MATH4822A (MATH391N) CLASSICAL ANALYSIS
(2011-2012, Fall semester)

September 15, 2011

Course Home Page:

http://www.math.ust.hk/~machiang/391N/391N_09_10.htm

(more updated lecture notes will be distributed during lectures)

Instructor: Prof. Edmund Y. M. Chiang (E-mail:machiang@ust.hk, Tel: 2358-7441)

Meeting Time: L1 Mon. 16:00-17:50, lecture room 3494 (lifts 25/26)

Course Description: 2-credit. The course gives an introduction in various topics on classical analysis. Topics include: infinite products, Gamma function; Fuchsian Equations; Hypergeometric functions; Confluent Hypergeometric function; Barnes's integrals, Bessel Functions, , Schwarz's problem; tentative topics include: Elliptic functions, various orthogonal polynomials, Láme equation; , etc.

Assessment Scheme: Distribution of Marks: Regular homework (%20) + Project presentation (%20) + final examination (%60).

Student Learning resources: Lecture notes and

1. N. N. Lebedev ‘‘Special Functions and Their Applications", Translated by R. A. Silverman, Dover Pulb. N. Y. 1972.
2. E. D. Rainville, "Special Functions", Chelsea Pulb. Comp., N. Y., 1960.
3. G. Andrews, R. Askey and R. Roy, "Special Functions", Camb. Univ. Press, 1999.

4. Lars Ahlfors "Complex Analysis", McGraw-Hill; 3 edition, 1979 (It contains a Chap. on hypergeometric functions) .

5. see the bibliography of the Notes.

Teaching Approach: Lecture notes will be provided as well as project presentations to facilitate the learning. Occasional guest speakers will be invited to give applications of certain classical analysis topics.

Intended Learning Outcomes: Upon successful completion of this course, students should be able to understand:

- convergence of infinite products of complex numbers and functions that converge uniformly in compact subsets of the complex plane.
- Gamma and Bate functions and their applications.
- Fuchsian-type equations and regular singular points and their implications.
- Gauss hypergeometric equations and functions, and their special cases such as the Bessel functions, Laguerre and Hermite polynomials.
- Barnes's integrals and their applications.

Course Schedule:

Week	Content	References
1	Overview, Infinite products	Chap. 1, 2
2	Infinite products, Euler's constant	Chap. 2, 3
3	Gamma function, Bata funciton, Integral representation and analyticity	Chap. 3
4	Stirling formula of Gamma function, Gauss's multiplication formula	Chap. 3
5	Linear differential equations, regular singular points	Chap. 4
6	Double indicial exponents, Fuchsian differential equations	Chap. 5
7	Riemann's $P-$scheme, Hypergeometric equation	Chap. 5
8	Hypergeometric series, Euler Integral representation	Chap. 5
9	Kummer's 24 solutions, Analytic continuation	Chap. 5
10	Barnes's integrals and applications	Chap. 6
11	Frobenius's method, degenerated Hypergeometric functions	Chap. 7
12	Confluent hypergeometric equation, Bessel functions	Chap. 8
13	Bessel equation, Fourier-Bessel series	Chap. 9
14	Kummer's function, Generating functions, orthogonal polynomials.	Chap. 9