

*Syllabus for the Maymester Course on*  
**ENVIRONMENT AND SOCIETY- INDIA**

A three-credit course offered in Dehradun, India by The University of Texas at Austin

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Component #1, Spring 2008- UGS 119: International Learning Seminar (1 credit)  
Component #2, Field Course in Dehradun, India: May 18-June 12, 2008 (3 credits)

**ALTERNATIVE COURSE NUMBERS**

**Department of Geography and the Environment:** GRG 309: Environment and Society- India (3) College of Liberal Arts, lower division undergraduate course (unique #: 37710)

**Department of Asian Studies:** ANS 301M: Introduction to Asia: India (3) College Liberal Arts, lower division undergraduate course (unique #: 31020)

**Jackson School of Geosciences:** GEO 310C: Conference Course: Environment and Society- India (3). A "C" natural sciences section; lower division undergraduate course (unique #26417)

**LBJ School of Public Affairs:** PA 310S. Topics in Public Policy Environment and Society- India (3) lower division undergraduate course (unique #: 64115)

**COURSE DESCRIPTION**

This course on Environment and Society- India focuses on the natural and human environment in India. This course will address major environmental topics related to India: water quantity, water quality, air quality, solid wastes, hazardous materials, protection of natural areas and endangered species, land management, human population, wildlife, energy, and natural resources. To enroll in one of the three alternative course numbers during Spring Semester of 2008 a student will enroll in UGS 119, "International Learning Seminar" which is a cross-cultural course component organized by the study abroad office. The field component of the class will be taught in Dehradun, India from approximately May 18, 2008 to June 13, 2008, a period which includes travel to and from India. This course will include class lectures and field study in the Dehradun region. Grading will be by an examination, a fieldwork journal and class participation.

## COURSE MEETINGS

Members of the class will meet in UGS 119 for eight weeks during Spring Semester 2008 to help students prepare for study abroad. Those 8 meetings will be scheduled following the Office of the Provost's procedure for Maymester courses. The field course in Dehradun will occur from **May 18 through June 12, 2008**. As the course requires extensive travel, the class will convene in the classroom for five days a week and there will be travel in the field for 6 days a week. A three-hour American-style exam (multiple choice, fill-in, and short essay questions) will occur on Monday, June 10, 2008. The exam will allow students the opportunity to demonstrate what they have learned about "Environment and Society- India," as well as reflect on their experiences. The class is designed for lower division undergraduate students at the University of Texas students at Austin. A junior and senior undergraduate can enroll for credit in the course with the approval of his or her departmental advisor. A graduate student can enroll in the course for credit with the approval of his or her graduate advisor. Below is a list of the class days and assigned topics. Students can enroll for credit under three different course numbers for Geography, Asian Studies, or Public Affairs.

## READINGS

The course has one required textbook, a series of required readings (primarily from the journal **Scientific American**), required readings related to local issues in India and optional readings from a variety of sources. The textbook can be purchased from the UT Co-Op. Other readings are available on E-res. **Textbook:** Chiras, Daniel D., **Environmental Science**, Seventh Edition, Jones and Bartlett Publishers, Inc., Sudbury MA, 2006 [phone: 978-443-5000] [Note: hereafter this book is referred to as "Chiras"]. A major portion of the readings are articles from the **Scientific American** magazine. A second portion of the readings are articles regarding Indian environment and society. For each field trip, there will be a reading about the location of the field trip.

### UGS 119: International Learning Seminar (1 credits)

As of 12/10/07 there are limited details available concerning the location of class for UGS 119. The content of the class will follow the procedures of the Office and the Provost for all Maymester courses. The class will occur on 8 Mondays, 4-6m. Exact dates and location to be provided later.

