جامعة أم القرى

كلية العلوم التطبيقية

الماجستير 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 (Master in Pure Mathematics)

Level	Course Code	Course Title	Required or Elective	Prerequisite Courses	Credit Hours
Level 1	4046401-4	Groups and rings	Required	404341-3 + 404342-3	4
	4046101-4	Introduction to functional analysis	Required	4044105-3	4
	4046601-4	General topology	Required	404360-3	4
Level 2	4046402-4	Modules and homological algebra	Required	4046401-4	4
	4046102-4	Banach algebra	Required	4046101-4	4
	4046602-4	Differentiable manifolds	Required	4046601-4	4
Level 3	4046411-4	Ordinary representations of groups	Elective	4046402-4	4
	4046404-4	Lie Algebras	Elective	4046402-4	4
	4046405-4	Graph Theory	Elective	40464014	4
	4046406-4	Coding theory	Elective	4046401-4 + 4043404-3 + 4044407-3 + 4046402-4	4
	4046407-4	Algebraic Cryptography	Elective	4044406-3 + 4043404-4	4
	4046103-4	Operator Theory	Elective	4044105-3 + 4046101-4	4
	4046104-4	Introduction to C*-Algebra	Elective	4046101-4	4
	4046105-4	Random Matrices and Orthogonal Polynomials	Elective	4042402-4+403404-3+404210-3+434477-4	4
	4046408-4	Algebraic number theory	Elective	4046401-4	4
	4046413-4	Cohomology of groups	Elective	4046402-4	4
	4046409-4	Galois Theory	Elective	4046401-4	4
	4046412-4	Modular Representation of Groups	Elective	4046411-4 + 4046408-4	4
	4046603-4	Differential Geometry	Elective	4042601-3	4
	4046106-4	Curves and Singularities	Elective	4042501-4 + 4043404-3 + 4042601-3 + 4043403-3	4
	4046107-4	Introduction to Orthogonal Polynomials	Elective	--	4
	4046200-4	Reading and research	Required	--	4
From the beginning of Level 3		Scientific thesis			16
		Research seminar			1
Total					49

In level 3:

- **Only ONE course will be selected among all stated courses in that level**
- **The course "4046200-4" called "Reading and research" will be recommended by the supervisor and graduate committee and its contents should be approved by the department council.**

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

Level	Course Code	Course Title	Required or Elective	Prerequisite Courses	Credit Hours
Level 1	4046701-4	Integral Equations	Required	4044505-3 + 4046702-4	4
	4046501-4	Variational Calculus	Required	Calculus of several Variables	4
	4046502-4	Advanced Mathematical Methods (1)	Required	-	4
Level 2	4046702-4	Introduction to Elasticity	Required	Continuum Mechanics	4
	4046503-4	Introduction to Mathematical Biology	Required	---	4
	4046703-4	Numerical Solutions of Differential Equations (1)	Required	Numerical Analysis + Partial Differential Equations	4
Level 3	4046704-4	Advanced Fluid Mechanics (2)	Elective	Fluid Mechanics + Continuum Mechanics	4
	4046504-4	Introduction to Special Relativity	Elective	Continuum Mechanics	4
	4046505-4	Advanced Mathematical Methods (2)	Elective	Advanced Mathematical Methods (1)	4
	4046705-4	Introduction to Magnetohydrodynamics	Elective	Continuum Mechanics	4
	4046706-4	Applications of Elasticity	Elective	4046702-4 + Continuum Mechanics	4
	4046707-4	Numerical Analysis (2)	Elective	4045703-4	4
	4046708-4	Asymptotic theory	Elective	--	4
	4046700-4	Reading and research	Required	--	4
From the beginning of Level 3		Scientific thesis			16
		Research seminar			1
Total					49

In level 3:

- **Only ONE course will be selected among all stated courses in that level**
- **The course "4046700-4" called "Reading and research" will be recommended by the supervisor and graduate committee and its contents should be approved by the department council.**

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

"Pure Mathematics Courses"

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Groups and rings**

Course Code: **4046401-4**

Course Specifications

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

A. Course Identification and General Information

1. Course title and code: Groups and rings (4046401-4)			
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) Master in Mathematics			
4. Name of faculty member responsible for the course Prof. Falih Al dosary			
5. Level/year at which this course is offered: level 1			
6. Pre-requisites for this course (if any):Group theory (404341-3) Ring theory (404342-3)			
7. Co-requisites for this course (if any):			
8. Location if not on main campus: Al-Abdia Campus & 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?	
Comments:			

B Objectives

1. What is the main purpose for this course?
   The aim of this course is to realize the importance of Groups and rings as central objects in algebra.

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.

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

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

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Basic concepts,	1	4
Free group, classification of finitely generated abelian groups	3	12
Some simple groups, A_n for $n \geq 5$ is simple, Group Actions	2	8
Sylow theorems and their applications	2	8
Soluble and nilpotent groups, Hall Subgroups.	3	12
Notherian and Artinieanrings.	2	8
Algebras, Structure of Rings	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	1) Know the basic facts and definitions free group and finitely generated abelian groups. 2) Studying some simple groups. 3) Study the Sylow sub-groups. 4) Studying series of subgroups (solubale and nilpotent groups). 5) Notherian and Artinean rings	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	6) Planning rigorous proofs of different propositions and assertions in this context. 7) Apply basic theorems for Hilbert spaces. 8) Investigate particular examples to which the theories under concern can be applied. 9) 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	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. 4) 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**		
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 1. Rose, J. S. A Course on Group Theory. : Dover, 1994. 2. Hungerford, Algebra, Springer, 1974. 3. DS Dummit and RM Foote, Abstract Algebra, 2003. 4. Rotuman, J. J. An Introduction to the Theory of Groups, 4th ed. : Springer-Verlag, 1995. 5. Ledermann,W, Introduction to Group Theory, Longman,1973 6. Burton, D. A first course in Rings and ideals. Addison Wesley, 1970 7. Daniel Gorenstein, Finite Groups, Chelsea (2nd edition), 2007.
2. List Essential References Materials (Journals, Reports, etc.)
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: Introduction to Functional Analysis

Course Code: 4046101-4

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: Introduction to Functional Analysis (4046101-4)			
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) Master 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 1			
6. Pre-requisites for this course (if any): Measure and Integration (4044105-3)			
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 main purpose of this course is to introduce the student to the of functional analysis. The theory includes operators on Banach spaces. The four big theorems in functional analysis, namely, Hahn-Banach theorem, uniform boundedness theorem, open mapping theorem and Banach-Steinhaus theorem will be covered.

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
Normed linear spaces and Banach spaces. Linear operators on Banach spaces. Linear functionals	4	16
Hanh-Banach Theorem. Open Mapping Theorem. Uniform. Boundedness Principle. Banach-Steinhaus Theorem, Closed Graph Theorem	4	16
Weak Topologies: Duality, The classical Banach spaces: ℓ^p, $L^p, C(K)$ Alaoglu's Theorem, Reflexivity, Separability. The Krein-Milman Theorem.	4	16
The Adjoint of a Linear Operator, Compact operators, finite rank operators Weakly compact operators.	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) Apply the fundamental theorems of functional 2) Apply Riez theorem to understand the dual of the algebra B(H). 3) Employ the Gram-Schmidt process. 4) Apply some results on Hilbert spaces to (partial) differential Equations.	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	5) Planning rigorous proofs of different propositions and assertions in this context. 6) Apply basic theorems for Banach spaces. 7) 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
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

Conway, J. B.: A Course in Functional Analysis, 2nd edition, Springer-Verlag, 1994, ISBN 0-387-97245-5

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

R.F. Curtain and A.J. Pritchard, Functional Analysis in Modern Applied Mathematics, Academic Press (1977).

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: April 15, 2018
Program Coordinator: _____

Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: General Topology

Course Code: 4046601-4

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 codeGeneral Topology (4046601-4)			
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) **MSc. Mathematics**			
4. Name of faculty member responsible for the course Dr. elsaid lashin			
5. Level/year at which this course is offered The firstLevel			
6. Pre-requisites for this course (if any) Intr. Topology (404360-3)			
7. Co-requisites for this course (if any)			
8. Location if not on main campus Al-Abdia 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

What is the main purpose for this course? • **Be able to deal with different topological spaces and with some types of points such as interior, isolated, boundary and accumulation points.** • **Be Familiar with the concepts of open ,closed sets and continuous mappings.** • **Understand the concepts of connectedness and compactness.** • **Deal with open and closed mappings.** • **Study the concepts of separations axioms.** • **Be familiar with the concept of topological property and hereditary property with 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. 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 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
Warming-Up: Theory of sets, Metric spaces , Topological spaces and Continuous functions.	2	8
Definition of connected and locally connected spaces with their properties. Studying of quotient spaces.	4	16
Compact spaces, Paracompact spaces, Countability, Separation Axioms and Tychonoff theorem.	4	16
Metrization theorem, Complete metric spaces , Nets and Filters.	5	20

2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Tot al
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	After successful completion of the course, the student should be able to Define a topological space, describe the standard examples of topological spaces from the course and demonstrate that they meet the definition. Define continuous function between topological spaces and demonstrate equivalence of alternative definitions.. Define and studying connected ,locally connected and quotient spaces. Define paracompact spaces ,countability and considering their properties . Studying separation axioms and tychonoff theorem . Define the metrization problem ,complete metric spaces , nets and filters with introducing their properties .	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	To define and recognize the basic concepts of topology. The ability of determining whether a given space is connected or not, the ability of generating a continuous mapping, and the ability of understanding the metrizability	Homework consisting in solving selected exercises. Encourage and develop self -	Homework Oral and written tests. Research projects.

	problem. The ability of understanding open covering, compactness and to determine whether a given space is compact or not. Knowing other types of compactness and how the different types of compactness are related in general topological spaces .	education	
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**		
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 (4 hours per week). 2- Contact with students by e-mail,SMS, and e-learning facilities.

E Learning Resources

1. Required Text(s) • Mícheál O'Searcoid, Metric Spaces, Springer Undergraduate Mathematics Series, 2007 • Theodore W Gomelin and RE Greene, Introduction to topology, Dover publications (second edition), 1999.
2. Essential References • Irving Kaplansky, Set Theory and Metric Spaces (AMS Chelsea Publishing) 2nd Edition • S Stahl and C Stenson, Introduction to topology and Geometry, Wiley, 2013.
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 (i.e. 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 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: E Lashin

Signature: _____ Date Specification Completed: April 15, 2018
Program Coordinator: _____

Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: **Modules and homological algebra**

Course Code: **4046402-4**

Course Specifications

Institution:Umm Alqura University, Makkah Date of Report: 05 November 2018
College/Department: College of Applied Science, Mathematical Science

A. Course Identification and General Information

1. Course Title and Code: : Modules and homological algebra 4046402-4
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) **Master 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: **Master/ Semester 1**
6. Pre-requisites for this course (if any) **Groups and Rings**
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 Modules and homological algebra. In particular, we shall cover the following topics:

- Modules over a ring, module homomorphism, substructure of modules, exact sequences
- Modules over principal ideal domain, Free modules, projective modules, injective modules, flat modules,
- Tensor product of modules.
- Introduction of Homological algebra (Ext and Tor). categories and functors. More Extension of modules.
- Derived functors and Kunneth formula.
- Introduction of cohomolgy of groups.
- Cohomology of a finite cyclic groups. Spectral sequences.

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.
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
Introduction and motivation: Modules over a ring, module homomorphism, substructure of modules, exact sequences	2	8
Modules over principal ideal domain, Free modules, projective modules, injective modules, flat modules, torsion and torsion-less modules.	3	8
Tensor product of modules. Introduction of Homological algebra (Ext and Tor)	3	12
categories and functors. More Extension of modules.	2	8
Derived functors and Kunneth formula. Introduction of cohomolgy of groups.	3	12
Cohomology of a finite cyclic groups and Spectral sequences.	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 define 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 modules over principal ideal domain as well as some special classes o modules such as free modules, projective modules, injective modules and flat modules and torsion modules.		
1.3	To give an algebraic structure to a set of module homomorphisms such as endomorphism algebra.		
1.4	To Describe some homological concept such as ext and tor and Shours Lemma for modules.		
1.5	To state and label and use isomorphism theorems for modules.		
1.6	To use tensor product of modules as well as exact sequences.		
1.7	To state some well know theorems in cohomology of finite cyclic groups and spectral sequences.		
2.0	**Cognitive Skills**		
2.1	1-To interpret and criticize as well as construct modules over principal ideal domain.	• 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	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
2.2	To explain categories and functors.		
2.3	To reorganize Derived functor and Kunneth formula		
2.4	To interpret homological algebra such as ext and tor and give some examples.		
2.5	To explain and interpret free modules, projective modules, torsion modules, injective modules and flat modules.		
2.6	To evaluate and calculate cohomology groups of finite cyclic groups.		
2.7	To prove and develop natural transformation and adjoint functor.		

		discussions to 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 college and	
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.		

