-To interpret and criticize as well as construct representation theory and algebras and fusion of elements of groups.	• Request from students to do some preparations for the lectures. • Give students challenging exercise and problems. • Asking students for doing generalizations and extensions for the theoretical parts of the lectures. • Request from students via discussions to compare the lectures with other topics in the same level. • Doing extensive discussions • Doing Quizzes.	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
2.2	To explain Green Correspondence of indecomposable modules (Vertex Theory)		
2.3	To reorganize of Puig's approach for G-algebras and interior G-algebras.		
2.4	To fusion systems and its local theory.		
2.5	To explain and interpret relative the relationship between fusion in groups and homotopy.		
2.6	To explain the relationship between fusion in groups and homotopy.		
2.7	To try to prove and develop some open problems which are related to fusion systems.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Demonstrate communication skills with the teacher and other students in the class.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and	
3.2	Analyze and illustrate basic facts.		
3.3	To show and exhibit ethical behavior.		
3.4	To show skills for judging basic facts.		
3.5	To write and work independently.		
3.6	To work effectively in teams.		

3.7	To manage time properly, meet deadlines.	department days and activities. • Joint and participate evocatively in college and department committees. • Joint and use useful media for education	
4.0	**Communication, Information Technology, Numerical**		
4.1	Demonstrate mathematics to others in oral form.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in college and department committees. • Joint and use useful media for education. • To use emails and internet evocatively. • Give presentations • Doing competitions and participate in mathematical discussions.	
4.2	illustrate mathematics to others in others in written form.		
4.3	Evaluate mathematics in a well-organized form.		
4.4	Research library in an excellent way.		
4.5	Research MathSciNet and good databases.		
4.6	Operate and use the university facilities in a good manner.		
4.7	Criticize and evaluate as well as express a judgment on the art of mathematics in this field.		
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	

Suggested Guidelines for Learning Outcome Verb, Assessment, and Teaching

NQF Learning Domains	Suggested Verbs
Knowledge	list, name, record, define, label, outline, state, describe, recall, memorize, reproduce, recognize, record, tell, write
Cognitive Skills	estimate, explain, summarize, write, compare, contrast, diagram, subdivide, differentiate, criticize, calculate, analyze, compose, develop, create, prepare, reconstruct, reorganize, summarize, explain, predict, justify, rate, evaluate, plan, design, measure, judge, justify, interpret, appraise
Interpersonal Skills & Responsibility	demonstrate, judge, choose, illustrate, modify, show, use, appraise, evaluate, justify, analyze, question, and write
Communication, Information Technology, Numerical	demonstrate, calculate, illustrate, interpret, research, question, operate, appraise, evaluate, assess, and criticize
Psychomotor	demonstrate, show, illustrate, perform, dramatize, employ, manipulate, operate, prepare, produce, draw, diagram, examine, construct, assemble, experiment, and reconstruct

Suggested ***verbs not to use*** when writing measurable and assessable learning outcomes are as follows:

Consider Maximize Continue Review Ensure Enlarge Understand
Maintain Reflect Examine Strengthen Explore Encourage Deepen

Some of these verbs can be used if tied to specific actions or quantification.

Suggested assessment methods and teaching strategies are:

According to research and best practices, multiple and continuous assessment methods are required to verify student learning. Current trends incorporate a wide range of rubric assessment tools; including web-based student performance systems that apply rubrics, benchmarks, KPIs, and analysis. Rubrics are especially helpful for qualitative evaluation. Differentiated assessment strategies include: exams, portfolios, long and short essays, log books, analytical reports, individual and group presentations, posters, journals, case studies, lab manuals, video analysis, group reports, lab reports, debates, speeches, learning logs, peer evaluations, self-evaluations, videos, graphs, dramatic performances, tables, demonstrations, graphic organizers, discussion forums, interviews, learning contracts, antidotal notes, artwork, KWL charts, and concept mapping.

Differentiated teaching strategies should be selected to align with the curriculum taught, the needs of students, and the intended learning outcomes. Teaching methods include: lecture, debate, small

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	Continuous Assessment Evaluation	Weekly	20%
2	First Periodic Exam	6	20 %
3	Second Periodic Exam	10	20%
4	Final Examination (written Exam)	End of the semester	40%

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)

-Each group of students is assigned to a particular faculty where he or she will provide academic advising during specific academic hours. Each staff will provide at least one session/week.
-There will be an academic advisor how will be a responsible for helping the student by doing the general supervision .
- The people in the library will support the students during the time of the course.

E. Learning Resources

Text books:

1. G. Navarro, Characters and blocks of finite groups, Volume 250 of London Mathematical Society Lecture Notes Series. Cambridge University Press, Cambridge 1998.
2. Michael Aschbacher, Radha Kessar and Bob Oliver, Fusion Systems in Algebra and Topology, LMS, LNS 391, Cambridge Press 2011 ISBN:978-107-60100-0.
3. H. Nagao and Y. Tsushima, Representation of finite groups, Academic Press Inc., Boston, MA, Translated from Japanese, (1989).
4. John L. Alperin, Local Representation Theory, Cambridge University Press, Cambridge, 1986.
5. Charles W. Curtis and Irving Reiner, Representation Theory of Finite Groups and Associative Algebras, American Mathematical Society, New York, 1962.
6. Charles W. Curtis and Irving Reiner, Methods of Representation Theory with Applications to Finite Groups and Orders, Volume I, John Wiley and Sons, New York, 1981.
7. Charles W. Curtis and Irving Reiner, Methods of Representation Theory with Applications to Finite Groups and Orders, Volume II, John Wiley and Sons, New York, 1987.
8. Charles W. Curtis, Pioneers of Representation Theory AMS and LMS, Volume 15, 1999.
9. David A. Craven, The Theory of Fusion Systems, Cambridge Studies in Advanced Mathematics, 131, 2011, ISBN: 978-107-00596-9.
10. Walter Feit, The representation Theory of Finite groups, North-Holand Mathematical Library, September 1980.
11. Serre, Jean-Pierre, Linear Representations of Finite Groups, New York: Springer-Verlag, (1977), ISBN: 0387-90190-6.

12. Peter Webb, A Course in Finite Group Representation Theory, Cambridge University Press, Cambridge, 2016. 13. Burkhard Kulshammer, Lectures on Block Theory, Cambridge University Press, Cambridge, 1991. 14. 9- J. Thevenaz, G-Algebras and Modular Representation Theory, Oxford Science Publications, Oxford, (1995).
2. List Essential References Materials (Journals, Reports, etc.) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID
4. List Electronic Materials(eg. Web Sites, Social Media, Blackboard, etc.) - https://en.wikipedia.org/wiki/FusionSystems - https://en.wikipedia.org/wiki/GreenCorrespondence -) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. -LaTeX and Latexbeamer. -Magma -Gap

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.)
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) - Lecture classroom which can accommodate 15 students for lectures (normal and classical classroom)

2. Computing resources (AV, data show, Smart Board, software, etc.) **Data Show (projector): sometimes shall be used.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **This course is a basic and fundamental course in Block Theory of finite groups.**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Following completion of the prescribed course study in Pediatrics module, an evaluation should be conducted through the following: - A student questionnaire feedback should be carried out on the quality & effectiveness of teaching and evaluation
2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor - A staff questionnaire feedback about course
3 Processes for Improvement of Teaching - Submission of a final evaluation report at the end of the course - A review of the recommended teaching strategies should be submitted after evaluation.

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) - Compare the standards of students achievements' with standards archived elsewhere (inside KSA or students from outside the kingdom) by checking the marking of a sample of some student work : tests, course work - Assignment by an independent member of teaching staff either from the UQU or other universities

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Reviewing feedback on the quality of course report from staff members, other university' staffs. - Looking for strengthen and weak points gathered at the end of the course and working on it. - Plan to introduce updating material and technology that could improve the quality

Faculty or Teaching Staff: Prof. Dr. Ahmad Mohammed Ahmad Alghamdi

Signature: ___Ahmad Mohammed Ahmad Alghamdi____

Date Report Completed: 14 November 2018_____

Received by: _____ Dean/Department Head

Signature: _____ Date: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Soluble and Locally Nilpotent Groups**

Course Code: **4047410-4**

Course Specifications

Institution:Umm Alqura University, Makkah Date of Report: 14 November 2018
College/Department: College of Applied Science, Mathematical Science

A. Course Identification and General Information

1. Course Title and Code: **Soluble and Locally Nilpotent Groups 4047410-4**
2. Credit hours: **4 Credit 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. Dr. Falih Aldosray**
5. Level/year at which this course is offered: **PhD/ Level 4**
6. Pre-requisites for this course (if any) **4046401-4, 4047409-4**
7. Co-requisites for this course (if any)
8. Locations: **Main campus+Girls Sections**
9. Mode of Instruction (mark all that apply) a. Traditional classroom √ What percentage? 100 b. Blended (traditional and online) What percentage?- c. e-learning What percentage? d. Correspondence What percentage? f. Other What percentage? Comments: Mainly traditional classroom will dominant the mode on instruction.

B Objectives

1. What is the main purpose for this course? The course is designed to introduce the students to the basic concepts of finite dimensional Lie algebras .
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) 3- Encourage students to use the most updated books. 4- Advise students to submit the homework online and using internet. 5- Encourage students to write their homework and essays using LaTeX.

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

(Finitely generated nilpotent groups, Finitely generated soluble groups. Locally nilpotent groups, Locally soluble groups).

Course Description: There are 4 credit hours for this course which are comprising approximately 60 hours of lectures.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact Hours
Abelian and Central series, Nilpotent groups, Finitely generated nilpotent groups, Groups of prime power orders.	3	9
Soluble groups: Composition Factors. Principal Factors and maximal subgroups,The Fitting subgroup of soluble groups, Supersoluble groups, Finitely generated soluble groups.	4	16
Hall π-subgroups, Sylow subgroups and system of normalizers, p-soluble groups, Formations.	2	8
Generalization of Nilpotent and Soluble groups: ; Locally nilpotent groups, Engel elements and Engel groups,	3	12
Classes of groups defined by general series,Locally soluble groups.	3	12

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

	Lecture	Tutorial	Laboratory	Practical /Clinical	Other: PBL	Total
Contact Hours	60	0	--	N/A	N/A	60
Credit	4	0				4

3. Additional private study/learning hours expected for students per week.	8

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:** After successful completion of the course, the student should be able to		
1.1	Know the basic facts about nilpotent and finitely generated nilpotent groups,	Lectures: • Build on what students already know. • present new concepts and principles • use questioning and encouraging students. • Doing practice and involving students in the class. • Draw facts and doing responds.	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
1.2	Know Fitting subgroup of soluble groups,		
1.3	Know Supersoluble groups, Finitely generated soluble groups.		
1.4	Know Hall π-subgroups, Sylow subgroups and system of normalizers,		
1.5	Know locally nilpotent groups, Engel elements and Engel groups.		
1.6	Know Locally soluble groups. Engel groups		
2.0	**Cognitive Skills**		
2.1	Planning rigorous proofs of different propositions and assertions in this context	• Request from students to do some preparations for the lectures. • Give students challenging exercise and problems. • Request from students via discussions to compare the lectures with other topics in the same level.	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
2.2	. Apply basic theorems Lie algebras		
2.3	Investigate particular examples of Lie algebras to which the theories under concern can be applied		
2.4	. Use lecture notes and other texts to solve challenging problems.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Demonstrate communication skills with the teacher and other students in the class.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in college and department committees.	
3.2	Analyze and illustrate basic facts.		
3.3	To show and exhibit ethical behavior.		
3.4	To show skills for judging basic facts.		
3.5	To write and work independently.		
3.6	To work effectively in teams.		
3.7	To manage time properly, meet deadlines.		

		• Joint and use useful media for education.	
4.0	**Communication, Information Technology, Numerical**		
4.1	Demonstrate mathematics to others in oral form.	Encourage students to: • Work in groups. • Visit library regularly. • Participate in the university activities. • Participate in college and department days and activities. • Joint and participate evocatively in college and department committees. • Joint and use useful media for education. • To use emails and internet evocatively. • Give presentations • Doing competitions and participate in mathematical discussions.	
4.2	illustrate mathematics to others in others in written form.		
4.3	Evaluate mathematics in a well-organized form.		
4.4	Research library in an excellent way.		
4.5	Research MathSciNet and good databases.		
4.6	Operate and use the university facilities in a good manner.		
4.7	Criticize and evaluate as well as express a judgment on the art of mathematics in this field.		
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable

Suggested Guidelines for Learning Outcome Verb, Assessment, and Teaching

NQF Learning Domains	Suggested Verbs
Knowledge	list, name, record, define, label, outline, state, describe, recall, memorize, reproduce, recognize, record, tell, write
Cognitive Skills	estimate, explain, summarize, write, compare, contrast, diagram, subdivide, differentiate, criticize, calculate, analyze, compose, develop, create, prepare, reconstruct, reorganize, summarize, explain, predict, justify, rate, evaluate, plan, design, measure, judge, justify, interpret, appraise
Interpersonal Skills & Responsibility	demonstrate, judge, choose, illustrate, modify, show, use, appraise, evaluate, justify, analyze, question, and write
Communication, Information Technology, Numerical	demonstrate, calculate, illustrate, interpret, research, question, operate, appraise, evaluate, assess, and criticize
Psychomotor	demonstrate, show, illustrate, perform, dramatize, employ, manipulate, operate, prepare, produce, draw, diagram, examine, construct, assemble, experiment, and reconstruct

Suggested ***verbs not to use*** when writing measurable and assessable learning outcomes are as follows:

Consider	Maximize	Continue	Review	Ensure	Enlarge	Understand
Maintain	Reflect	Examine	Strengthen	Explore	Encourage	Deepen

Some of these verbs can be used if tied to specific actions or quantification.