### GRG 309: Environment and Society – India

Students are to depart to New Delhi no later than Sunday, May 18, 2008 and arrive there no later than May 19. A bus will take students from New Delhi to Dehradun on May 20, 2008. Class will begin on May 21, 2008. The expected travel schedule would be:

- Departure from the US to New Delhi: no later than May 18, 2008.
- Arrival in New Delhi: no later than May 19, 2008
- Departure from New Delhi with travel to Dehradun: May 20, 2008
- Classes begin: May 21, 2008
- Departure from Dehradun to New Delhi and Agra: June 10, 2008
- Field trip to Taj Mahal: June 11, 2008
- Departure from New Delhi to the US: June 12, 2008
- Arrive in Austin: June 12, 2008

## CLASS SCHEDULE, MAY 21 TO JUNE 12, 2007

### May 21, Wednesday

**Morning:** Class sessions (50 minutes each, approximate)

Topics:

1. The earth
2. The sun and the energy cycle
3. The water cycle
4. Land and geomorphic processes

**Required Readings (105 pages):**

- Chiras, chapters 1-2, pp. 1-33.
- Hutcheson, G. Evelyn, "The Biosphere," **Scientific American**, September 1970, vol. 223, no. 3, pp. 44-53.
- Oort, Abraham H., "The Energy Cycle of the Earth," **Scientific American**, September 1970, vol. 223, no. 3, pp. 56-63.
- Woodwell, George M., "The Energy Cycle of the Biosphere," **Scientific American**, September 1970, vol. 223, no. 3, pp. 64-73.
- Gates, David M., "The Flow of Energy in the Biosphere," **Scientific American**, September 1971, vol. 225, no. 3, pp. 88-100.
- Penman, H.L., "The Water Cycle," **Scientific American**, September 1970, vol. 223, no. 3, pp. 98-108.
- Nance, R. Damian, Thomas R. Worsley and Judith B. Moody, "The Supercontinent Cycle," **Scientific American**, July 1988, vol. 259, issue 1, pp. 72-91.

**Additional Readings:**

- Lerner, Arthur, "How Do Scientists Know the Composition of Earth's Interior?" **Scientific American**, November 2004, vol. 291, no. 5, p. 112.

**Afternoon:** Field trip to the Forest Research Institute, Dehradun and its academic library

**Reading:** A reading about the Forest Research Institute of India from its website:

[www.icfre.org/institutes2/fri.htm](http://www.icfre.org/institutes2/fri.htm)

### May 22, Thursday

**Morning:** Class sessions (50 minutes each, approximate)

1. The carbon cycle
2. The nitrogen cycle
3. Other chemical cycles
4. Cycles involving life, organic chemicals, and inorganic chemicals

**Required Readings (97 pages):**

- Chiras, chapters 3-4, p. 34-70.
- Bolin, Bert, "The Carbon Cycle," **Scientific American**, September 1970, vol. 223, no. 3, pp.124-132.
- Delwiche, C.C., "The Nitrogen Cycle," **Scientific American**, September 1970, vol. 223, no. 3, pp.137-146.
- Cloud, Preston and Aharon Gibor, "The Oxygen Cycle," **Scientific American**, September

1970, vol. 223, no 3, pp.111-123.

- Deevey, Edward S., Jr. “Mineral Cycles,” **Scientific American**, September 1970, vol. 223, no3, pp. 148-158.
- Smil, Vaclav. “Global Population and the Nitrogen Cycle,” **Scientific American**, July 1997, vol. 277, issue 1, pp. 76-83.
- Berner, Robert A. and Lasaga, Antonio C. “Modeling the Geochemical Carbon Cycle,” **Scientific American**, March 1989, vol. 260, issue 2, pp. 74-81.
- “Phytoplankton's Influence on the Global Carbon Cycle,” **Scientific American**, August 2002, vol. 287, p. 58.

**Afternoon:** Field trip to the Wildlife Institute of India, Dehradun, and its academic library.

**Reading:** Readings about the Wildlife Institute of India: [envfor.nic.in/wii/wii.htm](http://envfor.nic.in/wii/wii.htm) and [www.wii.gov.in](http://www.wii.gov.in)

### May 23, Friday

**Morning:** Class sessions (50 minutes each, approximate)

Topics:

1. The origin of life and evolution
2. Weather cycles
3. The influence of natural processes on living things
4. The influence of living things on natural processes.

**Required Readings (85 pages):**

- Chiras, chapters 5-6, pp. 72-117.
- Wald, George, “The Origin of Life,” **Scientific American**, August 1957, vol. 191, no. 2 , pp. 45-53.
- Landsberg, Helmut E., “The Origin of the Atmosphere,” **Scientific American**, August 1953, pp. 82-85.
- Went, Frits W., “Climate and Agriculture,” **Scientific American**, June 1957, vol. 191, no. 3 pp. 83-93.
- Shapiro, Robert, “A Simpler Origin for Life,” **Scientific American**, June 2007, vol. 296, issue 6, pp. 46-53.
- Collins, William; Colman, Robert; Haywood, James; Manning, Martin R.; Mote, Philip. “The Physical Science Behind Climate Change,” **Scientific American**, August 2007, vol. 297, issue 2, pp. 64-71.

