King Fahd University of Petroleum and Minerals
Department of Mathematics & Statistics
Syllabus Math 605
Semester I, 2016-2017 (161)
(Prof. Bilal Chanane)

Course Title: **Asymptotic Expansions and Perturbation Methods**
Textbook: C. Bender and S. Orszag, Advanced Mathematical Methods for Scientists and Engineers: Asymptotic Methods and Perturbation Theory, Springer 1999

Course Description: Asymptotic sequences and series. Asymptotic expansions of integrals. Solution 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.

Prerequisites: Math 430 ; Math 301 or Math 513

Week	Period	Sections	Topics
1	Sep. 18-21	3.4	Introduction to Asymptotic, definition of O and o
2	Sep. 25-Sep.29	3.5	Asymptotic sequences, Asymptotic power series
3	Oct. 2-6	6.1-6.3	Asymptotic expansion of Integrals
4	Oct. 9-13	6.4	Laplace's method and Watson's lemma
5	Oct. 16-20	6.5-6.6	Method of stationary phase, method of steepest descents
6	Oct. 23-27	6.7	Asymptotic evaluation of sums
7	Oct. 30-Nov 3	3.1-3.3	Solution of differential equations (DE) at regular and irregular singular points
8	Nov. 6-10	3.4-3.5	Asymptotic expansions for DE
9	Nov 20- 24	7.1	Perturbation series
10	Nov. 27-Dec. 1	7.2	Regular and singular perturbation theory
11	Dec. 4-8	7.4	Asymptotic matching
12	Dec. 11- 15	8.1-8.2	Summation of series
13	Dec. 18-22	9	Boundary layer theory
14	Dec 25- 29	10	WKB method
15	Jan 1-5	11	Multiple Scale Analysis

Exams and Distribution of Marks:

- Midterm Exam I (25%)
- Final Exam (35%) (Comprehensive):
- Projects (20%)
- Homework (20%)

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