

## :(Course Information)

معلومات المقرر \*

	أجهزة ومعدات	اسم المقرر:
	فيز 3952	رقم المقرر:
	فيز 3932	اسم ورقم المتطلب السابق:
	--	اسم ورقم المتطلب المرافق:
	السادس	مستوى المقرر:
	3 (0+0+3)	الساعات المعتمدة:
<b>Module Title:</b>	Instrumentation	
<b>Module ID:</b>	PHYS 3952	
<b>Prerequisite (Co-requisite):</b>	PHYS 3932	
<b>Co-requisite:</b>	--	
<b>Course Level:</b>	Sixth	
<b>Credit Hours:</b>	3 (3+0+0)	



## Module Description

وصف المقرر :

**Part-I: Characterization of Materials**

Characterization of bulk or nanomaterials in general governs by a beam of radiation or high-energy particles, these include UV, Visb. Or IR light, laser, X-rays, electrons, ions and neutrons.

This course will give an overview and the basic principles of the most popular materials analysis methods:

- Introduction to bulk, micro-structured and thin film materials and its synthesis,
- Microstructure investigation in SEM, TEM and optical microscopes
- Structure determination by X-ray diffraction and electron diffraction
- Elemental analysis by X-ray analysis in electron microscopes (EDS)
- Thermal analysis: differential scanning calorimetry (DSC)
- UV-Visib Spectroscopy, FTIR spectroscopy

**Part-II: Radiation and detectors**

Characterization of bulk or nanomaterials in general governs by a beam of radiation or high-energy particles, these include UV, Visb. Or IR light, laser, X-rays, electrons, ions and neutrons.

This course will give an overview and the basic principles of the most popular materials analysis methods available in department of Physics, Majmaah university including:

- Introduction to bulk, micro-structured and thin film materials and its syntheses,
- Microstructure investigation in SEM, TEM and optical microscopes
- Structure determination by X-ray diffraction and electron diffraction
- Elemental analysis by X-ray analysis in electron microscopes (EDS)
- Thermal analysis: differential scanning calorimetry (DSC)

**Module Aims**

أهداف المقرر :

1	The student should know an overview and the basic principles of the most popular materials analysis methods available in department of Physics, Majmaah university.	1
2	Understand the theory behind the experimental techniques	2
3	Students can analyze the data and interpret results	3
4	Improve cognitive skills in students.	4

**Learning Outcomes:**

مخرجات التعليم:

1	<b>Knowledge:</b> <ul style="list-style-type: none"> <li>The student should learn basic of advanced Instrumentation</li> <li>Student should be able to understand the theoretical background and particular concepts.</li> <li>Learn the data acquisition and data recoding.</li> <li>Student will acquire general knowledge about the use of suitable technique and probing source.</li> <li>Student will be able to analysis data</li> <li>Student will be able to conclude the results.</li> </ul>	1
2	<b>Cognitive Skills:</b> <ul style="list-style-type: none"> <li>Solve different exercises in the course book.</li> <li>Student will acquire general knowledge about modern instrumentation.</li> <li>Student will be able to analysis data using the computer and software.</li> <li>Student will be able to understand the problem correctly.</li> </ul>	2
3	<b>Interpersonal skills and responsibility:</b> <ul style="list-style-type: none"> <li>The ability to form groups and distribute the duties.</li> <li>The skills of presentation in front of the others.</li> <li>The skill of constructive criticism, and discussion.</li> <li>The ability to express opinions clearly and accept others opinion</li> </ul>	3
4	<b>Communication, information Technology and Numerical Skills:</b> <ul style="list-style-type: none"> <li>To be able to use the email, whatsApp to connect with the teacher and the colleagues.</li> <li>Search the web to get any update information concerning the assigned experiment</li> </ul>	4
5	<b>Psychomotor</b> Not applicable.	5

**Course Contents:**

محتوى المقرر:

ساعات التدريس (Hours)	عدد الأسابيع (Weeks)	قائمة الموضوعات (Subjects)
3	1	Introduction to bulk, micro-structured and thin film materials and its syntheses,
6	2	Microstructure investigation in SEM, TEM and optical microscopes
3	1	Structure determination by X-ray diffraction and electron diffraction
3	1	Elemental analysis by X-ray analysis in electron microscopes (EDS)
3	1	Thermal analysis: differential scanning calorimetry (DSC)

3	1	UV-Vis Spectroscopy, FTIR spectroscopy
3	1	Introduction to bulk, micro-structured and thin film materials and its syntheses

**Textbook and References:**

الكتاب المقرر والمراجع المساندة:

سنة النشر Publishing Year	اسم الناشر Publisher	اسم المؤلف (رئيسي) Author's Name	اسم الكتاب المقرر Textbook title
سنة النشر Publishing Year	اسم الناشر Publisher	اسم المؤلف (رئيسي) Author's Name	اسم المرجع Reference
2006	New York; Chichester: Wiley Interscience.	Schroder, D.K.,	Semiconductor material and device characterization. 3 <sup>rd</sup> ed.
2012	Weinheim: Wiley-VCH.	Fischer, W.E.,	X-rays, neutrons and muons: photons and particles for material characterization.
1999	Council of Scientific & Industrial Research.	Sridhar, G.E., S.G.E. Chowdhury, and N.G.E. Goswami,	Material characterization techniques: principles and applications.
1993	New York: W.H. Freeman	Flegler, S.L., J.W. Heckman, and K.L. Klomparens,	Scanning and transmission electron microscopy: an introduction.
2002	Elsevier.	Riga, A.E. and J.M.E. Cahoon,	Material characterization by thermal analysis and calorimetry.
2004	Teddington: National Physical Laboratory.	Gower, M.R.L. and G.D. Sims,	Characterization of defects in composite material systems.
2016	University of Birmingham.	Jian, N.a.,	Scanning transmission electron microscopy of atomic structure of nanoparticle.
2002	Weinheim; Cambridge: Wiley-VCH.	Sanderson, R.D.E. and H.E. Pasch,	Polymer characterization and material science.
1995	Electronic resource	Nellist, P.D.	Image resolution improvement in scanning transmission electron microscopy.