Suggested assessment methods and teaching strategies are:

According to research and best practices, multiple and continuous assessment methods are required to verify student learning. Current trends incorporate a wide range of rubric assessment tools; including web-based student performance systems that apply rubrics, benchmarks, KPIs, and analysis. Rubrics are especially helpful for qualitative evaluation. Differentiated assessment strategies include: exams, portfolios, long and short essays, log books, analytical reports, individual and group presentations, posters, journals, case studies, lab manuals, video analysis, group reports, lab reports, debates, speeches, learning logs, peer evaluations, self-evaluations, videos, graphs, dramatic performances, tables, demonstrations, graphic organizers, discussion forums, interviews, learning contracts, antidotal notes, artwork, KWL charts, and concept mapping.

Differentiated teaching strategies should be selected to align with the curriculum taught, the needs of students, and the intended learning outcomes. Teaching methods include: lecture, debate, small group work, whole group and small group discussion, research activities, lab demonstrations, projects, debates, role playing, case studies, guest speakers, memorization, humor, individual presentation, brainstorming, and a wide variety of hands-on student learning activities.

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	Continuous Assessment Evaluation	Weekly	20%
2	First Periodic Exam	6	20 %
3	Second Periodic Exam	10	20%
4	Final Examination (written Exam)	End of the semester	40%

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) -Each group of students is assigned to a particular faculty where he or she will provide academic advising during specific academic hours. Each staff will provide at least one session/week. -There will be an academic advisor how will be a responsible for helping the student by doing the general supervision . - The people in the library will support the students during the time of the course.

E. Learning Resources

Text books: .1. John C. Lennox , Derek J. S. Robinson ; The Theory of Infinite Soluble Groups (Oxford Mathematical Monographs) 2004 2. Robinson, Derek, A Course in the Theory of Groups, Graduate Texts in Mathematics (1996).
2. List Essential References Materials (Journals, Reports, etc.)) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID.
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID.
4. List Electronic Materials(eg. Web Sites, Social Media, Blackboard, etc.) - https://en.wikipedia.org/wiki/BlockTheory -) MathSciNet, Springer, Scopus, Researchgate.net, ResearchId, Google Scholar, Academia, ORCID
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. -LaTeX and Latexbeamer. -Magma -Gap

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.)
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) - Lecture classroom which can accommodate 15 students for lectures (normal and classical classroom)

2. Computing resources (AV, data show, Smart Board, software, etc.) **Data Show (projector): sometimes shall be used.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **This course is a basic and fundamental course in commutative algebra.**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Following completion of the prescribed course study in Pediatrics module, an evaluation should be conducted through the following: - A student questionnaire feedback should be carried out on the quality & effectiveness of teaching and evaluation
2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor - A staff questionnaire feedback about course
3 Processes for Improvement of Teaching - Submission of a final evaluation report at the end of the course - A review of the recommended teaching strategies should be submitted after evaluation.
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) - Compare the standards of students achievements' with standards archived elsewhere (inside KSA or students from outside the kingdom) by checking the marking of a sample of some student work : tests, course work - Assignment by an independent member of teaching staff either from the UQU or other universities

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Reviewing feedback on the quality of course report from staff members, other university' staffs. - Looking for strengthen and weak points gathered at the end of the course and working on it. - Plan to introduce updating material and technology that could improve the quality

Faculty or Teaching Staff: Prof. Dr. Ahmad Mohammed Ahmad Alghamdi

Signature: ___Ahmad Mohammed Ahmad Alghamdi____

Date Report Completed: 14 November 2018_____

Received by: _____ Dean/Department Head

Signature: _____ Date: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Local Spectral Theory**

Course Code: **4047104-4**

Course Specifications

Institution: Umm Al-Qura University	Date: November 12, 2018
College/Department : Mathematics	

A. Course Identification and General Information

1. Course title and code: Local Spectral Theory
2. Credit hours: 4 Credit 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
....
5. Level/year at which this course is offered: PhD / level 4
6. Pre-requisites for this course (if any): Introduction to functional analysis (4046101-4)
Operator theory (4046103-4)
7. Co-requisites for this course (if any):
8. Location if not on main campus: Al-Abdia Campus Al-Zahir campus
9. Mode of Instruction (mark all that apply):

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

Comments:

B Objectives

1. What is the main purpose for this cou
   This course is intended to serve as an introduction to local spectral theory.

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) Updating references used in teaching process.
   2) Using e-learning facilities more efficiently.
   3) Encouraging students to collect problems from web-based reference material and supervise classroom discussions.

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

Course Description:
This is a 4 credit hours course comprising approximately 52 hours of lectures.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Preliminaries: Fréchet spaces, Cauchy Theorem. Relations of orthogonality. Inductive limit. Gleason Theorem	3	12
Local spectrum. Holomorphic functional calculus. Spectral subspaces. Local spectral radius	4	16
Decomposable operators: Single valued extension property Dunford Property. Beta property. Decomposable operators	4	16
Duality between ($\boldsymbol{\beta}$) and ($\boldsymbol{\delta}$) properties: Characterization of operators satisfying ($\boldsymbol{\beta}$) property. Characterization of operators satisfying ($\boldsymbol{\delta}$) property. ($\boldsymbol{\beta}$) and $\boldsymbol{\delta}$ properties Duality between ($\boldsymbol{\beta}$) and $\boldsymbol{\delta}$ properties.	4	16

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

	Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	60	0				60
Credit	4	0				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:** At the end of the course the student will be able to:		
1.1	1) reproduce definitions and results, together with their proofs, within the scope of the syllabus of the course 2) apply these results to examples 3) formulate and present definitions, proofs and computations in a mathematically rigorous way	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	4) Planning rigorous proofs of different propositions and assertions in this context. 5) Apply basic theorems for local spectral theory 6) Investigate examples to which the theories under concern can be applied.	Lectures	Periodic written and oral tests. Discussion. Observation.
3.0	**Interpersonal Skills & Responsibility**		
3.1	1) Punctual attendance of classes is required. 2) Students should demonstrate their sense of responsibility for learning by completing both reading and writing assignments in due time. 3) Students learn to manage their time. 4) Students should act responsibly and ethically in carrying.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Work effectively in groups and independently.	Tasks assigned and homework.	Marking the assignments

	Solve problems concerning the topics of the course.	Homework	Evaluating the homework
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable
5.2	Not applicable	Not applicable	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	First periodic exam	6	20
2	Second periodic exam	10	20
4	Homework + reports + Quizzes	Over all weeks	20
5	Final exam	End	40

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)

1- Office hours per week in the lecturer schedule (4 hours per week).

2- Contact with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks

- Laursen, K. B. and Neumann, M. M. (2000). An introduction to Local spectral Theory. London Math. Soc. Monographs, Clarendon Press, Oxford
- Conway, J. B. (1990). A course in Functional Analysis, 2nd edn. Springer-Verlag, New York. MR 91e : 46001.
- Conway, J. B. (2000). A course in Operator Theory, Graduate Studies in Mathematics, Volume 21, American Mathematical Society.
- Jarchow. H (1981). Locally convex spaces. Teubner, Stuttgart. MR 83h : 46008.
- Rudin. W. (1991). Functional Analysis, 2nd edn. McGraw-Hill, New York. MR 92k : 46001.

2. List Essential References Materials (Journals, Reports, etc.)

Laursen, K. B. and Neumann, M. M. (2000). An introduction to Local spectral Theory. London Math. Soc. Monographs, Clarendon Press, Oxford

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.

Microsoft Word, Latex

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.) Classroom with capacity of 30-students. - Library.
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) None

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching:

- Student feedback through electronic survey organized by the deanship of registration and acceptance.

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

- Evaluation of the teachers by internal & external faculty members.
- Visiting to the classrooms.
- Mutual visits between colleagues and giving advices to each other after each lecture

3 Processes for Improvement of Teaching

- Analysis of student course evaluation and feedback
- Peer evaluation and feedback
- Review of course portfolios
- Workshops on pedagogical methods

4. Processes for Verifying Standards of Student Achievement (eg. 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)

- Analysis of course assessments by other reviewers on a periodic basis.

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

- Material and learning outcomes are periodically reviewed internally and externally.
- Comparing course content and teaching methodologies with similar courses offered at other departments and universities.
- Studying the outcomes of the students' evaluations of the course and use it to improve teaching strategies.

Name of Course Instructor:

Signature: _____ Date Specification Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Distribution Theory and Fourier Analysis: An Introduction**

Course Code: **4047106-4**

Course Specifications

Institution: Umm Al-Qura University	Date: March 31, 2018
College/Department:	

A. Course Identification and General Information

1. Course title and code: Distribution Theory and Fourier Analysis: An Introduction 4047106-4
2. Credit hours: 4 Credit 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 Dr. Mohamed
5. Level/year at which this course is offered:
6. Pre-requisites for this course (if any): General Topology (4046601-4)
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?	100
b. blended (traditional and online)		What percentage?	
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?

Distribution theory can be thought of as the completion of diff erential calculus, just as Lebesgue integration theory can be thought of as the completion of integral calculus. It was created by Laurent Schwartz in the 20th century, as was Lebesgue's integration theory.

Distribution theory is a powerful tool that works very well in conjunction with the theory of Fourier transforms. One of the main areas of applications is to the theory of partial diff erential equations. In this course we give an introduction to these three theories.

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)

- Updating references used in teaching process.
- Using e-learning facilities more efficiently.
- Encouraging students to collect problems from web-based reference material and supervise classroom discussions.

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

Course Description:
This is a 4 credit hours course comprising approximately 60 hours of lectures.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Test functions and distributions on Rn: definitions and examples, Dirac δ- function, approximate identities and constructions using convolution of functions.	2	8
The calculus of distributions on Rn : functions as distributions, operations on distributions, adjoint identities, consistency of derivatives, distributional and weak solutions of PDEs, Sobolev functions.	2	12
The Fourier transform on Rn: from Fourier series to Fourier integrals (only for n=1n=1), the Schwartz class S of test functions on Rn , properties of the Fourier transform on S, the Fourier transform of a Gaussian and the inversion formula on S.	2	12
Fourier transforms of tempered distributions: definitions and examples, convolutions with tempered distributions.	3	12
Solving PDEs using Fourier transformation: the Laplace equation, the heat equation, the wave equation, Schrödinger's equation.	3	12

Fourier Analysis: the Riemann-Lebesgue lemma, Paley-Wiener theorems, the Poisson summation formula, the uncertainty principle.	3	12

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

	Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	60	0				60
Credit	4	0				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:** After successful completion of the course, the student should be able to		
1.1	1) Students will become acquainted with the basic techniques that in many situations form the starting point for the modern treatment of PDEs.	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	2) Planning rigorous proofs of different propositions and assertions in this context. 3) Investigate examples to which the theories under concern can be applied. 4) Use lecture notes and other texts to	Lectures	Periodic written and oral tests. Discussion. Observation.

	solve challenging problems.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	1) Punctual attendance of classes is required. 2) Students should demonstrate their sense of responsibility for learning by completing both reading and writing assignments in due time. 3) Students learn to manage their time. 4) Students should act responsibly and ethically in carrying.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Work effectively in groups and independently.	Tasks assigned and homework.	Marking the assignments
4.2	Solve problems concerning the topics of the course.	Homework	Evaluating the homework
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable
5.2	Not applicable	Not applicable	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	First periodic exam	6	20
2	Second periodic exam	10	20
4	Homework + reports + Quizzes	Over all weeks	20
5	Final exam	End	40

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)

1- Office hours per week in the lecturer schedule (4 hours per week).

2- Contact with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks

1) R.S. Strichartz, A Guide to Distribution Theory and Fourier Transforms (World Scientific, 1994. Reprinted: 2008, 2015)
In particular, Chapters 1-5 and Sections 7.1, 7.2, 7.3 and 7.5.

2. List Essential References Materials (Journals, Reports, etc.) 2) L.C. Evans, Partial Diff erential Equations (Amer. Math. Soc. 1998) 3) E.H. Lieb and M. Loss, Analysis (Amer. Math. Soc. 1997) 4) E.M. Stein and R. Shakarchi, Fourier analysis. An introduction (Princeton Univ. Press 2003)
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. Microsoft Word, Latex

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.) Classroom with capacity of 30-students. - Library.
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) None

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching: • Student feedback through electronic survey organized by the deanship of registration and acceptance.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Evaluation of the teachers by internal & external faculty members. • Visiting to the classrooms. • Mutual visits between colleagues and giving advices to each other after each lecture
3 Processes for Improvement of Teaching • Analysis of student course evaluation and feedback • Peer evaluation and feedback • Review of course portfolios

• Workshops on pedagogical methods
4. Processes for Verifying Standards of Student Achievement (eg. 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) • Analysis of course assessments by other reviewers on a periodic basis.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Material and learning outcomes are periodically reviewed internally and externally. • Comparing course content and teaching methodologies with similar courses offered at other departments and universities. • Studying the outcomes of the students' evaluations of the course and use it to improve teaching strategies.

