

King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
SYLLABUS
Semester II-2008-2009 (082)
(Dr. F.D. Zaman)

Course # **Math 605**
Title **Asymptotic Expansions and Perturbation Methods**
Bulletin Asymptotic sequences and series. Asymptotic expansions of integrals.
Description Solutions of differential equations at regular and irregular singular points.
 Nonlinear differential equations. Perturbation methods. Regular and singular
 perturbations. Matched asymptotic expansions and boundary layer theory.
 Multiple scales. WKB theory.

Textbook Advanced Mathematical Methods by Bender and Orszag , Springer, 1999.

Wk	Date	Sec.	Material
1	Feb.28 – March 5*	3.4-3.8	Idea of asymptotic expansion around an irregular singular point. Meaning of little o and big O. Asymptotic relations and functions. Examples. Asymptotic series.
2	March 7-11	3.7-3.8	Asymptotic solutions of linear differential equations
3	March 14-18	4.1 4.2 4.3	Singularities Nonlinear differential equations NLDE Contd.
4	March 21-25	6.1-6.3 6.4	Asymptotic approximation of integrals. Laplace method and Watson's Lemma
5	March 28 – April 1	6.5	Method of Stationary phase
6	April 4-8	6.6	Method of Steepest Descent Applications
7	April 11-15	7.1	Perturbation theory
8	April 18-22	7.2	Regular and singular perturbation
April 25-29 Mid Term Break			
9	May 2-6	7.3	Perturbation of eigenvalue problems
10	May 9-13	7.4	Asymptotic matching
11	May 16-20	9.1-9.2	Boundary layers
12	May 23-27	9.3-9.4	Boundary layer approximations
13	May 30 -June 3	10.1-10.2	WKB methods
14	June 6-10	10.3-10.4	Matching and turning points
15	June 13-16	10.5	Turning point problems

*Thursday, March 5 **Normal Wednesday classes**

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