		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 A sessment Tasks for Students During the Semester

	Assessment task (e. 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- Thomas W. Hungerford: Algebra, Springer, 1974, ISBN: 978-4612-6101-8. 2- David Dummit and Richard Foote: Abstract Algebra, Wily, July 14, 2003, ISBN: 978-0471433347 & 0471433349. 3- Rotman, Joseph: An introduction to Homological algebra, Springer, 2009, ISBN: 978-387-68324-9
2. List Essential References Materials (Journals, Reports, etc.) Hilton Peter, Stammbach: A course in Homological algebra, Springer, 1997, ISBN: 978-1-4419-8566-8
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) 1- Richard S. Pierce: Associative Algebras, Springer, 1982, ISBN: 978-1-4757-0163-0 2- Saunders Mac Lane: Categories for working mathematicians, Springer-Verlag, 1998, ISBN: 0-387-98403-8
4. List Electronic Materials(eg. Web Sites, Social Media, Blackboard, etc.) - https://en.wikipedia.org/wiki/Module_theory - https://en.wikipedia.org/wiki/Homologicalalgebra_theory
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 30 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 homological algebra and cohomology of groups. Module theory, category and functors as well as exact sequences are the main topic in this course.

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: 05 November 2018_____

Received by: _____ Dean/Department Head

Signature: _____ Date: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: Banach Algebra

Course Code: 4046102-4

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: Banach Algebra 4046102-4			
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) Master of Sciences (Pure 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): Introduction to functional analysis (4046101-4)			
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 present the basic theory of Banach algebras and algebras of operators on Hilbert spaces with emphasis on C*-algebra 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 60 hours of lectures.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Preliminaries on functional analysis. Banach algebras: Definition, homomorphism, spectrum, basic properties of spectra, Gelfand-Mazur theorem, spectral mapping theorem, group of invertible elements.	5	20
Commutative Banach algebras and Gelfand theory: Ideals, maximal ideals and homomorphism, semi-simple Banach algebra, Gelfand topology, Gelfand transform, involutions.	5	20
Banach*-algebras, Gelfand-Naimark theorem, applications to non-commutative Banach algebras. A characterization of Banach * - algebras	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

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
   - Rudin, W., Functional Analysis, second edition, McGraw-Hill, 1991
   - GR Allan, Introduction to Banach Spaces and Algebras, Oxford graduate texts 20, Oxford university press, 2011.

2. List Essential References Materials (Journals, Reports, etc.)
Frank F. Bonsall, John Duncan (1973). Complete Normed Algebras. Springer-Verlag, New York. ISBN 0-387-06386-2.

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: April 15, 2018

Program Coordinator: _____

Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: Differentiable manifolds

Course Code: 4046602-4

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 Differentiable manifolds (4046602-4)
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)
MSc. Mathematics
4. Name of faculty member responsible for the course
Dr. elsaid lashin
5. Level/year at which this course is offered
The second level
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
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

What is the main purpose for this course? • **Be able to deal with advanced topics in topology such as paths and path connected spaces ,homotopy of continuous mappings and multiplication of paths .** • **Be Familiar with the concepts of the fundamental group (theory and examples) .** • **Understand the concepts of the classification of covering spaces and the topological group (formal definition ,properties and examples) .** • **Deal with smooth manifolds , smooth maps , topological manifolds and topological properties of manifolds.** • **Study the concepts of Surfaces in the Euclidean space E^3 as a 2-dimensional manifold .** • **Be familiar with the concept of topological property and hereditary property with 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. 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 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
Warming-Up: Theory of paths and path connected spaces, Homotopy of continuous mappings, Multiplication of paths and the fundamental group	2	8
Studying the classification of covering spaces and the topological group.	4	16
Smooth manifolds and smooth maps (formal definition, properties and examples).	4	16
Surfaces as a 2-dimensional manifold (theory and properties).	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	After successful completion of the course, the student should be able to Define a path connected space, describe the standard examples of the fundamental group from the course and demonstrate that they meet the definition.. Define the covering space and the topological group and demonstrate equivalence of alternative definitions.. Define and studying smooth manifolds and smooth maps. Define topologyical manifolds and considering their properties . Studying surfaces in Euclidean spaces as a 2-dimensional submanifold . Define the theory of submanifolds .	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	To define and recognize the basic concepts of algebraic topology. The ability of determining whether a given space is path connected or not, the ability of defining the multiplication of paths, and the	Homework consisting in solving selected exercises. Encourage and	Homework Oral and written tests. Research projects.

	ability of understanding the fundamental group. The ability of understanding the smooth manifolds and the smooth maps between them , considering the topological properties of manifolds and studying the surfaces in Euclidean spaces as 2-dimensional submanifolds .	develop self - education	
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**		
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 (4 hours per week). 2- Contact with students by e-mail,SMS, and e-learning facilities.

E Learning Resources

1. Required Text(s) **John M. Lee, Introduction to smooth manifolds, Springer, 2002 .**
2. Essential References Allen Hatcher, Algebric Topology, Cambridge University press, 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 (i.e. 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 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: E Lashin

Signature: _____ Date Specification Completed: April 15, 2018
Program Coordinator: _____

Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: **Ordinary Representations of Groups**

Course Code: **4046411-4**

Course Specifications

Institution: Umm Alqura University, Makkah Date of Report: 05 November 2018
College/Department: College of Applied Science, Mathematical Science

A. Course Identification and General Information

1. Course title and code: Ordinary Representations of Groups 4046411-4			
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) **Master 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: **Master/ level 3**			
6. Pre-requisites for this course (if any) **Modules and homological algebra (4046402-4)**			
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. There is a need to apply some modes in some situations.			

B Objectives

1. What is the main purpose for this course?

The aim of the course is to introduce graduate students into ordinary representation of groups. In particular, we shall cover the following opics:

- Representation and Modules.
- Characters of finite groups and character tables.
- The regular representation.
- Induced representation.
- Burnside p-q theorem.
- Clifford Theorem and restriction characters to normal subgroups.
- Macky decomposition formula of induced characters.

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.
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
Introduction and motivation: Definition of a representation matrix representation and G-module, Maschke Theorem., examples	2	8
Characters and characters tables of some well known groups. Orthogonality relations. Shours lemma.	3	12
Regular representation and some applications (more character tables)	2	8
Induced representation. Macky Decomposition formula of induced characters.	3	12
Clifford Theorem and restriction characters to normal subgroups.	2	8
Burnside (p-q)Theorems, Some applications and revisions	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**		
1.1	To define and recognize matrix representation and modules over group algebras.	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 Permutations representation, ordinary representation of some well known groups of symmetries (triangle, rectangle, square), symmetric groups.		
1.3	construct character tables of some well known groups..		
1.4	To Describe orthogonality relations and Shours Lemma.		
1.5	To state and label linear Group Action on a basis of a vector space, Maschke theorem.		
1.6	To use conjugacy classes, class sums as a basis of the center of group algebras.		
1.7	To state Clifford theorem and use it for commute and construct the character tables.		
2.0	**Cognitive Skills**		
2.1	To interpret and criticize as well as construct character tables of some well known groups.	• Request from students to do some preparations for the lectures. • Give students challenging exercise and problems. • Asking students for doing generalizations and extensions	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
2.2	To explain Permutations representation, matrix representation		
2.3	To reorganize Co-sets, and Direct Products of groups.		
2.4	To interpret orthogonality relations between characters and use these relations to construct character tables		
2.5	To explain and interpret Mackey decomposition formula and use them.		
2.6	To prove and develop Burnside theorems of finite solvable groups		

2.7	To evaluate and calculate conjugacy classes, class sums as a basis of the center of group algebras.	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.	
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	
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.	department days and activities.	
4.7	Criticize and evaluate as well as express a judgment on the art of mathematics in this field.	• 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.	
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 A sessment 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

1- John. L. Alperin and Rowen B. Bell, Groups and Representations, Springer, NewYork, September 11, 1995.ISBN:978-0387945262.
2- Gordan James and Martin Liebeck, Representations and Characters of Groups, Cambridge University Press 2001.ISBN: 97805118114532.
3- Martin Isaacs, Character Theory of Finite Groups, Dover Publications, INC, New York, November 2, 2011..ISBN: 978-0486680149.

2. List Essential References Materials (Journals, Reports, etc.)
Representations of Finite Groups,Andrew Baker

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

1- L. Dornhoff, Group Representation Theory, Part A: Ordinary representation theory. Marcel Dekker Inc., New York, (1972).
2- Charles W. Curtis and Irving Reiner, Representation Theory of Finite Groups and Associative Algebras, American Mathematical Society, New York, 1962.
3- Hirosi Nagao and Yukio Tsushima, representation of finite groups, January 1989. 0-12-513660-9

4. List Electronic Materials(eg. Web Sites, Social Media, Blackboard, etc.)

- https://en.wikipedia.org/wiki/Representation_theory

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 30 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 ordinary representation and characters theory as well as basic course for building character tables and the main theorems in this direction such as Burnside theorem for soluble groups and Clifford theorem for characters.**

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: __Prof. Dr._Ahmad Mohammed Ahmad Alghamdi____
Date Report Completed: 05 November 2018_____

Received by: _____ Dean/Department Head

Signature: _____ Date: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Lie Algebras**

Course Code: **4046404-4**

Course Specifications

Institution:Umm Al-Qura University	Date: February 2018
College/Department :	

A. Course Identification and General Information

1. Course title and code:Lie Algebras 4046404-4
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)
Master in mathematics
4. Name of faculty member responsible for the course Prof. Falih A. Aldosray
5. Level/year at which this course is offered: level 3
6. Pre-requisites for this course (if any):Group theory, Linear algebra
Modules and Homological Algebra (**4046402-4**)
7. Co-requisites for this course (if any):
8. Location if not on main campus:Al-Abdia Campus & 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?	

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

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

Course Description:
Lie algebra, and basic properties. Soluble and nilpotent Lie algebras. Root systems, Classification of simple Lie algebras.

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 .	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/	Practical	Other:	Total

				Studio		(self-Study)	
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	1) Know the basic facts and definitions on Lie algebras and their properties 2) Determine when a Lie algebra is solvable and apply Lie's and Engel's Theorems. 3) Know and prove Cartan's criterion for solvability and semi simplicity. 4) Study and apply Killing form examples. 5) Classification of simple Lie algebras over a field of characteristic 0.	Lectures Tutorials Discussion Problem Solving	Exams Home work.

	6) Basic of the theory of representation of Lie algebra		
2.0	**Cognitive Skills**		
2.1	1) Planning rigorous proofs of different propositions and assertions in this context. 2) Apply basic theorems Lie algebras . 3) Investigate particular examples of Lie algebras to which the theories under concern can be applied. 4) 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	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. 4) 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**		
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: **Graph Theory**

Course Code: **4045405-4**

Course Specifications

Institution:Umm Alqura University, MakkahDate of Report: 05 November 2018
College/Department: College of Applied Science, Mathematical Science

A. Course Identification and General Information

1. Course title and code: : Graph Theory (4046405-4)			
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) **Master 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: **Master/ Semester 1**			
6. Pre-requisites for this course (if any) **Groups and Rings**+ Discrete mathematics + combinatorics.			
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. There is a need to apply some modes in some situations.			

B Objectives

1. What is the main purpose for this course?

The aim of the course is to introduce graduate students into Graph theory and its applications. In particular, we shall cover the followings topics:

- Introduction to graphs, structure and representations, trees, spanning trees.
- Connectivity, Optimal traversals and planarity.
- Drawing graph, graph coloring, and digraph models.
- Network flows, enumeration, Eulerian networks and Hamiltonoian net works.
- Algebraic graph, Algebraic specification, Nonplaner Layout. Some applications of graph theory.
- Spectrum and Energy of a graph: Laplacian spectrum and Laplacian energy of a graph.
- Brouwer's conjecture, the sum of the Laplacian eigenvalues of a graph.

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.
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)

1. Topics to be Covered

List of Topics	No. of Weeks	Contact Hours
Graph modules, structure and representations, trees, spanning trees.	2	8
Connectivity, Optimal traversals and planarity. Drawing graph, graph coloring, and digraph models.	3	12
Network flows, enumeration. Some applications.	2	8
Algebraic graph, Algebraic specification, Nonplaner Layout. Applications.	3	12
Spectrum and Energy of a graph: Laplacian spectrum and Laplacian energy of a graph.	3	12
Brouwer's conjecture, the sum of the Laplacian eigenvalues of a graph.	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					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	1-To recognize graph theory and its applications in many ways.	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 exam
1.2	To describe graph family, walks, distance, isomorphisms, symmetry and automorphisms of sub-graphs..		
1.3	To know Trees, connectivity, drawing, coloring, and network flows.		
1.4	To Describe enumerations, algebraic graph, energy graph and spectra of a graph.		
1.5	To state spanning trees and the related matters.		
1.6	To use graph for solving real live problems and understand some good applications in this direction		
1.7	To state basic facts of energy of graphs and spectra of graph.		
2.0	**Cognitive Skills**		
2.1	To interpret and criticize as well as construct basic and advanced theory of graphs such as trees, connectivity, planer and non-planer layouts.	• 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	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
2.2	To explain algebraic connections in graph theory.		
2.3	To reorganize enumerations such as automorphism groups and action on coloring.		
2.4	To interpret and explain network flows and use it to solve max-flow problem.		
2.5	To explain and interpret graph energy and graph spectra and to construct algebraic specification such as Cayley graphs, regular voltages applications.		
2.6	To evaluate and calculate eigen values of laplacian matrices and related matrices for graph theory which are related to Brouwer's conjecture.		
2.7	To prove and develop Burnside theorem and Polya generalization as well as inventories for counting colorings		

		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 college and department committees. • Joint and use useful media for	
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.		

