جامعة أم القرى

الكلية الجامعية بالجموم

برنامج ماجستير العلوم في فيزياء النانو

4. Learning and Teaching

4/1 Learning Outcomes and Graduate Specifications

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

(a)

(b)

(c)

4/1/2 Curriculum Study Plan Table

Level	Course Code	Course Title	Required or Elective	Prerequisite Courses	Credit Hours
Level 1	23066101	Experimental techniques I structural characterization	Required	-	2
	23066103	Experimental techniques II spectroscopies	Required	-	2
	23066105	Nanoscience and nanotechnology	Required	-	2
	23066107	Mathematical methods for nanoscience	Elective	-	2
	23066109	Classical electrodynamics	Elective	-	2
Level 2	23066102	Modelling and molecular dynamics simulations at the nanoscale	Required	-	2
	23066104	Nanostructural properties	Required	23066105	2
	23066106	Fundamentals of solid state physics	Required	23066105	2
	23066108	Advanced theoretical methods in nanoscience	Elective	23066107	2
	23066110	Advanced nano-scale characterization techniques	Elective	23066101 23066103	2
Level 3	23066201	Fundamentals of nanoscale characterization	Required	23066101 23066103	2
	23066203	Low dimensional systems and nanostructures	Required	23066106	2
	23066205	Nanostructured materials	Required	23066104	2
	23066207	Advanced topics in nanomaterials	Elective	23066104	2
	23066209	Introduction to materials science	Elective	23066106	2
Level 4	23066202	Thesis	Required		10

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Experimental techniques I structural characterization**

Course Code: **23066101**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Experimental techniques I structural characterization (23066101).**
2. Credit hours: **2 credit hours (1 credit for lectures and 1 credit for practical part).**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **1st Level.**
6. Pre-requisites for this course (if any): **-**
7. Co-requisites for this course (if any): **-**
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a.	Traditional classroom	✓	percentage?	35%
b.	Blended (traditional and online)		percentage?	
c.	E-learning	✓	percentage?	15%
d.	Correspondence		percentage?	
e.	Other: **Lab**	✓	percentage?	50%

Comments:

B. Objectives

1. The main objective of this course

The goal of this course is to approximate the student to the theoretical and experimental founding of the structural characterization techniques in materials, focusing in the ones that are more used in the characterization of nanostructured materials.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

Improving Course content using course report and references text book.
Using recent scientific research for improving course content.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Studying surface structure characterizing techniques (scanning microscopies, tunneling microscopy, atomic force microscopy) as well as bulk structure techniques (transmission electronic microscopy, x-ray diffraction, neutron diffraction) are introduced.

1. Topics to be Covered		
List of Topics	**No. of Weeks**	**Contact hours**
Introduction: measuring at the nanoscale	1	1
The limits of optical microscopy. Confocal microscopy	2	2
Electron microscopies.	4	4
Practical transmission electron microscopy, scanning electron microscopy	2	6
Scanning probe microscopy: principles of operation. Tunneling microscopy.	4	4
Atomic force microscopy. Basic principles and multimode operation.	4	4
Practical diffraction techniques: introduction to diffraction,	4	12
Practical X-ray diffraction (wide angle and small angle techniques)	4	12
Particle diffraction (neutrons, electrons, atoms)	4	12

2. Course components (total contact and credit hours per semester):							
		Lecture	**Tutorial**	**Laboratory/ Studio**	**Practical**	**Other**	**Total**
Contact Hours	Planned	15		42			57
	Actual	15		42			57
Credit	Planned	1		1			2
	Actual	1		1			2

3. Individual study/learning hours expected for students per week. ☐

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Understanding the nature of observation and scientific knowledge in the field of study.		
1.2	Relevant theories and their applications.		
1.5	Related terminology, numbering and classification systems.		

1.7	Related terminology, numbering and classification systems.		
2.0	**Cognitive Skills**		
2.1	Distinguish the relevant theories and evaluate its concepts and principles.		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.4	Develop and develop mechanisms to deal with scientific problems.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Design plans and method of treatment and report based on data that has been investigated, using appropriate techniques and consideration of scientific guidance.		
3.3	Solve scientific problems using a range of formats and approaches.		
4.0	**Communication, Information Technology, Numerical**		
4.2	Define roles, responsibilities and performance methods		
4.4	Work in groups effectively; manage time, collaborate and communicate with others positively.		
5.0	**Psychomotor(if any)**		
5.1	Conduct relevant scientific experiments.		
5.2	Developing scientific experiments and establishing techniques related to the experiments under study.		

5. Assessment Task Schedule 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	1st Quiz.	7	5
2	2nd Quiz.	12	5
3	1st Homework (E-Learning).	5	5
4	2nd Homework (E-Learning).	11	5
5	1st Quiz (Practical).	6	5
6	2nd Quiz (Practical).	10	5
7	1st Homework (Practical E-Learning).	4	5
8	2nd Homework (Practical E-Learning).	9	5
9	Research.	13	5
01	Final Practical Examination.	14	15
11	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

2. A Complete guidance at the beginning of this course as introductory lecture.

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week

E. Learning Resources

1. List Required Textbooks **Robert h webb, confocal optical microscopy, rep. Prog. Phys. 59 (1996) 427–471** **E. Meyer, h. J. Hug and r. Bennewitz "scanning probe icroscopy: the lab on a tip", springer verlag.** **The nanotechnology multimedia encyclopedic courses, "exploring nanotechnology" nanopolis.** **Scanning probe microscopy. The lab on a tip. E. Meyer, h.j. hug, r. Bennewitz. Springer** **J. P. Eberhart "structural and chemical analisys of materials: xray, electron and neutron diffraction - x-ray, electron and ion spectrometry – electron microscopy", Wiley, 1991** **"international tables for crystallography", kluwer, 1995.**
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.

