List of Approved Courses 2016

Field of Study**:** ***Natural Resources Management***

SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
ASIAN INSTITUTE OF TECHNOLOGY

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ASIAN INSTITUTE OF TECHNOLOGY
SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
Field of Study: *Natural Resources Management*

ED76.01 Ecological Principles for Natural Resources Management 3(3-0) Semester: August

Course Objectives: Managing and conserving natural resources requires a fundamental understanding of natural dynamics. This course will introduce students to the essential concepts of ecology and familiarise them with ecosystem patterns and processes at various spatial and temporal scales. A special focus lies on measurements of characteristics of ecosystems as engineering scientists, in particular on forests and woodlands. The importance of ecology for sustainable natural resource management will be illustrated from the points of ecosystem services.

Learning Outcomes: The students on completion of this course will be able to:

1. Distinguish ecosystems and their associated problems
2. Discriminate the mechanisms of ecosystem formation
3. Analyse the roles of ecosystem services
4. Apply appropriate measurement tools for ecosystem analysis

Pre-requisite: None

Course Outline:

I. Ecosystem on the Earth
   1. Earth environment as a planet
   2. Climate zone
   3. Climate and terrestrial ecosystems

II. Characteristics of Terrestrial Ecosystem
   1. Mechanisms of ecosystem formation
   2. Ecosystem types
   3. Biodiversity

III. Ecological Processes in Terrestrial Ecosystems
   1. Structure of ecosystem
   2. Growth of vegetation
   3. Material cycle

IV. Ecosystem Services
   1. Ecosystems and human relations
   2. Characteristics of ecosystem services
   3. Evaluation of ecosystem services

V. Worldwide Issues and Asian Problem
   1. Climate change and ecosystems
   2. Human activities and ecosystem
   3. Ecosystem management and natural conservation

Laboratory Sessions: None

Learning Resources:

Textbooks:
Textbooks:
1. Chapin III, F. S., P.A. Matson and P.M. Vitousek, 2012. *Principles of Terrestrial Ecosystem Ecology*, Springer, New York.
2. Kricher, J., 2011. *Tropical Ecology*, Princeton University Press, New Jersey.

Reference Books:

1. Millennium Ecosystem Assessment, 2005. *Ecosystem and Human Well-Being*, Synthesis, Island Press, Washington, DC.
2. Magurran, A. E., 2004. *Measuring Biological Diversity*, Blackwell Publishing, Malden, Oxford, Victoria.
3. Whitmore, T.C., 1984. *Tropical Rain Forests of the Far East*, Oxford University Press, Oxford.
4. FAO, 2015. *Forest Resources Assessment 2015*, Food and Agriculture Organization of the United Nations, Rome.
5. Allaby, M., 2006. *Oxford Dictionary of Ecology*, Oxford University Press, Oxford.
6. Archibold, O.W., 1995. *Ecology of World Vegetation*, Chapman and Hall, London.

Journals and Magazines:
1. Biotropica [Wiley]
2. Conservation Biology [Wiley]
3. International Journal of Sustainable Development and World Ecology [Taylor & Francis]
4. Journal of Tropical Ecology [Cambridge University Press]
5. Conservation Letters [Wiley]

Others: Relevant and selected articles will be distributed.

Teaching and Learning Methods:
The course will focus on participative learning, classroom lecturing, invited lectures, group discussions, group and individual presentations, individual assignments, and field visits.

Time Distribution and Study Load:
Lecture: 45 hours
Discussion/field: 15 hours
Other self-studies and assignments: 60 hours
Presentation: 4 hours

Evaluation Scheme:

Both Mid-semester and Final exams are closed book and caries 30% and 40% weight, respectively. Term-paper write-up and presentation made by individual students during the class carries another 30% weight.

Grade “A” will be awarded if a student can demonstrate thorough knowledge and mastery of concepts and techniques and understanding of subject matter with high degree of skill to relate them with real world examples from the region and beyond. Grade “B” will be awarded if a student can demonstrate good knowledge and mastery of concepts and understanding of subject matter with good skill of relating them with real work cases. Grade “C” will be awarded if a student can demonstrate some knowledge of the concepts and understanding but lacks skill of relating them with real world cases. Grade “D” will be awarded if a student has poor understanding of concepts and techniques with no or little skill to relate with real world cases. Grade “F” will be awarded if student demonstrates very poor and limited knowledge and understanding of concepts and lacks the skill to relate with real world cases.

Instructor: Dr. Nophea Sasaki

School Recommendation:_____ ADRC Approval: _____

Academic Senate Approval: _____

ASIAN INSTITUTE OF TECHNOLOGY
SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
Field of Study: Natural Resources Management

ED76.02 Natural Resources Management Issues in Asia 1(1-0) Semester: August

Course objective: It is very important for future natural resource managers to be exposed to the NRM-related issues across Asia, so that they can put their own country's issues in a regional perspective and learn from regional experiences. The objective of this course is to provide broad-based understanding of major natural resources management issues in Asian region so that they can formulate sustainable solutions applicable to their respective country.

Learning Outcomes: The students on completion of this course will be able to:

- Explain the broad issues of environment and natural resources management of regional importance
- Describe major land degradation problems and conservation measures at regional level
- Correlate the role and impact of climate change on natural resources
- Discuss the major issue related to biodiversity, food security and rural transition
- Appraise broad natural resources polices at regional level

Pre-requisite: None

Course Outline:

I. Introduction

1. Natural Resources and its management
2. Overview of natural resources in Asia
3. Key Issues in Natural Resources Management in Asia

III. Bio-physical aspects of NRM issues
1. Land Degradation and conservation
2. Climate change and natural resources
3. Biodiversity and conservation

III. Socio-political and economic aspects of NRM issues
1. Rural transition and food security
2. Economics of ecosystem services
3. Decentralization and governance

Laboratory Session(s): None

Learning Resources:

Textbooks: *No designated textbook, but class notes will be provided.*

Reference Books:

1. UNEP, 2012. *The Fifth Global Environment Outlook*, GEO-5, UNEP, Nairobi.
2. Shengji, P., 1996. *Banking on Biodiversity*, Report on the Regional Consultation on Biodiversity Assessment in the Hindukush-Himalayas, ICIMOD, Kathmandu.
3. Contreras-Hermosilla, A., 2000. *The Underlying Causes of Forest Decline*, CIFOR Occasional Paper No. 30. Bogo.
4. Daly, H.E., Farley, J., 2010. *Ecological Economics: Principles and Applications*. Island Press, Washington, D.C.