Name of Course Instructor:

Signature: _____ Date Specification Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: Singularities of Caustics and wave fronts

Course Code: 4047108-4

Course Specifications

Institution: Umm Al-Qura University	Date: November 12, 2018
College/Department : Faculty of Applied Science – Department of Mathematical Sciences	

A. Course Identification and General Information

1. Course title and code: **Singularities of Caustics and wave fronts (4047108-4)**
2. Credit hours **4 Credit 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
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course **Dr. Fawaz Allohaibi**
5. Level/year at which this course is offered**: PhD, Level 3**
6. Pre-requisites for this course (if any) : **Curves and singularities 4047107-4**
7. Co-requisites for this course (if any) : **--**
8. Location if not on main campus **Al-Abdia Campus and Alzahir Campus**
9. Mode of Instruction (mark all that apply):

a. traditional classroom	√	What percentage?	100
b. blended (traditional and online)		What percentage?	
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? **The course is intended to give an introduction to the ideas of modern singularity theory, using curves, families of curves and families of surfaces.**
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) **a) The course material is posted on the Web (CT) that could be accessed by the students enrolled in the course only.** **b) Students are encouraged to use online programs as one of computing resources .** **c) Use e-learning facilities more efficiently.** **d) Use computer packages for solving exercises**

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

Course Description: This is a 4 credit hours course comprising approximately 60 hours of lectures.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Symplectic spaces: defintians and examples, cotangent bundle, space of extremals of variational problem	**1**	**4**
Contact spaces : definitions and examples, projectivised cotangent bundle	**1**	**4**
Lagrangian submanifolds symplectic spaces	**1**	**4**
Legendre submanifolds of contact spaces	**1**	**4**
Lagrangian bundles, Lagrangian projections, caustics, Legendre projections, wave fronts, examples from differential geometry	**2**	**8**
Legendre transformation, dual surfaces	**1**	**4**
Local singularities: generating functions for Legendre and Lagrange germs. Space of germs of functions, classification of function germs singularities	**3**	**12**
Moser's homotopy method and Malgrange preparation theorem	**2**	**8**
Versality of families of functions	**1**	**4**
Stability of Lagrange, Legendre projections	**2**	**8**

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

	Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	60	0				60
Credit	4	0				4

1. 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:** After successful completion of the course, the student should be able to		
1.1	Define the related basic scientific facts, concepts, principles and techniques of singularities of caustics.	**Lectures Tutorials Discussion Problem Solving**	**Exams Home work.**
1.2	Recognize the relevant theories of Lagrangian and Legendre submanifolds and their applications.		
2.0	**Cognitive Skills**		
2.1	Representing problems mathematically.	**Lectures Tutorials Solve Problem Brain Storming**	**Exams Quizzes. Homework. Discussion**
2.2	distinguish different rules in the theory of singularities of Caustics		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Develop connections of singularity theory with other disciplines in Manifold theory	**Cooperative education Competitive education**	**Home work. Reports. Quizzes. Discussion**
3.2	Solve problems using a range of formats and approaches in basic science		
3.3	show the ability to work independently and within groups.		

4.0	**Communication, Information Technology, Numerical**		
4.1	Learn how to summarize lectures or to collect materials of the course.	**Lectures tutorials brain storming**	**Home work. Reports. Discussion**
4.2	Learn how to solve difficulties in learning: **solving problems – enhance educational skills**		
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	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	First periodic exam	6	20
2	Second periodic exam	10	20
4	Homework + reports + Quizzes	Over all weeks	20
5	Final exam	End	40

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)
1- Office hours per week in the lecturer schedule (6 hours per week).
2- Contact with students by e-mail,SMS, and e-learning facilities.

E Learning Resources

1. Required Text(s)

- V.I. Arnold, S.M. Gusein-Zade, A.N. Varchenko, Singularities of differentiable maps, Vol.1, Birkhauser, Basel,1986
- V Arnold, Singularities of Caustics and Wave Fronts, Kluwer academic publisher, 1990.

2. Essential References

V. I. Arnold, Singularities of caustics and wave fronts, Mathematics and its Applications (Soviet Series) 62, Kluwer, Dordrecht, 1990, xiv+259 pp. Apink, Aul

3. Recommended Books and Reference Material (Journals, Reports, etc) (Attach List):
--

4.Electronic Materials, Web Sites etc
https://en.wikipedia.org/wiki/Singularity_theory

5. Other learning material such as computer-based programs/CD, professional standards/regulations: **Maple**

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 (Lecture rooms, laboratories, etc.) -Classroom with capacity of 25-students. - Library.
2. Computing resources: **Online programs and computer laboratory**
3. Other resources (specify --eg. 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**:** **Student feedback through electronic facilities organized by the deanship of registration and acceptance.**
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department **(i) Evaluation of the teachers by internal & external faculty members.** **(ii) Visiting to the classrooms.** **(iii) Mutual visits between colleagues and giving advices to each other after each lecture**
3 Processes for Improvement of Teaching **(i) Analysis of student course evaluation and feedback** **(ii) Peer evaluation and feedback** **(iii) Review of course portfolios** (iv) **Workshops on pedagogical methods**
4. Processes for Verifying Standards of Student Achievement (eg. 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) **Analysis of course assessments by other reviewers on a periodic basis.**
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. **(i) Material and learning outcomes are periodically reviewed internally and externally.** **(ii) Comparing course content and teaching methodologies with similar courses offered at other departments and universities.** **(iii) Studying the outcomes of the students' evaluations of the course and use it to improve teaching strategies.**

Faculty or Teaching Staff: **Dr. Fawaz Alharbi** _____
Signature: _____ **Fawaz Alharbi** ___ Date Report Completed: _____
Received by: _____ Dean/Department Head
Signature: _____ Date_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Algebraic Topology**

Course Code: **4047604-4**

COURSE SPECIFICATIONS

Institution Umm Al-Qura University
College/Department Faculty of Applied Science/ Department of Mathematical Science

A. Course Identification and General Information

1. Course title and code Algebraic topology (4047604-4)				
2. Credit hours: 4 Credit 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 Dr. Elsaid lashin				
5. Level/year at which this course is offered PhD, Level 4				
6. Pre-requisites for this course (if any) General topology (4046601-4)				
7. Co-requisites for this course (if any)				
8. Location if not on main campus Al- Abdia Campus + Girls sections				
9. Mode of Instruction (mark all that apply)				
a. Traditional classroom	✓	What percentage?	100	
b. Blended (traditional and online)		What percentage?		
c. e-learning		What percentage?		
d. Correspondence		What percentage?		
f. Other		What percentage?		

B Objectives

What is the main purpose for this course?

- **Be able to use tools from abstract algebra to study topological spaces .**
- **Be able to find algebraic invariants that classify topological spaces up to homeomorphism, though usually most classify up to homotopy equivalence . .**
- **Understand the concepts of fundamental groups ,covering spacesand the fundamental theorem of algebra . .**
- **Discussing some classical groups and their fundamental groups . .**
- **Studying singular homology theory, homotopy invariance of homology and the relationship with fundamental group . .**
- **Be familiar with relative homology and Jordan Brouwer separation theorem . .**

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 collect problems from web based reference material and supervise classroom discussions.
2. Update references used in teaching process.
3. Use e-learning facilities more efficiently.

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		
List of Topics	No. of Weeks	Contact Hours
Warming-Up: **The fundamental group and covering spaces .**	2	8
Homology theories and homotopy invariance of homology .	4	16
Maps of spheres and relative homology . .	4	16
The cohomology ring of a space .	5	20

2. Course components (total contact hours and credits per semester):							
	Contact Hours				Self-Study	Other	Total
	Lecture	Tutorial	Laboratory	Practical			
Contact Hours	60						60
Credit	4						4

3. Additional private study/learning hours expected for students per week.	5

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

	NQF Learning Domains And Course Learning Outcomes	**Course Teaching Strategies**	**Course Assessment Methods**
1.0	**Knowledge**		
	After successful completion of the course, the student should be able to (a)Compute algebraic invariants associated to topological spaces and maps between them . (b)Prove topological results by using algebraic methods . (c)apply methods from algebraic topology to problems in a broader mathematical context .. .	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	(i)Define the various geometric and algebraic concepts introduced ,apply and interpret them in concrete examples . (ii)Formulate and apply central theorems in deRham theory and present their proofs . (iii)Use the theory and techniques of the course for problem solving .	Homework consisting in solving selected exercises. Encourage and develop self - education	Homework Oral and written tests. Research projects.
3.0	**Interpersonal Skills & Responsibility**		

3.1	Punctual attendance of classes is required. Students should demonstrate their sense of responsibility for learning by completing both reading and writing assignments in due time. Students learn to manage their time. Accustom students to take responsibility of self –learning Students should act responsibly and ethically in carrying	Discussion. Explanation. Guidance and supervision of the group Assignments for research projects.	Home work. Reports. Quizzes. Discussion
4.0	**Communication, Information Technology, Numerical**		
4.1	Ability to communicate in written and in oral. Ability to write reports in English Ability to explain each step in the problem solving process. Ability to apply course concepts to mathematical problem solving model. Ability to use information technology in communication and research projects. Interact with life problems using different methods of thinking and problem solving.	Lectures tutorials brain storming	Periodic written and oral tests. Discussion. Observation.
5.0	**Psychomotor**		
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	Midterm 1	6th week	20%
2	Midterm 2	10th week	20%
4	Homework + reports + Quizzes	During the semester	20%
5	Final exam	End of semester	40%

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)
1- Office hours per week in the lecturer schedule (4 hours per week).
2- Contact with students by e-mail,SMS, and e-learning facilities.

E. Learning Resources

1. Required Text(s):
Glen E. Bredon, Topology and Geometry (Graduate Texts in Mathematics). Springer, 1993.

2. Essential References :
James F. Davis and Paul Kirk , Lecture Notes in Algebraic Topology (Graduate Studies in Mathematics, 35). American Mathematical Society, 2001.

3. Recommended Books and Reference Material (Journals, Reports, etc) (Attach List):
Use previous list

4.Electronic Materials, Web Sites etc http://ebookee.org/
5. Other learning material such as computer-based programs/CD, professional standards/regulations: Microsoft Word

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.) -Classroom with capacity of 30-students. - Library.
2. Computing resources: Not available
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: • Student feedback through electronic survey organized by the deanship of registration and acceptance.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Evaluation of the teachers by internal & external faculty members. • Visiting to the classrooms. • Mutual visits between colleagues and giving advices to each other after each lecture
3 Processes for Improvement of Teaching • Analysis of student course evaluation and feedback • Peer evaluation and feedback • Review of course portfolios • Workshops on pedagogical methods
4. Processes for Verifying Standards of Student Achievement (eg. 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) • Analysis of course assessments by other reviewers on a periodic basis.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Material and learning outcomes are periodically reviewed internallyand externally. • Comparing course content and teaching methodologies with similar coursesoffered at other departments and universities. • Studying the outcomes of the students' evaluations of the course and useitto improve teaching strategies.

Faculty or Teaching Staff: _____
Signature: ___ _____ Date Report Completed: _____
Received by: _____ Dean/Department Head
Signature: _____ Date_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

"Applied Mathematics Courses"

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Fluid Mechanics (2)**

Course Code: **4047701-4**

Course Specifications

Institution: Umm Al-Qura University Date : 28 / 10 / 2017
College/Department : Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Fluid Mechanics(2) (4047701-4)				
2. Credit hours: 4 Hours				
3. Program(s) in which the course is offered: PhD in Mathematics				
4. Name of faculty member responsible for the course: Prof. Abdullah A. Abdullah				
5. Level/year at which this course is offered : Leve 1/ PhD				
6. Pre-requisites for this course (if any): ---				
7. Co-requisites for this course (if any): ---				
8. Location if not on main campus: Al-Abidiyah campus and Al-Zahir campus				
9. Mode of Instruction (mark all that apply)				
a. traditional classroom	✓	What percentage?	85	
b. blended (traditional and online)		What percentage?		
c. e-learning	✓	What percentage?	15	
d. correspondence		What percentage?		
f. other		What percentage?		
Comments:				

B Objectives

1. What is the main purpose for this course? The main purpose for this course is to introduce advanced topics and quantitative techniques for the study of Fluid Mechanics and its applications.
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. Updating references used in teaching process. 2. Using e-learning facilities more efficiently. 3. Encouraging students to collect problems from web based references and supervise discussions in the class.

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

Course Description: This is a 4 credit postgraduate course introducing advanced topics in Fluid Mechanics. The course comprises approximately comprising 52 hours of lectures. The role of the course is to introduce the mechanics of various Non-Newtonian Fluids. It is assumed that students entering this course have previously taken courses in Continuum Mechanics and Fluid Mechanics (1).

