Class title	Applied Mathematics for Meteorologists (기상응용수학)	**Credit**	3

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Level	Graduate students in atmospheric science
Objectives	Understanding and application of mathematical and numerical methods in processing atmospheric observational and modeling data or in formulating numerical model
Pre-requisites	Undergraduate-level knowledge of advanced engineering mathematics or mathematical physics can help (e.g., Linear algebra, Eigen value problem, Sturm-Liouville equation, Fourier transform, differential geometry).
References	R1: Numerical Recipes in Fortran 77 (1992), Cambridge University Press by William Press, Saul Teukolsky, Willam Vetterling, and Brian Flannery (Free online version at http://s3.amazonaws.com/nrbook.com/book_F210.html) R2: Tricubic interpolation in three dimensions (2005), International journal for numerical methods in engineering by F. Leikien and J. Marsden. R3: Statistics in a nutshell: A desktop quick reference, 2nd edition (2013), O'Relly by Sarah Boslaugh R4: Hands-on machine learning with Scikit-Learn, Keras & TensorFlow 2nd Edition, O'Reilly by Aurélien Géron R5: On the power spectrum of "Red Noise" (1963), Journal of the Atmospheric Sciences by D. L. Gilman, F. J. Fuglister, and J. M. Mitchell. R6: A practical guide to wavelet analysis (1998), Bulletin of the American Meteorological Society by C. Torrence and G. P. Compo. R7: A discontinuous Galerkin transport scheme on the cubed sphere (2005), Monthly Weather Review by R. D. Nair, S. J. Thomas, and R. D. Loft

Week	Contents
1	Introduction, interpolation (linear, Lagrange, cubic, tricubic)
2	Least-square fit, B-spline fit, nonlinear regression
3	Linear algebra, matrix, Eigen value problem
4	Optimization, minimization, Lagrange multiplier
5	Empirical orthogonal function (EOF), singular value decomposition (SVD)
6	EOF and SVD (continued)
7	Statistical inference
8	Mid-term exam
9	Machine learning primer
10	Machine learning primer (continued)
11	Fast Fourier transform, and periodogram,
12	Red noise spectrum, rotary spectrum, Hibert transform
13	Lomb-Scargle spectrum, wavelet analysis
14	Numerical integration, quadrature
15	Nonorthogonal coordinate, global unstructured grids
16	Presentations of term project