Journals/Magazines:

1. Conservation Biology [Wiley]
2. International Journal of Sustainable Development and World Ecology [Taylor & Francis]
3. Land Degradation and Development [Wiley]
4. Natural Resources Forum [Wiley]
5. World Development [Elsevier]

Others: Relevant and selected articles will be distributed.

Teaching and Learning Methods:
Seminar style lectures by several instructors on different topic; Classroom discussions; One field trip of 3 days covering the issues discussed in the class; Critical analysis report writing by each student demonstrating the learning in classroom and in the field.

Time Distribution and Study Load:
Lecture: 15 h
Self-study and report: 30 h
Field trip: 3 days

Evaluation Scheme:
There will be no midsem and final exams. Final grading with 100% weight will be based on the field trip report.

Grade "A" will be awarded if a student can demonstrate thorough knowledge and mastery of concepts of the issues discussed in class and by critically linking them with what they have observed in the field. Grade "B" will be awarded if a student can demonstrate good knowledge and concepts on the issues in relation to what they have observed in the field. Grade "C" will be given if a student can demonstrate some knowledge of the concepts and by explaining the field observation. Grade "D" will be given if a student have poor understanding of concept but able to explain some issues on field observation. Grade "F" will be given if student demonstrates very poor and limited knowledge about the concepts and non-submission of the field report.

Instructors: Prof. Rajendra P. Shrestha and NRM Faculty

School Recommendation:_____ ADRC Approval: _____
Academic Senate Approval: _____

ASIAN INSTITUTE OF TECHNOLOGY
SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
Field of Study: *Natural Resources Management*

ED76.03 Forestry 3(3-0) **Semester: January**

Course Objective: Not only forests represent a source of wood for building materials and biofuels, they are also important for biodiversity conservation, watershed protection and climate regulation. In recent years, role of forestry in climate change mitigation has increasingly been recognized, especially in the REDD+ Scheme. The objective of the course is to provide students with sound knowledge of the principles of forestry and its practices, forest inventory techniques, forest carbon monitoring and accounting, sustainable forestry and climate change mitigation, and forest financing with particular emphasis on Asia.

Learning Outcomes: Upon completion of the course, students will be able to:

1. Analyze forestry practices for natural forest and forest plantation
2. Design forest inventory for forest carbon monitoring
3. Develop forest monitoring and carbon accounting systems useful for estimating carbon emissions or sequestration under the REDD+ scheme
4. Predict growth and yield of forest plantations
5. Analyze the roles of community forestry in poverty reduction and sustainable development
6. Formulate forest management strategies for achieving management objectives

Pre-requisite: None

Course Outline:

I. Background and introduction
   1. Forestry: Definitions
   2. Valuation I: Timber Products and Economy
   3. Valuation II: Non-timber Products and Economy
   4. Valuation III: Environmental Services of Forests
   5. Status of Forests in South and Southeast Asia
   6. The History of Forest Management in Thailand

II Forestry in the International Agreements
   1. Forestry in the Kyoto protocol
   2. Forestry in the REDD+ Scheme
   3. Forestry in the Convention on Biodiversity
   4. Forest Financing

III. Forest Assessment
   1. Land Evaluation for Forestry
   2. Forest Survey and Inventory Methodologies
   3. Analysis of Forest Inventory Data
   4. Growth and Harvesting Modeling
   5. Geographic Information Systems and Forestry
   6. Social and Environmental Impact Assessment of Forestry

IV. Forest Carbon Assessment
1. Analysis of Activities Data
2. Estimation of Emission Factors
3. Carbon Emissions from Deforestation and Forest Degradation
4. Carbon Stocks of Conservation Forests
5. Carbon Stocks through Enhancement
6. Establishment of Forest Reference Emission Level
7. Drivers of Deforestation and Forest Degradation
8. Carbon Emissions from Project Activities

V. Forest Management Practices
1. Basics of Clear Cutting
2. Case Study 1: Clear Cutting in Japan
3. Basics of Selective Logging
4. Case Study 2: Conventional Logging vs Reduced Impact Logging
5. What are Forestry Practice Codes?
6. Forest Certification Scheme and Timber Verification

VI. Tropical Plantation Forestry
1. Nursery and Seed Collection Techniques
2. Thinning Techniques
3. Growth and Yield of Forest Plantations
4. Modeling of Growth and Yield
5. Ecological Comparisons between Forest Plantations and Natural Forests

VII. Community-Based Forestry
1. Indigenous Forest Management Strategies in Asia
2. Community Forestry
3. Agroforestry and Home Garden Forestry

Laboratory Session: None

Learning Resources:
Textbook:

1. Montagnini, F., and C.F. Jordan, 2005. *Tropical Forest Ecology. The Basis for Conservation and Management*, Springer-Verlag, Berlin-Heidelberg.
2. Sasaki, N., 2012. *Tropical Forestry Carbon Benefits*, Japan Society of Forest Planning Press, Tokyo.