**Afternoon:** Field trip to the Indian Civil Service Academy (Lal Bahadur Shastri National Academy of Administration) in Musoorie and its academic library.

**Reading:** A reading on the Lal Bahadur Shastri National Academy of Administration from their website: Lal Bahadur Shastri National Academy of Administration from its website: [en.wikipedia.org/wiki/Lal\\_Bahadur\\_Shastri\\_National\\_Academy\\_of\\_Administration](http://en.wikipedia.org/wiki/Lal_Bahadur_Shastri_National_Academy_of_Administration).

## May 24, Saturday

Open day

## May 25, Sunday

Field trip to the forests of Chakrata (full day trip)

**Reading:** A reading about the forests of Chakrata from a website:

[www.dehradun.nic.in/chakrata.htm](http://www.dehradun.nic.in/chakrata.htm)

## May 26, Monday

**Morning:** Class sessions (50 minutes each, approximately)

Topics:

1. Creation of the Indian subcontinent
2. Geomorphic processes in the Indian subcontinent
3. The role of the Himalayas and monsoon processes in India
4. Hydrology, politics and poverty in India

### **Required Readings (71 pages):**

- Chiras, chapter 12, pp. 222-245.
- Dietz, Robert S., "The Breakup of Pangaea," **Scientific American**, October 1970, vol. 223, no. 4, pp. 30-41
- Mukerjess, Madhusree, "The Scarred Earth," **Scientific American**, March 2005, vol. 292, no. 1, pp. 18-20.
- Murphy, J.B. and R.D. Nance, "Mountain Belts and the Supercontinent Cycle," **Scientific American**, April 1992, vol. 266, issue 4, pp. 72-91.
- Hodges, Kip, "Climate and the Evolution of Mountains," **Scientific American**, August 2006, vol. 295, issue 2, pp. 72-79.
- Pinter, Nicholas and Mark T. Brandon, "How Erosion Builds Mountains," **Scientific American**, April 1997, vol. 276, issue 4, pp. 74-80

### **Additional Readings:**

- "A Geological History of India," [En.wikipedia.org/wiki/Geology\\_of\\_India](http://en.wikipedia.org/wiki/Geology_of_India)

**Afternoon:** Field trip to the Wadia Institute of Himalyan Geology, Dehradun and its academic library

**Reading:** A reading on the Wadia Institute of Himalyan Geology from their website:

[www.himgeology.com](http://www.himgeology.com)

## May 27, Tuesday

**Morning:** Class sessions (50 minutes each, approximately)

Topics:

1. Ecology (1): Ecological processes
2. Ecology (2): Ecological niches and ecosystems
3. Biological protection of species in India
4. Protection of sensitive environments in India

### **Required Readings (60 pages):**

- Chiras, chapters 6-7, pp. 96-133.
- Cole, LaMont C., "The Ecosphere," **Scientific American**, April 1958, vol. 198, no. 2, pp. 83-90.

- Swan, Lawrence W., “The Ecology of the High Himalayas,” **Scientific American**, October 1961, vol. 205, no. 4, pp. 68-77.
- Wynne-Edwards, V.C., “Population Control in Animals,” **Scientific American**, August 1964, vol. 211, pp. 68-74.

**Additional Readings:**

- Harashima, Yohei, “Environmental Governance in Selected Asian Developing Countries,” **International Review for Environmental Strategies**, Summer 2000, vol. 1, no. 1, pp. 193-207.
- Kalas, Peggy Rodgers, “Environmental Justice in India,” **Asia-Pacific Journal on Human Rights and the Law**, 2000, vol. 1, pp. 97-116.