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.) **Class room for 10 students.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **The class room should be equipped with a pc and data-show.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **Questioners.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Using course report.**
3. Procedures for Teaching Development **Using course report.**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ **Date Completed:** _____

Program Coordinator: _____

Signature: _____ **Date Received:** _____

COURSE SPECIFICATIONS

Form

Course Title: **Experimental techniques II spectroscopies**

Course Code: **23066103**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Experimental techniques II spectroscopies (23066103).**
2. Credit hours: **2 credit hours (1 credit for lectures and 1 credit for practical part).**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **1st Level.**
6. Pre-requisites for this course (if any): **-**
7. Co-requisites for this course (if any): **-**
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a.	Traditional classroom	✓	percentage?	35%
b.	Blended (traditional and online)		percentage?	
c.	E-learning	✓	percentage?	15%
d.	Correspondence		percentage?	
e.	Other: **Lab**	✓	percentage?	50%

Comments:

B. Objectives

1. The main objective of this course

The main goal of the course is to introduce the spectroscopic experimental techniques in the nanoscience and nanotechnology context. two main groups are considered, techniques involving electron spectroscopy and those focus on molecular spectroscopy.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

Improving Course content using course report and references text book.
Using recent scientific research for improving course content.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

The course must be thought after basic scientific subjects, such as quantum physics and mathematics.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction: measuring electronic states in nanostructures	1	1
Surface approach ultra-high vacuum atomically clean surfaces	2	2

Evaporation of materials thin film growth quantum dots, stripes and wires	4	4
Practical evaporation of materials thin film growth.	2	6
Practical surface sensitive techniques, particle sources and particle analyzers	4	12
Low energy electron diffraction.	4	4
Practical Scanning tunneling microscopy and atomic force microscopy	4	12
photoemission	4	4
Practical Surface science	4	12

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	15		42			57
	Actual	15		42			57
Credit	Planned	1		1			2
	Actual	1		1			2

3. Individual study/learning hours expected for students per week. ☐

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	Understanding the nature of observation and scientific knowledge in the field of study.		
1.2	Relevant theories and their applications.		
1.5	Related terminology, numbering and classification systems.		
1.7	Related terminology, numbering and classification systems.		
2.0	**Cognitive Skills**		
2.1	Distinguish the relevant theories and evaluate its concepts and principles.		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		

2.4	Develop and develop mechanisms to deal with scientific problems.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Design plans and method of treatment and report based on data that has been investigated, using appropriate techniques and consideration of scientific guidance.		
3.3	Solve scientific problems using a range of formats and approaches.		
4.0	**Communication, Information Technology, Numerical**		
4.2	Define roles, responsibilities and performance methods		
4.4	Work in groups effectively; manage time, collaborate and communicate with others positively.		
5.0	**Psychomotor(if any)**		
5.1	Conduct relevant scientific experiments.		
5.2	Developing scientific experiments and establishing techniques related to the experiments under study.		

5. Assessment Task Schedule 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	1st Quiz.	7	5
2	2nd Quiz.	12	5
3	1st Homework (E-Learning).	5	5
4	2nd Homework (E-Learning).	11	5
5	1st Quiz (Practical).	6	5
6	2nd Quiz (Practical).	10	5
7	1st Homework (Practical E-Learning).	4	5
8	2nd Homework (Practical E-Learning).	9	5
9	Research.	13	5
01	Final Practical Examination.	14	15
11	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

2. A Complete guidance at the beginning of this course as introductory lecture.

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week

E. Learning Resources

1. List Required Textbooks

Physics at surfaces, A. Zangwill, Cambridge university press (1996)

Very high resolution photoelectron spectroscopy, ed. S. Hüfner, lect. notes in physics 715, Springer, Berlin, Heidelberg 2007.

Scanning Probe Microscopy and Spectroscopy: Methods and Applications. Roland Wiesendanger, Cambridge University Press (1994)

Broadband dielectric spectroscopy. F. Kremer, A. Schönhals, Springer-Verlag, Berlin 2003.

Exploring matter with Neutrons - 2nd edition, 2nd volume of the NANOPOLIS™ encyclopedia series. Multimedia distributed knowledge network in nanotechnology. www.nanopolis.net **Modern Raman Spectroscopy: A Practical Approach, Ewen Smith y Geoffrey Dent., Wiley (2005).**
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.

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.) **Class room for 10 students.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **The class room should be equipped with a pc and data-show.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **Questioners.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Using course report.**
3. Procedures for Teaching Development **Using course report.**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ **Date Completed:** _____

Program Coordinator: _____

Signature: _____ **Date Received:** _____

COURSE SPECIFICATIONS

Form

Course Title: **Nanoscience and nanotechnology**

Course Code: **23066105**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Nanoscience and nanotechnology (23066105).**
2. Credit hours: **2 credit hours.**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **1st Level.**
6. Pre-requisites for this course (if any): **-**
7. Co-requisites for this course (if any): **-**
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a.	Traditional classroom	✓	percentage?	70%
b.	Blended (traditional and online)		percentage?	
c.	E-learning	✓	percentage?	30%
d.	Correspondence		percentage?	
e.	Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course

The basic aim of the module is knowing the state of the art in several technology fields, the perspectives and the impact of nanoscience in those fields.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

In this context, the module focus on the connection of current research activities in nanoscience to their potential technological application.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

The course must be thought after basic scientific subjects, such as quantum physics and mathematics.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Creating small objects in a controlled way and the top down strategy: Lithography	1	2
The bottom-up strategy: self-assembly	1	2
Introduction to the geometries of nanoscale carbon and Fullerenes.	1	2

Carbon nanotubes.	1	2
Quantum dots.	2	4
Nanocomposites.	2	4
The semiconductor industry: state of the art and challenges.	1	2
Magnetic recording: state of the art and challenges and state of the art Lithography and its limits.	2	4
Towards molecular electronics	1	2
Nanotechnology challenges in solar energy research.	1	2
Solar Photovoltaics.	1	2
Solar fuel and solar thermal.	1	2

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30					30
	Actual	30					30
Credit	Planned	1					2
	Actual	1					2

3. Individual study/learning hours expected for students per week. ____

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
3.0	**Interpersonal Skills & Responsibility**		
3.2	Application of techniques and tools related to scientific ethics.		
4.0	**Communication, Information Technology, Numerical**		

4.1	Use information and communication technology effectively		
4.3	Think independently, assign tasks and solve problems on a scientific basis.		
4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		
4.7	Apply models, scientific systems and tools effectively.		

5. Assessment Task Schedule 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	1st Quiz.	7	10
2	2nd Quiz.	11	10
3	1st Homework (E-Learning).	4	10
4	2nd Homework (E-Learning).	8	10
5	Research.	12	20
6	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week

E. Learning Resources

1. List Required Textbooks

1- Introduction to nanoscale science and technology springer, 2004.
2.- Nanotechnology, basis science, Wilson et al chapman, 2002
3.- International technology roadmap for semiconductors itrs-2007

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.

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.)

Class room for 10 students.

2. Technology resources (AV, data show, Smart Board, software, etc.)

The class room should be equipped with a pc and data-show.

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

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

Questioners.

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

Using course report.

3. Procedures for Teaching Development

Using course report.
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ Date Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

COURSE SPECIFICATIONS

Form

Course Title: **Mathematical methods for nanoscience**

Course Code: **23066107**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Mathematical methods for nanoscience (23066107).**
2. Credit hours: **2 credit hours.**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **1st Level.**
6. Pre-requisites for this course (if any): **-**
7. Co-requisites for this course (if any): **-**
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a.	Traditional classroom	✓	percentage?	70%
b.	Blended (traditional and online)		percentage?	
c.	E-learning	✓	percentage?	30%
d.	Correspondence		percentage?	
e.	Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course

The goal of this module is to provide the students with the required fundamental mathematical methods for the theoretical developments of the degree.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

In this context, the module focus on the connection of current research activities in nanoscience to their potential technological application.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

The instrumental character of the subject requires the dedication of a considerable number of seminars and practical exercises in order to apply the theoretical mathematical methods to real problems.

