جامعة : المنصورة

كليـة : العلـــــوم

قســـم : الرياضيات

١- بيانات المقرر		
كود المادة : Math 411	**اسم المقرر :** **Theory of Differential Equations**	**المستوى: الرابع**
التخصص : رياضيات	**عدد الوحدات الدراسية: ٢ ساعة معتمدة نظرى ٢: تمارين: ١ عملى: ٠**	

For students undertaking this course, the aims are to: 1. Students should understand the concept of a solution to an initial value problem, and the guarantee of its existence and uniqueness under specific conditions. 2. The student will recognize basic types of differential equations which are solvable, and will understand the features of linear equations in particular. 3. Students will learn to use geometrical approaches to investigate equations which are not easily solvable. In particular, the student will be familiar with phase plane analysis. 4. Students will become proficient with the notions of linearization, equilibrium, stability. They will learn to use the eigenvalue method for autonomous systems on the plane. 5. The students will develop skills in the use of computer tools for the study of differential equations.	**٢- هدف المقرر :**
٣- المستهدف من تدريس المقرر	
a-Knowledge and Understanding **On completing this course, students will be able to:** a1 - demonstrate an understanding of differential equations and their solutions. a2 - be aware of the implications of existence and uniqueness theorems. a3 - interpret differential equations and their solutions in terms of models for various physical systems. a4- apply qualitative and quantitative methods to obtain solutions of differential equations to an appropriate level of accuracy. a5- Understand the applications of differential equations. a6- compute appropriate bases for the solution of linear algebra problems including	**أ- المعلومات و المفاهيم :**

orthogonal projections, linear transformations and eigenvalues and eigenvectors.	
b- Intellectual Skills: **On completing this course, students will be able to:** b1-distinguish between linear and non-linear differential equations and describe the properties of the solutions of linear differential equations. b2- develop skills in the use of computer tools for solving differential equations and integration. b3- represent curves and surfaces in space by parametric equations, or as a vector function of one or two variables. b4- communicate explanations and mathematical expositions in a clear and logical fashion.	**ب- المهارات الذهنية :**
c-Professional and Practical Skills: **On completing this course, students will be able to:** c1 - Solve linear ODEs using standard methods. c2- describe the properties of the solutions of linear algebraic equations.	**ج- المهارات المهنية الخاصة بالمقرر :**
d-General and Transferable Skills: **On completing this course, students will be able to:** d1- work in team. d2- Solve problems. d3- Use Internet and library.	**د- المهارات العامة :**
• The existence and uniqueness theory. • Some concepts for real functions theory. • Dependence of solutions on I.C & function. • E&U Theorem for systems and higher order equations. • Basic theory of homogeneous and non homogenous linear systems. • Sturm theory. • System of linear differential equation basic theory and methods of solutions and Stability and Nonlinear systems in the Plane. • Linearization theorem. Lyapunov functions, Lyapunov method.	**٤- محتوى المقرر :**
1- Lectures (4H/W) 2- Tutorial (1H/w)	**٥- أساليب التعليم و التعلم:**
The same as normal students, only skeletal disabilities are allowed in the Faculty of	**٦- أساليب التعليم و التعلم للطلاب ذوى القدرات**

المحـــــدودة :	Science.
٧- تقويـــــم الطـــــلاب :	
أ- الأساليب المستخدمة	1- Oral Exam. to assess a1-a6, b1-b4,d1-d3 2- Final Exam to assess a1-a6,b1- b4,c1, c2 3- Mid-Term Exam to assess a1,a2,a3,a5, b1,b2, c1
ب- التوقيت	1- Oral Eexam week 16 2- Final Exam week 16 3- Mid-Term Exam week 7
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	Available in the Dept.
ب- الكتب ملزمة	C. H Edwards, Elementary differential equations with boundary value problems, Pearson Prentice Hall, 2004.
ج- كتب مقترحة	1- W.E. Boyce & R.C. Di Prima, "Elementary Differential Equations and Boundary Value Problems", Wiley. 2- M. Braun, "Differential Equations and their Applications", Springer-Verlag. 3- R.K. Nagle & E.B. Saff, & A.D. Snider, "Fundamentals of Differential Equations and Boundary Value Problems", Addison-Wesley. 4- Ross , Theory of differential equations.
د- دوريـــات علميـــة أو نشرات ... الخ	http://www.sosmath.com/diffeq/diffeq.html

(أ) مصفوفة المعارف والمهارات المستهدفة من المقرر الدراسى

المحتويات للمقرر	اسبوع الدراسة	المعارف الرئيسية	مهارات ذهنية	مهارات مهنية	مهارات عامة
The existence and uniqueness theory	1-2	a1,a2	b1		
Some concepts for real functions theory	3-4	a3	b1		
Dependence of solutions on I.C & function f	5	a3	b1	c1	d1, d2
E&U Theorem for systems and higher order equations	6-7	a3,a5	b2	c1	
Basic theory of homogeneous and non-homogenous linear systems	8-9	a3,a4	b3		
Sturm theory	10	a3	b1		
System of linear differential equation basic theory and methods of solutions and Stability and Nonlinear systems in the Plane Linearization theorem. Lyapunov functions, Lyapunov method.	11-13	a3,a4	b4	c2	d1,d2,d3

أستاذ المادة : أ د. على شمندى

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