



Weather Risk Management Option

An Overview

Plus thoughts on scheduling courses for 2007-08

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Weather Risk

Weather and climate are fundamental drivers of economic activity and financial risk.

Weather affects a wide range of industries, including energy, agriculture, insurance, construction, retail, and transportation, among others.

Weather and climate variation play central roles in the availability of water resources, the spread of disease, and an array of other processes vital for human welfare.

There are, consequently, many organizations that confront risks related to weather, and that have a demand for experts who can help them manage these risks.



The Weather Risk Management Option

Designed for students who wish to work professionally at this intersection of meteorology and risk management.

Combines study of meteorology and atmospheric sciences with training in risk, finance, and decision-making.



Weather Risk Option: The Curriculum

- Meteorology: core, plus 1 free elective
- Probability & Statistics (Meteo core)
- Economics (1 course)
- Finance (3 courses)
- Computation & Data Management (1 course)
- Weather Risk Management (1 course)



Weather Risk Option: Required Courses

Required courses (7 x 3 = 21 credits total):

1. ENNEC 100 (GS) Introduction to Energy and Earth Science Economics
2. EM SC 301 Commodity & Environmental Markets
3. EM SC 401 Corporate Finance
4. ENNEC 473 Futures, Options & Other Derivatives
5. METEO 460 Weather Risk and Financial Markets
6. METEO 474 Artificial Intelligence, Forecasting & Verification
7. Free elective (long list, flexible)

Variations are possible...



The Curriculum: *Economics*

Preferred Course:

ENNEC 100 (GS) Introduction to Energy and
Earth Science Economics

Allowable Alternatives:

- ECON 2 (GS)
- Other courses in Principles of Economics or in Microeconomics
- Similar offerings on other campuses

Notes:

- Cannot substitute courses in management, entrepreneurship, etc. – must be *economics*
- Can use ENNEC 100 (GS) or ECON 2 (GS) to satisfy GS requirement. *This strategy encouraged.*
- Course offered in Fall and Spring.



The Curriculum: *Probability & Statistics*

Preferred Course: **ENNEC 472** (but, not offered 2007-08)

Alternatives (also in Meteo core):

- STAT 401 Experimental methods (rigorous, empirical); or
- STAT 301 Statistical Analysis I

Also *highly recommended*:

- STAT 318 Elementary Probability Theory; or
- **STAT 414 Intro to Probability Theory** (better)

Excellent rigorous foundation for integration of Meteo & Finance.

These don't substitute for ENNEC 472/STAT 301/STAT 401 in satisfying statistics requirements of Meteorology core.

But I would *definitely* count these for the free elective for WxRM.



The Curriculum: *Finance*

Three courses:

1. EM SC 301 Energy Commodity & Futures Markets
2. EM SC 401 Corporate Finance
3. ENNEC 473 Futures, Options and Other Derivatives



The Curriculum: *Finance*

EM SC 301 Energy Commodity & Futures Markets

Coverage:

1. Basic concepts of finance: time value of \$; risk
2. Markets for energy commodities and futures
3. Using futures to manage price risk in energy markets

Prerequisites or Co-requisites:

1. Economics: ENNEC 100 (or ECON 2)
2. Statistics: ENNEC 472 or STAT 301/401
3. Basic facility with Microsoft Excel

Notes:

- This course is offered in the Fall term only.



The Curriculum: *Finance*

EM SC 401 Corporate Finance

Coverage: Focus *inside* the company

1. Revisit basic concepts of finance: time value of \$; risk
2. How companies raise funds in capital markets to finance themselves
3. How companies make decisions about allocating capital to investment projects

Prerequisite: Economics: ENNEC 100 (or ECON 2)

Notes:

- EM SC 301 is *not* a pre-requisite for this course.
- This course is offered every term.



The Curriculum: *Finance*

ENNEC 473 Futures, Options and Other Derivatives

Coverage: More advanced treatment of risk management

1. Options, other more complex derivatives
2. Using futures, options, etc. in risk management
3. Tools, formulae for valuing options, other derivatives

Pre-requisites:

1. Statistics: ENNEC 472 or STAT 301/401
2. Finance: EM SC 301

Notes:

- This course is offered in Spring term only.



The Curriculum: *Computation, Forecast Verification, & Data Management*

METEO 474 Artificial Intelligence, Forecasting and Verification

Prerequisite: [STAT 301](#) or [STAT 401](#) or [ENNEC 472](#)

Essential take-away skills include:

1. Dealing w/ large data sets; MySQL
2. Forecast verification: concepts & techniques

Notes:

- This course is offered Fall term only.



The Curriculum: *Weather Risk*

METEO 460 Weather Risk & Financial Markets

Designed to serve as the capstone of the Wx RM Option

Coverage:

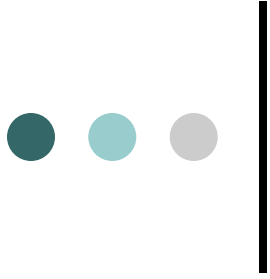
1. Probabilistic weather forecasting
2. Weather as a risk factor in financial markets
3. Applications in specific industries : Energy; agriculture; insurance
4. Weather derivatives
5. Integrative project: creating a risk management strategy for a “client” who confronts weather-related risks

Pre-requisites:

1. Statistics: ENNEC 472 or STAT 301/401
2. Finance: EM SC 301 Energy Commodities & Futures Markets

Notes:

- **IMPORTANT: THIS IS NOT AN INTRODUCTORY COURSE IN FINANCE. YOU WILL NOT SUCCEED IN THIS COURSE WITHOUT THE PRE-REQS!!**
- This course is offered in Spring term only.



