

**Department of Mathematics**

**Faculty of Science**

**MATH 745 (206745)    NONLINEAR DIFFERENTIAL EQUATIONS**

**3(3-0-6)**

**Prerequisite**                      Consent of the instructor

**Course Descriptions :**

Numerical, graphical and analytical solutions of first order nonlinear differential equation. Singular points. Limit cycles. Second order nonlinear differential equations: Van der Pol's equation. Analytic methods of approximation to periodic solutions. Methods of perturbation. The small parameter method of Poincare, Hill's equation, Mathien's equations. The reversion method for solving nonlinear differential equations (integral transform method). Nonlinear equations of first order partial differential equations.

**Course Contents**

**No. of Lecture Hours**

1. First order nonlinear differential equations	6
- Numerical solutions	
- Graphical solutions	
- Analytical solutions	
2. Singular points	9
- Integral curves in the neighbourhood of a singular point	
- The distribution of singular points for first order differential Equations	
3. Limit cycles	9
- The theory of contacts	
- The totalify of integral curves in the xy-plane	
- Cycles without contact and limit cycles	
- The resolution of limit cycles	
4. Second order nonlinear differential equations	12
- Van der Pol's equation	
- Analytic methods of approximation to periodic solution	
- Methods of perturbation	
- The small parameter method of Poincare	
- Hill's equation	
- Mathien's equation	

5. The reversion method for solving nonlinear differential equation	6
- General description of the method	
- Examples description of the method	
6. Nonlinear equation of first order partial differential equation	3