Since this module is aimed to provide the student with basic knowledge, the subject will be held in the first term (four month period) of the first year of the degree.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Theory of functions of a complex variable	2	4

Integration in the complex plane	2	4
Functional analysis. Hilbert spaces	2	4
Theory of linear operators.	2	4
Theory of linear operators. Applications to differential equations.	3	6
Group theory	4	8

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30					30
	Actual	30					30
Credit	Planned	1					2
	Actual	1					2

3. Individual study/learning hours expected for students per week.

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
1.6	Knowledge development related to the program.		
2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
3.0	**Interpersonal Skills & Responsibility**		
3.2	Application of techniques and tools related to scientific ethics.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use information and communication technology effectively		
4.3	Think independently, assign tasks and solve problems on a scientific basis.		

4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		
4.7	Apply models, scientific systems and tools effectively.		

5. Assessment Task Schedule 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	1st Quiz.	7	10
2	2nd Quiz.	11	10
3	1st Homework (E-Learning).	4	10
4	2nd Homework (E-Learning).	8	10
5	Research.	12	20
6	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week.

E. Learning Resources

1. List Required Textbooks

Complex analysis: for mathematics and engineering, fifth edition, 2006 John H. Mathews and Russell W. Howell
Graduate mathematical physics. Kelly, james j.
Advanced engineering mathematics. Erwing kreyzig. John wiley&sons
Mathematics methods for physics & engineering riley et al. Cambridge Group theory in physics

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.

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.)
Class room for 10 students.

2. Technology resources (AV, data show, Smart Board, software, etc.)
The class room should be equipped with a pc and data-show.

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

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching
Questioners.

2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
Using course report.

3. Procedures for Teaching Development **Using course report.**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ Date Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

COURSE SPECIFICATIONS

Form

Course Title: **Classical electrodynamics**

Course Code: **23066109**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Classical electrodynamics (23066109).**
2. Credit hours: **2 credit hours.**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **1st Level.**
6. Pre-requisites for this course (if any): **-**
7. Co-requisites for this course (if any): **-**
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a.	Traditional classroom	✓	percentage?	70%
b.	Blended (traditional and online)		percentage?	
c.	E-learning	✓	percentage?	30%
d.	Correspondence		percentage?	
e.	Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course

The interaction among charges is the one that determines the structure of matter from the atomic level up to the formation of macroscopic structures. Furthermore, the interaction of the electromagnetic field with matter is the basis of a great number of techniques devoted to the analysis of the structure of the materials. In many problems classical electrodynamics provides an adequate description of the interactions in Nanostructures. The aim of this subject is to familiarize the student with
The basic concepts of electric and magnetic fields, the response of macroscopic systems to external fields, and the relation of this response with the microscopic structure of the medium. Moreover, based on the Maxwell equations the fundamental concepts of optics will be presented, and the propagation, reflection and refraction of electromagnetic waves will be studied.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

In this context, the module focus on the connection of current research activities in nanoscience to their potential technological application.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Since the aim of this subject is that the student acquires basic knowledges, the subject will be taught during the first quadrisect of the first year of the master. In this way the student will be able to apply in a systematic way the acquired knowledge in the development of many subjects of the master, such as: fundamental of solid state physics low dimensional systems and nanostructures fundamentals of nanoscale characterization nanostructure properties.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to electrostatics. Problems of electrostatics with conductor	1	2
Dielectric media. Polarization. Boundary conditions in the presence of conductors. Electrostatic energy.	1	2
Magnetostatics. Magnetization. Boundary problems in the presence of magnetizable media.	2	4
Faraday law.	1	2
Maxwell equations.	2	4
Energy of the electromagnetic field.	2	4
Electromagnetic waves. Propagation, reflection and refraction.	2	4
Retarded potentials and radiative systems.	2	4
Radiation of an oscillating dipole and potentials created by a moving charge.	2	4

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30					30
	Actual	30					30
Credit	Planned	1					2
	Actual	1					2

3. Individual study/learning hours expected for students per week.

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment

			Methods
1.0	**Knowledge**		
1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
1.6	Knowledge development related to the program.		
2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
3.0	**Interpersonal Skills & Responsibility**		
3.2	Application of techniques and tools related to scientific ethics.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use information and communication technology effectively		
4.3	Think independently, assign tasks and solve problems on a scientific basis.		
4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		
4.7	Apply models, scientific systems and tools effectively.		

5. Assessment Task Schedule 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	1st Quiz.	7	10
2	2nd Quiz.	11	10
3	1st Homework (E-Learning).	4	10
4	2nd Homework (E-Learning).	8	10
5	Research.	12	20
6	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week.

E. Learning Resources

1. List Required Textbooks

J. D. Jackson, "classical electrodynamics", john wiley and sons, (1999)
F.E. Low, "classical field theory", john wiley and sons, 3ed edition (1998)
B. Di bartolo, "classical theory of electromagnetism", world Scientific, (2004)
W. Grenier, "classical electrodynamics", springer verlag, (2002).
A. S. Ilynski, g. Ya. Slepyan, a. Ya. Slepyan, "propagation, scattering and dissipation of electromagnetic waves", peter petegrinus, 1993

R. P. Feynman, r. B. Leighton, and m. Sands, "the feynman lectures on Physics: vol. 2", addison-wesley, 2006.
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.

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.) Class room for 10 students.
2. Technology resources (AV, data show, Smart Board, software, etc.) The class room should be equipped with a pc and data-show.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **Questioners.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Using course report.**
3. Procedures for Teaching Development **Using course report.**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ Date Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

COURSE SPECIFICATIONS

Form

Course Title: **Modelling and molecular dynamics simulations at the nanoscale**

Course Code: **23066102**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Modelling and molecular dynamics simulations at the nanoscale (23066102)**
2. Credit hours: **2 credit hours.**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **2nd Level.**
6. Pre-requisites for this course (if any): -
7. Co-requisites for this course (if any): -
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a.	Traditional classroom	✓	percentage?	70%
b.	Blended (traditional and online)		percentage?	
c.	E-learning	✓	percentage?	30%
d.	Correspondence		percentage?	
e.	Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course

The student should be trained on the basic knowledge about the computer methods of simulation and modelling used at present to study systems of nanometric size.
Moreover, the student should become familiar with the use of standard software packages in which this type of methods are relevant and should master their possible applications and limitations.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

In this context, the module focus on the connection of current research activities in nanoscience to their potential technological application.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

The subject will be divided in two great blocks, one due to the simulations of molecular dynamics and a second one aimed to the description of the methods of first principles used in the Nano-structure modelling.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to ab-initio methods in the modelling of nanostructures.	2	2
Solid-state methods.	3	6
Quantum physics methods.	3	6
Introduction to molecular dynamics simulation in the nanoscale.	2	4
The concept of forcefield.	2	4
Needed algorithms.	2	4
Mesoscopic methods.	2	4

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30					30
	Actual	30					30
Credit	Planned	1					2
	Actual	1					2

3. Individual study/learning hours expected for students per week. ☐

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
1.6	Knowledge development related to the program.		
2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
3.0	**Interpersonal Skills & Responsibility**		
3.2	Application of techniques and tools related to scientific ethics.		

