National Central University
Department of Atmospheric Sciences
Syllabus of Advanced Applied Mathematics

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Credit Hours：3

Lecture time：Wednesday 09:00～10:50 ； 13:00-13:50

Prerequisite: calculus, numerical analysis, Fortran

1. Extreme values under a multi-dimensional condition.
2. Getting extreme values with constraints.
3. Variation and derivative.
4. Constraints and Lagrange multiplier.
5. Application of variational method in mechanics and data interpolation.
6. Approximated solutions in variational analysis.
7. 3DVAR
8. Tangent linear model, adjoint equation, and 4DVAR.
9. Kalman filter and Ensemble Kalman filter.
10. Application of variational analysis in meteorology.

Reference：

- Method of Applied Mathematics (by Hilderbrand)
- 大氣科學中的反問題：曾忠一
- Dynamic data assimilation: A least squares approach (by J. Lewis, S. Lakshmivarahan, and S. K. Dhall)
- Atmospheric Modeling, data assimilation and predictability (by Eugenia Kalnay)
- Journal papers.

Homework: 70 %
Final oral report: 30%