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Chapter 1 - Introduction - Briefly recap on the basic conservation laws of Continuum Mechanics. - Develop the stability analysis for an incompressible viscous fluid confined to a finite region. - Develop the general constitutive expression for a stress tensor that depends on fluid density and velocity gradients alone. Particularize the model to incompressible fluids.	4	16
Chapter 2 – Non-Newtonian Fluids - Introduce the general Reiner-Rivlin fluid and determine constraints to ensure that the stress tensor always does work. - Investigate the problem of pure shear ow for a Reiner-Rivlin fluid. Discuss the relevance of the model to the experimentally observed properties of fluids. - Particularization the Reiner-Rivlin fluid to the generalized Newtonian fluid. - Introduce the Power-Law fluid. - Introduce the Bingham fluid. - Investigate pipe flow for:- • the generalized Newronian fluid; • the power-law fluid; • the Bingham fluid.	3	12
Chapter 3 – Memory Fluids - Introduce the Maxwell Fluid. - Extend the Maxwell fluid to tensor-valued functional involving history. - Introduce the Oldroyd-B fluid. - Investigate the problem of shear ow for the Oldroyd-B fluid. - Comment on the relevance of the Oldroyd-B model to the observed ow of polymers.	4	16

Chapter 4 – Liquid Crystals - Introduce the three main classes of liquid crystal and description of their properties. - Introduce the idea of a "Director" and develop the general continuum model of a liquid crystal. - Define the Oseen-Frank Free energy. - Introduce the Landau - de Gennes theory of liquid crystals based on the so-called Q-tensor. - Discuss various classes of boundary conditions applicable to the modelling of Nematic liquid crystals. - Investigate various steady state solutions for Nematic liquid crystals under various boundary conditions. - Discuss the Fredericks transition in a Nematic Liquid Crystal Layer	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	Course Teaching	Course

#	And Course Learning Outcomes	Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Have an enhanced knowledge and understanding of Non-Newtonian fluids, Memory fluids and liquid crystals.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
1.2	Have the ability to recall the learned material of the course.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
2.0	**Cognitive Skills**		
2.1	Be able to apply the learned material of the course in real life problems.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
2.2	Be able to integrate related topics from separate parts of the course	Lectures – Discussion-solve problems	Short quizzes, periodical and final exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Have the ability to prove theorems and develop lemmas using different techniques	Lectures – Discussion-solve problems	Short quizzes, periodical and final exams
3.2	Be able to describe and analyze models using related equations	Lectures – Discussion-solve problems	Short quizzes, periodical and final exams
4.0	**Communication, Information Technology, Numerical**		
4.1	Have the ability to use computers programs in obtaining numerical solutions and carrying out statistical tests.	Discussion - Use Matlab or Mathematica to solve some problems numerically.	Homework projects
5.0	**Psychomotor**		
	Not applicable		

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	Periodic exam (1)	6	20
2	Periodic exam (2)	10	20
3	Homework + Quizzes	Over all weeks	20
4	Final exam	End of semester	40

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) - Office hours are specified throughout the week (6 hours/week) - Contacts with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks - G. Astarita and G. Marrucci, Principles of Non-Newtonian Fluid Mechanics, McGraw Hill Book Company Ltd. (1974). - J. Betten, Creep Mechanics, Springer Berlin Heidelberg (2008). - P.G. de Gennes and J.Prost, The Physics of Liquid Crystals, OUP (1995).
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Matlab and Maple software

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.) Properly equipped classroom.
2. Computing resources (AV, data show, Smart Board, software, etc.) - Classroom equipped with desktop computers. - Projectors and related items. - Numerical packages. - Compilers
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Non

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Student feedback on effectiveness of teaching is arranged electronically at the end of the term by the University.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department - Course report. - Lecture development.
3 Processes for Improvement of Teaching Several workshops on the improvement of teaching are conducting yearly by the University.
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) Non
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. Reviewing process of courses for improvement and development is done normally every five years.

Name of Instructor: Prof. Abdullah A. Abdullah
Signature:_____Date Report Completed: 28 / 10 / 2017
Name of Field Experience Teaching Staff : _____
Program Coordinator:_____
Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Tensor Calculus and Special Relativity**

Course Code: **4047702-4**

Course Specifications

Institution: Umm Al-Qura University Date : 3/2/1439
College/Department: Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Tensor Calculus and Special Relativity (4047702-4)			
2. Credit hours: 4 Credit 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: DR. Mohammad Bilal Abdul Ghaffar			
5. Level/year at which this course is offered: Level 1/ PhD			
6. Pre-requisites for this course (if any):			
7. Co-requisites for this course (if any):			
8. Location if not on main campus: Al-Abidiyah campus and Al-Zahir campus			
9. Mode of Instruction (mark all that apply)			
a. traditional classroom	✓	What percentage?	70
b. blended (traditional and online)	✓	What percentage?	10
c. e-learning	✓	What percentage?	10
d. correspondence		What percentage?	
f. other	✓	What percentage?	10
Comments:			

B Objectives

1. What is the main purpose for this course? The principal aim of tensor analysis is to investigate the relations which remain valid when we change from one coordinate system to any other. The laws of physics cannot depend on the frame of reference which the physicist chooses for the description of such laws. Accordingly, it is aesthetically desirable and sometimes convenient to utilize tensor analysis as the mathematical background in which these laws can be formulated. Now, it has applications in most branches of theoretical physics and engineering such as mechanics, fluid mechanics elasticity, plasticity and electromagnetism, etc.
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) A - Encourage students to use the Internet to search for information and updated material. B - The inclusion of vocabulary and details to be within the e-learning site for the professor to make it easier for students to obtain. C - Including vocabulary compared served in other local, regional and global sections.

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

Course Description: This is a 4 credit postgraduate course introducing advanced topics in tensor calculus and special relativity. The course comprises approximately comprising 60 hours of lectures.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours

Chapter 1 - Tensors and their Algebra - Transformation of Coordinates. - Summation Convention. - Kronecker Delta, Scalar, Contravariant and Covariant Vectors. - Tensors of Higher Rank. - Symmetry of Tensors. - Algebra of Tensors: Addition, Subtraction, Equality, Inner and Outer Products, Contraction. - Quotient Law. - Irreducible Tensor. - Metric Tensor. - Fundamental and Associated Tensors. - Relative and Absolute Tensors.	5	20
Chapter 2 - Christoffel Symbols and Covariant Differentiation - Christoffel Symbols. - Transformation Laws for Christoffel Symbols. - Equation of Geodesic. - Covariant Differentiation. - Divergence of a Vector Field. - Curl of a Vector Field. - Divergence of Tensor Field.	5	20
Chapter 3 - Special Theory of Relativity functional - Galilean Transformation. - Postulates of Special Relativity. - Lorentz Transformation. - Length Contraction. - Time Dilation. - Addition of Velocities. - Variation of Mass with Velocity. - Equivalence of Mass and Energy. - Four Dimensional Formalism. - Relativistic Classification of Particles. - Maxwell's Equations and their Lorentz Invariance.	5	20

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	Have an enhanced knowledge of the basic concepts of tensor calculus and its origin.	Use various educational tools during the lecture such as open discussion, problem solving.	Quiz Homework Midterm exam Final exams
1.2	Have an enhanced knowledge of the basic concepts of special relativity and its origin.		
1.3	Have the ability to recall the learned material of the course.		
2.0	**Cognitive Skills**		
2.1	Be able to apply the learned material of the course in real life problems.	Use various educational tools during the	Quiz Homework Midterm exam
2.2	Be able to integrate related topics from		

	separate parts of the course	lecture such as open discussion, problem solving.	Final exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Have the ability to prove theorems and develop lemmas using different techniques	Use various educational tools during the lecture such as open discussion, problem solving.	Quiz Homework Midterm exam Final exams
3.2	Be able to describe and analyze models using related equations		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use of internet resources, e-learning and communication using blackboard	Encourage students to do research and investigate using the internet and contact digital libraries.	Student solve problems through TV network and then assessment this activity.
4.2	Use software such as matlab and maple for their calculations		
5.0	**Psychomotor**		
5.1	Not applicable		

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	Periodic exam (1)	6	20
2	Periodic exam (2)	10	20
3	Homework + Quizzes	Over all weeks	20
4	Final exam	End of semester	40

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) Assign office hours weekly for students.

E. Learning Resources

1. List Required Textbooks - Tensor Analysis with Applications by Zafar Ahsan, Anamaya Publication, 2008. - Tensor Analysis by Edward Nelson, Princeton University Press.
2. List Essential References Materials (Journals, Reports, etc.) - The Special Theory of Relativity : A Mathematical Approach by Anandijiban Das, Springer Verlag, 1996.
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc.) - Introduction to Special Relativity by Wolfgang Rindler, second edition, Oxford University Press, 1991.
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software Matlab and Maple software

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.) Provide a suitable classroom.
2. Computing resources (AV, data show, Smart Board, software, etc.) E-Learning lab.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) - Overhead projector. - Laboratory equipment for individual students.

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching - Ask questions during lectures. - Course evaluation questionnaire conducted electronically by the University at the end of the term.

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department - Results analysis. - Self- assessment of the program - External revisions and assessment. - Course report. - Annual reports sufficiently prepared by the head of department.
3. Processes for Improvement of Teaching - Application of modern technologies in the education. - Application of e-learning. - Programs and trainings to improve the skills of teaching and learning.
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) None
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Comparisons of the course with other institutes in other universities. - Reviewing process of courses for improvement and development is done normally every five years.

Name of Instructor: DR. Mohammad Bilal Abdul Ghaffar

Signature : _____ Report Completed: 3/2/1439
Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received:

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Numerical Solutions of Differential Equations (2)**

Course Code: **4047703-4**

Course Specifications

Institution: Umm Al-Qura University Date : 31/10/2018
College/Department: Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Numerical Solutions of Differential Equations (2) (4047703-4)				
2. Credit hours: 4 Credit 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: Dr. Hala Ahmad Hejazi				
5. Level/year at which this course is offered: Level 1/ PhD				
6. Pre-requisites for this course (if any) ---				
7. Co-requisites for this course (if any) --				
8. Location if not on main campus -- Al-Abidiyah campus and Al-Zahir campus				
9. Mode of Instruction (mark all that apply)				
a. traditional classroom	√	What percentage?	85	
b. blended (traditional and online)		What percentage?		
c. e-learning	√	What percentage?	15	
d. correspondence		What percentage?		
f. other		What percentage?		
Comments:				

B Objectives

1. What is the main purpose for this course? The main purpose of this course is to provide students with more advanced numerical methods, numerical techniques and programming skills that will allow them to solve more complex real world problems that involve differential equations. They will become familiar with the methodologies for developing numerical algorithms that can be employed for problems that would otherwise be unsolvable.
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) Search for more online references materials.

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

Course Description: Many real world problems are not solvable analytically, meaning that it is necessary to develop numerical methods to solve these problems. Additionally, applying these methods to large problems requires the algorithms to be implemented in a computer language such as MATLAB. This course addresses both the theoretical development of numerical methods and their implementation in MATLAB

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours

Taylor and Runge-Kutta Methods • Introduce Euler's algorithm for the solution of systems of ordinary differential equations and the θ method. • Develop error bounds for the growth of the error in the θ method for equations $\dot{y} = f(t, y)$ when f satisfies a Lipshitz condition. • Introduce Taylor's method for the numerical solution of ODE's and the order of a numerical algorithm. • Describe Heun's method and use it to introduce a 2-stage Runge-Kutta algorithm. • Establish the classical 3-stage and 4-stage Runge-Kutta algorithms RK3 and RK4. • Introduce several Runge-Kutta 45 schemes and explain how these may be used to adaptively modify the integration step-size to meet a prescribed error tolerance. Possible schemes are Runge-Kutta Fehlberg, Runge-Kutta Cash-Karp, Runge-Kutta Mersen and Runge-Kutta Butcher.	3	12

Linear Multi-Step Methods • Illustrate the idea of a linear multi-step method using Simpson's rule to integrate the equation $\dot{y} = f(t, y)$ over the interval $[x_k - h, x_k + h]$. Briefly discuss the advantages and disadvantages of this approach by comparison with RK4. • Introduce the form of the general linear multi-step method. Describe well known examples such as the Implicit Euler scheme, Trapezoidal scheme and a low order Adams-Bashforth method. • Demonstrate how the finite difference operator can be used to construct linear multi-step algorithms using backward differentiation. • Introduce the concept of zero stability and establish the classical stability result for the location of the zeros of the associated characteristic polynomial, namely that the zeros all lie within the unit disc. • Briefly describe the distinction between an Adams-Bashforth method (explicit) and an Adams-Moulton method (implicit). Summarize, consistency, convergence and stability properties of these schemes. For example, an AdamsMoulton scheme always has larger interval of absolute stability than the same order of Adams-Bashforth scheme. • Describe the idea of a Predictor-Corrector (PC) method. State how the accuracy of the PC depends on the orders on the predictor and corrector schemes. • Introduce the idea of a stiff ODE and use the ODE $\dot{y} = \lambda y$ and initial condition Y(0) = y0 to demonstrate the difficulty with stiff equations. • Introduce backward differentiation methods for stiff systems and establish Gear's method.	4	16

Finite Element Method in 1D • Introduce the idea of the variational formulation of a problem. • Introduce the notion of an element and state how the solution of the variational problem is expressed in terms of the elements and demonstrate that the underlying variational problem is uniquely solvable. • Describe the set of tent-functions over a finite dissection of [a,b] and construct all possible inner products of tent functions. Introduce the idea of a reference element and the element mapping and element stiffness matrix. • Show how these components are assembled into a final linear problem. • Discuss how different boundary conditions are incorporated into the procedure. For example, Dirichlet boundary conditions enter through the space of finite elements whereas Neumann boundary conditions enter through the variational formulation of the problem. • Briefly introduce quadratic elements and indicate what changes need to be made to accommodate these elements. • Do several specimen examples involving the solution of linear and nonlinear problems over [0,1] for various choices of boundary condition. Demonstrate the idea that changing the boundary conditions involves minimalist changes to the formulation of the numerical problem	4	16