Professional electives in Meteorology

<i>METEO 414</i>	<i>Mesoscale Meteorology (4)</i>
<i>METEO 415</i>	<i>Forecasting Practicum (3)</i>
<i>METEO 416</i>	<i>Advanced Forecasting (3)</i>
<i>METEO 417</i>	<i>Hydrometeorology (3)</i>
<i>METEO 448</i>	<i>Stormwater Hydrology (3)</i>
<i>METEO 452</i>	<i>Tropical Meteorology (3)</i>
<i>METEO 454</i>	<i>Micrometeorology; Planetary Boundary Layer (3)</i>
<i>METEO 455</i>	<i>Atmospheric Dispersion (3)</i>
<i>METEO 456</i>	<i>Environmental Meteorology (3)</i>
<i>METEO 470</i>	<i>Climate Dynamics (3)</i>
<i>METEO 476</i>	<i>Atmospheric Natural Disasters Seminar (3)</i>

Substitutions are possible subject with *prior* approval.



Additional Activities (subject to student initiative)

- Internship with an organization involved with weather risk – *strongly encouraged!*
 - Companies: energy, insurance, ag, air, ...
 - Government agencies
 - International orgs: UN, World Bank, ...
 - Local stakeholders – farm groups, ...



Additional Activities (subject to student initiative)

- Field trips, e.g. to visit NYMEX?
- A “Wx Risk” section of PSUBAMS?
- Invited speakers, esp. Meteo alumni working in Wx Risk Management roles?
- Others?

NOTE: It can't all rest on faculty initiative!



Wx Risk Management Option and Minor in Global Business Strategies

If you complete all the requirements for the WxRM option, you are *two* courses away from fulfilling the requirements to add a minor in Global Business Strategies to your Meteo major.

Need also:

1. EM SC 304 Management
2. One free elective within Energy Business & Finance major

[See Dr. Kleit for details.]



For students planning Spring 2008 graduation with B.S.

Current Status of the Wx RM Option:

- On its way to the Faculty Senate.
- Official final approval all-but certain Fall 2007.
- Students will be able to declare option officially in Spring 2008.

Almost surely, barring unlikely hitch, students graduating Spring 2008 can do WxRM option --

IF they have by now satisfied essentially all METEO core requirements; and

IF they are *very* organized about their schedule of courses during 2007-08; and

IF they are ready to work hard at unfamiliar material, and be cheerful in the face of occasional sequencing challenges.



WxRM Option in 2007-08: Example Fall 2007 Schedule

1.	ENNEC 100 (GS) Intro Energy and Earth Science Economics	M W F 11:15A - 12:05P
2.	EM SC 301 Energy Commodities and Futures	M W F 8:00P - 8:50A [Conflict w/ METEO 422 unavoidable]
3.	METEO 474 AI, Forecasting, ...	T R 11:15A - 12:30P
4.	EM SC 401 Corporate Finance OR: defer this to Spring, finish other required	W F 02:30P - 03:45P
5.	Finish other required, or take a free elective	



WxRM Option in 2007-08: Other possible courses, Fall 2007

- METEO 473 Computing W F 12:20P - 02:15P or
T R 01:25P - 03:20P

- STAT 301 M W F 12:20P - 01:10P
- Or STAT 401 (several sections)

- STAT 318 Elementary Probability M W F 01:25P - 02:15P
- Or STAT 414 Intro to Probability Theory M W F 02:30P - 03:20P or
M W F 11:15A - 12:05P or
M W F 02:30P - 03:20P



WxRM Option in 2007-08: Example Spring 2008 Schedule

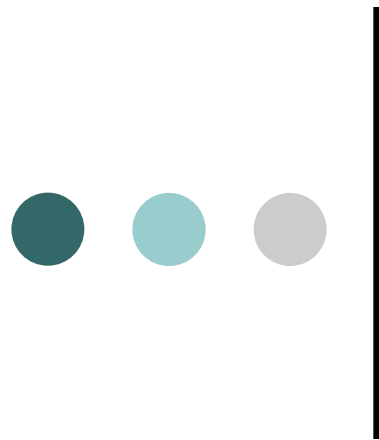
1. ENNEC 473 Futures, Options, Derivatives
2. METEO 460 Weather Risk & Financial Markets
(may be listed as “METEO 497x”)
3. Free elective (or METEO 422)
4. Free elective (or EM SC 401)
5. Free elective (or internship, research, ...)

(Course times not yet assigned)



WxRM Option in 2007-08: Example electives, Spring 2008

- STAT 414 **INTRO PROB THEORY**
- ENNEC 484W **ENERGY ECON**
- Most METEO 400-level courses
- ENGL 202C Technical Writing
- Other courses & experiences that build *writing skills*



Questions?

See also www.met.psu.edu/risk

Students interested in expressing “advance interest” in Wx RM Option should contact Rhonda Spsychalski rfs14@psu.edu to get on the list.