COS 702 Data Analysis Techniques

Bulletin Description Introduction to numerical data using analytical tools, e.g., signal processing and post-processing data, and numerical and functional approximation for data analysis.

Text *None.* In class lectures, online texts and handouts.

References The following is a partial list of supplemental reading:

1. *Numerical Analysis*, Endre Süli and David Mayers, Cambridge;
2. *Introduction to Numerical Analysis* , Stoer Bulirsh, Springer.
3. *Numerical Analysis*, Burden and Faires.
4. *Matrix Analysis and Applied Linear Algebra*, Carl D. Meyer, SIAM.

Owing to the diverse nature of the material a substantial amount of online supplemental readings will be made available.

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Goals To provide a foundation in the fundamental methods of data analysis. The objective is to develop an understanding of the methods and techniques used with equal emphasis on analysis, theory, and computational algorithmic methods for achieving workable solutions to a range of data analysis problems. Areas of study include:

1. Different approaches to analyzing data: graphical, functional, statistical methods and complex combined methods.
2. Understand the computational difficulties that arise in attempting to analyze data;
3. Understand the analytical framework in which the solution methodology is set, and its limitations; and, develop an ability to work with computational problems.

Theory and analysis complement algorithm understanding, and the course requires that the student develop proficiency in working with large data sets, so as to be able to creatively develop solution methodologies for complex, integrated problems.

Topics The intent is to cover topics involving several areas of emphasis:

1. Error Analysis and convergence, graphical methods;
2. Approximation and interpolation of data;
3. Best fit to data in various norms;
4. Spectral decompositions and Fourier methods;
5. Statistical analysis; and,
6. Multidimensional data analysis and information abstraction, and principal component analysis.

Special topics of computational interest are also covered to the extent possible, with a focus on solution methods applicable to large data handling problems.

Detailed weekly assignments are posted online at `http://www.math.usm.edu/kolibal`.

Assessment The course assessment is based on total accumulated points which are earned through course assignments and examination. The exam will consist of a final comprehensive examination stressing knowledge (closed book), and course assignments will be computational and analytically motivated, stressing problem solving. Working with computers is required to develop solutions to many of the course assignment problems, as well as developing an ability to articulate and present data analysis results through technical writing skills. Please review the comprehensive document on grading at `http://www.math.usm/kolibal/courses_html/policies.html`.

If a student has a disability that qualifies under the American with Disabilities Act (ADA) and requires accommodations, he/she should contact the Office for Disability Accommodations (ODA) for information on appropriate policies and procedures. Disabilities covered by ADA may include learning, psychiatric, physical disabilities, or chronic health disorders. Students can contact ODA if they are not certain whether a medical condition/disability qualifies. Address: The University of Southern Mississippi, Office for Disability Accommodations, 118 College Drive #8586, Hattiesburg, MS 39406-0001, Voice Telephone: (601) 266-5024 or (228) 214-3232, Fax: (601) 266-6035. Individuals with hearing impairments can contact ODA using the Mississippi Relay Service at 1-800-582-2233 (TTY) or email Suzy Hebert at Suzanne.Hebert@usm.edu.