4.0	**Communication, Information Technology, Numerical**		
4.1	Use information and communication technology effectively		
4.3	Think independently, assign tasks and solve problems on a scientific basis.		
4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		
4.7	Apply models, scientific systems and tools effectively.		

5. Assessment Task Schedule 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	1st Quiz.	7	10
2	2nd Quiz.	11	10
3	1st Homework (E-Learning).	4	10
4	2nd Homework (E-Learning).	8	10
5	Research.	12	20
6	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week.

E. Learning Resources

1. List Required Textbooks

Computer Simulation of Liquids, M.P. Allen D.J. Tildesley, Oxford Science Publications, 2nd edition (2017).

Modelling Molecular Structures, A. Hinchliffe, Wiley and Sons, (2000).

Computational Materials Science, K. Ohno, K. Esfarjani, and Y. Kawazoe Springer, Berlin, 2nd edition (2018).

Electronic structure: basic theory and practical methods, Richard M. Martin, Cambridge University Press, (2004)

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.

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.)
Class room for 10 students.

2. Technology resources (AV, data show, Smart Board, software, etc.)
The class room should be equipped with a pc and data-show.

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

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **Questioners.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Using course report.**
3. Procedures for Teaching Development **Using course report.**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ Date Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

COURSE SPECIFICATIONS

Form

Course Title: **Nanostructural properties**

Course Code: **23066104**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Nanostructural properties (23066104).**
2. Credit hours: **2 credit hours.**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **2nd Level.**
6. Pre-requisites for this course (if any): **Nanoscience and nanotechnology (23066105)**
7. Co-requisites for this course (if any): **-**
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a.	Traditional classroom	✓	percentage?	70%
b.	Blended (traditional and online)		percentage?	
c.	E-learning	✓	percentage?	30%
d.	Correspondence		percentage?	
e.	Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course

The main goal of this module is to establish the connection between the nanostructures that have been presented in previous moduli and the different physical properties that those nanostructured materials hold.
Special emphasis will be addressed for a deeper understanding of the electronic structure in low dimensional systems, an introduction to transport properties, as well as an introductory review of magnetic, optical and mechanical properties of nanostructures.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

In this context, the module focus on the connection of current research activities in nanoscience to their potential technological application.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

The modulus will be taught during the second semester of the first course of the master. In this way, the student will develop a solid basis on structural and electronic properties of different nanostructures during the first semester, and the connection with the

different mechanical, optical, magnetic and transport properties can be reached progressively along the course.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction. Thermodynamically approach to solid surfaces and nanostructured systems, Surface energy and stability, and Wulff construction.	1	2
Electronic properties. Jellium model, Periodicity: Bloch theorem and bands, Nearly-free electrons in solids and surfaces, Tight binding method, Truncated systems: electron localization effects,	3	6
Transport properties. Friedel model. Surface core level shifts, and Hubbard model. Mott transition. Origin of magnetic exchange.	3	6
Optical properties. Light propagation in a material, Localized and propagating plasmonic resonances in metallic nanostructures, Dielectric nanostructures, Microscopic description of the optical properties of materials, Microscopic polarizability, Forced damped harmonic oscillator model, and Drude Model.	2	4
Magnetic properties. Exchange and anisotropy, X-ray magnetic circular dichroism (XMCD), Layers, Magnetism in nanoparticles, and Giant magnetoresistance.	3	6
Mechanical properties. Linear Elastic Properties, Nonlinear Elasticity and Shell Model, Atomic Relaxation and Failure Mechanisms, Kinetic Theory of Strength, Coalescence of Nanotubes as a Reversed Failure.	3	6

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30					30
	Actual	30					30
Credit	Planned	1					2
	Actual	1					2

3. Individual study/learning hours expected for students per week.

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
1.6	Knowledge development related to the program.		
2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
3.0	**Interpersonal Skills & Responsibility**		
3.2	Application of techniques and tools related to scientific ethics.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use information and communication technology effectively		
4.3	Think independently, assign tasks and solve problems on a scientific basis.		
4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		
4.7	Apply models, scientific systems and tools effectively.		

5. Assessment Task Schedule 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	1st Quiz.	7	10
2	2nd Quiz.	11	10
3	1st Homework (E-Learning).	4	10
4	2nd Homework (E-Learning).	8	10
5	Research.	12	20
6	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week.

E. Learning Resources

1. List Required Textbooks **-"Handbook of nanoscience, Engineering, and technology", Donald Brenner, Sergey Lyshevski, Gerald Lafrate, William A. Goddard III (eds.) CRC PRESS, 3ed edition (2012).** **- "Encyclopedia of Nanoscience and Nanotechnology", Hari Singh Nalwa (ed.) American Scientific Publishers. 2005** **- "Exploring Nanotechnology" CD-ROM encyclopedia. NANOPOLYS. 2005** **- "Principles of Nano-optics", Lucas Novotny and Bert Hecht, Cambridge university Press, 2006** **"Mesoscopic Physics and electronics", T. Ando, Y. Arakawa, F. Furuya, S. Komiyama and H. Nakashima, Spinger, Kindle Edition (2012).** **- "Mesoscopic systems. Fundamentals and Applications", Yoshimasa Murayama, Wiley-Vch, 2001.**
2. List Essential References Materials (Journals, Reports, etc.)
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. http://nanotech.nanopolis.net
4. 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.) Class room for 10 students.
2. Technology resources (AV, data show, Smart Board, software, etc.) The class room should be equipped with a pc and data-show.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **Questioners.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Using course report.**
3. Procedures for Teaching Development **Using course report.**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ **Date Completed:** _____

Program Coordinator: _____
Signature: _____ **Date Received:** _____

COURSE SPECIFICATIONS

Form

Course Title: **Fundamentals of solid state physics**

Course Code: **23066106**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Fundamentals of solid state physics (23066106).**
2. Credit hours: **2 credit hours.**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **2nd Level.**
6. Pre-requisites for this course (if any): **Nanoscience and nanotechnology (23066105)**
7. Co-requisites for this course (if any): **-**
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a.	Traditional classroom	✓	percentage?	70%
b.	Blended (traditional and online)		percentage?	
c.	E-learning	✓	percentage?	30%
d.	Correspondence		percentage?	
e.	Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course

The goal of the module is to develop a general picture of solid state physics that can be used by students to understand the classification of Materials in terms of their properties: metals, semiconductors, and insulators.
This includes general properties of crystal symmetry: crystal lattice translational symmetry and point group operations, reciprocal lattice, one particle properties and classification of one particle states in terms of wave vectors. It also includes band structure of metals, semiconductors, and insulators; vibrations in solids; experimental and theoretical methods of study of electronic and vibrational properties of solids. Magnetism of solids – why some materials are magnetic?