Reference Books:

1. Günter, S., M. Weber, B. Stimm, and R. Mosandl, 2011. *Silviculture in the Tropics* (Tropical Forestry), Springer-Verlag, Berlin-Heidelberg.
2. Pretzsch, J. and D. Darr, 2014. *Forests and Rural Development* (*Tropical Forestry*), Springer, Heidelberg, New York, Dordrecht, London.
3. Sessions, J., 2010. *Harvesting Operations in the Tropics* (*Tropical Forestry*), Springer, Heidelberg, New York, Dordrecht, London.

4. Higman, S., J. Mayers, S. Bass, N. Judd, and R. Nussbaum, 2004. *The Sustainable Forestry Handbook: A Practical Guide for Tropical Forest Managers on Implementing New Standards*, Routledge, London.
5. Mansourian, S. and D. Vallauri, 2005. *Forest Restoration in Landscapes: Beyond Planting Trees*, Springer, New York.
6. Kangas, A. and M. Maltamo (eds.), 2006. *Forest Inventory: Methodology and Applications* (Managing Forest Ecosystems), Springer, New York.
7. Hyde, W.F., 2012. *The Global Economics of Forestry*, Routledge, London.

Journals and Magazines:

1. Forest Ecology and Management [Elsevier]
2. Forest Policy and Economics [Elsevier]
3. Environmental Science and Policy [Elsevier]
4. Conservation Letters [Wiley]
5. Current Opinion in Environmental Sustainability [Elsevier]
6. Biotropica [Wiley]

Others: Most recent articles on the related topics will be distributed.

Teaching and Learning Methods:

1. Classroom lecturing and invited lectures
2. Group discussions, group and individual presentations. Prior to each lecture, relevant literatures and handouts will be provided. Students are required to read and propose problems for group presentations and discussions.
3. Each students will be required to complete two assignments on emergent topics
4. Field visits will be organized throughout the course
5. Fieldwork to REDD+ project sites will be organized to expose students to the real world problems.

Time Distribution and Study Load:
Lecture: 45 hours
Discussion: 10 hours
Assignments and reports: 80 hours
Presentation: 4 hours

Evaluation Scheme:

Two closed-book exams will be conducted with 30% and 40% weight for Mid-semester and Final exams, respectively. Two assignments carrying 10 and 20% weight are to be completed and submitted by individual students.

Grade “A” will be awarded if a student can demonstrate thorough knowledge and mastery of concepts and techniques and understanding of subject matter with high degree of skill to relate them with real world examples. Grade “B” will be awarded if a student can demonstrate good knowledge and mastery of concepts and understanding of subject matter with good skill of relating them with real work cases. Grade “C” will be awarded if a student can demonstrate some knowledge of the concepts and understanding but lacks skill of relating them with real world cases. Grade “D” will be awarded if a student has poor understanding of concepts and

techniques with no or little skill to relate with real world cases. Grade “F” will be awarded if student demonstrates very poor and limited knowledge and understanding of concepts and lacks the skill to relate with real world cases.

Instructor: Dr. Nophea Sasaki

School Recommendation:_____ ADRC Endorsement:_____
Academic Senate Approval: _____

ASIAN INSTITUTE OF TECHNOLOGY
SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
Field of Study: *Natural Resources Management*

ED76.04 Biodiversity and Conservation 3(3-0) **Semester: August**

Course Objective: Biodiversity conservation is important for achieving sustainable development through harmonization of human being with nature. It involves dealing with diverse biophysical, socioeconomic, cultural, political and legal issues to resolve conservation problems and natural resource use conflicts. The objective of the course is to provide students with a sound knowledge of conservation biology, methods for biodiversity assessment, an overview of current approaches to biodiversity conservation, e.g. ecoregional or community-based approaches, and with a solid introduction to planning and management strategies for biodiversity conservation inside and outside of protected areas, biodiversity safeguards, and conservation and biodiversity banking.

Learning Outcomes: Upon completion of the course, students will be able to:

1. Describe the status of biodiversity in the area of interest
2. Perform biodiversity assessment using available methods with the aid of statistical tools
3. Identify appropriate strategies to biodiversity restoration and conservation
4. Analyze the benefits of biodiversity conservation within the context of international agreements
5. Design biodiversity conservation that results in safeguarding socioeconomic and biodiversity values for local people

Prerequisite: None

Course Outline:

I. Introduction to Biodiversity
1. Terms and Definitions
2. Methods of Biodiversity Assessment
3. Biodiversity and Space
4. Distribution of Biodiversity
5. Biodiversity Services
6. Socioeconomic Values of Biodiversity
7. Threats to Biodiversity

II. Approaches to Biodiversity Conservation
1. History of Nature Conservation
2. Approaches in Modern Biodiversity Conservation
3. The REDD+ Scheme and Biodiversity Safeguards
4. The Convention on Biological Diversity
5. The Nagoya Protocol on Access and Benefit-sharing
6. Other International Agreements

III. Biodiversity Conservation inside Protected Areas
1. Protected Area Categories

2. Protected Area Design
3. Management of Natural Resources in Protected Areas
4. Harmonization of Human Activities with Natural Mechanisms

IV. Biodiversity Conservation Outside Protected Areas
1. Ex-Situ Conservation Strategies
2. Restoration Ecology
3. Agrobiodiversity
4. Natural Resource Management for Biodiversity Conservation

V. Conservation and Biodiversity Banking
1. The History and Theory
2. The Advantages and Opportunities
3. Ecological Consideration
4. Business Consideration
5. Financial Consideration

VI. Case Studies on Biodiversity Conservation

Laboratory Session: None

Learning Resources:

Textbook:

1. Jeffries, M., 2006. *Biodiversity and Conservation*, Routledge, Abingdon.

Reference Books:

1. Root, T.L., K.R. Hall, M. P. Herzog, and C. A. Howell (eds.), 2015. *Biodiversity in a Changing Climate: Linking Science and Management in Conservation*, University of California Press, California.
2. Carroll, N., J. Fox, and R. Bayon, 2008. *Conservation and Biodiversity Banking - a Guide to Setting up and Running Biodiversity Credit Trading Systems*, Earthscan, Abingdon, New York.
3. Groombridge, B. and M. D. Jenkins, 2002. *World Atlas of Biodiversity: Earth's Living Resources in the 21 Century*, University of California Press, California.
4. Buck, L., 2001. *Biological Diversity: Balancing Interests Through Adaptive Collaborative Management*, CRC Press, Danvers.
5. Terborgh, J., C. van Schaik, L. Davenport, and M. Rao, 2002. *Making Parks Work: Strategies for Preserving Tropical Nature*, Island Press, Washington, DC.

