توصيف مقرر دراسي

جامعة : المنصورة

كليـة : العلـــوم

قســم : الرياضيات

١- بيانات المقرر		
كود المادة : Math 414	**اسم المقرر :** **Functional Analysis**	**المستوى: الرابع**
التخصص : رياضيات	**عدد الوحدات الدراسية: ٣ ساعة معتمدة نظرى ٢: تمارين: ٢ عملى: ٠**	

٢- هدف المقرر :	**For students undertaking this course, the aims are to:** - Familiarize the student with the basic concepts, principles and methods of Functional Analysis and its applications. Functional Analysis plays an important role in applied sciences as well as in mathematics itself. Generally speaking, Functional Analysis - Develops further the tools from Calculus and Linear Algebra to the more general setting where one has either vector spaces comprising functions or general abstract infinite-dimensional vector spaces. Problems from various application areas can then be conveniently posed in this common general set up, and solved using techniques of Functional Analysis.
٣- المستهدف من تدريس المقرر	
أ- المعلومات و المفاهيم :	**On completing this course, students will be able to:** a1 – Understand the main concepts in the theories of normed spaces and inner product spaces. a2 - Know the basic facts and definitions on Hilbert and Banach spaces and their duals. a3 - State and sketch the ideas of proofs of the following theorems and principles: Holder – Minkowski – Hahn - Schwarz – Riesz representation Th.
ب- المهارات الذهنية :	**On completing this course, students will be able to:** b1- construct rigorous proofs of different propositions and assertions in this context. b2- apply basic theorems for Hilbert and Banach spaces.
ج- المهارات المهنية الخاصة بالمقرر :	**On completing this course, students will be able to:** c1 - Extend Gram-Schmidt process to a wider class of functions. c2 - Investigate particular examples to which the theories under concern can be

applied. c3 - Use lecture notes and other texts to solve challenging problems.	
On completing this course, students will be able to: d1- Solve problems. d2- Work both in a team and individually. d3- Use Internet and Library.	**د- المهارات العامة :**
• Metric spaces : definition, examples and well- known inequalities. • topology in metric spaces. • Normed spaces : definition and examples -convergence - Banach spaces and examples. • subspaces - separable spaces – linear hulls. • Bounded linear transformations and functionals. • Finite-dimensional normed spaces . • The algebra of bounded linear operators (an introductory account of the spectral aspect). • Inner products : examples - Schwarz's inequality - parallelogram law – Hilbert spaces and examples. • Orthogonality in Hilbert spaces - Riesz's representation Theorem - Gram-Schmidt process . • The adjoint operator - properties - self-adjoint bounded linear operators • Positive operators - properties – the spectrum, eigenvalues and eigen vectors. • Orthogonal projections.	**٤- محتوى المقرر :**
1- lectures. 2- Tutorials. 3- Quiz sheets.	**٥- أســـاليـــب التعليـــم و التعلـم :**
The same as for normal students, only skeletal disabilities are allowed in the Faculty of Science.	**٦- أساليب التعليم و التعلم للطـــلاب ذوى القـــدرات المحـــدودة :**
	٧- تقويـــــم الطـــلاب :
1- Oral Exam. to assess a1-a3,b1-b2,d1-d3 2- Final Exam to assess a1-a3,b1-b2,c1-c3 3- Mid-Term Exam to assess a1-a2,b1-b2,c1-c2	**أ- الأساليب المستخدمة**
1- Oral Exam week 16 2- Final Exam week 16 3- Mid-Term Exam week 7	**ب- التوقيت**

ج- توزيع الدرجات	- Mid-Term Examination 10 - Final-Term Examination 80 - Oral Examination 10 - Practical Examination 0 Total 100%
٨- قائمة الكتب الدراسية و المراجع :	
أ- المذكرات	- Lecture Notes.
ب- الكتب ملزمة	
ج- كتب مقترحة	1] W. Rudin, Functional Analysis, McGraw--Hill (1973). [2] F. Riesz and B. Sz.-Nagy, Functional Analysis, Dover (1990). [3] R.F. Curtain and A.J. Pritchard, Functional Analysis in Modern Applied Mathematics, Academic Press (1977). [4] A.L.Brown &A.Page"Elements of Functional Analysis", London, 1970.
د- دوريـــات علميـــة أو نشرات	http://www.mth.uea.ac.uk/~h720/teaching/functionalanalysis/materials/FAnotes.pdf http://www.math.nyu.edu/phd_students/vilensky/Functional_Analysis.pdf

(أ) مصفوفة المعارف والمهارات المستهدفة من المقرر الدراسى

المحتويات للمقرر	اسبوع الدراسة	المعارف الرئيسية	مهارات ذهنية	مهارات مهنية	مهارات عامة
Metric spaces : definition, examples and well-known inequalities.	1	a1	b1		d1
topology in metric spaces.	2	a1	b1	c1	d1
Normed spaces : definition and examples - convergence - Banach spaces and examples.	3	a1,a2	b1	c1	d1,d2
subspaces - separable spaces - linear hulls.	4	a1,a2	b2	c1	d1,d2
Bounded linear transformations and functionals .	5-6	a1,a2	b2	c1,c2	d1
Finite-dimensional normed spaces .	7	a1,a2	b2	c1,c2	d1,d2
The algebra of bounded linear operators (an introductory account of the spectral aspect).	8-9	a1,a2	b2	c1,c2	d1,d2
Inner products : examples - Schwarz's inequality - parallelogram law - Hilbert spaces and examples.	10	a1, a2	b2	c1,c2	d1,d2
Orthogonality in Hilbert spaces - Riesz's representation Theorem - Gram-Schmidt process .	11	a1,a2,a3	b2	c1,c2	d2,d3
The adjoint operator - properties - self-adjoint bounded linear operators.	12	a1,a2,a3	b1, b2	c2,c3	d2,d3
Positive operators - properties - the spectrum, eigenvalues and eigen vectors.	13	a1,a2,a3	b1, b2	c2,c3	d2,d3
Orthogonal projections .	14	a1,a2,a3	b1, b2	c1,c2,c3	d1,d2,d3

أستاذ المادة : د. محمد سمير قاسم

رئيس مجلس القسم العلمي :ا.د. مجدى إلياس فارس