Spectral and Pseudo-Spectral Methods • Describe the benefits of a spectral approach to the solution of differential equations over finite element, finite difference, Runge-Kutta and multi-step methods. Distinguish between a pseudospectral (or collocation) approach to the solution of a differential equation, a Galerkin spectral approach and a Tau spectral approach. • Introduce the Chebyshev and Legendre families of orthogonal polynomials. Develop basic properties of these polynomial families, and specifically how the derivatives of family members are expressible as spectral series within the family. Explain why these polynomial families allow spectral accuracy if the underlying unknown is arbitrarily smooth. • Use polynomial interpolation to construct the pseudo-spectral differentiation matrix for Chebyshev polynomials. • Develop the Chebyshev transform pair by which function values are determined from Chebyshev spectral coefficients and vice-versa. Indicate how the Chebyshev transform pair can be implemented using the Fast Fourier Transform. • Provide examples in the use of spectral and pseudo-spectral methods in solving, for example, the Diffusion equation and Burger's equation. • Discuss the extension of spectral methods to higher dimensional regions, for example a rectangular region or a disk, or a cylinder.	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** Upon completion of the course, the student is expected to		
1.1	Have knowledge and understanding of various numerical methods (e.g., Taylor, Runge-Kutta, Linear Multi-Step, finite element, Spectral and Pseudo-Spectral Methods) used to solve differential equations problems.	Lectures - Discussions, and homework	Short quizzes, periodical and final exams.
1.2	Be able to integrate related topics from separate parts of the course	Lectures - Discussions, and homework	Short quizzes, periodical and final exams.
2.0	**Cognitive Skills** Upon completion of the course, the student is expected to		
2.1	Be able to follow specialized and application-oriented technical literature in the area	Lectures - Discussions, and homework	Short quizzes, periodical and final exams.
2.2	Formulate and solve relatively complicated mathematical models for real world problems where there is dependence in both time and space.	Lectures - Discussions, and homework	Short quizzes, periodical and final exams.
3.0	**Interpersonal Skills & Responsibility** Upon completion of the course, the student is expected to		
3.1	Effectively work alone and in groups on the solution of problems	Lectures - Discussions, and homework	Short quizzes, periodical and final exams.
3.2	Develop and implement in MATLAB advanced algorithms for solving nonlinear systems of algebraic equations and one and two-dimensional nonlinear	Lectures - Discussions, and homework	Short quizzes, periodical and final exams.

	partial differential equations on regular structured grids		
4.0	**Communication, Information Technology, Numerical** Upon completion of the course, the student is expected to		
4.1	Be able to use commercial software with understanding of fundamental methods, properties, and limitations	Lectures - Discussions, and homework	Short quizzes, periodical and final exams.
4.2	Engage critical, analytical and communication skills though a combination of report writing, group collaboration, individual problem solving and computer programming.	Lectures - Discussions, and homework	Short quizzes, periodical and final exams.
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable

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	Periodic exam (1)	8	20
2	Periodic exam (2)	14	20
3	Home work	During the semester	20
4	Final exam	End of semester	40

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 subject's lecturers will be available for individual student consultations and advice in their specified office hours

E Learning Resources

1. List Required Textbooks
- Numerical Methods for Ordinary Differential Equations J.C. Butcher (2003).
- The mathematical theory of finite element methods, S.C. Brenner and R. Scott, 2ed, Springer, 2002.

• Spectral Methods in Fluid Dynamics, C. Canuto, M.Y. Hussaini, A. Quarteroni and T.A. Zang (1988).
2. List Essential References Materials (Journals, Reports, etc.) Journal of Computational and Applied Mathematics
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. https://en.wikipedia.org/wiki/Numerical_partial_differential_equations
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. None

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.) Classroom with the capacity of 10-20 students
2. Computing resources (AV, data show, Smart Board, software, etc.) Smart board. - Classroom is equipped with a computer. - Provide projectors and related items. Matlab software – Smart board
3. Other resources (specify, e.g. 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 Student feedback on effectiveness of teaching
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department Monitoring the achievement of the students in solving homework and periodical exams
3 Processes for Improvement of Teaching Following up the student's homework. Encouraging the students to read and practice more.
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) The instructors watch and give their feedbacks to their students through all work done by them, including exams to verify standards of achievements for different domains of learning outcomes.
5 Describe the planning arrangements for periodically reviewing course effectiveness

and planning for improvement. Reviewing the course reports submitted at the end of each semester.

Name of Instructor: Dr. Hala Ahmad Hejazi
Signature: Hala Ahmad Hejazi Date Report Completed: 31/10/2018
Name of Field Experience Teaching Staff _____
Program Coordinator:_____
Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Elasticity**

Course Code: **4047704-4**

Course Specifications

Institution: Umm Al-Qura University Date : 31/ 10 / 2018
College/Department : Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Elasticity 4047704-4			
2. Credit hours: 4Credit Hours			
3. Program(s) in which the course is offered: PhD in Mathematics			
4. Name of faculty member responsible for the course: Dr. Sameha Raad			
5. Level/year at which this course is offered: Level 2/PhD			
6. Pre-requisites for this course (if any) : Introduction to Elasticity (4046702-4)			
7. Co-requisites for this course (if any):			
8. Location if not on main campus: Al-Abidiyah. and Al-Zahir			
9. Mode of Instruction (mark all that apply)			
a. traditional classroom	✓	What percentage?	85
b. blended (traditional and online)		What percentage?	
c. e-learning	✓	What percentage?	15
d. correspondence		What percentage?	
f. other		What percentage?	
Comments:			

B Objectives

1. What is the main purpose for this course? The aim of this course is to investigate problems in Plane Strain, Plane Stress and Shell Theory.
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. Updating references used in teaching process. 2. Using e-learning facilities more efficiently. 3. Encouraging students to collect problems from web based references and supervise discussions in the class.

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

Course Description: This course will concentrate on applications which involve the solution of problems including two-dimensional problems of plane strain and plane stress, plasticity theory, the phenomenon of viscoelastic behavior and the special cases of classical shell theory. MAPLE or equivalent software will be used to evaluate and plot particular solutions.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Chapter 1 – Revision - Briefly revise the development of the full nonlinear equations of Thermo-Elasticity. - Revise the construction of the thermo-elastic strain energy in its most general form assuming that it is a function of temperature, temperature gradients and strain. - Derive the form of the stress tensor for several anisotropic materials, for example, a transversely isotropic material.	1	4

Chapter 2 - Plane Strain and Plain Stress - State what is meant by "Plane Strain" and "Plain Stress". Develop the elastic equations for plane strain and plane stress from the general nonlinear model of elasticity. - Introduce the Airy Stress function. - Reformulate the equations of plane stress and plane strain within the framework of functions of a complex variable. - Solve several problems in plane strain and plane stress, for example, the deformation under axial tension of a slab containing a circular hole.	2	8
Chapter 3 - Plasticity Theory - Discuss the various types of material behavior underlying loading and unloading, namely Linear elastic behavior, Nonlinear elastic behavior, Plastic behavior, Visco-elastic behavior and Visco-plastic behavior. - Introduce the notion of Yield Stress in terms of the strain-hardening factor and develop expressions for strain energy. - Introduce strain-energy density criterion proposed by Beltrami. - Introduce the Tresca, Von-Mises and Mohr-Coulomb criteria. Demonstrate that the latter reduces to the Tresca criterion in the case of a frictionless material. - Develop constitutive equations for the plastic stress tensor. - Supplement theory with a number of worked examples using the Tresca and Von-Mises criteria illustrating which is more conservative. Introduce the notion of Safety Factor.	3	12
Chapter 4 - Introduce Granular Materials - Define what is meant by a granular material. Set out the basic assumptions underlying the behavior of a granular material, for example, particles only interact when they touch; particle collisions are inelastic etc. - Investigate several mathematical models describing the flow of granular materials.	3	12

Chapter 5 - Visco-Elasticity - Describe the phenomenon of viscoelastic behavior. Compare the form of the stress tensor for elastic and viscoelastic materials. Introduce the idea of "creep" and "stress relaxation". - If the case of linear visco-elasticity introduces the general form for the stress-strain relationship in terms of the compliance matrix. Describe the Maxwell and Kelvin-Voigt models of visco-elasticity and state their advantages and disadvantages. - Illustrate Maxwell and Kelvin-Voigt visco-elastic behavior in one dimension via several examples.	3	12
Chapter 6 - Classical Shell Theory - Introduce the description of a surface in space via a power series expansion of a material point in terms of its location with respect to a membrane surface and a normal coordinate to that surface. - Develop the kinematics of the shell and conservation laws for density, momentum and energy. - Consider the special case of a thin shell in which the deformation p about the membrane surface r is of the form $\boldsymbol{p} = \boldsymbol{r}(t;\theta^{\alpha}) + \xi \boldsymbol{d}(t;\theta^{\alpha})$. - Discuss the example in which shell theory and the classical linear theory of elasticity are applied to the solution of a plate of thickness H and area occupying the region $(-a,a)x(-b,b)$ is deformed by uniform forces F_a and F_b along the respective boundaries $x = \pm a, y = \pm b$. - Repeat the previous problem with the forces Fa and Fb replaced by the couples M_a and M_b.	3	12

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** upon completion of this course, the student is expected to		
1.1	Have an enhanced knowledge and understanding of the definition of plane stress, plane strain.	Lectures Discussion	Exams, Quizzes, Homework
1.2	Identify how to solve the basic problems of the theory of elasticity by using Airy function expressed as bi-harmonic function.		
2.0	**Cognitive Skills** upon completion of this course, the student is expected to		
2.1	Construct the exact solution for some basic problems of the theory of elasticity by using Airy function expressed as bi-harmonic function.	Lectures Solve Problems Brain Storming	Exams, Quizzes, Homework.
2.2	Specifying the several mathematical models describing the phenomenon of viscoelastic behavior and the special cases of classical shell theory.		
3.0	**Interpersonal Skills & Responsibility** upon completion of this course, the student is expected to		
3.1	Show the ability to work independently and within groups.	Competitive education	Exams, Quizzes,

			Homework
4.0	**Communication, Information Technology, Numerical** upon completion of this course, the student is expected to		
4.1	Be aware of using many programs in computers in studying mathematics.	Use Maple software to solve some problems numerically.	Discussion Home Work.
4.2	Ability to analyze mathematical problems and to implement short programs for solving it.		
5.0	**Psychomotor**		
5.1	Not applicable		

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	Periodic exam (1)	7th week	20 %
2	Periodic exam (2)	13th week	20%
3	Homework + Quizzes	During the semester	20%
4	Final exam	End of semester	40 %

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)

1. Office hours per week in the lecturer schedule (4 hours per week).
2. Contact with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks

- An Introduction to Continuum Mechanics. Academic Press, New York Hunter SC (1976).
- Theory of Elasticity, L.D. Landau and E.M. Lifshitz . Pergamon Press, (1986).
- Theory of Plasticity 3rd Ed. J. Chakrabarty, Elsevier, (2006).

2. List Essential References Materials (Journals, Reports, etc.)

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
https://www.journals.elsevier.com/international-journal-of-plasticity/

4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. http://homepages.engineering.auckland.ac.nz/~pkel015/SolidMechanicsBooks/Part_IV/index.html
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

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.) - Provide a suitable classroom. - The number of student not exceed 6 in the class.
2. Computing resources (AV, data show, Smart Board, software, etc.) -Smart board. - Classroom is equipped with a computer. - Provide projectors and related items. - Maple software.
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 Electronically in UQU website.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department
3 Processes for Improvement of Teaching - Course report. - Lecture development.
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) The instructors watch and give their feedbacks to their students through all work done by them, including exams to verify standards of achievements for different domains of learning outcomes
5 Describe the planning arrangements for periodically reviewing course effectiveness

and planning for improvement. - Student's feedback. - Course report.

Name of Instructor: Dr. Sameha Raad

Signature:__ Sameha Raad ___Date Report Completed: 31 / 10 / 2018

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Magnetohydrodynamics**

Course Code: **4047705-4**

Course Specifications

Institution: Umm Al-Qura University Date : 28 / 10 / 2017
College/Department : Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Magnetohydrodynamics (4047705-4)				
2. Credit hours: 4 Hours				
3. Program(s) in which the course is offered: PhD in Mathematics				
4. Name of faculty member responsible for the course: Prof. Abdullah A. Abdullah				
5. Level/year at which this course is offered : Leve 2/ PhD				
6. Pre-requisites for this course (if any): Fluid Mechanics() 4047701-4				
7. Co-requisites for this course (if any): --				
8. Location if not on main campus: Al-Abidiyah campus and Al-Zahir campus				
9. Mode of Instruction (mark all that apply)				
a. traditional classroom	✓	What percentage?	85	
b. blended (traditional and online)		What percentage?		
c. e-learning	✓	What percentage?	15	
d. correspondence		What percentage?		
f. other		What percentage?		
Comments:				

B Objectives

1. What is the main purpose for this course? This is a 4 credit postgraduate course introducing advanced topics in Magnetohydrodynamics. The main purpose for this course is to introduce the fundamentals of Magnetohydrodynamics which describes the dynamics of electrically conducting fluids, such as plasmas. The course covers the fundamental equations in magnetohydrodynamics, waves and oscillations and dynamic instability and convection.
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. Updating references used in teaching process. 2. Using e-learning facilities more efficiently.