Journals and Magazines:

1. Biological Conservation [Elsevier]
2. Conservation Biology [Wiley]
3. Trends in Ecology & Evolution [Elsevier]
4. Conservation Letters [Wiley]
5. Diversity and Distributions [Wiley]

Others: Most recent articles on the related topics will be distrubuted.

Teaching and Learning Methods:

1. The course is delivered through direct instructions in the form of class lectures and invited lecture.
2. Handouts and relevant literatures will be provided prior to each lecture
3. Students need to read the provided literatures and to come up with two questions each for discussions in the class
4. Field data collection will be orginized and students are required to make group presentations on their findings from the fieldworks
5. Individual students need to make individual presentations and complete two assignments
6. Case studies in the selected Asian Region will be provided.

Time Dustribution and Study Load:
Lecture: 45 hours
Discussion: 10 hours
Assignments and reports: 80 hours
Presentation: 4 hours

Evaluation Scheme:

Two closed-book exams will be conducted with 30% and 40% weight for Mid-semester and Final exams, respectively. Two assignments carrying 10 and 20% weight are to be completed and submitted by individual students.

Grade “A” will be awarded if a student can demonstrate thorough knowledge and mastery of concepts and techniques and understanding of subject matter with high degree of skill to relate them with real world examples. Grade “B” will be awarded if a student can demonstrate good knowledge and mastery of concepts and understanding of subject matter with good skill of relating them with real work cases. Grade “C” will be awarded if a student can demonstrate some knowledge of the concepts and understanding but lacks skill of relating them with real world cases. Grade “D” will be awarded if a student have poor understanding of concepts and techniques with no or little skill to relate with real world cases. Grade “F” will be awarded if student demonstrates very poor and limited knowledge and understanding of concepts and lacks of the skill relating them with real world.

Instructor: Dr. Nophea Sasaki

INSTITUTE OF TECHNOLOGY
SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
Field of Study: *Natural Resources Management*

ED76.05 Integrated Land Use Management Systems 3(3-0) **Semester: August**

Course Objective : Integrated land use systems are capable of contributing significantly to sustainable land use, economic diversification, watershed protection and biodiversity conservation. The focus of the course will be on integrated smallholder systems in Asia (swiddens, crop-livestock systems, rice-fish systems). The course will provide students with knowledge of the various types of integrated land use systems, as well as with an understanding of their ecology, economics and social functions..

Learning Outcomes : The students on completion of this courses will be able to:

- Assess the sustainability of integrated land use systems
- Analyse land use systems according to biophysical, social, infrastructural and economic resourse use potentials.
- Comprehend integrated land use systems in various contexts across Asia
- Assess the performance and potential of land use systems with respect to environmental, economic and sociocultural considerations
- Explore ways to promote, improve or conserve integrated land use systems

Prerequisite: none

Course Outline:

I. Definitions and typology

1. Terminology (land, resource, system, land use);
2. Food systems in Southeaset Asia
3. Land use types
4. Resource use systems
5. Resource use indicators

II. Integrated analysis of land use management

1. Land use categories
2. Units of analysis
3. Transition of land use types
4. Definition of indicators
5. Assessment of land use systems

III. Properties of integrated land use systems

1. Relevance of integrated land use systems
2. Shifting cultivation
3. Land-Time-Budget Analysis

IV. ILUS for Sustainable Development

1. Strategic Environmental Assessment
2. Scenario development
3. Triple bottom line outcomes of ILUS

School Recommendation: _____ ADRC Approval: _____

Academic Senate Approval: _____

Laboratory Session(s): n/a

Learning Resources:

Textbook:

1. Netting,R. M.. 1986. Cultural Ecology. Second Edition. Waveland Press, Long Grove.

Reference Books:

1. Netting, R. M. 1993. Smallholders, Households: farm families and the ecology of intensive, sustainable agriculture. Stanford University Press, Stanford.
2. Giampietro, M. 2004. Multi-scale Integrated Analysis of Agroecosystems. CRC Press,
3. FAO. 2001. Mixed Crop-Livestock Farming: A review of traditional technologies based on literature and field experience. Food and Agriculture Organisation (FAO), Rome.
4. Marten, G.G. 1986. Traditional Land Use in Southeast Asia. A Human Ecology Perspective. Westview Press, Boulder.
5. Cairns, M. (ed). 2007. Voices from the Forest: Integrating Indigenous Knowledge into Sustainable Upland Farming. RFF Press, Washington D.C.