**Afternoon:** Field Trip to Rajaji National Park

**Reading:** Rajaji National Park reading from websites:

- Rajaji National Park, Rajaji National Park Uttaranchal, Rajaji [www.indiawildliferesorts.com/national-oarks/rajaji-national-park.html](http://www.indiawildliferesorts.com/national-oarks/rajaji-national-park.html)
- Official Website of Rajaji National Park, Wild Brook Retreat [www.rajajinationalpark.in](http://www.rajajinationalpark.in)
- Rajaji National Park-Wikipedia [en.wikipedia.org/wiki/Rajaji\\_National\\_Park](http://en.wikipedia.org/wiki/Rajaji_National_Park)

**May 28, Wednesday**

**Morning:** Class sessions (50 minutes each, approximate)

Topics:

1. Land use in South Asia
2. Land use planning in South Asia
3. Demography of South Asia
4. Population geography of South Asia

**Required Readings (96 pages):**

- Chiras, chapters 8-9, pp. 134-165.
- Pant, Pitamber, “The Development of India,” **Scientific American**, September 1963, pp. 189-206.
- Sjoberg, Gideon, “The Origin and Evolution of Cities,” **Scientific American**, vol. 213, no. 3, pp. 54-62.
- Bose, Nirmal Kumar, “Calcutta: A Premature Metropolis,” **Scientific American**, September 1965, vol. 213, no. 3, pp. 81-102.
- Musser, George, “The Climax of Humanity,” **Scientific American**, September 2005, vol. 293, issue 3, pp. 44-47.
- Haub, Carl and O.P. Sharma, “India’s Population Reality: Reconciling Change and Tradition,” **Population Bulletin**, September 2006, vol. 61, no. 3, pp. 1-20.

**Additional Reading:**

- Andrews, C.F., “India’s Emigration Problem,” **Foreign Affairs**, April 1930, vol. 8, no. 3, pp. 430-441.
- Dasgupta, Partha S., “Population, Poverty and the Local Environment,” **Scientific**

**American**, February 1995, vol. 272, issue 2, pp. 40-46.

- Gupta, J.P., "Land Use Planning in India," **Journal of Hazardous Materials**, March 2006, vol. 130, issue 3, pp. 300-306.

**Afternoon:** Field trip to the Zoological Survey of India and its academic library.

**Reading:** A reading on the Zoological Survey of India from a website: [envfor.nic.in/zsi](http://envfor.nic.in/zsi)

### **May 29, Thursday**

**Morning:** Class sessions (50 minutes each, approximate)

Topics:

1. Family planning and population control in South Asia
2. Control of animals and plants in South Asia
3. Human diseases, vectors and disease control in South Asia
4. Food in South Asia
5. Medical geography of South Asia

#### **Required Readings (90 pages):**

- Chiras, chapters 9 and 10, pp. 166-221.
- Brown, Lester, "Human Food Production as a Process of the Biosphere," **Scientific American**, September 1970, vol. 223, no. 3, pp. 161-170.
- Taylor, Carl E., "Population Trends in an Indian Village," **Scientific American**, July 1970, vol. 223, no. 1, pp. 106-114.
- Sriniva, M.N., and Andre Beteille, "The 'Untouchables' of India," **Scientific American**, December 1965, vol. 213, no. 6, pp. 13-17.
- Deevey, Edward J., "The Human Population," **Scientific American**, September 1960, vol. 203, no. 3, pp. 194-204.

#### **Additional Readings:**

- Baker, Kathleen and Sarah Jewitt, "Evaluating 35 Years of Green Revolution Technology in Villages of Bulandshahr District, Western Up, North India," **Journal of Development Studies**, February 2007, vol. 43, no. 2, pp. 312-339.
- Alagh, Yoginder K., "Water and Food Security in South Asia," **International Journal of Water Resources Development**, March 2001, vol. 17, no. 2, pp. 23-36.
- Sarin, Ashi R., "India: Population Control – A Dismal Record of Non-Performance," **Women's International Network News**, Winter 2001, vol. 27, issue 1, pp. 69-71.
- Visaria, Leela, Dhireen Jejeebhoy and Tom Merrick, "From Family Planning to Reproductive Health: Challenge Facing India," **International Family Planning Perspectives**, January 1999 Supplement, pp. S44-S50.