		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 A sessment 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	5	20 %
3	Second Periodic Exam	10	20%
4	Final Examination (written Exam)	16	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

1- Sharie fuddin Pirzada: An introduction to graph theory, University press Orient BlackSwan. Hyderabad, India 2012. 2- Gross and Yellen, Graph Theory and Its Applications, SECOND Edition, CRC Press, 2006. 3- A.E. Brouwer, W.H. Haemers, Spectra of graphs, available from http://homepages.cwi.nl/~aeb/math/ipm.pdf.
2. List Essential References Materials (Journals, Reports, etc.) On the sum of the Laplacian eigenvalues of a graph and Brouwer's conjecture; Journal of : Linear Algebra and its applications, 501, (2016), 376-389.
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) 1- D. Cvetkovic, M. Doob and H. Sachs: Spectra of graphs. Theory and applications Academic Press, New Work 1980. 2- Michel Rigo, Advanced Graph Theory and Combinatorics, Wiley-ISTE, 2016, ISBN: 079-1848216167 & 1848216165.
4. List Electronic Materials(eg. Web Sites, Social Media, Blackboard, etc.) - https://en.wikipedia.org/wiki/Graph_theory
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 30 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 aadvanced and fundamental course in Graph theory and its applications. And the main theory can be devoted to applications in many situations as well as study Brouwer's conjecture for spectra and energy of graphs.**

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 05 November 2018_____

Received by: _____ Dean/Department Head

Signature: _____ Date: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **CODING THEORY**

Course Code: 4046406-4

Course Specifications

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

A. Course Identification and General Information

1. Course title and code: Coding Theory 4046406-4			
2. Credit hours 4			
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) Master 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) 4046401-4 + 4043404-3 + 4044407-3 + 4046402-4			
7. Co-requisites for this course (if any)			
8. Location if not on main campus Alabdiya and alzaher			
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? To introduce the students to coding theory. This includes the concept and different method of describing codes as well as main theorems concerning the main aim of coding 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) In certain stage of the course the students will be introduced to certain computer packages which deal with coding theory 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 hours of lectures.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Introduction to coding theory : Basic assumption – weight and distance - Generating and check matrices- Encoding- Error correcting codes ; the main problem of coding theory	2	8
Linear Codes: Codes over finite fields – Equivalent codes - Cyclic linear Codes	2	8
BCH Codes: Finite fields – Minimal polynomials – Cyclic Hamming codes - Decoding 2 error_correcting BCH code	2	8
Reed-Solomon Codes: Codes over $GF(2^r)$, Reed-Solomon codes	2	8
Reed- Muller Codes : Constructing Reed-Muller codes – Decoding Reed-Muller codes	2	8
Codes and Group Rings: The notion of group rings and their structure, Linear codes as ideals in group rings, Group rings as matrices, unit-type codes, Zero divisors type codes.	3	12
Recent conjectures and open problems in this field.	2	8

2. Course components (total contact hours and credits per semester): 21 contact hours (3 credits)						
	Lecture	Tutorial	Laboratory	Practical	Other:	Total

			or Studio			
Contact Hours	60					60
Credit	4					4

3. Additional private study/learning hours expected for students per week.
Three 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 basic set up of codes (how to describe a linear code)	Lectures and tutorials	Quizzes, periodical and final exams
1.2	The student will also aware of different kinds of codes and their coding capacities	Lectures and tutorials	Quizzes, periodical and final exams
2.0	**Cognitive Skills**		
2.1	Constructing codes of certain parameters. Distinguishing between codes by equivalence.	Lectures and tutorials	Quizzes, periodical and final exams
2.2	Judging codes according to their coding capacities.	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	Working in small groups	Oral Presentations

	critically		
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 existing 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	Second periodic exam	10	20
3	Homework and tutorial activities	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)
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) Hoffman et. al. , Coding Theory the essentials , DEKKER #150, 1992

(2) Vera Pless , Introduction to the theory of Error-Correcting Codes, WILEY 1990

(3) Steven Roman , Coding and Information Theory, Springer-Verlag 1992.

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)

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: 20/2/ 2018
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: Algebraic Cryptography

Course Code: 4046407-4

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: **Algebraic Cryptography** 4046407-4			
2. Credit hours 4			
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) Master in Mathematics			
4. Name of faculty member responsible for the course Prof. Ahmed A Khammash			
5. Level/year at which this course is offered Level3/Master			
6. Pre-requisites for this course (if any) 4044406-3 + 4043404-4			
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? To introduce the student to the basic concepts and different techniques of algebraic cryptography.
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 and other resources used in teaching process. (2) Using e-learning facilities. (3) Encouraging students to collect problems (and conjectures) from web based resources, ask them to present their collected data and discuss it in an interactive way in the class.

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

Course Description: This course 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
(1) ELEMENTARY NUMBER THEORY • Time estimates for arithmetic , Divisibility , Congruence (1) FINITE FIELDS AND QUADRATIC RESIDUES • Finite fields , Quadratic residue	5	20
(2) CRYPTOGRAPHY • Basic principles of Cryptosystems , Reliability , Enciphering matrices (3) PUBLIC KEY • The idea of public key cryptography , RSA , Authentication	5	20
(4) PRIMALITY AND FACTORING (5) COMPUTATIONAL COMPLEXITY	5	20

2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory or 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 of homework, revision and presentations

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	Develop the knowledge and understanding of the concept and the main idea of the algebraic cryptography and the basic principles of Cryptosystems (enciphering , deciphering and breaking codes)	Lectures , homeworks and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations.
1.2	Learn the concept of public key cryptography , RSA , Authentication	Lectures , homeworks and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations
2.0	**Cognitive Skills**		
2.1	Demonstrate the ability to representing data digitally as well as implementing different techniques transferring and retrieving data using ciphering and deciphering process.	Lectures , homeworks and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations
2.2	Demonstrate the ability of using public	Lectures , homeworks and	Quizzes ,

	key ciphers and applying such ciphers in transferring secret data as well as judging its reliability	discovery-based-learning discussions	periodicals and final exams as well as presentations
3.0	**Interpersonal Skills & Responsibility**		
3.1	Practicing how to work within small team as an outcome of the discovery-based-learning discussions implemented throughout the course. Presentations teaches the student how to cite and quote	Lectures , homework and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations
3.2			
4.0	**Communication, Information Technology, Numerical**		
4.1	Demonstrate communication and listening skills with the people in the class with positive attitudes and deportment. Show the ability of raising mathematical questions (problems) and how to solve them	Lectures , homework and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations
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	First periodic exam	6	20
2	Second periodic exam	10	20
3	Homework and tutorial activities	Over all weeks	20
4	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) The instructor is available for six hours at least per week. S/he is also available on appointments.

E Learning Resources

1. List Required Textbooks

(1) Neal Koblitz, Algebraic Aspects of Cryptography, Springer 1998 (2) Neal Koblitz, A course in number theory and cryptography , Springer 1987 (3) Charles GOLDIE and RICHARD PINCH, Communication theory, 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.

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 classroom with the capacity of 10-20 students
2. Computing 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)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching A student survey questions is implemented by the end of the semester which usually provides valuable feedback for both the teacher and the institution
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department Peer consultations and coordination
3 Processes for Improvement of Teaching In the light of the outcome of the survey questions in (1) and (2), the instructor and the department take series steps towards improving the teaching process.
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) Coordination with other colleagues in both teaching and marking
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. The department obliged by the regulations to review the whole program each certain period of time (5 years) in the light of the different outcomes.

Name of Instructor: **Prof. Ahmed Khammash**
Signature: *Ahmed Khammash* Date Report Completed: November 1,2018

Name of Field Experience Teaching Staff Algebra (Representation Theory)
Program Coordinator:_____
Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: Operator Theory

Course Code: 4045103-4

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: Operator Theory 4046103-4
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)
Master in Mathematics
4. Name of faculty member responsible for the course Dr. Mohamed Mabrouk
5. Level/year at which this course is offered: Second Year
6. Pre-requisites for this course (if any): Introduction to functional analysis (4046101-4)
Measure and Integration (4044105-3)
7. Co-requisites for this course (if any): General Topology (4046601-4)
8. Location if not on main campus: Al-Abdia and Al-Zahir Campuses
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 aim of this course is to introduce some of the fundamental tools of the operator 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)
   - 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
Basic theory of Hilbert spaces: Inner product spaces, geometric and metric properties of Hilbert spaces	2	8
Orthogonal complements and direct sums, Orthonormal sets and sequences, Bessel inequality, Total sets and Total Orthonormal sets, Separable Hilbert spaces, Projection on a closed convex set. Functional on Hilbert spaces and Riesz' s theorem.	2	8
Adjoint of an operator, Spectrum of a self-adjoint operator, Spectral properties of self-adjoint operator, Functional Calculus for a self-adjoint operator	3	12
Compact operators: Definition and properties, Finite rank operators, Spectral properties of Compact operators	3	12
Self-adjoint compacts operators: Spectral decomposition of finite rank operators and self-adjoint compact operators.	3	12

Application to Sturm-Liouville system; Fredholm alternatives; Integral equations.	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:** After successful completion of the course, the student should be able to		
1.1	1) Know the basic the spectrum of operator 2) Determine the spectrum of well-known operators. 3) The spectral theorem for bounded operators, Continuous functional calculus for self-adjoint operators 4) Spectral measures, The spectral theorem for self-adjoint operator	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	5) Planning rigorous proofs of different propositions and assertions in this context.	Lectures	Periodic written and oral tests. Discussion.

	6) Investigate examples to which the theories under concern can be applied. 7) Use lecture notes and other texts to solve challenging problems.		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 • Conway, J. B.: A Course in Functional Analysis, 2nd edition, Springer-Verlag, 1994, ISBN 0-387-97245-5 • Rabindranath Sen, A first course in functional analysis: theory and applications, Anthem press, 2013
2. List Essential References Materials (Journals, Reports, etc.) R.F. Curtain and A.J. Pritchard, Functional Analysis in Modern Applied Mathematics, Academic Press (1977).
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. Mohamed Mabrouk

Signature: _____ Date Specification Completed: April 15, 2018

Program Coordinator: _____

Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: Introduction to C*-algebra

Course Code: 4046104-4

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: Introduction to C*-algebra 4046104-4
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)
Master in Mathematics
4. Name of faculty member responsible for the course Dr. M. Mabrouk
5. Level/year at which this course is offered: Second Year
6. Pre-requisites for this course (if any): Introduction to functional analysis (4046101-4)
7. Co-requisites for this course (if any): Banach Algebra (4046104-4)
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
Definition of a C*-algebra, examples, the multiplier algebra, the unitization of a C*- algebra. *-homomorphisms, Gelfand's structure theorem for commutative C*-algebras, functional calculus with normal operators, the spectral mapping theorem	6	2
Positive elements, ideals, approximate units, hereditary subalgebras. . Quotient algebras of C*- algebras Representations: Positive linear functionals, representations and the Gelfand–Naimark–Segal (GNS) construction.	5	20
Irreducible representations and pure states, Kadison's transitivity theorem. Primitive ideals, hull-kernel topology.	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.	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.)

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. M. Mabrouk

Signature: _____ Date Specification Completed: April 15, 2018

Program Coordinator: _____

Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: Random Matrices and Orthogonal Polynomials

Course Code: 4046105-4

Course Specifications

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

A. Course Identification and General Information

1. Course title and code: Random matrices and orthogonal polynomials (4046105-4)
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)
Master of Sciences (Pure Mathematics)
4. Name of faculty member responsible for the course Dr. B. Mohamed
5. Level/year at which this course is offered: level 3
6. Pre-requisites for this course (if any): Lineair Algebra1 (4042402-4), Lineair Algebra 2 (403404-3), Measures theory (404210-3), Special Functions (434477-4).
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 main purpose of this course is to introduce to student, the random matrices theory. The theory includes Gaussian random matrices. The Wigner semi-circle law, by using Method of orthogonal polynomials, method of logarithmic potential. Mehta formula and Fredholm determinant.

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
Orthogonal polynomials, recurrence relations, zeros and Christoffel Darboux formula	3	12
Moments generating functions, Weak convergence of measures and Lévy-Cramer theorem	3	12
Logarithm potential of probability measure: existence and unicity	3	12
Ensemble of Gaussian random matrices, Weyl integration formula, Mehta formula and Fredohlm determinant, Statistical density of eigenvalues	3	12
Wigner theorem: method of orthogonal polynomials Wigner theorem: method of potential logarithmic theory	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.
Three 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) Understand the Gaussian complex ensemble and be able to generalize to real and quaternion Gaussian ensemble 2) Apply the orthogonal method to others random matrices ensembe 3) Apply the logarithmic potential method to others exemples 4) Apply the Fredholm determinant to study the local spectrum of random matrices	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	5) Planning rigorous proofs of different	Lectures	Periodic written

	propositions and assertions in this context. 6) Apply basic theorems for random matrices. 7) Investigate examples to which the theories under concern can be applied.		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	5	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 Percy Deift, Orthogonal polynomials and random matrices: a Riemann-Hilbert approach. Courant Institute of Mathematical Sciences & A.M.S (2000).
2. List Essential References Materials (Journals, Reports, etc.) 1) M L Mehta, Random matrices. Academic Press (1991). 2) Forrester.J. P. Log-Gases and random matrices. Princeton university Press (2010).
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. B. Mohamed

Signature: _____ Date Specification Completed: November 10, 2018
Program Coordinator: _____

Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: **Algebraic number theory**

Course Code: **4046408-4**

Course Specifications

Institution:Umm Alqura University, Makkah Date of Report:05 November 2018
College/Department: College of Applied Science, Mathematical Science

A. Course Identification and General Information

1. Course Title and Code: : Algebraic Number Theory **4046408-4**			
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) **Master 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: **Master/ Semester 1**			
6. Pre-requisites for this course (if any) **Groups and Rings**+ Number theory			
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. There is a need to apply some modes in some situations.			