Journals and Magazines:

1. Human Ecology [Springer]
2. Land Use Policy [Elsevier]
3. Agricultural Systems [Elsevier]
4. International Journal of Agricultural Sustainability [Taylor & Francis]

Others:
Readings (for discussion in class):

1. Stepp, J. R., E. C. Jones, M. Pavao-Zuckerman, D. Casagrande, and R. K. Zarger, 2003. Remarkable Properties of Human Ecosystems. *Conservation Ecology 7(3)* 11 [online].
2. Netting, R.M. 1993. Chapter 5: Cultivators. In: R. Netting, *Cultural Ecology*. Waveland P. 59-85.
3. Netting, R.M. 1993. Chapter 6: Testing Ecological Explanations. In: R. Netting, *Cultural Ecology*. Waveland P. 86-103.
4. Fox, J., Y. Fujita, D. Ngidang, N. Peluso, L. Potter, N. Sakuntaladewi, J. Sturgeon, and D. Thomas, 2009. Policies, Political-Economy, and Swidden in Southeast Asia. *Human Ecology* 37: 305-322.
5. Smil, V. 2006. *Energy. A Beginner's Guide.* Oneworld, Oxford
6. Hanks, L.J. 1992. *Rice and Man: Agricultural Ecology in Southeast Asia*. Univ of Hawaii Press, Honolulu.
7. Fukui, H. 1994. *Food and Population in a Northeast Thai Village.* Univ of Hawaii Press, Honolulu.
8. Diamond, J. 2005. *Guns, Germs and Steel. The Fates of Human Societies*. WW Norton, New York.
9. Boserup, E. 1993. *The conditions of Agricultural Growth: The Economics of Agrarian Change under Population Pressure.* Routledge, London.
10. Bennett, J.W. 2005. *The Ecological Transition: Cultural Anthropology and Human Adaptation.* Transaction, New Brunswick.

Teaching and Learning Methods:

- Direct instructions in the form of class lectures, using lecture notes and reading materials
- Visuals/Video specifically on case experiences relevant to natural resources degradation and conservation topics.
- Self-learning by completing two autonomous assignments to demonstrate and relate discussed concepts
- Group work: assignments with students taking different roles, such as moderating, observing, providing feedback, and synthesizing
- Student presentations with consecutive student feedback (peer-group)
- Readings: assigned to students who will summarise, discuss, and analyse according to specific assignments
- Regular summaries of course material provided by students
- Case studies
- Field visits: Chitralada Palace, Royal Agricultural Museum

Time Distribution and Study Load:
Lectures: 45h
Student presentations: 6h
Field work and study visits: 10h
Self study: 80h

Evaluation Scheme:

Mid-semester exam (closed book, 40%), and Final exam (closed book, 60%)

Grade “A” will be awarded if a student can demonstrate thorough knowledge and mastery of concepts and techniques and understanding of subject matter with high degree of skill to relate them with real world examples. Grade “B” will be awarded if a student can demonstrate good knowledge and mastery of concepts and understanding of subject matter with good skill of relating them with real world cases. Grade “C” will be awarded if a student can demonstrate some knowledge of the concepts and understanding but lacks skill of relating them with real world cases. Grade “D” will be awarded if a student have poor understanding of concepts and techniques with no or little skill to relate with real world cases. Grade “F” will be awarded if student demonstrates very poor and limited knowledge and understanding of concepts and lacks the skill to relate with real world cases.

Instructor(s): Dr Clemens M Grünbühel

School Recommendation: _____ ADRC Approval: _____

Academic Senate Approval: _____

ASIAN INSTITUTE OF TECHNOLOGY
SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
Field of Study: *Natural Resources Management*

ED76.09 Integrated Natural Resources Planning and Policy 2(2-0) Semester: January

Course Objective: The aim of the course is to provide students with an understanding of environmental, socioeconomic and policy perspectives on resource relationships, with an insight into the paradigms of conservation and sustainable development, and with a policy background to an understanding of resource use and planning issues. It also familiarizes students with modern planning tools for natural resources management and conservation, such as strategies for sustainable development & environmental impact studies.

Learning Outcomes: The students on completion of this course will be able to:

- Analyze NRM issues through a policy lense and develop research-based recommendations
- Assess stakeholder requirements and deliver policy-relevant research statements
- Apply scientific results which can support the development of NRM policies

Prerequisite: none

Course Outline:

I. Introduction
1. Overview: Policy and Planning
2. Baseline exercise
3. Conceptual framework

II. Policy-relevant NRM frameworks
1. Sustainable Livelihoods
2. Ecosystems Resilience

III. Theory of Science for Governance
1. Complex/Coupled Systems
2. Post-normal science
3. Political economy of decisions
4. Participatory and adaptive management

IV. Concepts and examples of NRM policy
1. Precautionary principle
2. Acceptable risk
3. 3R policy
4. Technological assessment and multi-criteria evaluation
5. Environmental Action Plans
6. Land Allocation Policy
7. Sustainable Development

Laboratory Session(s): n/a

Learning Resources:

Textbooks:

No designated textbook, but class notes will be provided.

Reference Book:

1. Daly, H. E. & Farley, J. 2010. Ecological Economics: Principles and Applications. Island Press, Washington D.C.

Journals and Magazines:

1. Ecological Economics [Elsevier]
2. Society and Natural Resources [Taylor and Francis]
3. Natural Resources Forum [Wiley]
4. Ecology and Society [Resilience Alliance]

Others:

1. Blaikie P. 2006. Is Small Really Beautiful? Community-based Natural Resource Management in Malawi and Botswana. World Development, 34(11): 1942-1957.
2. Campbell B.A. Mandondo N., Nemarundwe N. Sithole B. de Jong W., Luckert M., Matose F. 2001. Challenges to Proponents of Common Property Resource Systems: Despairing Voices from the Social Forests of Zimbabwe. World Development 29(4): 589–600.
3. Cooke B, Kothari U. 2001. Participation: The New Tyranny? Zed Books, London.
4. Edmunds D., Wollenberg E. 2001. A Strategic Approach to Multistakeholder Negotiations. Development and Change, 32(2): 231–253.
5. Nightingale A. 2003. Nature–society and Development: Social, Cultural and Ecological Change in Nepal. Geoforum, 34; 525-540.
6. Ostrom E. 1990. Governing the Commons. The Evolution of Institutions for Collective Action. Cambridge University Press, Cambridge.
7. Shah T. 2009. Taming the Anarchy. Groundwater Governance in South Asia. Resources for the Future Press, Washington, DC.
8. Carney D., Drinkwater M., Rusinow T., Wanmali S., Singh N. 1999. Livelihoods Approaches Compared. CARE, Oxfam and the United Nations Development Programme (UNDP). Department for International Development, London
9. Funtowicz S., Ravetz J. 2013. Post-Normal Science. The Encyclopedia of the Earth. http://www.eoearth.org/view/article/155319/.
10. Hulme M. 2007. The Appliance of Science. The Guardian, www.guardian.co.uk.
11. Folke C., Carpenter S., Elmqvist T., Gunderson L., Holling C.S., Walker B. 2002. Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformations. AMBIO. A Journal of the Human Environment, 31(5)437-440.