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

In this context, the module focus on the connection of current research activities in nanoscience to their potential technological application.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

The course of the fundamentals of solid state physics will be given in the second four-month period of a master in nanoscience. This is because a knowledge of basic notions and properties of solids is fundamentals for understanding of other disciplines of a master in nanoscience. The themes of the course form a bridge that connects phenomena of extended materials and Nano size metallic.
Semiconductor and insulator systems. In particular, information obtained is necessary for study of other courses.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Geometrical description of crystals: direct and Reciprocal lattices	2	4
Vibrations in solids: phonons	2	4
Free electrons in solids.	2	4
The electronic band structure of solids: Bloch theorem, the nearly free-electron approximation, the tight-binding approximation.	2	4
Band structure of selected metals	2	4
Cohesion of solids.	2	4
Magnetism in solids: why some materials are Magnetic	3	6

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30					30
	Actual	30					30
Credit	Planned	1					2
	Actual	1					2

3. Individual study/learning hours expected for students per week. ☐

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		

1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
1.6	Knowledge development related to the program.		
2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
3.0	**Interpersonal Skills & Responsibility**		
3.2	Application of techniques and tools related to scientific ethics.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use information and communication technology effectively		
4.3	Think independently, assign tasks and solve problems on a scientific basis.		
4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		
4.7	Apply models, scientific systems and tools effectively.		

5. Assessment Task Schedule 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	1st Quiz.	7	10
2	2nd Quiz.	11	10
3	1st Homework (E-Learning).	4	10
4	2nd Homework (E-Learning).	8	10
5	Research.	12	20
6	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week.

E. Learning Resources

1. List Required Textbooks

Introduction to Solid State Physics, 8th Edition, Wiley; (2004)

Advanced Solid State Physics 2nd Edition Cambridge University Press; 2 edition (2012)

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.

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.) Class room for 10 students.
2. Technology resources (AV, data show, Smart Board, software, etc.) The class room should be equipped with a pc and data-show.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **Questioners.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Using course report.**
3. Procedures for Teaching Development **Using course report.**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ Date Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

COURSE SPECIFICATIONS

Form

Course Title: **Advanced theoretical methods in nanoscience**

Course Code: **23066108**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Advanced theoretical methods in nanoscience (23066108).**
2. Credit hours: **2 credit hours.**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **2nd Level.**
6. Pre-requisites for this course (if any): **Mathematical methods for nanoscience (23066107).**
7. Co-requisites for this course (if any): **-**
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a.	Traditional classroom	✓	percentage?	70%
b.	Blended (traditional and online)		percentage?	
c.	E-learning	✓	percentage?	30%
d.	Correspondence		percentage?	
e.	Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course

This course will introduce the student to theoretical methods such as Quantum physical methods and that are commonly used to study the electronic properties of important systems in Nanoscience.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

In this context, the module focus on the connection of current research activities in nanoscience to their potential technological application.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

The student will also learn the fundamentals of molecular structure, electronic and structural properties of surfaces and basic concepts on the chemical processes in gas/surface interactions. Furthermore, the student will get practice on the use of computer codes for Quantum physical calculations.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours

Introduction	2	4
Molecular Structure	2	4
Quantum physical Methods: Theory.	3	6
Quantum physical Methods: Exercises.	2	4
Properties of surfaces.	2	4
Adsorption processes.	2	4
Density Functional Theory.	2	4

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30					30
	Actual	30					30
Credit	Planned	1					2
	Actual	1					2

3. Individual study/learning hours expected for students per week.

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
1.6	Knowledge development related to the program.		
2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
3.0	**Interpersonal Skills & Responsibility**		
3.2	Application of techniques and tools related to scientific ethics.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use information and communication technology effectively		

4.3	Think independently, assign tasks and solve problems on a scientific basis.		
4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		
4.7	Apply models, scientific systems and tools effectively.		

5. Assessment Task Schedule 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	1st Quiz.	7	10
2	2nd Quiz.	11	10
3	1st Homework (E-Learning).	4	10
4	2nd Homework (E-Learning).	8	10
5	Research.	12	20
6	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week.

E. Learning Resources

1. List Required Textbooks

Handbook of Nanophysics: Principles and Methods (Volume 7) 1st Edition CRC Press; (2010)

Complex analysis: for mathematics and engineering, fifth edition, 2006 John H. Mathews and Russell W. Howell

Graduate mathematical physics. Kelly, james j. Wiley (2006).

Advanced engineering mathematics. Erwing kreyzig. John wiley&sons 10th edition (2015).

Mathematics methods for physics & engineering riley et al. Cambridge Group theory in physics

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.

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.)
Class room for 10 students.

2. Technology resources (AV, data show, Smart Board, software, etc.)
The class room should be equipped with a pc and data-show.

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

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching
Questioners.

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

Using course report.
3. Procedures for Teaching Development **Using course report.**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ Date Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

COURSE SPECIFICATIONS

Form

Course Title: **Advanced nano-scale characterization techniques**

Course Code: **23066110**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Advanced nano-scale characterization techniques (23066110).**	
2. Credit hours: **2 credit hours.**	
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.** (If general elective available in many programs indicate this rather than list programs)	
4. Name of faculty member responsible for the course:	
5. Level/year at which this course is offered: **2nd Level.**	
6. Pre-requisites for this course (if any):	**Experimental techniques I structural characterization (23066101)** **Experimental techniques II spectroscopies (23066103)**
7. Co-requisites for this course (if any): -	
8. Location if not on main campus: **Al-Jamoum University College.**	

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

a. Traditional classroom	✓	percentage?	70%
b. Blended (traditional and online)		percentage?	
c. E-learning	✓	percentage?	30%
d. Correspondence		percentage?	
e. Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course

The goal of this course is to introduce the student to selected experimental techniques of relevance in the nanoscale characterization. Both the theoretical and experimental findings are going to be considered in details. This year the electron energy loss spectroscopy will be considered.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

In this context, the module focus on the connection of current research activities in nanoscience to their potential technological application.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

The student will have to do some bibliographic work with the corresponding exposition about some part of the course.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
An introduction to electron energy loss spectroscopy (EELS).	1	2
Instrumentation for energy loss spectroscopy.	2	4
Electron scattering theory.	2	4
Electron scattering theory: inner shell and valence electron excitations.	2	4
Quantitative analysis of eels.	2	4
EELS in Nano systems:	3	6
EELS in Nano systems: bulk and surface plasmons	3	6

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30					30
	Actual	30					30
Credit	Planned	1					2
	Actual	1					2

3. Individual study/learning hours expected for students per week.

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
1.6	Knowledge development related to the program.		
2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
3.0	**Interpersonal Skills & Responsibility**		
3.2	Application of techniques and tools related to scientific ethics.		

