COURSE SPECIFICATIONS

Form

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

Course Code: **23066101-2**

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).**			
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)

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: _____