Teaching and Learning Methods:

1. Lectures in classroom.
2. Readings: students will read assigned books and articles and will summarize and discuss according to specific assignments, with consecutive student feedback (peer-group).
3. Group work: various assignments with students taking different roles, such as moderating, observing, providing feedback, and synthesizing.
4. Presentation: Students will be assigned an issue related to NRM policy in their country for thorough analysis and presentation in class. The class is encouraged to ask questions, debate and discuss as necessary. The instructor may facilitate the discussion.

Time Distribution and Study Load:

Lecture in class room: 30h
Student presentations: 6h
Self-study and assignements: 45h

Evaluation Scheme:

The scheme is organized as follows: Mid-term exam (open book) – 30%; Final exam (open book) – 40%, Assignment and presentation – 30%.

Grade A is awarded if students have a thorough understanding of the theories and analytical frameworks taught in the course, and are able to make a critical and comparative assessment of these theories and frameworks.
Grade B will be awarded to students who are able to use the theories and analytical frameworks adequately to assess case studies.
Grade C is for below-expected understanding.
D is for students with very poor understanding of the theories and analytical frameworks taught.

Instructor(s): Dr. Nicolas Faysse

ASIAN INSTITUTE OF TECHNOLOGY
SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
Field of Study: Natural Resources Management

ED76.11 Natural Resources Economics 2 (2-0) **Semester: January**

Course Objective:
The main objective of the course is to introduce the advanced economic concepts and tools used by economists to analyze natural resource problems and propose policies that foster efficient and sustainable use of natural resources.

Learning Outcomes: On completion of the course, the students will be able to:

1. Analyze economic policies using the concepts of economic efficiency, equity and sustainability
2. Describe the different types of economic valuation techniques applied to natural resources
3. Evaluate allocations of natural resources applied to important natural resources; water, forest and land, and propose different economic instruments to correct possible market failures
4. Apply the principles of Cost-Benefit Analysis for the analysis of projects or policies
5. Identify the relationship between natural resources and economics, well as the role and importance of environmental issues in economic development.

Prerequisite: ED76.XX Introduction to NRE (Course Code to be included once it is assigned by Registry upon approval.

Course Outline:

I. Value of natural resources and its use in policy-making
   1. Welfare Economics and Value in Economics
   2. Valuation techniques of non-market natural resources
   3. Cost-Benefit Analysis

II. Allocation of natural resources
   1. Static allocation of natural resources
   2. Allocation of non-renewable resources when time matters
   3. Allocation of renewable resources
   4. Allocation of natural resources when markets fail (including common pool resources)

III. Application to specific natural resources problems
   1. Water
   2. Forestry
   3. Land

IV. Economics of Externalities
   1. Optimal level of pollution and related policies
   2. Payment for Ecosystem Services

Laboratory Session(s): none

Learning Resources:

Textbooks:

School Recommendation: _____ ADRC Approval: _____

Academic Senate Approval: _____

1. Tietenberg, T., Lewis, L., 2009. Environmental & Natural Resource Economics, 8th ed. Pearson - Addison Wesley, Boston.
2. Daly, H.E., Farley, J., 2010. Ecological economics: principles and applications. Island Press, Washington D.C.

Reference Books:

1. Hanley, N., Barbier, E.B., 2009. Pricing nature: Cost-benefit analysis and environmental policy. Edward Elgar Publishing.
2. Griffin, R.C., 2006. Water resource economics: the analysis of scarcity, policies and projects. MIT Press Cambridge, Cambridge (USA).

Journals and Magazines:

1. Ecological Economics, [Elsevier]
2. Ecosystem Services, [Elsevier]

Others:

1. Christie, M., 2012. Approaches to Valuing Ecosystem Services in Developing Countries Information pack for the Regional Workshop on "Mainstreaming Ecosystem Services Approaches into Development: Application of Economic Valuation for Designing Innovative Response Policies", Bangkok.
2. Christie, M., Fazey, I., Cooper, R., Hyde, T., Kenter, J.O., 2012. An evaluation of monetary and non-monetary techniques for assessing the importance of biodiversity and ecosystem services to people in countries with developing economies. Ecol. Econ. 83, 67-78.

Teaching and Learning Methods:

Lectures in classroom, quizzes, individually assigned readings and presentation to other members for discussion, group work and presentation.

Time Distribution and Study Load:

Lecture: 30 h
Presentation: 4 h
Self-study and assignments: 50 h

Evaluation Scheme:

Both the Mid-semester and Final exams are closed books and carry 30 and 40% weight respectively. The individual assignment carries 15%, and Group work and presentations carries 15% of the grade.

Grade "A" will be awarded if a student can demonstrate thorough knowledge and mastery of concepts and techniques and understanding of subject matter with high degree of skill to relate them with real world examples. Grade "B" will be awarded if a student can demonstrate good knowledge and mastery of concepts and understanding of subject matter with good skill of relating them with real work cases. Grade "C" will be given if a student can demonstrate some knowledge of the concepts and understanding but lacks skill of relating them with real world cases. Grade "D" will be given if a student has poor understanding of concepts and techniques with no or little skill to relate with real world cases. Grade "F" will be given if student demonstrates very poor and limited knowledge and understanding of concepts and lacks the skill to relate with real world cases.