4.0	**Communication, Information Technology, Numerical**		
4.1	Use information and communication technology effectively		
4.3	Think independently, assign tasks and solve problems on a scientific basis.		
4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		
4.7	Apply models, scientific systems and tools effectively.		

5. Assessment Task Schedule 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	1st Quiz.	7	10
2	2nd Quiz.	11	10
3	1st Homework (E-Learning).	4	10
4	2nd Homework (E-Learning).	8	10
5	Research.	12	20
6	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week.

E. Learning Resources

1. List Required Textbooks

Electron energy loss spectroscopy in the electron microscope, R.F. Egerton Springer press 3ed edition (2011).

Elastic and inelastic scattering in electron diffraction and imaging, Z.l wang, Plenum 1995

Transmission electron energy loss spectroscopy in materials science and the EELS atlas, ed. Channing C. Ahn, Wiley, 2004

Physical principles of electron microscopy, R.F. Egerton. Springer 2005

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.

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.)
Class room for 10 students.

2. Technology resources (AV, data show, Smart Board, software, etc.)
The class room should be equipped with a pc and data-show.

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

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **Questioners.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Using course report.**
3. Procedures for Teaching Development **Using course report.**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ Date Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

COURSE SPECIFICATIONS

Form

Course Title: **Fundamentals of nanoscale characterization**

Course Code: **23066201**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Fundamentals of nanoscale characterization (23066201).**	
2. Credit hours: **2 credit hours.**	
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.** (If general elective available in many programs indicate this rather than list programs)	
4. Name of faculty member responsible for the course:	
5. Level/year at which this course is offered: **3ed Level.**	
6. Pre-requisites for this course (if any):	**Experimental techniques I structural characterization (23066101)** **Experimental techniques II spectroscopies (23066103)**
7. Co-requisites for this course (if any): -	
8. Location if not on main campus: **Al-Jamoum University College.**	

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

a. Traditional classroom	✓	percentage?	70%
b. Blended (traditional and online)		percentage?	
c. E-learning	✓	percentage?	30%
d. Correspondence		percentage?	
e. Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course

The aim of this course is that the student acquires the basic theoretical concepts that are behind the experimental techniques used to characterize solids and nanostructures. Concepts on elastic and inelastic scattering processes will be developed paying attention to the characteristics of the probes and the theoretical methods that are used to describe the interaction with the targets.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

In this context, the module focus on the connection of current research activities in nanoscience to their potential technological application.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

This module is scheduled for the third term of the first course of the master. The idea is that the student will have acquired the basic knowledges needed to follow this subject in the fundamental subjects that are taught in the first term of the master, such as "fundamentals of quantum mechanics", "classical electrodynamics" and "fundamental of solid state physics". In addition, this module is complementary to the subjects that

are also given in this first term of the master "experimental techniques 1" and "experimental techniques 2".

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Elastic scattering and diffraction Elastic scattering of light with matter Static structure factor and pair distribution function Diffraction in crystalline solids Elastic scattering of electrons with matter Elastic scattering of neutrons with matter	2	4
Inelastic scattering. Dynamic structure factor and time correlation	1	2
Density-density response function Non interacting fermi gas.	2	4
The charged fermi liquid and the dielectric function Random phase approximation. Plasmons.	2	4
Green functions (classical, one-body Schrödinger equation, single-particle for many body) Lehman representation. The spectral function. Broadening (line width)	2	4
Measuring the spectral function with scanning tunneling spectroscopy. Two-particle correlation functions (response functions)	2	4
Inelastic electrons tunneling spectroscopy Angle resolved photoemission spectroscopy	2	4
Two photon photoemission spectroscopy (2ppe) Vibrational spectroscopies: infrared and Raman. X-ray absorption spectroscopy.	2	4

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30					30
	Actual	30					30
Credit	Planned	1					2
	Actual	1					2

3. Individual study/learning hours expected for students per week. ☐

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
1.6	Knowledge development related to the program.		
2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
3.0	**Interpersonal Skills & Responsibility**		
3.2	Application of techniques and tools related to scientific ethics.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use information and communication technology effectively		
4.3	Think independently, assign tasks and solve problems on a scientific basis.		
4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		
4.7	Apply models, scientific systems and tools effectively.		

5. Assessment Task Schedule 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	1st Quiz.	7	10
2	2nd Quiz.	11	10
3	1st Homework (E-Learning).	4	10
4	2nd Homework (E-Learning).	8	10
5	Research.	12	20
6	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week.

E. Learning Resources

1. List Required Textbooks **"X-ray diffraction" by b. E. Warren dover publications, 1990.** **"Diffraction physics" by j. M. Cowley north-holland physics publishers, 3ed ed (1995).** **"Transmission electron microscopy and diffractometry of materials" by b. Fultz and j. M. Howe springer,4th edition (2013).**
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.

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.) Class room for 10 students.
2. Technology resources (AV, data show, Smart Board, software, etc.) The class room should be equipped with a pc and data-show.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **Questioners.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Using course report.**
3. Procedures for Teaching Development **Using course report.**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ **Date Completed:** _____

Program Coordinator: _____

Signature: _____ **Date Received:** _____

COURSE SPECIFICATIONS

Form

Course Title: **Low dimensional systems and nanostructures**

Course Code: **23066203**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Low dimensional systems and nanostructures (23066203).**
2. Credit hours: **2 credit hours.**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **3ed Level.**
6. Pre-requisites for this course (if any): **Fundamentals of solid state physics (23066106)**
7. Co-requisites for this course (if any): **-**
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a.	Traditional classroom	✓	percentage?	70%
b.	Blended (traditional and online)		percentage?	
c.	E-learning	✓	percentage?	30%
d.	Correspondence		percentage?	
e.	Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course

This course is intended to provide a general introduction to the most important nanostructures in nanoscience and nanotechnology, attending to their dimensionality (2d, 1d and od). The most important phenomena emerging in low dimensional systems will be described. Finally, special attention will be paid to carbon and other inorganic nanostructures, which exist in all dimensions (diamond, graphite, nanotubes, and fullerenes).

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

In this context, the module focus on the connection of current research activities in nanoscience to their potential technological application.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Some exercises will be solved with the aid of the computer. The rest of the time will be devoted to the personal work of the student and will be distributed among study of the theory, solving exercises, bibliographic search and preparing an essay and its oral presentation.