B Objectives

1. What is the main purpose for this course?

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

- Revision of some well known domains such as integral domain, Euclidian domain, Principal ideal domain
- Algebraic extensions of a field and algebraic number field.
- More Domain such as Noetherian domain, Dedekend domain and unique factorization domain and the relationship with algebraic number field.
- Norm of ideals and factoring primes in a number field.
- Units in Real quadratic fields. Ideal class groups.
- Dirichlet's unit theorem. Applications of Diophantian equations.

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.
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)

1. Topics to be Covered

List of Topics	No. of Weeks	Contact Hours
Introduction and motivation: Revision of some well known domains such as integral domain, Euclidian domain, Principal ideal domain. Algebraic extensions of a field and algebraic number field.	2	8
More Domain such as Noetherian domain, Dedekend domain and unique factorization domain and the relationship with algebraic number field.	3	12
Norm of ideals and factoring primes in a number field.	3	12
Units in Real quadratic fields	2	8
Ideal class groups.	2	8
Dirichlet's unit theorem. Applications of Diophantine equations.	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					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 define and recognize several types of domains such as integral domain, unique factorization domain principal ideal domain, Noetherian domain and Dedekind domain.	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 exam
1.2	To describe algebraic extensions of fields and algebraic number field.		
1.3	To recognize the concept of norm of ideals.		
1.4	To Describe units in real quadratic fields.		
1.5	To state and label several facts and theorems in algebraic number fields.		
1.6	To use norm in the theory of algebraic numbers.		
1.7	To state and use Dirichlet's unit theorem.		
2.0	**Cognitive Skills**		
2.1	To interpret and criticize as well as construct relationship between several kinds of domains.	• 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	• Questions in the classes • Quizzes • Two periodical exams • Homework assignments • Final written exam
2.2	To explain factoring primes in a number field.		
2.3	To understand Ideal class groups.		
2.4	To interpret norm of ideals and factoring primes.		
2.5	To explain and interpret Dirichlet's theorem and use it.		
2.6	To evaluate and calculate norms of ideals.		
2.7	To prove and develop Dirichlet's theorem and to do some application of Diophantine equations.		

		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.	
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	
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.	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.	
4.6	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,

5 Schedule f 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

1- SabanAlacaand Kenneth S. Williams, Introductory Algebraic Number Theory, Cambridge University PressSeptember 2012, Print publication year: 2003, Online ISBN: 9780511791260 2- Hilbert David, The theory of Algebraic number field, Springer, 1998, ISBN: 978-3-662-03545-0 3- Gerald J. Janusz, Algebraic number fields, American Mathematical Society, December 5, 2005. ISBN: 978-0821804294.
2. List Essential References Materials (Journals, Reports, etc.) Journal of Algebra and number theory, journal of number theory.
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) 1- John William, etal..Algebraic Number Theorey, London Mathematical Socity, March 12, 2010. ISBN: 9780950273426 2- A. FrohlichandM Taylor, Algebraic Number Theory, Cambridge University Press, Febrauary 26, 1993. ISBN: 978-05214383346.
4. List Electronic Materials(eg. Web Sites, Social Media, Blackboard, etc.) - https://en.wikipedia.org/wiki/algebraic numbers_theory
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 30 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 foundation and fundamental course in algebraic number theory and basic invariants such as rings of integers, class groups, norm, Dirichlets's theorem and some applications in Diophantine equations.**

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: 05 November 2018_____

Received by: _____ Dean/Department Head

Signature: _____ Date: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Cohomology of Groups**

Course Code: **4046413-4**

Course Specifications

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

A. Course Identification and General Information

1. Course title and code: Cohomology of groups 4046413-4			
2. Credit hours 4			
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) Master in Mathematics			
4. Name of faculty member responsible for the course Prof. Ahmed A Khammash			
5. Level/year at which this course is offered Level2/Master			
6. Pre-requisites for this course (if any) 4046402-4			
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? To introduce the student to the basic concepts and different techniques of the cohomology of groups
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 and other resources used in teaching process. (2) Using e-learning facilities. (3) Encouraging students to collect problems (and conjectures) from web based resources, ask them to present their collected data and discuss it in an interactive way in the class.

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

Course Description: This course 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
Some revision of modules, rings and fields.	2	8
Some revision of categories and functors.	2	8
Extension of modules.	2	8
Derived functors and Kunneth formula.	3	12
Homology and cohomolgy of groups.	2	8
Spectral sequences	2	8

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

	Lecture	Tutorial	Laboratory or 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 of homework, revision and presentations	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	Develop the knowledge and understanding of the concept and the main idea of the group cohomology and its main properties	Lectures , homeworks and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations
1.2	Learn the concept of spectral sequences and its application in cohomology	Lectures , homeworks and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations
2.0	**Cognitive Skills**		
2.1	Demonstrate the ability to determine the cohomology ring of different classes of groups	Lectures , homeworks and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations
2.2	Demonstrate the ability of performing different types of operations on the elements of the cohomology rings	Lectures , homeworks and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations
3.0	**Interpersonal Skills & Responsibility**		
3.1	Practicing how to work within small team as an outcome of the discovery-based-learning discussions implemented throughout the course. Presentations teaches the student how to cite and quote	Lectures , homework and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations
3.2			

4.0	**Communication, Information Technology, Numerical**		
4.1	Demonstrate communication and listening skills with the people in the class with positive attitudes and deportment. Show the ability of raising mathematical questions (problems) and how to solve them	Lectures , homework and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations
4.2			
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 (e.g. essay, test, 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
3	Homework and tutorial activities	Overall weeks	20
4	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)
The instructor is available for six hours at least per week. S/he is also available on appointments.

E Learning Resources

1. List Required Textbooks

1- P. J. Hilton and U. Stammbach, A course in Homological Algebra, Springer 1997.
2- Joseph J. Rotman, An introduction to homological algebra, Academic Press 1979
3- John F. Carlson, Lisa Townsley, Luis Valeri-Elizondo and Mucheng Zhang , Cohomology rings of finite groups , KLUWER ACADEMIC PUBLISHERS, 2003

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.

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 classroom with the capacity of 10-20 students
2. Computing 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)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching A student survey questions is implemented by the end of the semester which usually provides valuable feedback for both the teacher and the institution
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department Peer consultations and coordination
3 Processes for Improvement of Teaching In the light of the outcome of the survey questions in (1) and (2), the instructor and the department take series steps towards improving the teaching process
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) Coordination with other colleagues in both teaching and marking
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. The department obliged by the regulations to review the whole program each certain period of time (5 years) in the light of the different outcomes.

Name of Instructor: **Prof. Ahmed Khammash**
Signature: *Ahmed Khammash* Date Report Completed: November 1, 2018

Name of Field Experience Teaching Staff _____
Program Coordinator:_____
Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: Galois Theory

Course Code: **4046409-4**

Course Specifications

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

A. Course Identification and General Information

1. Course title and code: Galois Theory 4046409-4
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)
Master in mathematics
4. Name of faculty member responsible for the course Prof. Falih Al dosary
5. Level/year at which this course is offered: level 3
6. Pre-requisites for this course (if any): Linear Algebra,
Groups and Rings
7. Co-requisites for this course (if any):
8. Location if not on main campus:Al-Abdia Campus & 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?	

Comments:

B Objectives

1. What is the main purpose for this course?

Aims: The course will discuss the problem of solutions of polynomial equations both in explicit terms and in terms of abstract algebraic structures. The course demonstrates the tools of abstract algebra (linear algebra, group theory, rings and ideals) .

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.

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

Course Description:

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Polynomial rings. Irreducible polynomials	2	4
Field extensions. Algebraic and transcendental elements. Simple extensions. Degree of an extension. Splitting fields. Algebraic closure.	3	12
Impossibility of some geometric constructions	2	8
Fixed fields and Galois groups. Splitting fields and normal extensions. Separable extensions.	2	8
The fundamental theorem of Galois theory.	2	8
Solutions of polynomials by radicals. Insolubility of the general quintic.	2	8
Finite fields. Transcendental elements and algebraic independence. Applications. The fundamental theorem of algebra.	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	-	-	-	0	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 about polynomial rings and some of its applications	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	1) Planning rigorous proofs of different propositions and assertions in this context. 2) Apply basic theorems for Hilbert spaces. 3) Investigate particular examples to which the theories under concern can be applied. 4) 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	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. 4) 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**		
5.1	Not Applicable		
5.2			

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 1. D. J. H. Garling, A Course in Galois Theory, Cambridge University Press, 1986. 2. Ian Stewart, Galois Theory, 3rd ed. Chapman & Hall, 2003. 3. Emil Artin, Galois Theory, New ed. Dover, 1998. 4. Postnikov, M. M. (2004). Foundations of Galois Theory. Dover
2. List Essential References Materials (Journals, Reports, etc.) 1) …….
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: **MODULAR REPRESENTATION OF GROUPS**

Course Code: **4046412-4**

Course Specifications

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

A. Course Identification and General Information

1. Course title and code: Modular Representations Of Groups 4046412-4			
2. Credit hours 4			
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) Master in Mathematics			
4. Name of faculty member responsible for the course Prof. Ahmed A Khammash			
5. Level/year at which this course is offered Level1/Master			
6. Pre-requisites for this course (if any) 4046411-4 + 4046408-4			
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? To introduce the student to the basic concepts and different techniques of modular representations theory of groups.
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 and other resources used in teaching process. (2) Using e-learning facilities. (3) Encouraging students to collect problems (and conjectures) from web based resources, ask them to present their collected data and discuss it in an interactive way in the class.

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

Course Description: This course 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
- Representation over field of characteristic prime number p. - Brauer characters of finite groups and character tables of Brauer characters.	3	12
- Principal Indecomposable Characters, decomposition numbers and related topics. - Brauer and Feits Theorem of the bound of the number of irreducible characters in a block.	4	16
- G-Algebras and trace map. - Green Theory of indecomposable Modules: Green correspondence, Vertex of indecomposable module.	4	16
- Brauer's Main theorems in blocks. - Some recent conjectures in this field.	4	16

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

	Lecture	Tutorial	Laboratory or 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 of homework, revision and presentations	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	Develop knowledge and understanding on the modular representation of groups and the effect of changing the base field on the structure of modules and representations	Lectures , homeworks and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations.
1.2	Learn the different invariants related to the indecomposable modules such as defects , vertices , decomposition numbers and Cartan matrices.	Lectures , homeworks and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations
2.0	**Cognitive Skills**		
2.1	Demonstrate the ability to solve problems for determining the complete set of simple modules for certain group algebra as well as constructing its projective indecomposable modules and the blocks to which they belong.	Lectures , homeworks and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations
2.2			
3.0	**Interpersonal Skills & Responsibility**		

3.1	Practicing how to work within small team as an outcome of the discovery-based-learning discussions implemented throughout the course. Presentations teaches the student how to cite and quote.	Lectures , homework and discovery-based-learning discussions	Quizzes , periodicals and final exams as well as presentations
3.2			
4.0	**Communication, Information Technology, Numerical**		
4.1	Demonstrate communication and listening skills with the people in the class with positive attitudes and deportment. Show the ability of raising mathematical questions (problems) and how to solve them.	Lectures , homework and discovery-based-learning discussions	Quizzes , periodicals and final exams , presentations and discussion panels
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	First periodic exam	6	20
2	Second periodic exam	10	20
3	Homework and tutorial activities	Overall weeks	20
4	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)
The instructor is available for six hours at least per week. S/he is also available on appointments.

E Learning Resources

1. List Required Textbooks
   1- John L. Alperin, Local Representation Theory, Cambridge University

Press, Cambridge, 1986. 2- Charles W. Curtis and Irving Reiner, Representation Theory of Finite Groups and Associative Algebras, American Mathematical Society, New York, 1962. 3- 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. 4- 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. Representation of finite groups by Nagao and Tsushima 1987. 5- Representation of finite groups by Feit 1982. 6- L. Dornhoff, Group Representation Theory, Part B: Modular representation theory. Marcel Dekker Inc., New York, (1972). 7- Peter Webb, A Course in Finite Group Representation Theory, Cambridge University Press, Cambridge, 2016.
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.

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 classroom with the capacity of 10-20 students
2. Computing 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)

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching A student survey questions is implemented by the end of the semester which usually provides valuable feedback for both the teacher and the institution
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department Peer consultations and coordination
3 Processes for Improvement of Teaching In the light of the outcome of the survey questions in (1) and (2), the instructor and the department take series steps towards improving the teaching process.

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) Coordination with other colleagues in both teaching and marking.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. The department is obliged by the regulations to review the whole program each certain period of time (5 years) in the light of the different outcomes.