Instructor(s): Adjunct/Visiting Faculty

School Recommendation: _____ ADRC Approval: _____

Academic Senate Approval: _____

ASIAN INSTITUTE OF TECHNOLOGY
SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
Field of Study: *Natural Resources Management*

ED76.13 Natural Resources Degradation and Conservation 3(3-0) Semester: January

Course Objective: Degradation of natural resources has undermined the supporting capacity of the ecosystem with eventual consequences on the issues like food security, poverty alleviation, climate change and biodiversity loss. This is especially important in developing countries including those in Asia. The objective of the course is to introduce the major types of natural resources degradation in Asia, techniques and tools to monitor them, and to design appropriate conservation practices.

Learning Outcomes: The students on completion of this courses will be able to:

- Discuss major type of natural resources degradation in Asia
- Explain types and impacts on vegetation, animals, water and soil due to human activities
- Distinguish different type of degradation and explain the process of soil erosion
- Determine and apply appropriate tools needed for monitoring different types of degradation.
- Formulate an integrative and suitable conservation strategies for various degradation problems.

Pre-requisite: None

Course Outline:

I. Natural resources degradation
   1. Resource domain
   2. Regional overview of degradation
   3. Concept of Hazard, Risk, Vulnerability

II. Human impacts on Natural Resources (types, causes and impacts)
   1. Vegetation degradation
   2. Animals
   3. Water
   4. Soil

III. Soil erosion
   1. Domain
   2. Mechanics
   3. Types

IV. Tools for natural resource degradation assessment and monitoring
   1. GIS
   2. Remote sensing
   3. Global Positioning system

V. Degradation assessment method
   1. Field techniques
   2. Empirical models
   3. Process-based models

VI. Conservation concepts and measures

1. Watershed management
2. Land use planning concept
3. Soil and water conservation measures

Laboratory Session(s): None

Learning Resources:

Textbooks: *No designated textbook, but class notes will be provided.*

Reference Books:

1. Goudie, A. 2013. *The Human Impact on the Natural Environment*, Seventh edition, The MIT Press, Cambridge.
2. Gregersen, H.M., P.F. Ffolliott, and K.N. Brooks, 2007. *Integrated Watershed Management: Connecting People to Their Land and Water*. CABI International, Oxfordshire.
3. Hellin, J. 2006. *Better Land Husbandry: From Soil Conservation to Holistic Land Management*, Science Publishers, New Hampshire.
4. Roder, A. and J. Hill, 2009. *Recent Advances in Remote Sensing and Geoinformation processing for land degradation assessment*, CRC Press, London.
5. Stocking, M.A. and N. Murnaghan, 2001. *Handbook for the Field Assessment of Land Degradation*. Earthscan Publications Ltd., London.

Journals/ Magazines:

1. Natural Resources Forum [Wiley]
2. Land Degradation and Development [Wiley]
3. International Journal of Remote Sensing [Taylor & Francis]
4. Ecological Economics [Elsevier]
5. International Journal of Sustainable Development and World Ecology [Taylor & Francis]

Others: Relevant and selected articles will be distributed.

Teaching and Learning Methods:

Lectures; Interactive classroom discussions; Individual student assignments on degradation issues; Group discussions; Individual student presentations.

Time Distribution and Study Load:

Lecture: 45 h
Discussion/Visuals: 10 h
Presentation: 4 h
Self-study and assignments: 80 h

Evaluation Scheme:

Both the midsem and final exam are closed book exams, carrying 30 and 40% weights respectively. Two assignments to be done by individual student carry 10 and 20% weights respectively.

Grade “A” will be awarded if a student can demonstrate thorough knowledge and mastery of concepts and techniques and understanding of subject matter with high degree of skill to relate them with real world examples. Grade “B” will be awarded if a student can demonstrate good knowledge and mastery of concepts and understanding of subject matter with good skill of relating them with real work cases. Grade “C” will be given if a student can demonstrate some knowledge of the concepts and understanding but lacks skill of relating them with real world cases. Grade “D” will be given if a student have poor understanding of concepts and techniques with no or little skill to relate with real world cases. Grade “F” will be given if student demonstrates very poor and limited knowledge and understanding of concepts and lacks the skill to relate with real world cases.

Instructor: Prof. Rajendra P. Shrestha

School Recommendation:_____ ADRC Approval: _____

Academic Senate Approval: _____

ASIAN INSTITUTE OF TECHNOLOGY
SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
Field of Study: *Natural Resources Management*

ED76.14 Society and Natural Resource Management 3(3-0) Semester: August

Course Objective : This course aims at comprehending the social dimensions of the complex natural resource issues by exploring the relationship between society and natural resources. Emphasis is on social and institutional dimensions of common pool natural resources management.

Learning Outcomes :

1. Comprehend complex socio-ecological systems
2. Analyse social dimensions of natrual resource management issues
3. Apply an institutional analysis framework to NRM
4. Develop innovative solutions to socio-ecological research questions

Prerequisite: none

Course Outline:

I. Introduction
   1. Introduction to social and economic dimensions of natural resources management
   2. The use and paradigms of the social sciences
   3. Contribution of natural resource and environmental sociology to the study of natural resources
   4. Political economy and political ecology of natural resources

II. Paradigms and Theoretical Approaches to the Management of Common Pool Natural Resources
   1. "The Tragedy of the Commons" model
   2. The logic of collective action and self-governance
   3. An institutional approach to the study of common pool natural resources
   4. Social constructivism

III. Issues Related to Use of Natural Resources
   1. Population pressure and resource condition
   2. Dependence, scarcity, and resource condition
   3. Value, attitudes, and cultural perspectives and their effects on natural resources
   4. Conflicts and controversies
   5. Equity issues in natural resource management

IV. Natural Resource Management Approaches
   1. Stakeholders in natural resource management
   2. Community based management
   3. Co-management

V. Sustainability of Natural Resource Management
   1. Criteria and indicators of sustainability
   2. Recognizing interdependencies
   3. Concepts of polycentric governance and legal pluralism.