**Afternoon:** Field trip to Central Soil and Water Conservation Research and Training Institute and its academic library

**Reading:** Readings from the Central Soil and Water Conservation Research and Training Institute of India from a website: [www.cswcrtiweb.org](http://www.cswcrtiweb.org)

### May 30, Friday

**Morning:** Class sessions (50 minutes each, approximate)

Topics:

1. Coal and its role in South Asian energy
2. Oil and gas and their role in South Asian energy
3. Nuclear energy in South Asia
4. Hydroelectric power in South Asia

**Required Readings (85 pages):**

- Chiras, chapters 14 and 16, pages 276-307 and 338-355.
- Summers, Claude M., "The Conversion of Energy," **Scientific American**, September 1971, vol. 225, no. 3, pp. 148-160.
- Starr, Chauncey, "Energy and Power," **Scientific American**, September 1971, vol. 225, no. 3, pp. 36-49.
- Deutch, John M. and Ernest J. Moniz, "The Nuclear Option," **Scientific American**, September 2006, vol. 295, issue 3, pp. 76-83.
- Hubbert, M. King, "The Energy Resources of the Earth," **Scientific American**, September 1970, vol. 225, no. 3, pp. 60-70.
- Cambell, Colin J., and Jean H. Laherrere, "The End of Cheap Oil," **Scientific American**, March 1998, vol. 278, no. 3, pp. 78.
- Goldemberg, Jose, "The Limited Appeal of Nuclear Energy," **Scientific American**, July 2007, vol. 297, issue 1, pp. 38-40.

**Additional Reading:**

- Bush, Jason, "China and India: A Rage for Oil," **Business Week Online**, August 25, 2005
- Pachauri, R. K., "India's Energy Challenge," **Public Policy Research**, September/November 2006, vol. 13, pp. 200-205
- Sharma, Kalpana, "Fuelling the Fire," **New Statesman**, August 2007, vol. 136, no. 2, p. 31
- Sharma, Ashok, "India and Energy Security," **Asian Affairs**, July 2007, vol. 38, pp. 158-172

**Afternoon:** Field trip to India Institute of Petroleum and its academic library

**Reading:** Readings on the India Institute of Petroleum from websites:

[www.indiaeducation.ernet.in/institutions/PROFILE.ASP?no=U00941](http://www.indiaeducation.ernet.in/institutions/PROFILE.ASP?no=U00941)

[www.ias.ac.in/currsci/apr25/articles16.htm](http://www.ias.ac.in/currsci/apr25/articles16.htm)

### May 31, Saturday

Open day

### June 1, Sunday

Field trip to Rishikeck at the Ganga River (full day trip)

**Required Readings:** A reading about Rishikeck at the Ganga River. (Reading to be selected)

### June 2, Monday

**Morning:** Class sessions (50 minutes each, approximate)

Topics:

1. Solar, geothermal, and tidal power in South Asia

2. Wind power in South Asia
3. Energy efficiency and the choice of energy sources in South Asia
4. South Asia's energy future

**Required Readings (79 pages):**

- Chiras, chapters 15 and 18, pp. 308-337 and pp. 376-401.
- Wald, Matthew L., "Questions About a Hydrogen Economy," **Scientific American**, May 2004, vol. 290, issue 5, pp 66-73.
- Musser, George, "More Power to Solar," **Scientific American**, December 2005, vol. 293, issue 6, pp. 52-53.
- Ogden, Joan, "High Hope for Hydrogen," **Scientific American**, September 2006, vol. 295, no. 3, pp. 94.
- Biello, David, "Hot Rocks," **Scientific American**, April 2007, vol. 296, issue 4, p. 28.
- Motavalli, Jim, "Developing World Wind: Under Construction," **E Magazine: The Environmental Magazine**, January/February 2005, vol. 16, issue 1, p. 35.
- Mukherjee, Ishani, "Solar Power Reaches 100,000 in Rural India," **World Watch**, September/October 2007, vol. 20, issue 5, p. 5

**Additional Readings:**

- Chaurey, Akanksha, Kamal Gueye, M. Babu and N. Dinesh Yuvaraj, "Financing Renewable Energy in India: A Review of Mechanisms in Wind and Solar Applications," **International Review for Environmental Strategies**, Winter 2003, vol. 4, no. 2, pp. 249-263.
- Shikha, Singh, T.S. Bhatti and D.P. Kothari, "Indian Scenario of Wind Energy: Problems and Solutions," **Energy Sources**, July 2004, vol. 25, pp. 811-819.
- Shikha, Singh, T.S. Bhatti, and D.P. Kothari, "Wind Energy in India: Shifting Paradigms and Challenges Ahead," **Journal of Energy Engineering**, December 2004, vol. 130, no. 3, pp. 67-80.