Name of Instructor: Prof. Ahmed Khammash

Signature: Ahmed Khammash _Date Report Completed: November 1, 2018

Name of Field Experience Teaching Staff Algebra (Representation Theory)

Program Coordinator:

Signature: _____ Date Received:

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: Differential Geometry

Course Code: 4046603-4

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 Differential Geometry (4046603-4)			
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) **MSc. 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) Intr. Differential Geometry (4042601-3)			
7. Co-requisites for this course (if any)			
8. Location if not on main campus Al-Abdia 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

What is the main purpose for this course? • **Be able to deal with surfaces and their geometric properties .** • **Be Familiar with the concepts of differentiable manifolds (theory and examples) .** • **Understand the concepts of tensor fields , differential forms , covariant differentiation , geodesics and normal coordinates .** • **Deal with Riemannian connection and spaces of constant curvature .** • **Studying Schur theorem , Gauss and Bonnet theorem .** • **Be familiar with Stokes theorem on 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 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
Warming-Up: Theory of curves , surfaces and their geometrical properties .	2	8
Definition of smooth manifolds taking into account the interaction between geometry , analysis and topology. Studying of tensor fields , differential forms , covariant differentiation , geodesics and normal coordinates.	4	16
Riemannian connection , Riemannian manifolds and spaces of constant curvature .	4	16
Schur theorem , Gauss and Bonnet theorem and Stokes theorem on differentiable manifolds .	5	20

2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Tot al
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	After successful completion of the course, the student should be able to Define a surface, describe the standard examples of smooth manifolds from the course and demonstrate that they meet the definition.. Define tensor fields , differential forms , covariant differentiation , geodesics and demonstrate equivalence of alternative definitions.. Define and studying Riemannian connection and Riemannian manifolds (theory and examples). Define spaces of constant curvature and considering their properties . Studying Schur theorem –Gauss and Bonnet theorem –Stokes theorem on manifolds .	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	To define and recognize the basic concepts of differential geometry. The ability of determining whether a given surface is a smooth manifold or not, the ability of dealing with tensor fields ,	Homework consisting in solving selected exercises. Encourage and	Homework Oral and written tests. Research projects.

	differential forms , covariant differentiation and geodesics, the ability of understanding the Riemannian connection and the Riemannian manifolds .Deal with Schur theorem , Gauss and Bonnet theorem and Stokes theorem on manifolds .	develop self - education	
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**		
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 (4 hours per week). 2- Contact with students by e-mail,SMS, and e-learning facilities.

E Learning Resources

1. Required Text(s) Differential Geometry of curves and surfaces , Manfredo Do Carmo ,(Dover) , Second Edition ,December 14 ,2016 .
2. Essential References Introduction to Differential Geometry , Michael Spivak ,(Springer) , Vol.5 , Thired Edition , 1999 .
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 (i.e. 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 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: E Lashin

Signature: _____ Date Specification Completed: April 15, 2018
Program Coordinator: _____

Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: Introduction to Curves and Singularities

Course Code: 4046106-4

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: **Introduction to Curves and Singularities 4046106-4**
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)
Master 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**: 2nd Year – 1st Semester(Elective course)**
6. Pre-requisites for this course (if any) : **4042501-4 + 4043404-3 + 4042601-3 + 4043403-3**
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: Introduction to Orthogonal Polynomials

Course Code: 4046107-4

Course Specifications

Institution: Umm Al-Qura University	Date: April 09, 2018
College/Department:	

A. Course Identification and General Information

1. Course title and code: Introduction to Orthogonal Polynomials 4046107-4
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)
Master in Mathematics
4. Name of faculty member responsible for the course Dr. Alaya Atef
5. Level/year at which this course is offered: 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
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:
A computer Lab equipped with Matlab®, Mathematica® and Maple® is needed for some lectures

B Objectives

1. What is the main purpose for this course?
   The aim of this course is to introduce orthogonal polynomials algebraically.

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 handle several Mathematical software packages which are useful for computations.
   2) Improve the use of some important web-databases like:
      NIST Digital Library of Mathematical Functions (https://dlmf.nist.gov/),
      http://www.walfram.com. ….

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

Course Description:

1. Series.
2. Some special functions.
3. Calculus in C[X] and its dual.
4. The orthogonality.
5. Recurrence relation and Favard's theorem.
6. Derivative operators.
7. The classical case.
8. Some applications.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Series.	2	8
Some special functions	2	8

Calculus in C[X] and its dual	2	8
The orthogonality	1	4
Recurrence relation and Favard's theorem	1	4
Derivative operators.	2	8
The classical case	3	12
Some applications	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:** After successful completion of the course, the student should be able to		

1.1	1) Know the different versions of orthogonality. 2) Handle different characterizations of classical orthogonal polynomials. 3) Identify the classical polynomials (discrete and continuous) and their properties. 4) Identify the analogues of classical orthogonal polynomials. 5) Construct new orthogonal sequences or quasi-definite linear forms. 6) Use some mathematical software packages to compute different coefficients related to orthogonal polynomials.	Lectures Tutorials Discussion Problem Solving	Exams Home work.
2.0	**Cognitive Skills**		
2.1	7) Planning rigorous proofs of different propositions and assertions in this context. 8) Investigate examples to which the theories under concern can be applied. 9) Use lecture notes and other texts to solve challenging problems. 10) Write down some codes with mathematical software packages	Lectures/ Tutorials	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	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.	Lectures tutorials brain storming	Periodic written and oral tests. Discussion. Observation.

	3) Ability to apply course concepts to mathematical problem-solving model. 4) Ability to use information technology in communication and research projects. 5) Interact with life problems using different methods of thinking and problem solving.		
5.0	**Psychomotor**		
5.1	Not Applicable		
5.2			

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

1) N. Lebedev and Richard A. Silverman, Special Functions and Their Applications, New York, Dover, 1972.
2) M. Ismail and E. Koelink, Theory and Applications of Special Functions, Springer, 2005.
3) Mourad E. H. Ismail, Classical and Quantum Orthogonal Polynomials in One Variable, Cambridge University Press, 2009.

4) G. Szego, Orthogonal Polynomials, A.M.S. Coll. Publ. vol 23. Providence, Rhode Island, 1978
5) T. S. Chihara: An Introduction to Orthogonal Polynomials, Dover,2011.
6) G. Andrews and, R. Askey and R. Roy Special functions, Cambridge University Press, 1999.
7) R. Askey Orthogonal polynomials and special functions-SIAM (1975)
8) F. Marcell and W. Van Assche, Orthogonal Polynomials and Special Functions, Computation and Applications, 2008.
9) Orthogonal Polynomials and Painlevé Equations, Australian Mathematical Society Lecture Series 27, Cambridge University Press, 2018
10) B. G. S. Doman, The Classical Orthogonal Polynomials, World Scientific Publishing Company, 2016.

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

- T. S. Chihara: An Introduction to Orthogonal Polynomials, Dover,2011
- G. Szego, Orthogonal Polynomials, A.M.S. Coll. Publ. vol 23. Providence, Rhode Island, 1978.
- B. G. S. Doman, The Classical Orthogonal Polynomials, World Scientific Publishing Company, 2016.
- R. Askey Orthogonal polynomials and special functions-SIAM (1975).
- http://lists.siam.org/mailman/listinfo/siam-opsf
- https://dlmf.nist.gov/
- http://www.walfram.com.

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
http://www.ams.org/home/page
https://www.sciencedirect.com/
https://sdl.edu.sa/SDLPortal/EN/Publishers.aspx

1. Other learning material such as computer-based programs/CD, professional standards or regulations and software.
Matlab®, Mathematica® and Maple®, 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 - Computer Laboratory
2. Technology resources (AV, data show, Smart Board, software, etc.) Data show, Smart Board, Matlab®, Mathematica® and Maple®, Latex®
2. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) A computer Lab equipped with Matlab®, Mathematica® and Maple® and Latex.

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
- Attendance of OPSF summer schools.

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: Alaya Atef

Signature: _____ Date Specification Completed: 10/04/2018

Program Coordinator: _____

Signature: _____ Date Received: _____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

"Applied Mathematics Courses"

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: **Integral Equations**

Course Code: **4046701-4**

Course Specifications

Institution: Umm Al-Qura University Date : 8 / 11 / 2018
College/Department : Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Integral Equations (4046708-4)				
2. Credit hours: 4 Hours				
3. Program(s) in which the course is offered: Master in Mathematics				
4. Name of faculty member responsible for the course: Dr. Sameha Raad				
5. Level/year at which this course is offered : Leve 3/ Master (Elective course)				
6. Pre-requisites for this course (if any): Integral Equations (4044505-3)				
7. Co-requisites for this course (if any): Introduction to Elasticity (4046702-4)				
8. Location if not on main campus: Al-Abidia campus and Al-Zahir campus				
9. Mode of Instruction (mark all that apply)				
a. traditional classroom	✓	What percentage?	90	
b. blended (traditional and online)		What percentage?		
c. e-learning	✓	What percentage?	10	
d. correspondence		What percentage?		
f. other		What percentage?		

Comments:

B Objectives

1. What is the main purpose for this course? By the end of the course the students will learn the following main concepts: 1- Some numerical methods for solving Volterra and Fredholm integral equation. 2- Techniques for solving Volterra integral equation of the first kind. 3- Treatment of Fredholm integral equation with Singular kernel. 4- An overview of Nonlinear Volterra and Fredholm integral equations.
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 solve different kinds of integral equations. 2. Update references used in teaching process. 3. Use e-learning facilities more efficiently. 4. Use computer packages for solving the integral equations numerically.

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

Course Description: The integral equation is one of the most important branch of mathematics. An integral equation is an equation in which an unknown function appears under one or more integral signs. The integral equation can be categorized and then processed according to the kernel and kind, as well as linearity and dimensions. The course provides numerical methods for solving Volterra and Fredholm integral equations of the second kind, some treatments for Volterra integral equation of the first kind and two famous methods for solving integral equations with discontinuous kernels, then gives a general view of nonlinear integral equations.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact Hours
1. Review: the basic concept of integral equations with respect to its formulas and kernels. Review some different methods for solving Volterra and Fredholm integral equations of the second kind with continuous kernels, using some analytic methods.	2	8
2. Numerical methods ● Some numerical methods for solving Volterra integral equation with continuous kernels: 1-The Trapezoidal Rule- Simpson's Rule – Rung Kutta, Fast method . collection and Galerkian methods 2- Error Analysis. Applications ● Some numerical methods for solving Fredholm integral equation with continuous kernels: 1-The Trapezoidal Rule- Simpson's Rule-– Rung Kutta, Fast method, collection and Galerkian methods . 2- Error Analysis. Applications.	3	12
3. Volterra integral equation of the first kind: The solution of Volterra integral equation of the first kind using Laplace transformation. Abel's equations: Abel's integral equation in general form, Dynamical systems and Abel integral equation, **Midterm exam (1)** Abel equations in view of fractional integral. Reduction of Volterra Equations of the Second Kind › Volterra Equations of the First Kind.	4	12

4. Integral equations with discontinuous kernels Fredholm and Volterra integral equation with Singular kernel. ● The existence of a unique solution of Fredholm integral equation with singular kernel, Some methods to solve linear Fredholm integral equation with singular kernel: Toeplitz matrix method, Nystrom matrix method). Some applications using Maple soft-ware. **Midterm exam (2)**	3	12
5. Nonlinear Volterra and Fredholm integral equations. Theory of existence and uniqueness of the solution using Picard method- Banach fixed point theorem. Some analytics methods to solve the nonlinear integral equations. Some numerical methods to solve the nonlinear integral equations.	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

2. 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.)

	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Define some integral transforms and integral operator.	Lectures Tutorials Discussion Problem Solving	Exams Home work.
1.2	Determine the appropriate method for solving the integral equation based on the kind and the kernel.		
2.0	**Cognitive Skills**		
2.1	Construct the analytical and numerical solution of some integral equations .	Lectures Tutorials Solve Problem Brain Storming	Exams Quizzes. Homework. Discussion
2.2	How to distinguish several methods in solving different kinds of integral equations.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Develop the concept of integral equations.	Cooperative education Competitive education	Home work. Reports. Quizzes. Discussion
	Apply a range of theorems and methods to treat problems in integral equations.		
3.2	Show the ability to work independently and effectively within a team.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Be aware of using some computer		Home

	programs for solving problems.	Use Maple or MATLAB software to solve some problems numerically.	work. Reports. Discussion
4.2	Ability to analyze mathematical problems and to implement short programs for solving it.		
	Be able to write short programs for solving mathematical problems		
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	Midterm 1	7th week	20 %
2	Midterm 2	13th week	20%
3	Homework + Quizzes	During the semester	20%
4	Final exam	End of semester	60 %

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 per week in the lecturer schedule (6 hours per week).
2- Contact with students by e-mail,SMS, and e-learning facilities.
3- The lab technician will cooperate with the students to help them develop their software skills

E. Learning Resources

1. Required Text(s)

Rahman, M. (2007). Integral Equations and their Applications. WIT Press.
Kanwal, R. (2015). Linear Integral Equations. Kent: Elsevier Science.

2. Essential References

Atkinson, K. (1997). The numerical solution of integral equations of the second kind.

Cambridge: Cambridge University Press.

J. (2009). Computational Methods for Integral Equations. Cambridge, GBR: Cambridge University Press.

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

Linz, P. (1969). Numerical methods for Volterra integral equations of the first kind. The Computer Journal, 12(4), pp.393-397.
Abdou, M., Mohamed, K. and Ismail, A. (2003). On the numerical solutions of Fredholm–Volterra integral equation. Applied Mathematics and Computation, 146(2-3), pp.713-728.

4.Electronic Materials, Web Sites etc

https://projecteuclid.org/euclid.jiea

http://www.papersciences.com/J-Int-Eqs.htm

5. Other learning material such as computer-based programs/CD, professional standards/regulations: Maple 18.

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 suitable capacity.
- Library.

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.

