Intro: Time series are all around us: Whether you are tracking global warming, looking for the best moment to sell your assets, or simply wonder why the gas prices jumped up (again!). Time series is the most common form of data in physics, finance, economics, geosciences, biology, and social sciences. Accordingly, time series analysis is an inevitable component in a toolbox of a professional statistician. In this class we will discuss essential theoretical and practical methods of time series analysis, including descriptive techniques, stationary and non-stationary model building and verification, analysis in time and frequency domains, and forecasting. The professional statistical package \( \mathbb{R} \) will be used to apply the concepts discussed in the class to real data sets.

Required textbook:

Optional reading:

Tentative list of topics (may change slightly as class proceeds):
- Descriptive techniques
- Stochastic processes, stationarity, simple time-series models
- Time domain methods (MA, AR, ARMA, ARIMA, SARIMA, Box-Jenkins approach)
- Forecasting
- Frequency domain methods, spectral analysis
- General linear models
- State-space models and Kalman filter
- Point processes and prediction of extreme events
- Non-linear models, chaos

Statistical Lab is an integral part of the course. You will be given regular take-home assignments that require application of selected statistical techniques using the package \( \mathbb{R} \). The results should be presented in a form of illustrated reports (we will discuss the report writing in the class). The previous knowledge of \( \mathbb{R} \) is not required (but definitely will make the class easier). \( \mathbb{R} \) is a free software and it is very similar to S-plus. The \( \mathbb{R} \)-portal with downloads, manuals, FAQs, and much more is located at: [http://www.r-project.org/](http://www.r-project.org/). You are encouraged to discuss the Lab assignments and can do them in groups, but your reports have to be written individually and demonstrate that you are able to perform the presented analysis independently. You may use any
other statistical package if you like, but all instructions and discussions in the class will refer only to R, and I will not be able to help you with other packages.

**Midterms:** There will be two midterms. The dates will be announced later.

**Final project:** The project will consist of comprehensive theoretical and practical statistical analysis of time series of your choice; it will result in a project report and a short presentation that will be delivered at the end of the semester to the class. The project should demonstrate that you are (i) well familiar with essential concepts, methods, and techniques studied in the class; (ii) able to use package R for analysis and report preparation; (iii) ready to present your findings to the professional audience.

You will need to discuss with me the final project proposal by October 20 and get my approval of your proposed project. The proposal should include the suggested data set, questions to be asked, theoretical and computational methods to be applied.

A detailed discussion of how to complete the final project will follow in the class.

**Home works** will be given weekly, but they are not graded and intended solely for midterm preparation. You are encouraged to discuss HW assignments between each other and with instructor during office hours.

**Quizzes:** There might be occasional pop quizzes intended to help us in choosing the right course pace. You will not lower your grade by failing at quizzes, but you can improve your grade by doing them right. Quizzes contribute to approximately 2% of your overall performance, and may be crucial when evaluating borderline performance.

**Grading policy:** Your letter grade (which may include + or −) for the course will be based on Statistical Lab reports (30% altogether), two midterms (15% each), and a final project (40%).

**Final meeting (presentations):** Monday, December 18, 2006, 4:30-6:30PM

**Prerequisites:** MATH 311; MATH 330; MATH/STAT 352.

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**Important dates:**

- September 7, 2006  Final date for dropping class with 100% refund
- October 20, 2006  Final date for dropping classes and changing from credit to audit

See more at [http://www.ss.unr.edu/records/pdf/sched/20064cal.pdf](http://www.ss.unr.edu/records/pdf/sched/20064cal.pdf)

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The Department of Mathematics and Statistics supports providing equal access for students with disabilities. Any student needing accommodations for a specific disability is encouraged to meet with instructor or any Department representative at your earliest convenience to ensure timely and appropriate accommodations.