**Afternoon:** Field trip to the Indian Institute of Remote Sensing and its academic library

**Reading:** A reading on the Indian Institute of Remote Sensing from its website:

**June 3, Tuesday**

**Morning:** Class sessions (50 minutes each, approximate)

Topics:

1. Solid waste in South Asia
2. Hazardous wastes in South Asia
3. Management of wastes in South Asia
4. Recycling and resource reuse in South Asia

**Required Readings (75 pages):**

- Chiras, chapters 22 and 23 pp. 486-539.
- Woodwell, George M., "Toxic Substances and Ecological Cycles," **Scientific American**, March 1967, volume 216, no. 3, pp. 24-31
- Misra, Virendra and S.D. Pandey, "Hazardous Waste, Impact on Health and Environment for Development of Better Waste Management Strategies in Future in India," **Environment International**, April 2005, vol. 31, issue 3, pp. 417-431.

**Additional Readings:**

- Mukerjee, Madhurse, "The Fishy Business of Waste," **Scientific American**, April 1995, vol. 272, issue 4, p. 40.
- Raj, K., K.K. Prasad, and N.K. Bansal, "Radioactive Waste Management Practices in India," **Nuclear Engineering & Design**, April 2006, vol. 236, issue 718, pp. 914-930.
- Sharholy, Mufeed, Kafeel Ahmad, R.C. Vaishya and R.D. Gupta, "Municipal Solid Waste Characteristics and Management in Allahabad, India," **Waste Management**, April 2007, vol. 27, issue 4, pp. 490-496.

**Afternoon:** Field trip to Tapkeshwar Temple

**Reading:** A reading on the Tapkeshwar Temple. Reading to be selected.

**June 4, Wednesday**

**Morning:** Class sessions (50 minutes each, approximately)

Topics:

1. Air pollution in South Asia – sources
2. Air pollution in South Asia – control methods
3. Air pollution in South Asia – government policies
4. Global climate change and air emissions in South Asia

**Required Readings (87 pages):**

- Chiras, chapters 19 and 20, pp. 402-459.
- Went, Fritz W., "Air Pollution," **Scientific American**, May 1955, pp. 63-71.
- McDermott, Walsh, "Air Pollution and Public Health," **Scientific American**, October 1961, vol 205, no. 4, pp. 49-57.
- Haagen-Smit, A.J., "The Control of Air Pollution," **Scientific American**, January 1964, vol. 210, no.1, pp. 24-31.
- Bridgman, Howard, "Air Pollution in South Asia: the Asian Brown Cloud," **Geodate**, March 2003, vol. 16, issue 1, pp. 1-5.

**Additional Readings:**

- Bell, Ruth Greenspan, Kuldeep Mathur, Urvashi Narain, and David Simpson, "Clearing the Air: How Delhi Broke the Logjam on Air Quality Reforms," **Environment**, April 2004, vol. 46, issue 3, pp. 22-39.
- Cramer, Wolfgang, "Air Pollution and Climate Change Both Reduce Indian Rice Harvests," **Proceedings of the National Academy of Sciences of the United States of America**, December 12, 2006, vol. 103, issue 52, pp. 19609-19610.

**Afternoon:** Field trip to Takpathar

**Reading:** A reading on Takpathar. Reading to be selected.

### **June 5, Thursday**

**Morning:** Class sessions (50 minutes each, approximate)

Topics:

1. Water use in South Asia - domestic, industrial, recreation, transport, fisheries, ports, etc.
2. Water use in South Asia-irrigation
3. Aquatic ecology in South Asia– freshwater
4. Aquatic ecology in South Asia – saltwater

**Required Readings (57 pages):**

- Chiras, chapter 13, pp. 246-275
- Sengupta, Somini, “In Teeming India, Water Crisis Means Dry Pipes and Foul Sludge,” **New York Times**, September 2006, vol. 156, pA1-A14.
- Subedi, Surya P, “Hydro-diplomacy in South Asia: The Conclusion of the Mahakali and Ganges River Treaties,” **American Journal of International Law**, October 1999, Vol. 93, pp. 953-963.
- Sengupta, Somini, “India Digs Deeper, but Wells Are Drying Up, and a Farming Crisis Looms,” **New York Times**, September 2006, vol. 156, pp. 7-11.