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

Course Description: This is a 4 credit postgraduate course at Master/Ph. D. level introducing fundamentals of Magnetohydrodynamics. The course comprises approximately 60 hours of lectures.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Chapter 1 – General Principles . Electromagnetic effects. . Mechanical effects. . Parallel flow. . Magnetic rigidity.	2	8
Chapter 2 - Magnetohydrostatics . Magnetohydrostatic states. . Force-free field. . Sunpost Equilibrium. . Filaments and prominences. . Magnetohydrostatic instability. . Spiral arma.	3	12
Chapter 3 – Waves and Oscillations . Allven waves and its properties. . Magnetosonic waves. . Hydromagnetic shock waves. . Stellar rotation.	3	12
Chapter 4 – Dynamic Instability and Convection . Modes of instability. . Stability of shear flow. . Kelvin-Helmholtz instability. . Thermal convection.	3	12
Chapter 5 – Dynamo Theories . The dynamo problem. . Symmetric field. . The general kinematic dynamo. . The mechanics of the dynamo. . Turbulent motion.	2	8

Chapter 6 – Plasma Magnetohydrodynamics . Particle effects. . Two-fluid theory. . Partially-ionized gases. . Collisionless plasmas.	2	8

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	Have a knowledge on magnetohydrodynamics, waves and oscillations, dynamic instability and convection.	Use various educational tools during the lecture such as open discussion,	Quiz Homework Midterm exam Final exams
1.2	Have the ability to recall the learned		

	material of the course.	problem solving.	
2.0	**Cognitive Skills**		
2.1	Be able to apply the learned material of the course in real life problems.	Use various educational tools during the lecture such as open discussion, problem solving.	Quiz Homework Midterm exam Final exams
2.2	Be able to integrate related topics from separate parts of the course.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Show the ability to work independently and within groups.	Use various educational tools during the lecture such as open discussion, problem solving.	Quiz Homework Midterm exam Final exams
	Have the ability to prove theorems and develop lemmas using different techniques		
	Be able to describe and analyze models using related equations		
4.0	**Communication, Information Technology, Numerical**		
4.1	Learn how to use computer codes to solve problems in Magnetohydrodynamics.	Use software to solve some problems numerically.	Discussion Home Work.
4.2	Use software such as matlab and maple for their calculations.		
5.0	**Psychomotor**		
	Not applicable		

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	Periodic exam (1)	6	20
2	Periodic exam (2)	10	20
3	Homework + Quizzes	Over all weeks	20
4	Final exam	End of semester	40

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) 1. Weekly Office hours. 2. Contact with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks - Magnetohydrodynamics, T. G. Cowling, Adam Hilger, Bristol (1976). - An Introduction to Magnetohydrodynamics, P. A. Davidson, Cambridge texts in applied mathematics, Cambridge University Press, 2001.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Matlab and Maple software

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.) Provide a suitable classroom.
2. Computing resources (AV, data show, Smart Board, software, etc.) - Classroom equipped with desktop computers. - Projectors and related items. - Numerical packages. - Compilers
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

- Overhead projector. - Laboratory equipment for individual students.

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Course evaluation questionnaire conducted electronically by the University at the end of the term.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department - Course report. - Lecture development. - Self- assessment of the program - External revisions and assessment. - Course report. - Annual reports sufficiently prepared by the head of department.
3 Processes for Improvement of Teaching - Application of modern technologies in the education. - Application of e-learning. - Programs and trainings to improve the skills of teaching and learning.
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) None
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Student's feedback. - Course report. - Comparisons of the course with other institutes in other universities. - Reviewing process of courses for improvement and development is done normally every five years.

Name of Instructor: Prof. Abdullah A. Abdullah

Signature:_____Date Report Completed: 28 / 10 / 2017

Name of Field Experience Teaching Staff : _____

Program Coordinator:_____

Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Advanced Numerical Analysis (1)**

Course Code: **4047707-4**

Course Specifications

Institution: Umm Al-Qura University Date: 8/10/2018
College/Department: Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Advanced Numerical Analysis (1) (4047707-4)
2. Credit hours: 4 Credit 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:
5. Level/year at which this course is offered: Level 3/ Ph. D.
6. Pre-requisites for this course (if any): Numerical Solutions of Differential Equations (1) 4046703-4
7. Co-requisites for this course (if any): Numerical Solutions of Differential Equations (2) 4047703-4
8. Location if not on main campus: Al-Abidiyah campus and Al-Zahir campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	85
b. blended (traditional and online)		What percentage?	
c. e-learning	✓	What percentage?	15
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course? The role of the course is to introduce and develop the use of Finite Difference techniques for the numerical solution of ordinary and partial differential equations. It is assumed that students entering this course have previously taken the entry level courses on Numerical Solutions of Differential Equations (1) and (2).
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. Updating references used in teaching process. 2. Using e-learning facilities more efficiently. 3. Encouraging students to collect problems from web based references and supervise discussions in the class.

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

Course Description: This is a 4 credit Ph. D. course introducing advanced topics in Numerical Analysis. The course comprises approximately 60 hours of lectures. The role of the course is to introduce and develop the use of Finite Difference techniques for the numerical solution of ordinary and partial differential equations.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours

Chapter 1 – Finite differences and finite volumes for stationary diffusion problems - Method of finite differences. - Method of finite volume. - Non-homogeneous Dirichlet conditions. - Neumann and Fourier conditions. - Analysis of the finite difference method. - Existence and uniqueness of the solution. - Discretization error. - Analysis of finite volume schema. - Existence of the finite volume schema solution. - Finite volumes to account for discontinuities. - Finite differences and finite volumes for 2D diffusion problems. - Finite volume discretization.	6	24
Chapter 2 – Variational methods - Examples of variational problems. - Weak formulations. - Lax-Migram theorem. - Problem of non homogeneous Dirichlet. - Problem with Fourier boundary conditions. - Weak formulation and variational formulation. - Ritz and Galerkin methods. - Construction of the mesh.	5	20
Chapter 3 – Hyperbolic problems - A transport equation. - Linear case. - Classical solution and weak solution. - Existence and unicity of weak solution. - Schemas linear case. - Riemann problem. - Schemas non-linear case.	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	60	--				60

3. Additional private study/learning hours expected for students per week.	4

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	Have an enhanced knowledge and understanding of advanced topics in numerical analysis.	Lectures- Discussion- solve problems	Short quizzes, periodical and final exams.
1.2	Have the ability to recall the learned material of the course	Lectures- Discussion- solve problems	Short quizzes, periodical and final exams.
2.0	**Cognitive Skills**		
2.1	Be able to apply the learned material of the course in real life problems.	Lectures- Discussion- solve problems	Short quizzes, periodical and final exams.
2.2	Be able to integrate related topics from separate parts of the course	Lectures – Discussion- solve problems	Short quizzes, periodical and final exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Have the ability to prove theorems and develop lemmas using different	Lectures – Discussion- solve	Short quizzes, periodical and

	techniques	problems	final exams
3.2	Be able to describe and analyze models using related equations	Lectures – Discussion- solve problems	Short quizzes, periodical and final exams
4.0	**Communication, Information Technology, Numerical**		
4.1	Have the ability to use computer programs in obtaining numerical solutions.	Discussion - Use Matlab, Mathematica or Numerical Packages to solve some problems numerically.	Homework projects
4.2			
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable

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	Periodic exam (1)	6	20
2	Periodic exam (2)	10	20
3	Home work	Over all weeks	20
4	Final exam	End of semester	40

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)

- Office hours are specified throughout the week (6 hours/week)
- Contacts with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks: • G.D. Smith, Numerical solution of partial differential equations: finite difference methods (3rd ed.). Oxford University Press (1985). • L.N. Trefethen, Finite difference and spectral methods for ordinary and partial differential equations, unpublished text, (1996), available at http://people.maths.ox.ac.uk/trefethen/pdetext.html • U.M. Ascher and L.R. Petzold, Computer Methods for Ordinary Differential Equations and Differential Algebraic Equations (1998).
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Matlab, Mathematica and Numerical Packages

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.) Properly equipped classroom
2. Computing resources (AV, data show, Smart Board, software, etc.) - Classroom equipped with desktop computers. - Projectors and related items. - Numerical packages. - Compilers
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Non

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Student feedback on effectiveness of teaching is arranged electronically at the end of the term by the University.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department - Course report. - Lecture development.
3 Processes for Improvement of Teaching

Several workshops on the improvement of teaching are conducting yearly by the University.
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) Non
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. Reviewing process of courses for improvement and development is done normally every five years.

Name of Instructor:

Signature:_____Date Report Completed: 8/10/2018

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Tensor Analysis**

Course Code: **4047709-4**

Course Specifications

Institution: Umm Al-Qura University Date: 8/10/2018
College/Department: Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Tensor Analysis (4047709-4)
2. Credit hours: 4 Credit 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: DR. Mohammad Bilal Abdul Ghaffar
5. Level/year at which this course is offered: Level 3 Ph. D.
6. Pre-requisites for this course (if any):
7. Co-requisites for this course (if any):
8. Location if not on main campus: Al-Abidiyah campus and Al-Zahir campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	85
b. blended (traditional and online)		What percentage?	
c. e-learning	✓	What percentage?	15
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course? The role of the course is to introduce the principles of tensor analysis. It is assumed that students entering this course have previously taken the entry level course on Continuum Mechanics.
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. Updating references used in teaching process. 2. Using e-learning facilities more efficiently. 3. Encouraging students to collect problems from web based references and supervise discussions in the class.

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

Course Description: This is a 4 credit Ph. D. course introducing the concepts of tensor analysis. The course comprises approximately 60 hours of lectures. The course is suitable for postgraduates who have no previous experience of tensors.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Chapter 1 – Tensors and their algebra - Transformation of coordinates. - Summation convention. - Kronecker delta, scalar, contravariant and covariant vectors. - Tensors of higher rank. - Symmetry of tensors. - Algebra of tensors: addition, subtraction, equality, inner and outer products, contraction. - Quotient law. - Irreducible tensor. - Metric tensor. - Fundamental and associated tensors. - Relative and absolute tensors.	8	32
Chapter 2 – Christoffel Symbols and Covariant Differentiation - Christoffels Symbols. - Transformation laws for Christoffel Symbols. - Equation of geodesic. - Covariant differentiation. - Divergence of a vector field. - Curl of a vector field. - Divergence of tensor field. - Null geodesics.	7	28

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. 4

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	Have an enhanced knowledge and understanding of tensor analysis and tensor calculus.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
1.2	Have the ability to recall the learned material of the course	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
2.0	**Cognitive Skills**		
2.1	Be able to apply the learned material of the course in real life problems.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
2.2	Be able to integrate related topics from separate parts of the course	Lectures – Discussion- solve problems	Short quizzes, periodical and final exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Have the ability to prove theorems and develop lemmas using different techniques	Lectures – Discussion- solve problems	Short quizzes, periodical and final exams
3.2	Be able to describe and analyze models using related equations	Lectures – Discussion- solve problems	Short quizzes, periodical and final exams
4.0	**Communication, Information Technology, Numerical**		
4.1	Have the ability to use computer programs in obtaining numerical solutions.	Discussion - Use Matlab, Mathematica or Numerical Packages to solve some problems	Homework projects

		numerically.	
4.2			
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable

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	Periodic exam (1)	6	20
2	Periodic exam (2)	10	20
3	Home work	Over all weeks	20
4	Final exam	End of semester	40

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)

- Office hours are specified throughout the week (6 hours/week)
- Contacts with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks:

- Tensor Analysis with Applications by Zafar Ahsan, Anamaya Publication, 2008.
- Tensor Analysis by Edward Nelson, Princeton University Press.
- Tensor Calculus : A concise Course by Barry Spain.

2. List Essential References Materials (Journals, Reports, etc.)

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

Matlab, Mathematica and Numerical Packages

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.) Properly equipped classroom
2. Computing resources (AV, data show, Smart Board, software, etc.) - Classroom equipped with desktop computers. - Projectors and related items. - Numerical packages. - Compilers
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Non

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Course evaluation questionnaire conducted electronically by the University at the end of the term.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department - Results analysis. - Self- assessment of the program - External revisions and assessment. - Course report. - Annual reports sufficiently prepared by the head of department.
3 Processes for Improvement of Teaching - Application of modern technologies in the education. - Application of e-learning. - Programs and trainings to improve the skills of teaching and learning. Several workshops on the improvement of teaching are conducting yearly by the University.

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) Non
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Comparisons of the course with other institutes in other universities. - Reviewing process of courses for improvement and development is done normally every five years.

Name of Instructor: DR. Mohammad Bilal Abdul Ghaffar

Signature:_____Date Report Completed: 8/10/2018

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Haydrodynamic Stability (1)**

Course Code: **4047711-4**

Course Specifications

Institution: Umm Al-Qura University Date : 8 / 10 / 2018
College/Department : Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Haydrodynamic Stability (1) (4047711-4)
2. Credit hours: 4 Credit Hours
3. Program(s) in which the course is offered: Doctor of Philosophy in Mathematics
4. Name of faculty member responsible for the course: Prof. Abdullah A. Abdullah
5. Level/year at which this course is offered : Leve 3/ Ph. D.
6. Pre-requisites for this course (if any): Fluid Mechanics (2) 4047701-4
7. Co-requisites for this course (if any):
8. Location if not on main campus: Al-Abidiyah campus and Al-Zahir campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	85
b. blended (traditional and online)		What percentage?	
c. e-learning	✓	What percentage?	15
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course? The main purpose for this course is to introduce advanced topics and quantitative techniques for the study of Hydrodynamic Stability and its applications.
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. Updating references used in teaching process. 2. Using e-learning facilities more efficiently. 3. Encouraging students to collect problems from web based references and supervise discussions in the class.

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

Course Description: This is a 4 credit Ph. D. course introducing advanced topics in Hydrodynamic Stability. The course comprises approximately 60 hours of lectures. The role of the course is to introduce linear hydrodynamic and hydromagnetic stability analyses and also provide an overview of classical findings in this field. Students will familiarize themselves with selected topics covering thermal instability of different flows. It is assumed that students entering this course have previously taken the course of Fluid Mechanics (2).