This course is a continuation of fundamentals of solid state".

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Length scales and low dimensionality	1	2
Electronic states and quantum confined systems	2	4
One-dimensional systems: quantum wires, the pearls transition and quantum transport.	2	4
Two dimensional systems: surfaces and heterojunctions, quantum wells and superlattices.	2	4
Two dimensional systems: quantum hall effect.	2	4
Zero dimensional systems: quantum dots and metal clusters. Electronic and optical properties.	2	4
Zero dimensional systems: Coulomb blockade and single electron devices.	2	4
Carbon and other inorganic nanostructures: fullerenes and carbon nanotubes.	2	4

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30					30
	Actual	30					30
Credit	Planned	1					2
	Actual	1					2

3. Individual study/learning hours expected for students per week. ☐

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
1.6	Knowledge development related to the program.		

2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
3.0	**Interpersonal Skills & Responsibility**		
3.2	Application of techniques and tools related to scientific ethics.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use information and communication technology effectively		
4.3	Think independently, assign tasks and solve problems on a scientific basis.		
4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		
4.7	Apply models, scientific systems and tools effectively.		

5. Assessment Task Schedule 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	1st Quiz.	7	10
2	2nd Quiz.	11	10
3	1st Homework (E-Learning).	4	10
4	2nd Homework (E-Learning).	8	10
5	Research.	12	20
6	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week.

E. Learning Resources

1. List Required Textbooks

"The Physics and Chemistry of Solids", Stephen Elliot, Wiley, 2000.

- "Introduction to Modern Solid State Physics", Y. M. Galperin, (2014)

-"Introduction to Solid State Physics", Charles Kittel, 8th edition, Wiley, 2005.

"The Physics of low dimensional semiconductors", J.H. Davies, Cambridge Univ. Press, 1998.

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

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

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

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.) Class room for 10 students.
2. Technology resources (AV, data show, Smart Board, software, etc.) The class room should be equipped with a pc and data-show.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **Questioners.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Using course report.**
3. Procedures for Teaching Development **Using course report.**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ Date Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

COURSE SPECIFICATIONS

Form

Course Title: **Nanostructured materials**

Course Code: **23066205**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Nanostructured materials (23066205).**
2. Credit hours: **2 credit hours.**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **3ed Level.**
6. Pre-requisites for this course (if any): **Nanostructural properties (23066104)**
7. Co-requisites for this course (if any): **-**
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a.	Traditional classroom	✓	percentage?	70%
b.	Blended (traditional and online)		percentage?	
c.	E-learning	✓	percentage?	30%
d.	Correspondence		percentage?	
e.	Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course

Introduction of general concepts in soft matter.
Description of soft matter categories.
Basis for self-assembly.
Nanostructured materials based on soft systems.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

In this context, the module focus on the connection of current research activities in nanoscience to their potential technological application.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Introduction of general concepts in soft matter:
• universal aspects shared by soft materials
• kinds of soft materials
Description of soft matter categories:
• colloids
• polymers
• amphiphiles

• liquid crystals
• biomolecules
Basis for self-assembly
Nanostructured materials based on soft systems

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction of general concepts in soft matter.	1	2
Universal aspects shared by soft materials.	2	4
Description of soft matter.	2	4
Description of soft matter: colloids.	2	4
Description of soft matter: polymers and amphiphiles	2	4
Description of soft matter: liquid crystals and biomolecules	2	4
Basis for self-assembly.	2	4
Nanostructured materials based on soft systems	2	4

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30					30
	Actual	30					30
Credit	Planned	1					2
	Actual	1					2

3. Individual study/learning hours expected for students per week. ☐

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
1.6	Knowledge development related to the program.		
2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		

2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
3.0	**Interpersonal Skills & Responsibility**		
3.2	Application of techniques and tools related to scientific ethics.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use information and communication technology effectively		
4.3	Think independently, assign tasks and solve problems on a scientific basis.		
4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		
4.7	Apply models, scientific systems and tools effectively.		

5. Assessment Task Schedule 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	1st Quiz.	7	10
2	2nd Quiz.	11	10
3	1st Homework (E-Learning).	4	10
4	2nd Homework (E-Learning).	8	10
5	Research.	12	20
6	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week.

E. Learning Resources

1. List Required Textbooks

Soft condensed matter, richard A.L. Jones, Oxford university press, 2002

Introduction to soft matter. Polymers, colloids, amphiphiles and liquid crystals Ian W. Hamley John Wiley & sons, ltd., 2000

Introduction to physical polymer science (4th ed) l. H. Sperling John Wiley & sons, ltd., 2002

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.

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.)
Class room for 10 students.

2. Technology resources (AV, data show, Smart Board, software, etc.)

The class room should be equipped with a pc and data-show.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **Questioners.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Using course report.**
3. Procedures for Teaching Development **Using course report.**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ Date Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

COURSE SPECIFICATIONS

Form

Course Title: **Advanced topics in nanomaterials**

Course Code: **23066207**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Advanced topics in nanomaterials (23066207).**
2. Credit hours: **2 credit hours.**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **3ed Level.**
6. Pre-requisites for this course (if any): **Nanostructural properties (23066104)**
7. Co-requisites for this course (if any): **Nanostructured materials (2306205)**
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a.	Traditional classroom	✓	percentage?	70%
b.	Blended (traditional and online)		percentage?	
c.	E-learning	✓	percentage?	30%
d.	Correspondence		percentage?	
e.	Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course
This course will review the optical properties of nanoscale metallic and semiconductor particles.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)
In this context, the module focus on the connection of current research activities in nanoscience to their potential technological application.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:
The focus of the course will be the understanding of the physics of surface plasmons in metallic nanoparticles, and excitons in semiconductor quantum dots.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Basics of electromagnetism. Optical response.	2	4
Surface plasmon polaritons.	2	4
Localized surface plasmons in metal nanoparticles.	4	8

Semiconductor quantum dots.	3	6
Near-field nanoscopic for material characterization.	2	4
Photonic crystals.	2	4

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30					30
	Actual	30					30
Credit	Planned	1					2
	Actual	1					2

3. Individual study/learning hours expected for students per week.

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
1.6	Knowledge development related to the program.		
2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
3.0	**Interpersonal Skills & Responsibility**		
3.2	Application of techniques and tools related to scientific ethics.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use information and communication technology effectively		
4.3	Think independently, assign tasks and solve problems on a scientific basis.		
4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		

4.7	Apply models, scientific systems and tools effectively.		

5. Assessment Task Schedule 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	1st Quiz.	7	10
2	2nd Quiz.	11	10
3	1st Homework (E-Learning).	4	10
4	2nd Homework (E-Learning).	8	10
5	Research.	12	20
6	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week.