4. 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 facilities 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. ● Attend the classrooms. ● Mutual visits between colleagues and giving advices to each other.
3 Processes for Improvement of Teaching ● Analysis of student course evaluation and feedback ● Peer evaluation and feedback ● 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 Instructor: Dr. Sameha Raad

Signature:____ Sameha Raad _____Date Report Completed: 8 / 11 / 2018

Name of Field Experience Teaching Staff : _____

Program Coordinator:_____

Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Variational Calculus**.....

Course Code: ..... **4046501-4**.....

Course Specifications

Institution: Umm Al-Qura University Date: 20/2/1439
College/Department: Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Variational Calculus (4046501-4)
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) Master in Mathematics
4. Name of faculty member responsible for the course: Dr. Wajdi F. Kallel
5. Level/year at which this course is offered: Level 1/ Master
6. Pre-requisites for this course (if any): Calculus of several Variables
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 concepts and quantitative techniques for the study of Variational Calculus. It is assumed that students entering this course have previously taken courses in differential and integral Calculus for functions of many variables. ▪ The calculus of variations is concerned with finding extrema and, in this sense; it can be considered a branch of optimization. The problems and techniques in this branch, however, differ markedly from those involving the extrema of functions of several variables owing to the nature of the domain on the quantity to be optimized.
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: The Variational Calculus is nearly as old as the calculus, and the two subjects were developed somewhat in parallel. In 1927 Forsyth noted that the subject "attracted a rather fickle attention at more or less isolated intervals in its growth." In the eighteenth century, the Bernoulli brothers, Newton, Leibniz, Euler, Lagrange, and Legendre contributed to the subject, and their work was extended significantly in the next century by Jacobi and Weierstrafi. Variational principles abound in physics and particularly in mechanics. The application of these principles usually entails finding functions that minimize definite integrals (e.g., energy integrals) and hence the Variational Calculus comes naturally to the fore. Hamilton's Principle in classical mechanics is a prominent example. This course 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
Chapter 1 - Introduction to Calculus of Variations. • Describe some of the classical problems of Calculus of Variations. - The Brachistochrone problem - The Geodesic problem - The Isoperimetric problem - The Plateau problem • Introduce the concept of a Functional and the associated notation.	1	4
Chapter 2- The Euler-Lagrange equation for functionals of a single variable: • Develop the lemmas to be used in the construction of Euler equations. • Define the variation of a functional. • Derive the Euler-Lagrange equation for the functional I(y)= $\int_a^b f(x,y,y')dx$ • Derive particular results in the cases: -The integrand $f(x,y,y')$ does not depend on y. -The integrand $f(x,y,y')$ does not depend on x. -The integrand $f(x,y,y')$ does not depend on y'. • Solve the Brachistochrone problem and other assorted problems. • Establish the Euler-Lagrange equations for functionals involving n> 1 functions of a single variable with fixed endpoint conditions. • Introduce geodesic lines in two and three dimensions. Develop the distance metric $ds^2 = E(u,v)du^2 + 2F(u,v)du\,dv + G(u,v)dv^2$ • Develop the Euler-Lagrange equations for functionals of type I(y)= $\int_a^b f(x,y,y',y'',\dots,y^{(n)})dx$	3	12

Chapter 3 - General Variation of a functional. • Derive the Euler-Lagrange equation for the general variation of the functional • Establish the conditions of transversality for the functional. • Introduce the Weierstrass-Erdmann Corner Conditions. • Do examples using the conditions of transversality including the modified Brachistochrone problem in which the lower endpoint is replace by a horizontal distance to be travelled. • Derive the Euler-Lagrange equations for functionals of many dependent variables but a single independent variable when functional constraints are in force. • Examples on the Isoperimetric problem for a curve of fixed length and the shape of a suspended chain of fixed length among other examples.	2	8
Chapter 4 - Sufficiency conditions for a weak extremum. • Introduce the concept of the second variation of a functional. J[y]= $\int_{x_0}^{x_1} f(x,y,y')dx$ • Calculate the second variation of the functional. • State and prove Legendre's theorem and use it the prove that the extremal of the Brachistochrone problem is in fact a minimum.	2	8
Chapter 5 - Functionals with two or more independent variables. • Derive the Euler-Lagrange equation for the functional. I[φ]=$\iint f(x,y,\varphi,p,q)dxdy$ • Derive the Euler-Lagrange equation to be satisfied in the case of the Plateau Problem. • Derive the equation to be satisfied by the optimal shape of a homogeneous membrane stretched to tension T and subjected to uniform loading P by minimizing the energy integral I[φ]=$\iint \left(T_p^2 + T_q^2 - 2P\varphi\right)dxdy, \quad \varphi = 0 \ on \ \partial A$	3	12

Chapter 6 - Canonical variables • Introduce the concept of momentum for the functional $J[y_1, \dots, y_n] = \int_{x_0}^{x_1} f(x, y_1, .., y_n, y_1', .., y_n')dx$ • Establish the canonical Euler equations, often more commonly called Hamilton's equations of motion and deduce that the Hamiltonian is conserved on extremely curves if the function does not depend explicitly on the independent variable. • Introduce the Principal of Least Action, define the Lagrangian function and construct Lagrange's equations. • Derive the Hamilton-Jacobi equation, and thereafter state and prove Jacobi's Theorem. • Analyse the problem of motion under a central force using (a) Hamilton's equations , (b) The Hamilton-Jacobi equation. • Introduce the concept of canonical transformations, Poisson Bracket and Generating function and show how these are used in the context of Hamilton's equations. • Define a Legendre transformation and illustrate Legendre transformations with reference to connections between the classical functions of Thermodynamics, namely Internal Energy U, Helmholtz Free Energy F, Gibbs Free Energy G and Enthalpy H. • Show that the Legendre transformation of the Lagrangian with respect to velocity is the Hamiltonian.	2	8

Chapter 7 - Assorted matters • Explain the strategy by which the lowest eigenvalue of the system Ly = α y may be approximated by estimating the eigenvalues of a suitable Rayleigh-Ritz quotient. Illustrate the technique, for example, with reference to the eigenvalue problem. • Explain how higher order eigenvalues of the system Ly = α y may also be approximated by the use of the Rayleigh-Ritz quotient. Illustrate the technique by estimating the second eigenvalue of equation (1). • Introduce Pontryagin's maximum (or minimum) principle for moving a dynamical system between states in an optimal way particularly when constraints are in place, for example, there is a maximum force that can be applied to the system. • Illustrate Pontryagin's principle by calculating the minimum time needed to bring a particle of mass m at the origin given that the particle is initially at x = a with velocity V , and that the maximum available force is F but this force can be applied in any direction.	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 an enhanced knowledge and understanding of Variational 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 computers programs in obtaining numerical solutions and carrying out statistical tests.	Discussion - Use Matlab or Mathematica 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:

- University Mathematical Texts: Calculus of Variations, J.C. Clegg: Oliver and Boyd Ltd Ed-inburgh, New York, (1968).
- Calculus of Variations, I.M. Gelfand and S.V. Fomin: Prentice-Hall, Inc. Englewood Cliffs, N. J, (1963).
- A history of Calculus of Variations from the 17th through the 19th century, H.H. Goldstine: Springer-Verlag, New York, (1980).

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.) Matlab and Mathematica software
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 The evaluation of teaching is composed by the Department.
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. Wajdi F. Kallel
Signature:_____Date Report Completed: 20/2/1439
Name of Field Experience Teaching Staff _____
Program Coordinator:_____
Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: ... **Advanced Mathematical Methods (1)**

Course Code:.. **4046502-4**.

Course Specifications

Institution: Umm Al-Qura University Date: 31/10/218
College/Department: Faculty of Applied Science/ Department of Mathematical Sciences

A. Course Identification and General Information

1. Course title and code: Advanced Mathematical Methods (1) (4046502-4)				
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) Master of Science in Mathematics				
4. Name of faculty member responsible for the course: Dr. Muntaser Safan				
5. Level/year at which this course is offered: Leve 1/ Master				
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: The course is suitable for postgraduates at Masters level.				

B Objectives

1. What is the main purpose for this course? The main purpose of this course is to introduce a selection of advanced mathematical methods that are of use in research in Applied Mathematics. It is assumed that students entering this course have previously taken courses in differential and integral Calculus for functions of many variables and have some familiarity with concepts from Complex Analysis such as the properties of analytic functions and the methods of residue Calculus.
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)

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

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

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

Chapter 1 - Sturm-Liouville Theory - State the regular Sturm-Liouville problem. - Establish the orthogonality property of the eigenfunctions of a Sturm-Liouville operator. - Establish the interlacing property of the zeros of the eigenfunctions of a Sturm-Liouville operator. - Introduce the notion of a self-adjoint operator and establish some general properties of self-adjoint operators. - Give examples of well-known Sturm-Liouville operators, for example, the Bessel and Legendre differential equations expressed in Sturm-Liouville form among other examples. - Discuss the use of an integrating factor to re-express second order differential equations in Sturm-Liouville form. - Develop the spectral expansion of functions using the eigenfunctions of a Sturm-Liouville operator. Establish existence and convergence properties for this spectral series and the differentiated series (Dirichlet's Theorem). - Discuss the Spectral Parameter Power Series (SPPS) method (reduction of order)	3	12

Chapter 2 - Transform Theory - Introduce the concept of a transform as a tool for reducing the complexity of a linear ordinary or partial differential equation. - Define the Laplace transform, state sufficient conditions for a function to have a Laplace Transform, and establish many of its well-known properties. State the inversion theorem for the Laplace Transform and illustrate its validity by using Residue Calculus to invert several well-known Laplace Transforms. - Demonstrate the use of the Laplace transform in the solution of ordinary and partial differential equations, e.g. the diffusion equation. - Discuss the behaviour of the Laplace Transform in the case of small and large transform parameters. - Define the Fourier Transform and establish the Fourier inversion theorem. Establish the connection between the Fourier Transform and Fourier series. - State conditions for the existence of the Fourier transform. - Establish the Fourier Sine and Fourier Cosine transforms and derive their inversion formulae. - Give examples of the use of the Fourier Transform, the Fourier Sine transform and the Fourier Cosine transform in the context of solving partial differential equations. Explain when to use and when not to use the Fourier Sine and Cosine transforms. - Introduce the Discrete Fourier Transform (DFT) and derive the inversion result. - Introduce the Fast Fourier Transform (FFF), explain its relationship to the DFT and the underlying mechanism that contributes to its speed, say with reference to the all numbers with prime decomposition containing powers of 2, 3 or 5. - Define the Hankel Transform and derive its inversion result. Illustrate the use of the Hankel Transform, for example, with reference to the oscillations of a circular membrane with fixed perimeter. - Define the Mellin Transform and Z-Transform and derive their inversion result. Briefly Illustrate the use of theses transforms. For example, with reference to the oscillations of a circular membrane with fixed perimeter.	3	12

Chapter 3 - The Wiener-Hopf Technique - Introduce the Wiener-Hopf technique, named after Norbert Wiener and Eberhard Hopf, and give an example of a situation in which the technique is useful, say the solution of a mixed boundary problem for an elastic half-space. - Explain the strategy of the Wiener-Hopf technique in terms of a pair of singular integrals in the complex plain, the notion of analytic continuation and Liouville's theorem. - Use the Wiener-Hopf technique to solve the classical "punch" and "torsion" problems for the deformation of a linearly elastic half-space.	3	12
Chapter 4 - Floquet Theory - Introduce the class of problem described by Floquet Theory, named after its originator Gaston Floquet (1883). - Derive the basic results underlying the solution of the equation $\frac{dX}{dt} = A(t)X$ (1) where A(t) is an N x N matrix with fixed period T, i.e. $A(t+T) = A(t)$ for $t \in R$. Derive. Derive the condition for the stability of equations (1). - Illustrate the use of Floquet Theory with respect to a two dimension system of ordinary differential equations. - Use Floquet Theory to investigate the behaviour of Hill's equation $\frac{d^2X}{dt^2} + \big(a + \varphi(t)\big)X = 0, \quad \varphi(t+T) = \varphi(t),$ where a is constant and $\phi(t)$ is a real-valued continuous function. - Discuss the particularization of Hill's equation to the Mathieu equation, namely the case in which $a = \omega^2 > 0$ and $\varphi(t) = \varepsilon\cos 2t$. The Mathieu equation describes the motion of an inverted undamped pendulum of natural frequency ω with forced motion at its point of support.	3	12

Chapter 5 - Numerical Optimisation - Describe the Golden Section algorithm and Brent's algorithm for the minimization of a unimodal function of a single variable. Discuss the speed of convergence of each algorithm. - Describe the Method of Steepest Descent as a minimisation tool and explain its advantages and disadvantages. - Introduce the notion of a Quasi-Newton algorithm. - Describe the mathematical details of the Davidson, Fletcher Powell (DFP) algorithm for function minimization. - Describe the mathematical details of the Broyden, Fletcher, Goldfarb and Shannon (BFGS) algorithm for function minimization. - Briefly discuss the advantages and disadvantages of the DFP and BFGS algorithms. - Describe the mathematical details and logical steps of the Nelder-Mead or downhill Simplex technique. Explain its advantages and disadvantages over the DFP and BFGS algorithms.	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**		
1.1	Develop knowledge and understanding on the Sturm-Liouville Theory and their applications.	Lectures and tutorials	Short quizzes, periodical and final exams
1.2	Be aware of Transform Theory ,Wiener-Hopf Technique, Floquet Theory and their applications.	Lectures and tutorials	Short quizzes, periodical and final exams
2.0	**Cognitive Skills**		
2.1	Establish the Fourier Sine and Fourier Cosine transforms and derive their inversion formulae	Lectures and tutorials	Short quizzes, periodical and final exams
2.2	Explain the strategy of the Wiener-Hopf technique in terms of a pair of singular integrals in the complex plain, the notion of analytic continuation and Liouville's theorem	Lectures and tutorials	Short quizzes, periodical and final exams
3.0	**Interpersonal Skills & Responsibility**		
3.1	Describe the Golden Section algorithm and Brent's algorithm for the minimization of a unimodal function of a single variable. Discuss the speed of convergence of each algorithm.	Lectures and tutorials	Short quizzes, periodical and final exams
3.2	Use the Wiener-Hopf technique to solve the classical "punch" and "torsion" problems for the deformation of a linearly elastic half-space	Lectures and tutorials	Short quizzes, periodical and final exams
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. 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 midterm exam	6	20
2	Second midterm exam	10	20
3	Homework and tutorial activities	Over all weeks	20
4	Final exam		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 instructor is available for at least six hours per week. He is also available on appointments.