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Chapter 1 – Introduction . Basic concepts. . The analysis in terms of normal modes. . Non-dimensional numbers.	4	16

Chapter 2 – Thermal Instability . The Benard problem. . The effect of rotation. . The effect of magnetic field. . The effect of rotation and magnetic field.	4	16
Chapter 3 – The Stability of Couette Flow	4	16
Chapter 4 – Rayleigh-Taylor Instability	3	12

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. 4

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	Have an enhanced knowledge and understanding of hydrodynamic and hydromagnetic stability.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
1.2	Have the ability to recall the learned material of the course.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
2.0	**Cognitive Skills**		
2.1	Be able to apply the learned material of the course in real life problems.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
2.2	Be able to integrate related topics from separate parts of the course	Lectures – Discussion- solve problems	Short quizzes, periodical and final exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Have the ability to prove theorems and develop lemmas using different techniques	Lectures – Discussion- solve problems	Short quizzes, periodical and final exams
3.2	Be able to describe and analyze models using related equations	Lectures – Discussion- solve problems	Short quizzes, periodical and final exams
4.0	**Communication, Information Technology, Numerical**		
4.1	Have the ability to use computers programs in obtaining numerical solutions.	Discussion - Use Matlab, Mathematica or some numerical packages to solve some problems numerically.	Homework projects
5.0	**Psychomotor**		
	Not applicable		

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	Periodic exam (1)	6	20
2	Periodic exam (2)	10	20
3	Homework + Quizzes	Over all weeks	20
4	Final exam	End of semester	40

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) - Office hours are specified throughout the week (6 hours/week) - Contacts with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks - Hydrodynamic stability, P. G. Drazin and W. H. Reid, Cambridge University Press, Cambridge (1981). - Hydrodynamic and Hydromagnetic Stability, S. Chandrasekhar, Dover, 1981. - PG Drazin, WH Reid, Hydrodynamic Stability, 2nd edition, Cambridge University Press, 2004 - PG Drazin, Introduction to Hydrodynamic Stability, 1st edition, Cambridge University Press, 2002.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Matlab, Mathematica and Numerical Packages

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.) Properly equipped classroom.
2. Computing resources (AV, data show, Smart Board, software, etc.) - Classroom equipped with desktop computers. - Projectors and related items. - Numerical packages. - Compilers
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Non

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Student feedback on effectiveness of teaching is arranged electronically at the end of the term by the University.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department - Course report. - Lecture development.
3 Processes for Improvement of Teaching Several workshops on the improvement of teaching are conducting yearly by the University.
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) Non
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. Reviewing process of courses for improvement and development is done normally every five years.

Name of Instructor: Prof. Abdullah A. Abdullah

Signature:_____Date Report Completed: 8 / 10 / 2018

Name of Field Experience Teaching Staff : _____

Program Coordinator:_____

Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Mathematical Biology (1)**

Course Code: **4047501-4**

Course Specifications

Institution: Umm Al-Qura University Date : 8 / 10 / 2018
College/Department : Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Mathematical Biology (1) (047501-4)
2. Credit hours: 4Credit Hours
3. Program(s) in which the course is offered: Doctor of Philosophy (Applied Mathematics)
4. Name of faculty member responsible for the course: Dr. Faiza Allehiani
5. Level/year at which this course is offered : Leve 2/ Ph. D.
6. Pre-requisites for this course (if any): Introduction to Mathematical Biology 4046503-4
7. Co-requisites for this course (if any):
8. Location if not on main campus: Al-Abidiyah campus and Al-Zahir campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	85
b. blended (traditional and online)		What percentage?	
c. e-learning	✓	What percentage?	15
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course? The main purpose for this course is to introduce advanced topics and quantitative techniques for the study of Mathematical Biology and Physiology.
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. Updating references used in teaching process. 2. Using e-learning facilities more efficiently. 3. Encouraging students to collect problems from web based references and supervise discussions in the class.

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

Course Description: This is a 4 credit Ph. D. course introducing advanced topics in Mathematical Biology and Physiology. The course comprises approximately 60 hours of lectures. The role of the course is to introduce reaction kinetics, biological waves, and stochastic models in biology. It is assumed that students entering this course have previously taken the course of Introduction to Mathematical Biology.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Chapter 1 – Reaction Kinetics - Enzyme Kinetics. - Transient time estimation and non-dimensionlisation. - Michaelis-Menten Quasi-steady state analysis. - Suicide Substrate Kinetics. - Cooperativity. - Autocatalysis, Activation, Inhibition.	5	20

Chapter 2 – Biological Waves - Reaction-Diffusion waves. - Travelling waveform. - Wave propagation in population dynamics. • Single-Species Models . Fisher-Kolmogoroff Equation and Propagating wave Solution. . Asymptotic Solution and Stability of FK Equation. . Density-Dependent Diffusion-Reaction Models. . Waves in Models with Multi-Steady State Kinetics. • Multi-Species Models . Predator-Prey system. . Competition models. . Spiral waves. . Spiral wave solutions of $(\lambda - \omega)$ Reaction Diffusion System.	5	20
Chapter 3 – Stochastic Models in Biology - Stochastic Processes. - Sample Mean. - Variance Estimate. - Autocorrelation function. - Cross-correlation function. - Stationarity. - Markov Processes. - Weiner Processes. - Stochastic Differential equation. - The Ito's Identity. - Stochastic Integrals. - Stochastic model of population growth. - Asymptotic of large initial population.	5	20

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.	4

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	Have an enhanced knowledge and understanding of mathematical biology and physiology.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
1.2	Have the ability to recall the learned material of the course.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
2.0	**Cognitive Skills**		
2.1	Be able to apply the learned material of the course in real life problems.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
2.2	Be able to integrate related topics from separate parts of the course.	Lectures – Discussion-solve problems	Short quizzes, periodical and final exams

3.0	**Interpersonal Skills & Responsibility**		
3.1	Have the ability to prove theorems and develop lemmas using different techniques.	Lectures – Discussion-solve problems	Short quizzes, periodical and final exams
3.2	Be able to describe and analyze models using related equations.	Lectures – Discussion-solve problems	Short quizzes, periodical and final exams
4.0	**Communication, Information Technology, Numerical**		
4.1	Have the ability to use computers programs in obtaining numerical solutions.	Discussion - Use Matlab, Mathematica or some numerical packages to solve some problems numerically.	Homework projects
5.0	**Psychomotor**		
	Not applicable		

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	Periodic exam (1)	6	20
2	Periodic exam (2)	10	20
3	Homework + Quizzes	Over all weeks	20
4	Final exam	End of semester	40

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)

- Office hours are specified throughout the week (6 hours/week)

- Contacts with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks - Mathematical Biology, J. D. Murray Volume I: An Introduction. Volume II: Spatial Models Biomedical Applications. (2002) Springer-Verlag Berlin Heidlberg - Time Series: data analysis and theory, Brillinger, D. R. , Holden-Day, Inc. (1981)
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Matlab, Mathematica and Numerical Packages

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.) Properly equipped classroom.
2. Computing resources (AV, data show, Smart Board, software, etc.) - Classroom equipped with desktop computers. - Projectors and related items. - Numerical packages. - Compilers
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Non

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Student feedback on effectiveness of teaching is arranged electronically at the end of the term by the University.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department - Course report. - Lecture development.
3 Processes for Improvement of Teaching Several workshops on the improvement of teaching are conducting yearly by the University.
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) Non
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. Reviewing process of courses for improvement and development is done normally every five years.

Name of Instructor: Dr. Faiza Alehiani

Signature:_____Date Report Completed: 8 / 10 / 2018

Name of Field Experience Teaching Staff : _____

Program Coordinator:_____

Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Advanced Numerical Analysis (2)**

Course Code: **4047708-4**

Course Specifications

Institution: Umm Al-Qura University Date: 8/10/2018
College/Department: Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Advance Numerical Analysis (2) (4047708-4)
2. Credit hours: 4 Credit Hours
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) Doctor of Philosophy (Applied Mathematics)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: Level 3/ Ph. D.
6. Pre-requisites for this course (if any): Numerical Solutions of Differential Equations (1) 4046703-4
7. Co-requisites for this course (if any): Numerical Solutions of Differential Equations (2) 4047703-4
8. Location if not on main campus: Al-Abidiyah campus and Al-Zahir campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	85
b. blended (traditional and online)		What percentage?	
c. e-learning	✓	What percentage?	15
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course? The role of the course is to introduce the principles of inverse theory and data assimilation with applications to geophysics and other sciences. Inverse theory refers to the mathematical techniques used to determine the parameters of a model that describes a set of observed data. It is assumed that students entering this course have previously taken the entry level course on Numerical Solutions of Differential Equations (1) and (2).
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. Updating references used in teaching process. 2. Using e-learning facilities more efficiently. 3. Encouraging students to collect problems from web based references and supervise discussions in the class.

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

Course Description: This is a 4 credit Ph. D. course introducing advanced topics in Numerical Analysis. The course comprises approximately 60 hours of lectures. The role of the course is to introduce the principles of inverse theory and data assimilation with applications to geophysics and other sciences. Inverse theory refers to the mathematical techniques used to determine the parameters of a model that describes a set of observed data. After the course the students are expected to understand basic mathematical and numerical methods to solve inverse problems related to partial differential equations. It is assumed that students entering this course have previously taken the entry level courses on Numerical Solutions of Differential Equations (1),(2).

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Chapter 1 – Inverse problem and Fourier transforms - One dimensional inverse scattering problem. - Fourier transforms and well-posedness - Hilbert scale and ill-posedness.	3	12
Chapter 2 – Inverse kinematic problem - Kinematic Inverse Source Problem. - Kinematic velocity Inverse Problem.	2	8
Chapter 3 – Cauchy problem - Half Space Problem. - General two dimensional case. - Laplace equation on an annulus. - Riemann mapping theorem.	2	4
Chapter 4 – Regularization of ill-posed problems - Ill-posed problems and compact operators. - Regularity assumptions and error bound. - Regularization methods. - Tikhonov Regularization.	2	4
Chapter 5 – Transport equations - Transport equation. - Decomposition into singular components.	2	4
Chapter 6 – - Diffusion Equations - Introduction. - Exponential solutions . - The potential problem . - Inverse conductivity problem . - Stability result.	2	4

Chapter 7 – Reconstructing the domain of inclusions. - Forward Problem. - Factorization method. - Reconstruction of Σ.	2	4

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. 4

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	Have an enhanced knowledge and understanding of advanced topics in numerical analysis.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
1.2	Have the ability to recall the learned material of the course	Lectures-Discussion-solve	Short quizzes, periodical and

		problems	final exams.
2.0	**Cognitive Skills**		
2.1	Be able to apply the learned material of the course in real life problems.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
2.2	Be able to integrate related topics from separate parts of the course	Lectures – Discussion-solve problems	Short quizzes, periodical and final exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Have the ability to prove theorems and develop lemmas using different techniques	Lectures – Discussion-solve problems	Short quizzes, periodical and final exams
3.2	Be able to describe and analyze models using related equations	Lectures – Discussion-solve problems	Short quizzes, periodical and final exams
4.0	**Communication, Information Technology, Numerical**		
4.1	Have the ability to use computer programs in obtaining numerical solutions.	Discussion - Use Matlab, Mathematica or Numerical Packages to solve some problems numerically.	Homework projects
4.2			
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable

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	Periodic exam (1)	6	20
2	Periodic exam (2)	10	20
3	Home work	Over all weeks	20
4	Final exam	End of semester	40

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) - Office hours are specified throughout the week (6 hours/week) - Contacts with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks: - Richard Aster : Parameter Estimation and Inverse Problems. Academic Press, pp. 302, 2005, ISBN: 0-12-065604-3. - Carl Wunsch: Discrete Inverse and State Estimation Problems. Cambridge University Press, pp.384, 2006, ISBN: 0521854245.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Matlab, Mathematica and Numerical Packages

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.) Properly equipped classroom
2. Computing resources (AV, data show, Smart Board, software, etc.) - Classroom equipped with desktop computers. - Projectors and related items. - Numerical packages. - Compilers
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Non

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Course evaluation questionnaire conducted electronically by the University at the end of the term.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department - Results analysis. - Self- assessment of the program - External revisions and assessment. - Course report. - Annual reports sufficiently prepared by the head of department.
3 Processes for Improvement of Teaching - Application of modern technologies in the education. - Application of e-learning. - Programs and trainings to improve the skills of teaching and learning. Several workshops on the improvement of teaching are conducting yearly by the University.
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) Non
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Comparisons of the course with other institutes in other universities. - Reviewing process of courses for improvement and development is done normally every five years.

Name of Instructor:

Signature:_____Date Report Completed: 8/10/2018

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **General Theory of Relativity**

Course Code: **4047710-4**

Course Specifications

Institution: Umm Al-Qura University Date: 8/10/2018
College/Department: Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: General Theory of Relativity (4047710-4)
2. Credit hours: 4 Credit Hours
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) Doctor of Philosophy (Applied Mathematics)
4. Name of faculty member responsible for the course: DR. Mohammad Bilal Abdul Ghaffar
5. Level/year at which this course is offered: Level 2/ Ph. D.
6. Pre-requisites for this course (if any): Tensor Analysis (4047709-4)
7. Co-requisites for this course (if any):
8. Location if not on main campus: Al-Abidiyah campus and Al-Zahir campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	85
b. blended (traditional and online)		What percentage?	
c. e-learning	✓	What percentage?	15
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course? The role of the course is to introduce the principles of the general theory of relativity. It is assumed that students entering this course have previously taken the entry level course on tensor analysis.
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. Updating references used in teaching process. 2. Using e-learning facilities more efficiently. 3. Encouraging students to collect problems from web based references and supervise discussions in the class.