**Additional Readings:**

- Ananda, Jayanath, Lin Crase and P.G. Pagan, “A Preliminary Assessment of Water Institutions in India: An Institutional Design Perspective.” **Review of Policy Research**, July 2006, vol. 23, pp. 927-953.
- Bandyopadhyay, Tirthankar, “India: Calcutta Plugs its Deficit,” **UNESCO Courier**, February 1999, vol. 52, pp. 28-29.
- Smout, Ian K. and Sunil D. Gorantiwar, “Improving Allocation of Irrigation Water in Southwest India,” **Proceedings of ICE: Water Management**, June 2006, vol. 159, pp. 95-101.

**Afternoon:** Field trip to the Asa Barrage

**Reading:** A reading on the Asa Barrage. Reading to be selected.

### **June 6, Friday**

**Morning:** Class sessions (50 minutes each, approximate)

Topics:

1. Treatment of water in South Asia (1) – health standards
2. Treatment of water in South Asia (2) – treatment technologies
3. Wastewater treatment in South Asia (1) – sewage systems and conventional treatment
4. Wastewater treatment in South Asia (2) – water re-use technology and hazardous waste disposal affecting water

**Required Readings:**

- Chiras, chapter 21, pp. 460-485.

**Afternoon:** Open afternoon- no field trip

### **June 7, Saturday**

**Morning:** Class sessions (50 minutes each, approximate)

Topics:

1. Principles for a sustainable society
2. Review of course lectures
3. Review of field trips

**Required Readings (49 pages):**

- Chiras, chapters 24, 26 and 27, pp. 540-553 and pp. 582-618.

**Optional Readings:**

Afternoon: Field trip to the Sahastra Dhara Springs

**Reading:** A reading on the Sahastra Dhara Springs. Reading to be selected.

### **June 8, Sunday**

Open Day

### **June 9, Monday**

In-class exam (3 hours)

### **June 10, Tuesday**

Travel to New Delhi and within New Delhi

**Optional Readings:** Readings to be selected.

### **June 11, Wednesday**

Tour of Taj Majal

**Optional Readings:** Readings to be selected.

## **DISCUSSION OF CLASS FIELD TRIPS**

This course will travel on field trips in the Dehradun region, one per day for many of the days. The daily field trip program appears below. Actual destinations may be changed based on conditions in the region. Participation in each field trip is a required component of the course.

## **FIELD TRIP SCHEDULE**

**W, May 21, 2008 Field Trip** – Afternoon: Field trip to the Forest Research Institute, Dehradun and its academic library

**Th, May 22, 2008 Field Trip** – Afternoon: Field trip to the Wildlife Institute of India, Dehradun, and its academic library

**F, May 23, 2008 Field Trip** – Afternoon: Field trip to Mussoorie: Lal Bahadar Shastri Academy of Administration, India Civil Service Academy and its academic library

**Su, May 25, 2008 Field Trip** – All day: Field trip to the forests of Chakrata (full day trip)

**M, May 26, 2008 Field Trip** – Afternoon: Field trip to the Wadia Institute of Himalyan Geology, Dehradun and its academic library

**F, May 27, 2008 Field Trip** – Afternoon: Field trip to Rajaji National Park

**W, May 28, 2008 Field Trip** –Afternoon: Field trip to the Zoological Survey of India and its academic library

**Th, May 29, 2008 Field Trip** –Afternoon: Field trip to Centrol Soil and Water Conservation Research and Training Institute and its academic library

**F, May 30, 2008 Field Trip** – Afternoon: Field trip to India Institute of Petroleum and its library

**Su, June 1, 2008 Field Trip** – Afternoon: Field trip to Rishikesh and the Ganga River

**M, June 2, 2008 Field Trip** – Afternoon: Field trip to the Indian Institute of Remote Sensing and its academic library.

**Tu, June 3, 2008 Field Trip** – Afternoon: Field trip to Tapkeshwar Temple

**W, June 4, 2008 Field Trip** – Afternoon: Field trip to Takpathar

**Th, June 5, 2008 Field Trip** – Afternoon: Field trip to the Asa Barrage

**Sa, June 7, 2007 Field Trip** – Afternoon: Field trip to the Sahastra Dhara Springs

#### **RESEARCH INSTITUTES IN DEHRADUN**

**Forest Research Institute** - [www.icfre.org/](http://www.icfre.org/)

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**Oil & Natural Gas Corporation Ltd. - [http://www.ongcindia.com/](http://www ONGC India.com/)**

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