E Learning Resources

1. List Required Textbooks
The advanced mathematical methods in this course are specialized, and with the exception of the optimization chapter, are not to be found in a single textbook. Each technique requires a specialized text.

- James P. Keener - Principles Of Applied Mathematics: 2d (second) Edition (2001)
- Gill, Murray and Wright, Practical Optimization, Emerald Group Publishing Ltd, (1982).

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

- S I Hayek, Advanced mathematical methods in science and engineering (2nd edition), CRC Press by Taylor and Francis, 2010.
- **Journal of Advanced Mathematics and Applications**

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

Advanced Mathematical Methods for Scientists and Engineers I
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **http://www.lmm.jussieu.fr/~lagree/COURS/M2MHP/Bender-Orszag-chap9-11.pdf --**
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.) 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
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 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. Muntaser Safan

Signature:__ *Muntaser Safan* ___Date Report Completed: 20/2/1439

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: ..... **Introduction to Elasticity**.....

Course Code: ..... **4046702-4**..

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: Introduction to Elasticity (4046702-4)				
2. Credit hours: 4 Hours				
3. Program(s) in which the course is offered: Master in Mathematics				
4. Name of faculty member responsible for the course: Dr. Sameha Raad				
5. Level/year at which this course is offered : Leve 2/ Master				
6. Pre-requisites for this course (if any): Continuum Mechanics				
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 concepts and quantitative techniques for the study of the theory of Elasticity 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: Elasticity is the ability of a body to resist a distorting influence or deforming force and to return to its original size and shape when that influence, or force is removed. The elasticity of materials is described by a stress-strain curve. If the material is Isotropic, the linearized stress-strain relationship is called Hooke's law. The course will provide a basic treatment of the formulation of elasticity theory and its application to problems of stress and displacement analysis. The fundamental field equations will be developed including strain energy concepts, torsion, bending and stress concentration, and an introduction to three-dimensional solutions.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Chapter 1 - Review of Principles of Continuum Mechanics - Review the concept of a body, reference coordinates and material coordinates. Review what is meant by a deformation. - Review the notion of a material or convicted derivative, material velocity and material acceleration. - Review the Transport Theorem. - Derive Nansen's formula. - Review conservation laws for mass, linear momentum, angular of momentum and conservation of energy. - Review what it means to say that a body is elastic. Develop the constitutive theory for a classical thermo-elastic material in terms of the strain energy. Refine the constitutive form of these equations as required by frame invariance (SRBM). - Use the Clausius Duhen Entropy inequality to deduce expressions for the stress tensor and specific entropy for a thermo-elastic solid in terms of the Helmholtz Free Energy. - Particularize the strain energy to the case of an isotropic solid. - Introduce the principle stretches. Express the stress tensor in terms of the principle stretches. - Introduce the Piola-Kirkoff and Cauchy-Green stress tensors.	3	12

Chapter 2 - Exact Solutions in Nonlinear Elasticity - Construct exact solution for the pure shear of a cube in nonlinear Elasticity. Particularization to an incompressible elastic solid. - Construct the exact solution for the flexure of a beam in nonlinear Elasticity. Particularization to an incompressible elastic solid. - Construct the exact solution for the pure inflation of a cylindrical tube in nonlinear Elasticity. particularization to an incompressible elastic solid. - Construct the exact solution of the pure inflation of a hollow spherical shell in nonlinear Elasticity. Particularization to an incompressible elastic solid.	3	12
Chapter 3 - Linear Elasticity - Develop the general equations for the infinitesimal deformation of a thermo-elastic solid from a pre-stressed state. - Particularize the stress tensor to an isotropic elastic solid. - Use the entropy inequality to deduce constraints of the material properties of the linearized isotropic stress tensor. Introduce Young's modulus and Poisson's ratio and express the linear stress tensor in terms of these quantities. - Establish uniqueness of the initial boundary value problem for linear thermo-elasticity. - Discuss wave propagation in a linearly elastic half space. Discuss S-waves and P-waves. - Formulate and solve the punch and torsion problems for an unstressed linear elastic half-s-pace.	3	12

Chapter 4 - Saint Venant Torsion - Establish the general solution for the torsion of a cylinder of arbitrary cross-section. - Examine the torsion of a notched circular cylinder and triangular cylinder.	3	12
Chapter 5 - Deformation of a Beam - Establish the Euler-Lagrange model of a loaded rectangular beam. - Construct the deformation of a rectangular beam with point and distributed loads. - Examine the vibration of a rectangular beam for various boundary conditions. - Establish the Timoshenko model of a rectangular beam for various boundary conditions. - Examine the vibration of a rectangular beam for various boundary conditions according to the Timoshenko model.	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 a knowledge on the basics of linear and nonlinear elasticity.	Lectures Discussion	Exams Home work
1.2	Recognize the formulas in 2D and 3D for the stress and strain fields in elastic bodies related to various states.		
2.0	**Cognitive Skills** upon completion of this course, the student is expected to		
2.1	Construct the exact solution for some problems in linear and nonlinear Elasticity.	Lectures Solve Problems Brain Storming	Exams Quizzes Homework Discussion
2.2	Specify the general equations for the stress tensor for special kinds of elastic materials in Cartesian and cylindrical coordinates.		
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	Home work. Quizzes.
4.0	**Communication, Information Technology, Numerical** upon completion of this course, the student is expected to		
4.1	use 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**		
	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)	6th week	20 %
2	Periodic exam (2)	10th week	20%
3	Homework + Quizzes	During the semester	50%
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 - Mechanics of continuous media. S.C. Hunter, Ellis Horwood (1975). - Continuum Mechanics, A.J.M. Spencer: Dover publications (2004). - Non-Linear Elastic Deformations, R.W. Ogden: Dover publications (1997).
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://esag.harvard.edu/rice/e0_Solid_Mechanics_94_10.pdf - http://homepages.engineering.auckland.ac.nz/~pkel015/SolidMechanicsBooks/PartIII/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.
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 Monitoring the achievement of the students in solving homework and periodical exams
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: .. **Introduction to Mathematical Biology**....

Course Code: . **4046503-4**..

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: Introduction to Mathematical Biology (4046503-4)
2. Credit hours: 4hrs
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) Master of Science in Mathematics
4. Name of faculty member responsible for the course: Dr. Faiza Mohammad Allehiany
5. Level/year at which this course is offered: Leve 2/ Master
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? ▪ To introduce students to the application of mathematical modelling in the analysis of biological systems including population model for single species, genetics, interacting population model, infectious disease. ▪ To show how mathematics, statistics and computing can be used in an integrated way to analyse biological systems. ▪ To develop students' skills in algebraic manipulation, the calculus of linear and non-linear differential equations, mathematical modelling, matrix algebra and statistical methods.
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: Mathematical Biology is the application of mathematical modeling to solve problems in biology and physiology. It is one of the fastest growing research areas in mathematics and is contributing significantly to our understanding of the biological world and the processes in disease. It also produces new mathematical questions

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Population Models for Single Species . Continuous logistic models . Insect population models . Continuous delay models . Periodic solutions of delay models . Harvesting . Population model with age distribution . Discrete logistic models . Stability, Periodic solutions and Bifurcation . Discrete delay models	3	12

Interacting populations models: . Predator - Prey Models: Lotka-Volterra Systems . Generalised Lotka-Volterra Predator-Prey System . Realistic Predator - Prey Models . Predator-Prey model analysis with Limit Cycle Periodic Behaviour . Competition . Mutualism . Threshold Phenomena . Discrete Growth Models for Interacting Populations. . Discrete time Predator-Prey system analysis	4	16
Infectious Disease: . The Susceptible – Invective SI model . The Susceptible – Invective – Susceptible SIS model . The Susceptible - Invective SIR epidemic disease model . Vaccination . The SIR endemic disease model . Evolution of virulence	4	16
Population Genetics: . Haploid genetics . Spread of favored allele . Mutation-selection balance . Diploid genetics . Diploid reproduction . Heterosis . Frequency-dependent selection . Recombination and the approach to linkage equilibrium . Random genetic drift.	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 wee k. None

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 an enhanced knowledge and understanding of mathematical modelling and statistical methods in the analysis of biological systems.	Lectures and homework.	Short quizzes, periodical and final exams.
1.2	Be aware of the basic concepts of mathematical population dynamics	Lectures and homework.	Short quizzes, periodical and final exams.
2.0	**Cognitive Skills** Upon completion of the course, the student is expected to be able to		
2.1	find equilibria of a dynamical system	Lectures and homework.	Short quizzes, periodical and final exams.
2.2	analyse the stability of equilibrium points of a mathematical model	Lectures and homework.	Short quizzes, periodical and final exams.
3.0	**Interpersonal Skills & Responsibility** Upon completion of the course, the student is expected to be able to		
3.1	formulate a mathematical model for the interaction between species.	Lectures and homework.	Short quizzes, periodical and final exams.
3.2	Interpret and comment on the results	Lectures and homework.	Short quizzes, periodical and final exams.
4.0	**Communication, Information Technology, Numerical** Upon completion of the course, the student is expected to be able to		
4.1	Numerically solve a mathematical	Lectures,	Short quizzes,

	model.	discussion and homework.	periodical and final exams.
4.2	Work effectively in groups and independently.	Tasks assigned and homework.	Marking the assignments
4.3	Solve problems concerning the topics of the course.	Homework	Evaluating the homework
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	During the term	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)
-

E Learning Resources

1. List Required Textbooks

1- Mathematical Biology, J. D. Murray, Volume I: An Introduction. (2002) Springer-Verlag Berlin Heidlberg.

2- Essential Mathematical Biology, N. F. Britton. (2003) Springer-Verlag London Limited.

2. List Essential References Materials (Journals, Reports, etc.)
- Journal of Mathematical Biology.
- Bulletin of Mathematical Biology

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
None

4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. https://en.wikipedia.org/wiki/Mathematical and theoretical biology
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.) 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. Faiza Mohammad Allehiany
Signature:_ *Faiza Mohammad Allehiany* _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: **Numerical Solutions of Differential Equations (1)**

Course Code: **4046703-4**

Course Specifications

Institution: Umm Al-Qura University Date: 31/1/2018
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 (1) (4046703-3)				
2. Credit hours: 4hrs				
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) Master of Science 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 2/ Master				
6. Pre-requisites for this course (if any): Numerical Analysis				
7. Co-requisites for this course (if any): Partial Differential Equations				
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 main purpose of this course is to provide students with the introductory concepts, numerical techniques and programming skills that will allow them to solve many real world problems that involve differential equations. It is also designed to prepare them for study in the advanced courses in numerical methods for solving partial differential equations.
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: The course gives knowledge to students of problem classes, basic mathematical and numerical concepts and properties, modern numerical methods, and software for solution of engineering and scientific problems formulated as differential equations.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Preliminaries • Discussion of sources of numerical error. Why use numerical methods even when an analytical solution is available. • Classification problem for partial differential equations, namely elliptic, parabolic and hyperbolic equations. Specification of suitable boundary conditions and initial conditions (if appropriate) for each of these problems. • Construction of finite difference formulae for first and second ordinary and partial derivatives with error analysis. Interplay between truncation and rounding error in choosing the length if intervals in the method of Finite Differences. • Efficacy of numerical algorithms.	3	12

Finite Difference Procedure for ODE • The tri-diagonal algorithm. • Measurement of numerical error, loss of significance leading to the concept of pivoting. • Treatment of equations with non-constant coefficients. • Treatment of gradient boundary conditions. 1. First order approximation 2. Second order approximation. 3. Fictitious nodes. ▪ The concept and use of Richardson extrapolation. ▪ Treatment of nonlinear equations. ▪ Fixed point procedure. 1. One dimension. 2. Many dimensions.	3	12
Elliptic Equations in Two Dimensions • Concept and construction of a computational molecule. • A general representation of a sparse matrix. • Iterative methods. 1. Gauss-Jacobi algorithm. 2. Gauss-Seidel algorithm. 3. Comparison of Gauss-Jacobi and Gauss-Seidel. 4. Diagonal dominance. 5. Convergence of Gauss-Jacobi and Gauss-Seidel algorithm. 6. The multi-grid procedure. • Treatment of non-rectangular domains.	3	12

Parabolic Equations in 1D
• Historical Introduction
  • Euler's method.
  • Richardson's method Dufort-Frankel method.
  • Crank-Nicolson method.
  • Summary of these various methods.
• Numerical consistency
  • Dufort-Frankel.
  • Crank-Nicolson.
• Numerical stability - The Fourier Method
  • Application to Euler method.
  • Application to Richardson method.
  • Application to Dufort-Frankel method.
  • Application to Crank-Nicolson method.
• Numerical stability - Matrix method
  • Application to Euler method.
  • Application to gradient boundary conditions.
• Numerical convergence - The Lax equivalence theorem.
	3	12

Parabolic Equations in 2D
• Historical Introduction.
• Alternating Direction Implicit (ADI)
  • Consistency of ADI.
  • Stability of the ADI algorithm.
	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 the course, the student is expected to		
1.1	Understand properties of different classes of differential equations and their impact on solutions and proper numerical methods	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	Be able to apply the different learnt methods to solve mathematical problems	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	Design, implement and use numerical methods for computer solution of scientific problems involving differential equations	Lectures - Discussions, and homework	Short quizzes, periodical and final exams.
3.2			
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	Effectively work alone and in groups on the solution of problems.	Lectures - Discussions, and	Short quizzes, periodical and

		homework	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 • 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.) 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: **Advanced Fluid Mechanics**

Course Code: **4046704-4**

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: Advanced Fluid Mechanics (4046704-4)				
2. Credit hours: 4 Hours				
3. Program(s) in which the course is offered: Master of Science (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 3/ Master				
6. Pre-requisites for this course (if any): Fluid Mechanics				
7. Co-requisites for this course (if any): Continuum Mechanics				
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: **Introduction to Special Relativity**

Course Code: **4046504-4**

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: Introduction to Special Relativity (4046504-4)			
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) Master 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/ Master			
6. Pre-requisites for this course (if any): Continuum Mechanics			
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: **Advanced Mathematical Methods (2)**

Course Code: **4046505-4**

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: Advanced Mathematical Methods (2) (4046505-4)				
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) Master in Mathematics				
4. Name of faculty member responsible for the course: Dr. Muntaser Safan				
5. Level/year at which this course is offered: Leve 3/ Master				
6. Pre-requisites for this course (if any) : Advanced Mathematical Methods (1)				
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: The course is suitable for postgraduates at Master/Doctoral level.				

