附件1：

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| 课程名称（中英文） | 生态系统风险、管理和工程  Ecoasystem Risk, Management and Engineering |
| 课程先修条件  （中英文） | 掌握统计和概率知识。推荐阅读《Ecohydrology and Biodiversity》。  Prerequisite is statistics and probability. ‘Ecohydrology and Biodiversity’ is recommended. |
| 课程大纲及  考核方式 | (1) Course Syllabus  1.Introduction of Ecosystem Health, Engineering and Design  1. Ecological and Environmental Risks and their Feedback  1.1 Ecosystem critical issues, catastrophes and health  1.2 Systemic risk  1.3 Ecology-Environment Nexus and Ecosystem Engineering solutions  2. Probabilistic Ecosystem Risk Assessment: from traditional definition to non-linear dynamics  2.1 Classical hazard-exposure-vulnerability formulation  2.2 Non-linear hazard-response functions  2.3 Exceedance probability and extreme-value theory  2.4 Non-linear dynamical risks  3. Complex Network Inference and Analysis  3.1 Structural and functional ecosystem networks  3.2 Network statics and dynamics  3.3 Spreading processes in complex networked ecosystems (natural and urban)  4. Multicriteria Indicators: Pattern-based Selection and Predictions  4.1 Ecosystem shifts and Early Warning Signal indicators  4.2 Environmental indicators of ecological change  4.3 Selection of predictability indicators for long-term trend  4.4 Causality versus predictability  5. Modeling Principles & Model Design: Pattern- and Process-oriented Models  5.1 Lotka-Volterra model and other toy models  5.2 Information-diffusion model  5.3 Optimal Information Network model  6. Environmental Health Science and Computational Epidemiology  6.1 Environmental health concerns and metrics: incidence, mortality and morbidity  6.2 Susceptible-Infected-Recovered and affine models  6.3 Linking eco-environmental and epidemiological dynamics: infectious, chronic and complex diseases  7. Decision Analysis in Ecosystem Management  7.1 Multi-criteria decision analysis models  7.2 Utility curves, risk perceptions, and copula functions  7.3 Portfolio decision models and sequential decision making under uncertainty  8. Global Sensitivity and Uncertainty Analysis  8.1 Noise characterization and classical variance-based approaches  8.2 Information-theoretic sensitivity Global Sensitivity and Uncertainty Analysis (GSUA)  8.3 GSUA of models and data  9. Ecosystem Monitoring and Ecological Restoration  9.1 Sensors and ecosystem feature tracking  9.2 Model-based Monitoring network design and evaluation  9.3 Nature-based solutions and advanced technology-driven restoration  9.4 Multispecies Area Preservation, targeted Species conservation, and Habitat Creation  10. Quantitative Sustainability/Ecosystem Valuation, Ecosystem Planning and Policy  10.1 Indicators and MCDA for Quantitative Sustainability  10.2 Evaluation of Ecosystem Impacts and Valuation via Eco-environmental effects and Project Costs  10.3 Scenario-based Predictive Modeling in Ecosystem Planning and Policy  10.4 Example of global and local issues and their interaction  (2) Assessment method  Grading will be based on final examination (60%) and group project (40%). |