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

Course Description: This is a 4 credit Ph. D. course introducing the concepts of general theory of relativity. The course comprises approximately 60 hours of lectures. The course is suitable for postgraduates who have no previous experience of general theory of relativity. Albert Einstein (1879-1955) found tensors as an excellent tool for the presentation of his general theory of relativity. A detailed account of Riemann curvature tensor and its properties is discussed which characterizes the gravitational field.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Chapter 1 – Riemann curvature tensor - Riemann curvature tensor. - Covariant form of Riemann curvature tensor. - Properties of Riemann curvature tensor. - Ricci tensor and scalar curvature. - Einstein tensor. - Integrability of the Riemann curvature tensor. - Flatness of the Space.	8	32
Chapter 2 – General theory of relativity - Postulates of general relativity. - Hypothesis of general relativity. - Schwarzchild exterior solution. - Relativistic equation for the path of a particle (planet). - Experimental verification of general theory of relativity, (a) Advancement of the Perihilion of a Planet, (b) Deflection of light ray when passing near a gravitational field. - Energy momentum tensor. - Schwarzchild interior solution.	7	28

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 revisions.

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	Have an enhanced knowledge and understanding of the general theory of relativity.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
1.2	Have the ability to recall the learned material of the course.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
2.0	**Cognitive Skills**		
2.1	Be able to apply the learned material of the course in real life problems.	Lectures-Discussion-solve problems	Short quizzes, periodical and final exams.
2.2	Be able to integrate related topics from separate parts of the course.	Lectures – Discussion- solve problems	Short quizzes, periodical and final exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Show the ability to work independently and within groups.		
3.2	Have the ability to prove theorems and develop lemmas using different techniques.	Lectures – Discussion- solve problems	Short quizzes, periodical and final exams
3.3	Be able to describe and analyze models using related equations.	Lectures – Discussion- solve problems	Short quizzes, periodical and final exams
4.0	**Communication, Information Technology, Numerical**		
4.1	Have the ability to use computer programs	Discussion - Use	Homework

	in obtaining numerical solutions.	Matlab, Mathematica or Numerical Packages to solve some problems numerically.	projects
4.2			
5.0	**Psychomotor**		
5.1	Not applicable	Not applicable	Not applicable

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	Periodic exam (1)	6	20
2	Periodic exam (2)	10	20
3	Home work	Over all weeks	20
4	Final exam	End of semester	40

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)

- Office hours are specified throughout the week (6 hours/week)
- Contacts with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks:

- Tensor Analysis with Applications by Zafar Ahsan, Anamaya Publication, 2008.
- General Relativity : A text book by Robert M. Wald, University of Chicago

Press, 1984. - Space-time and Geometry: An Introduction to General Relativity by Sean Caroll, 2004.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Matlab, Mathematica and Numerical Packages

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.) Properly equipped classroom
2. Computing resources (AV, data show, Smart Board, software, etc.) - Classroom equipped with desktop computers. - Projectors and related items. - Numerical packages. - Compilers
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Non

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Course evaluation questionnaire conducted electronically by the University at the end of the term.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department - Results analysis. - Self- assessment of the program - External revisions and assessment. - Course report.

- Annual reports sufficiently prepared by the head of department.
3 Processes for Improvement of Teaching - Application of modern technologies in the education. - Application of e-learning. - Programs and trainings to improve the skills of teaching and learning. Several workshops on the improvement of teaching are conducting yearly by the University.
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) Non
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Comparisons of the course with other institutes in other universities. - Reviewing process of courses for improvement and development is done normally every five years.

Name of Instructor: DR. Mohammad Bilal Abdul Ghaffar

Signature:_____Date Report Completed: 8/10/2018

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Haydrodynamic Stability (2)**

Course Code: **4047712-4**

Course Specifications

Institution: Umm Al-Qura University Date : 8 / 10 / 2018
College/Department : Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Haydrodynamic Stability (2) (4047712-4)
2. Credit hours: 4 Hours
3. Program(s) in which the course is offered: Doctor of Philosophy (Applied Mathematics)
4. Name of faculty member responsible for the course: Prof. Abdullah A. Abdullah
5. Level/year at which this course is offered : Leve 2/ Ph. D.
6. Pre-requisites for this course (if any): Fluid Mechanics (2) 4047701-4
7. Co-requisites for this course (if any):
8. Location if not on main campus: Al-Abidiyah campus and Al-Zahir campus
9. Mode of Instruction (mark all that apply)

a. traditional classroom	✓	What percentage?	85
b. blended (traditional and online)		What percentage?	
c. e-learning	✓	What percentage?	15
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course? The main purpose for this course is to introduce advanced topics and quantitative techniques for the study of Hydrodynamic Stability and its applications.
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. Updating references used in teaching process. 2. Using e-learning facilities more efficiently. 3. Encouraging students to collect problems from web based references and supervise discussions in the class.

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

Course Description: This is a 4 credit Ph. D. course introducing advanced topics in Hydrodynamic Stability. The course comprises approximately 60 hours of lectures. The role of the course is to introduce linear hydrodynamic and hydromagnetic stability analyses and also provide an overview of classical findings in this field. Students will familiarize themselves with selected topics covering thermal instability of different flows. It is assumed that students entering this course have previously taken the course of Fluid Mechanics (2).

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Chapter 1 – Introduction . Mechanism of instability. . Fundamental concepts of hydrodynamic stability. . Kelvin-Helmholtz instability. . Magnetic rigidity.	4	16

Chapter 2– Centrifugal Instabilities . The Taylor Problem. . The Dean problem.	4	16
Chapter 3 – Parallel Shear Flows . The inviscid theory. . The viscous theory.	4	16
Chapter 4 – Plane Couette Flow	3	12

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 revisions.

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	Have an enhanced knowledge and understanding of hydrodynamic and hydromagnetic stability.	Lectures- Discussion-solve problems	Short quizzes, periodical and final exams.
1.2	Have the ability to recall the learned material of the course.	Lectures- Discussion-solve problems	Short quizzes, periodical and final exams.
2.0	**Cognitive Skills**		
2.1	Be able to apply the learned material of the course in real life problems.	Lectures- Discussion-solve problems	Short quizzes, periodical and final exams.
2.2	Be able to integrate related topics from separate parts of the course	Lectures –Discussion-solve problems	Short quizzes, periodical and final exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Show the ability to work independently and within groups.	Lectures –Discussion-solve problems	Short quizzes, periodical and final exams
3.2	Be able to describe and analyze models using related equations	Lectures –Discussion-solve problems	Short quizzes, periodical and final exams
4.0	**Communication, Information Technology, Numerical**		
4.1	Learn how to use computer codes to solve problems in Hydrodynamic Stability.	Discussion - Use Matlab, Mathematica or some numerical packages to solve some problems numerically.	Homework projects
5.0	**Psychomotor**		

	Not applicable

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	Periodic exam (1)	6	20
2	Periodic exam (2)	10	20
3	Homework + Quizzes	Over all weeks	20
4	Final exam	End of semester	40

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)
- Office hours are specified throughout the week (6 hours/week) - Contacts with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks
- Hydrodynamic stability, P. G. Drazin and W. H. Reid, Cambridge University Press, Cambridge (1981). - Hydrodynamic and Hydromagnetic Stability, S. Chandrasekhar, Dover, 1981. - PG Drazin, WH Reid, Hydrodynamic Stability, 2nd edition, Cambridge University Press, 2004 - PG Drazin, Introduction to Hydrodynamic Stability, 1st edition, Cambridge University Press, 2002.
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Matlab, Mathematica and Numerical Packages

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.) Properly equipped classroom.
2. Computing resources (AV, data show, Smart Board, software, etc.) - Classroom equipped with desktop computers. - Projectors and related items. - Numerical packages. - Compilers
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) - Overhead projector. - Laboratory equipment for individual students.

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Course evaluation questionnaire conducted electronically by the University at the end of the term.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department - Course report. - Lecture development. - Self- assessment of the program - External revisions and assessment. - Course report.

- Annual reports sufficiently prepared by the head of department.
3 Processes for Improvement of Teaching - Application of modern technologies in the education. - Application of e-learning. - Programs and trainings to improve the skills of teaching and learning.
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) Non
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. - Student's feedback. - Course report. - Comparisons of the course with other institutes in other Universities. - Reviewing process of courses for improvement and development is done normally every five years.

Name of Instructor: Prof. Abdullah A. Abdullah

Signature:_____Date Report Completed: 8 / 10 / 2018

Name of Field Experience Teaching Staff : _____

Program Coordinator:_____

Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Mathematical Biology (2)**

Course Code: **4047502-4**

Course Specifications

Institution: Umm Al-Qura University Date : 8 / 10 / 2018
College/Department : Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Mathematical Biology (2) 4047502-4				
2. Credit hours: 4Credit Hours				
3. Program(s) in which the course is offered: PhD in Mathematics				
4. Name of faculty member responsible for the course: Dr. Muntaser Safan				
5. Level/year at which this course is offered : Leve 2/ Ph. D.				
6. Pre-requisites for this course (if any): Introduction to Mathematical Biology 4046503-4				
7. Co-requisites for this course (if any):				
8. Location if not on main campus: Al-Abidiyah campus and Al-Zahir campus				
9. Mode of Instruction (mark all that apply)				
a. traditional classroom	✓	What percentage?	85	
b. blended (traditional and online)		What percentage?		
c. e-learning	✓	What percentage?	15	
d. correspondence		What percentage?		
f. other		What percentage?		

Comments:

B Objectives

1. What is the main purpose for this course? The main purpose for this course is to introduce advanced topics and quantitative techniques for the study of Mathematical Biology and Physiology.
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. Updating references used in teaching process. 2. Using e-learning facilities more efficiently. 3. Encouraging students to collect problems from web based references and supervise discussions in the class.

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

Course Description: This is a 4 credit Ph. D. course introducing advanced topics in Mathematical Biology and Physiology. The course comprises approximately 60 hours of lectures. The role of the course is to introduce topics such as epidemic models, modeling Vector-Borne disease, spatial heterogeneity, simple birth-death process and time-lag models. It is assumed that students entering this course have previously taken the course of Introduction to Mathematical Biology.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Chapter 1 – Epidemic Models with Demography - Modeling populations with varying size. - SIR model with demographic parameters. - Analysis in reduced dimensions. - Dimensionless SIR model: local stability analysis. - Basic reproduction number and forward bifurcation. - Global stability analysis of equilibria.	4	16
Chapter 2 – Modeling Vector-Borne Diseases - A simple model for vector-borne disease. - Model analysis, equilibria. - Basic reproduction number, stability.	3	12
Chapter 3 – Spatial Heterogeneity in Epidemiological Models - Meta population models. - Spatial models with diffusion.	2	8
Chapter 4 – Simple Birth-Death Process - Pure birth process. - Pure death process. - Simple linear and death process. - Simple immigration-birth-death process.	3	12
Chapter 5 – Time-Lag Models of Population Growth - Reaction time-lag – deterministic analysis. - Reaction time-lag – stochastic analysis. - More general deterministic models.	3	12

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 revisions.

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	Have an enhanced knowledge and understanding of mathematical biology and physiology.	Lectures- Discussion-solve problems	Short quizzes, periodical and final exams.
1.2	Have the ability to recall the learned material of the course.	Lectures- Discussion-solve problems	Short quizzes, periodical and final exams.
2.0	**Cognitive Skills**		
2.1	Be able to apply the learned material of the course in real life problems.	Lectures- Discussion-solve problems	Short quizzes, periodical and final

			exams.
2.2	Be able to integrate related topics from separate parts of the course.	Lectures –Discussion-solve problems	Short quizzes, periodical and final exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Have the ability to prove theorems and develop lemmas using different techniques.	Lectures –Discussion-solve problems	Short quizzes, periodical and final exams
3.2	Be able to describe and analyze models using related equations.	Lectures –Discussion-solve problems	Short quizzes, periodical and final exams
4.0	**Communication, Information Technology, Numerical**		
4.1	Have the ability to use computers programs in obtaining numerical solutions.	Discussion - Use Matlab, Mathematica or some numerical packages to solve some problems numerically.	Homework projects
5.0	**Psychomotor**		
	Not applicable		

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	Periodic exam (1)	6	20
2	Periodic exam (2)	10	20
3	Homework + Quizzes	Over all weeks	20
4	Final exam	End of semester	40

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) - Office hours are specified throughout the week (6 hours/week) - Contacts with students by e-mail, SMS, and e-learning facilities.

E Learning Resources

1. List Required Textbooks - Mathematics in Population Biology, Horst Thieme. Princeton University Press (2003). - Modelling Biological Populations in Space and Time, Eric Renshow. Cambridge University Press (1991).
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Matlab, Mathematica and Numerical Packages

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3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Non

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching Student feedback on effectiveness of teaching is arranged electronically at the end of the term by the University.
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department - Course report. - Lecture development.
3 Processes for Improvement of Teaching Several workshops on the improvement of teaching are conducting yearly by the University.
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) Non
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. Reviewing process of courses for improvement and development is done normally every five years.

Name of Instructor: Dr. Muntaser Safan

Signature:_____Date Report Completed: 8 / 10 / 2018

Name of Field Experience Teaching Staff : _____

Program Coordinator:_____

Signature: _____ Date Received:_____