B Objectives

1. What is the main purpose for this course? The role of the course is to introduce a selection of advanced mathematical topics that are relevant to research in Applied Mathematics. It is likely that most students entering this course will have previously taken Advanced Mathematical Methods - Part I, but this is not essential. This course will focus on aspects of Dynamical and Integral 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. 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 course comprising approximately 52 hours of lectures.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Chapter 1 - Introduction Review properties of ordinary differential equations:- - Lipshitz condition - Existence and uniqueness of solution - Fixed point theory - Stability of fixed point algorithms - Linear stability analysis - Stable and overstable modes.	3	12

Chapter 2 - Bifurcation Theory - State what is meant by a bifurcation. - Introduce and describe the properties of various types of bifurcation, e.g. • Saddle Node bifurcation • Trans-critical bifurcation • Hopf bifurcation • Pitchfork bifurcation. - Give examples of these bifurcations with reference to dynamical problems from mechanics and biology etc. - Discuss uniform and non-uniform oscillators - Provide and investigate physical examples of each type of oscillator.	3	12
Chapter 3 - Two dimensional dynamical systems - Briefly review the concepts of Phase portrait, Orbits and Index Theory. - Introduce the concept of a Limit Cycle. - Introduce the Poincare-Bendixson Theorem. - Discuss relaxation oscillations and weakly nonlinear oscillations. - Introduce Poincare maps. - Provide physical examples illustrating these concepts.	3	12
Chapter 4 - Soliton equations - Discuss the meaning of integrability for Ordinary and Partial Differential equations. Introduce the notion of Lie symmetries and their role in the search for general solutions. - Introduce several examples of soliton equations with their histories, e.g. the Korteweg de Vries (KdV) and Sine-Gordon equations. - Derive the KdV equation and develop the classical one-soliton solution. Briefly discuss the properties of the two-soliton solution. - Introduce Backlund transformations and use them to treat the Sine-Gordon equation.	3	12

Chapter 5 - The inverse scattering transform - Introduce the concept of bound and scattering states, and wave function as understood within the framework of Quantum Mechanics. Introduce Schrodinger's equation and solve the problem of a particle held within a potential well. Discuss the meaning of the solution and contrast how the quantum and classical views of the world differ. - Describe the aim of the inverse scattering problem and why it is an important practical problem. State the Gelfand-Levitan-Marchenko (GLM) theorem. - Introduce the notion of a Quasi-Newton algorithm. - Discuss direct scattering in the context of the one-dimensional scattering of a particle on a potential. - Discuss the inverse scattering problem in one dimension by which the potential is recovered from reflected data and energy levels using the GLM theory. - State and prove Lax's theorem on the time independence of eigenstates. - Construct the N-soliton solution of the KdV equation and particularise it to the 2-soliton case to show that, asymptotically, two interacting solitons are not distorted by the interaction but that the interaction generates a phase shift.	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	Develop knowledge and understanding on the bifurcation Theory and its applications.	Lectures and tutorials	Short quizzes, periodical and final exams
1.2	Be aware of Poincare-Bendixson theorem and the inverse scattering transform.	Lectures and tutorials	Short quizzes, periodical and final exams
2.0	**Cognitive Skills: upon completion of this course, the student is expected to**		
2.1	Discuss relaxation oscillations and weakly nonlinear oscillations	Lectures and tutorials	Short quizzes, periodical and final exams
2.2	Discuss the meaning of integrability for Ordinary and Partial Differential equations. Introduce the notion of Lie symmetries and their role in the search for general solutions.	Lectures and tutorials	Short quizzes, periodical and final exams
3.0	**Interpersonal Skills & Responsibility: upon completion of this course, the student is expected to**		
3.1	Describe the aim of the inverse scattering problem and why it is an important practical problem. State the Gelfand-Levitan-Marchenko (GLM) theorem.	Lectures and tutorials	Short quizzes, periodical and final exams
3.2	Use Poincare-Bendixson Theorem in studying dynamical systems	Lectures and tutorials	Short quizzes, periodical and final exams
4.0	**Communication, Information Technology, Numerical: upon completion of this course, the student is expected to**		
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. 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 midterm exam	Week 6	20
2	Second midterm exam	Week10	20
3	Homework and tutorial activities	Over all weeks	20
4	Final exam		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 instructor is available for at least 8 hours per week. He is also available on appointments.

E Learning Resources

1. List Required Textbooks - S.H. Strogatz, Nonlinear Dynamics and Chaos: With Applications To Physics, Biology, Chemistry, And Engineering (Studies in Nonlinearity), 2nd Ed. (2015). - L.D. Landau and E.M. Lifshitz, Course of Theoretical Physics. Vol I and II, Butterworth-Heinemann, (1995). - M. Dunajski, Solitons, Instantons and Twistors, Oxford Graduate Texts in Mathematics, OUP, (2009).
2. List Essential References Materials (Journals, Reports, etc.) **Journal of Advanced Mathematics and Applications**
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) **Advanced Mathematical Methods for Scientists and Engineers I**
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. **http://www.lmm.jussieu.fr/~lagree/COURS/M2MHP/Bender-Orszag-chap9-11.pdf --**
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

Not applicable

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
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Not applicable

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. Muntaser Safan
Signature:_ *Muntaser Safan* ___Date Report Completed: 31/10/218
Name of Field Experience Teaching Staff _____
Program Coordinator:_____
Signature: _____ Date Received:_____

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Introduction to Magnetohydrodynamics**

Course Code: **4046705-4**

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: Introduction to Magnetohydrodynamics (4046705-4)				
2. Credit hours: 4 Hours				
3. Program(s) in which the course is offered: Master of Science (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 3/ Master				
6. Pre-requisites for this course (if any): Fluid Mechanics				
7. Co-requisites for this course (if any): Continuum Mechanics				
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: **Applications of Elasticity**

Course Code: **4046706-4**

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: Applications of Elasticity 4045706-4
2. Credit hours: 4 Hours
3. Program(s) in which the course is offered: Master in Mathematics
4. Name of faculty member responsible for the course: Dr. Sameha Raad
5. Level/year at which this course is offered: Level 3/Master
6. Pre-requisites for this course (if any) : Introduction to Elasticity (4046702-4)
7. Co-requisites for this course (if any): Continuum Mechanics
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: **Numerical Analysis (2)**

Course Code: **4046707-4**

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 Analysis (2) (4046707-4)			
2. Credit hours: 4hrs			
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) Master 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 3/ Master			
6. Pre-requisites for this course (if any) Numerical Solutions of Differential Equations (1) (4045703-4)			
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 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: ..... **Asymptotic Theory**...

Course Code: .... **4046708-4**.....

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: Asymptotic Theory (4046701-4)				
2. Credit hours: 4 Hours				
3. Program(s) in which the course is offered. Master of Science in applied mathematics (If general elective available in many programs indicate this rather than list programs) Master of Science in Mathematic				
4. Name of faculty member responsible for the course: Dr. Muntaser Safan				
5. Level/year at which this course is offered: Leve 1/ Master				
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:

The course is suitable for undergraduates at Level 8 and for postgraduates at Masters level for those who have no previous experience of Asymptotic Methods will be introduced.

B Objectives

1. What is the main purpose for this course? The main purpose of this course is to introduce the student to the basic concepts and quantitative techniques for the study of Asymptotic Analysis in the presence of very small or very large parameters.
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 hours course comprising approximately 52 hours of lectures.**

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Chapter 1: Algebraic Equations - Regular iterative and expansion methods for the solution of algebraic equations. - Singular perturbations and their application to iterative and expansion methods for the solution of algebraic equations. - Rescaling in the expansion method. - Logarithmic approach for transcendental equations. - Convergence by establishing a contraction iteration scheme. - Perturbation expansions applied to eigenvalue problems.	3	12

Chapter 2: Asymptotic Expansion of Integrals - Integral representation of solutions of differential equations with examples, e.g. Bessel functions. - Laplace Method and Watson's Lemma. - Method of Stationary Phase. - Method of Steepest Descent and applications e.g. Stirling's formula, Airy function, etc. - Approximation of common incomplete integrals, e.g. Incomplete Gamma function, Incomplete Exponential integral, etc.	3	12
Chapter 3 - Approximate Solutions of Linear Differential Equations - Classification of the nature of singular points, e.g. regular, regular singular or irregular singular with survey of solution behaviours. - Taylor series solutions of first and second order equations near regular points. - Series solution near regular singular points, e.g. modified Bessel equation. - Asymptotic expansion of solution near irregular singular points. - Asymptotic properties of oscillatory functions, e.g. Bessel functions and Airy function. - Stokes phenomenon.	3	12
Chapter 4: Boundary Layer Theory - What is boundary layer theory? - The outer approximation. - The inner approximation (commonly called the boundary layer solution). - Matching inner and outer approximations and Van Dyke's matching rule. - Choosing boundary layer stretching variable and identification of the boundary layer. - Boundary layer not $O(\varepsilon)$. - Intermediate regions between the inner and outer solutions. - Examples in the use of boundary layer analysis. - Examples where boundary layer analysis fails.	3	12

Chapter 5 - Multiple Scales and WKBJ Theory - Analysis of the van der Pol oscillator. - The WKBJ approximation and conditions for the validity of the theory. - WKBJ approximation of the solution to an inhomogeneous linear equation. - Examples in the use of the WKBJ approximation, e.g. transmission and reflection of waves by potential barriers.	3	12

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

	Lecture	Tutorial	Laboratory or 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** Upon completion of the course, the student is expected to		
1.1	Develop knowledge and understanding	Lectures and	Short quizzes,

	on the perturbation expansions and their applications to algebraic equations, integrals, and differential equations.	homework.	periodical and final exams.
1.2	Be aware of the multiple scales method and its applications.	Lectures and homework.	Short quizzes, periodical and final exams.
2.0	**Cognitive Skills** Upon completion of the course, the student is expected to		
2.1	Solve problems using the fundamental ideas of asymptotic and multiple scale analysis.	Lectures and homework.	Short quizzes, periodical and final exams.
2.2	Develop practical skills in applying asymptotic methods for analysing mathematical problems.	Lectures 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	Identify small model parameters that influence the overall behavior of systems.	Lectures and homework.	Short quizzes, periodical and final exams.
3.2	Practice techniques for incorporating multiple scales into complicated nonlinear equations, and for solving the resulting simplified systems methodically to obtain increasingly accurate approximations of the true solution.	Lectures and homework.	Short quizzes, periodical and final exams.
4.0	**Communication, Information Technology, Numerical** Upon completion of the course, the student is expected to		
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. 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 periodic exam	6	20
2	Second periodic exam	10	20
3	Homework and tutorial activities	Over all weeks	20
4	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) The instructor is available for at least six hours per week. S/he is also available on appointments.

E Learning Resources

1. List Required Textbooks - A First Look at Perturbation Theory by James G. Simmonds and James E. Mann Jr. Dover publications (1998). - Perturbation methods, E. J. Hinch, Cambridge University Press (1996). - Advanced Mathematical Methods for Scientists and Engineers: Asymptotic Methods and Perturbation Theory by Carl M. Bender, Steven A. Orszag. Springer Verlag (1999).
2. List Essential References Materials (Journals, Reports, etc.) Journal of Asymptotic Analysis
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) - William Paulsen , Asymptotic Analysis and Perturbation Theory, Chapman and Hall/CRC, 2014
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. https://en.wikipedia.org/wiki/Asymptotic_analysis
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.)

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.
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 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. Muntaser Safan

Signature:_ *Muntaser Safan* _Date Report Completed: 31/10/2018

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received:_____