STAT 521A(101) - Copula Foundations and Application
2011-2012 - Term 2

Instructor: Harry Joe

Outline: This is a statistics course in the theory and applications of dependence modeling with copulas. The course will show why copulas have become increasingly popular in the past 15 years.
The course covers copulas and inference for multivariate non-normal response data, such as binary, count, extreme value, heavy-tailed. Applications of copula models can be found in finance, insurance,
environmetrics, biostatistics etc. Both theory and practice will be emphasized.

Pre-requisites: Familiarity with a software such as R is essential.
Familiarity with probability, statistical inference (especially likelihood inference) and classical multivariate statistics is desirable.

***Tentative* topics**

1. Multivariate distributions: from univariate to multivariate (including history); some extreme value theory.

2. Multivariate normal and classical multivariate statistics.

3. Copula models. When classical multivariate methods are inappropriate, data examples and diagnostics.

4. Construction methods for multivariate copulas. Desirable properties for parametric families of copulas; the difficulty of extending from bivariate to multivariate.

5. Properties of parametric families of copulas.
Tail dependence and asymmetry, measures of dependence, measure of deviation from multivariate normal, Kullback-Leibler divergence.

6. Likelihood inference and computing for copula models.

7. Simulation from parametric families of copulas.

8. Applications and data examples: model comparisons, assessing model adequacy.

9. Newer research on copulas and tail dependence concepts; copula models for high-dimensional data.