E. Learning Resources

1. List Required Textbooks

William D. Callister, Jr., "Material Science and Engineering: An Introduction", Wiley 10 edition 2018.

G. Gottstein "Physical Foundations of Materials Science", Springer, 2004 edition.

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.

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.)
Class room for 10 students.

2. Technology resources (AV, data show, Smart Board, software, etc.)
The class room should be equipped with a pc and data-show.

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

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching
Questioners.

2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
Using course report.

3. Procedures for Teaching Development
Using course report.

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)

A random sample of students' assessments is corrected through the committee formed by the department.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ Date Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

COURSE SPECIFICATIONS

Form

Course Title: **Introduction to materials science**

Course Code: **23066209**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Introduction to materials science (23066209).**
2. Credit hours: **2 credit hours.**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **3ed Level.**
6. Pre-requisites for this course (if any): **Fundamentals of solid state physics (23066106)**
7. Co-requisites for this course (if any): **Nanostructured materials (23066205)**
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a.	Traditional classroom	✓	percentage?	70%
b.	Blended (traditional and online)		percentage?	
c.	E-learning	✓	percentage?	30%
d.	Correspondence		percentage?	
e.	Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course

The student to acquire a basic knowledge in materials science: a classification of materials depending on their structure and an overview and a description of thermal, mechanical optical, electric and magnetic properties of materials.
The student must learn the importance of the different types of defects which change the properties of materials, like doping of semiconductors, and the structural changes appearing when submitting the materials to pressure, temperature or composition changes.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

In this context, the module focus on the connection of current research activities in nanoscience to their potential technological application.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

Under the recent research results in materials science, a revision of the new methods for the design of new materials will be presented.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Classification of materials: structure and fundamental properties.	1	2
Imperfections: defects, dislocation, impurities	2	4
Mechanical properties	2	4
Thermal properties	2	4
Optical properties	2	4
Electric properties	2	4
Magnetic properties	2	4
Different type of materials: polymers, ceramics, alloys, new materials. Preparation techniques	2	4

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	30					30
	Actual	30					30
Credit	Planned	1					2
	Actual	1					2

3. Individual study/learning hours expected for students per week. ☐

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
1.6	Knowledge development related to the program.		
2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
3.0	**Interpersonal Skills & Responsibility**		

3.2	Application of techniques and tools related to scientific ethics.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use information and communication technology effectively		
4.3	Think independently, assign tasks and solve problems on a scientific basis.		
4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		
4.7	Apply models, scientific systems and tools effectively.		

5. Assessment Task Schedule 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	1st Quiz.	7	10
2	2nd Quiz.	11	10
3	1st Homework (E-Learning).	4	10
4	2nd Homework (E-Learning).	8	10
5	Research.	12	20
6	Final written Examination.	16	40

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week.

E. Learning Resources

1. List Required Textbooks

William D. Callister, Jr., "Material Science and Engineering: An Introduction", Wiley 10 edition 2018.

G. Gottstein "Physical Foundations of Materials Science", Springer, 2004 edition.

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.

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.)
Class room for 10 students.

2. Technology resources (AV, data show, Smart Board, software, etc.)
The class room should be equipped with a pc and data-show.

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

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

Questioners.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Using course report.**
3. Procedures for Teaching Development **Using course report.**
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ Date Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____

COURSE SPECIFICATIONS

Form

Course Title: **Thesis**

Course Code: **23066202**

Date: 2018 – 12 – 28	**Institution**: Umm Al-Qura University
College: Al-Jamoum University College	**Department**: Physics

A. Course Identification and General Information

1. Course title and code: **Thesis (23066202).**
2. Credit hours: **10 credit hours.**
3. Program(s) in which the course is offered: **Nano physics Program, Al-Jamoum University College.**
(If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course:
5. Level/year at which this course is offered: **4th Level.**
6. Pre-requisites for this course (if any):
7. Co-requisites for this course (if any): **-**
8. Location if not on main campus: **Al-Jamoum University College.**
9. Mode of Instruction (mark all that apply):

a. Traditional classroom		percentage?	
b. Blended (traditional and online)		percentage?	
c. E-learning		percentage?	
d. Correspondence		percentage?	
e. Other:		percentage?	

Comments:

B. Objectives

1. The main objective of this course
2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online 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 the program's bulletin or handbook)

Course Description:

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned						
	Actual						
Credit	Planned						
	Actual						

3. Individual study/learning hours expected for students per week.

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

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 targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.2	Relevant theories and their applications.		
1.3	The process and mechanisms supporting the structure and function are specific topics.		
1.4	Related terminology, numbering and classification systems.		
1.5	Knowledge development related to the program.		
1.6	Knowledge development related to the program.		
1.7	The relationship between studied subjects and the environment.		
2.0	**Cognitive Skills**		
2.2	Analyzing, evaluating and interpreting relevant qualitative and quantitative scientific data.		
2.3	Develop the argument and divorce the appropriate judgments according to scientific theories and concepts.		
2.4	Develop and develop mechanisms to deal with scientific problems.		
2.5	Build relevant and integrated information to confirm evidence submission and test hypotheses.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Design plans and method of treatment and report based on data that has been investigated, using appropriate techniques and consideration of scientific guidance.		
3.2	Application of techniques and tools related to scientific ethics.		
3.3	Solve scientific problems using a range of formats and approaches.		
3.4	Identify and critique the various methods used to address the topic related issues.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use information and communication technology effectively		
4.3	Think independently, assign tasks and solve problems on a scientific basis.		

4.5	Taking into account societal problems associated with customs, traditions and ethics.		
4.6	Ability to learn self and continuously.		
4.7	Apply models, scientific systems and tools effectively.		
4.8	Dealing with scientific patents and consideration of property rights.		
5.0	**Psychomotor**		
5.1	Conduct relevant scientific experiments.		
5.2	Developing scientific experiments and establishing techniques related to the experiments under study.		

5. Assessment Task Schedule 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	Obtain the scientific material		5
2	Results analysis.		10
3	Responding to the guidance of supervisors.		10
4	Candidate commitment to attend and conduct research.		5
5	Proposal defense and the final report.		70

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

Academic advising hours for guidance are included in the faculty member schedule of 4 hours per week.

E. Learning Resources

1. List Required Textbooks
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.

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.)
Class room for 10 students.

2. Technology resources (AV, data show, Smart Board, software, etc.)
The class room should be equipped with a pc and data-show.

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

G. Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching
Questioners.

2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
Using course report.

3. Procedures for Teaching Development

Using course report.
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) **A random sample of students' assessments is corrected through the committee formed by the department.**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Review stakeholders and conduct periodic questioners.**

Name of Course Instructor: _____

Signature: _____ Date Completed: _____

Program Coordinator: _____

Signature: _____ Date Received: _____