Laboratory Session(s): n/a

School Recommendation: _____ ADRC Approval: _____

Academic Senate Approval: _____

Learning Resources:

Textbook:

1. Moran, E. F. 2010. Environmental Social Science. Human-Environment Interactions and Sustainability. Wiley-Blackwell, West Sussex.

Reference Books:

1. Bromley, D. 1992. Making the Commons Work: Theory, Practice, and Policy. ICS Press, San Francisco.
2. Hirsch, P. and Warren, C. 1998. The Politics of Environment in Southeast Asia: Resources and Resistance. Routledge, London.
3. Gibson, C. C., M. A. McKean, and E. Ostrom (eds.). 2000. People and Forests: Communities, Institutions, and Governance. The MIT Press, Massachusetts.
4. Ostrom, E. 1990. Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press, Cambridge.
5. Ascher, W. 1995. Communities and Sustainable Forestry in Developing Countries. Institute for Contemporary Studies, San Francisco.
6. Mitchell, B. 2002. Resource and Environmental Management (second edition). Prentice Hall, Singapore.
7. Ritchie, B., C. McDougall, M. Haggith, and N. B. de Oliviera. 2000. Criteria and Indicators of Sustainability in Community Managed Forest Landscapes. Center for International Forestry Research, Bogor.

Journals and Magazines:

1. Society and Natural Resources [Taylor & Francis]
2. Natural Resources Forum [Wiley]
3. Journal of Political Ecology [University of Arizona]
4. Unasylva [FAO]
5. Ambio [Springer]
6. Environmental Management [Elsevier]

Teaching and Learning Methods:

- Direct instructions in the form of class lectures.
- Self-learning by completing two assignments.
- Group work assignments
- Student presentations with consecutive student feedback (peer-group)
- Readings: assigned to students who will summarise, discuss, and analyse according to specific assignments
- Regular summaries of course material provided by students
- Case study applications on frameworks and theory

Time Distribution and Study Load:
Lectures, exercises, group work: 45h
Student presentations: 6h
Self study: 80h

School Recommendation: _____ ADRC Approval: _____

Academic Senate Approval: _____

Evaluation Scheme:

Both the mid-semester and final exams are closed book exams, carrying 30% and 40% weight respectively. Two assignments to be done by individual student carry 10% and 20% weight respectively. Each student will present his/her second assignment in the class.

Grade "A" will be awarded if a student can demonstrate thorough knowledge and mastery of concepts and techniques and understanding of subject matter with high degree of skill to relate them with real world examples. Grade "B" will be awarded if a student can demonstrate good knowledge and mastery of concepts and understanding of subject matter with good skill of relating them with real work cases. Grade "C" will be awarded if a student can demonstrate some knowledge of the concepts and understanding but lacks skill of relating them with real world cases. Grade "D" will be awarded if a student have poor understanding of concepts and techniques with no or little skill to relate with real world cases. Grade "F" will be awarded if student demonstrates very poor and limited knowledge and understanding of concepts and lacks the skill to relate with real world cases.

Instructor(s): Dr Clemens M Grünbühel

ASIAN INSTITUTE OF TECHNOLOGY
SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
Field of Study: ***Natural Resources Management***

ED76.15 Research Design for Natural Resources Management 3(3-0) Semester: January

Course Objective: Research related to natural resources management involves a variety of techniques and methods, as it cut across different sciences, namely biophysical, spatial, socioeconomic and political. The objective of this course is to let students understand and learn to design and execute a research project in various afore-mentioned aspects of natural resources (forest, biodiversity, land and soils).

Learning Outcomes : The students on completion of this courses will be able to:

1. Identify a research problem, forumlate a research question and contingent hypotheses.
2. Decide on appropriate research methods and analysis techniques
3. Decide on appropriate statistical tools in analyzing the problem and produce the results
4. Design and develop a research proposal for Masters' thesis

Prerequisite: none

Course Outline:

I. Problem identification
   1. Introduction
   2. Problem statement
   3. Research design selection

II. Developing the proposal – Part I
   1. Literature review
   2. Citations and references
   3. Research questions

III. Developing the proposal –Part 2
   1. Hypotheses
   2. The use of theory
   3. Qualitative vs quantitative research design

IV. Methods
   1. Primary and Secondary data and data gathering
   2. Analysis methods for Qualitative data
   3. Quantitative methods and analysis
   4. Use of Statistical tools
   5. Impact evaluation technique

V. Quality control
   1. Interpretation and evaluation of results
   2. Ethics
   3. Effective presentation techniques
   4. Budget, timeline , Practical considerations

Laboratory Session(s): none

Learning Resources:

Textbooks: *No designated textbook, but class notes will be provided.*

Reference books:

1. Creswell, J.W. 2009. *Research Design. Qualitative, Quantitative and Mixed Methods Approaches*. Sage Publications, Thousand Oaks.
2. Gotelli, N.J. and A.M. Ellison. 2004. *A Primer of Ecological Statistics*. Sinaruer Associates, Inc. Publishers, Massachusetts
3. Kumar, R., 2011. *Research Methodology: A Step-by-step Guide for Beginners*, Third edition, Sage Publications, New Delhi.

Journals/Magazines:

1. Journal of Mixed Methods Research [Sage publications]
2. International Journal of Qualitative Methods [University of Alberta]
3. Statistical Methods and Application [Springer]
4. Journal of Modern Applied Statistical Methods [JMASM Inc. and Wayne State University]
5. Journal of Writing Research [University of Antwerp]

Others: Relevant and selected articles will be distributed.

Teaching and Learning Methods:
Lectures in class and class discussions; individual student assignments; peer review of assignments by fellow students.

Time Distribution and Study Load:
Lectures: 45 hrs
Discussion: 8 hrs
Student presentations: 5 hrs
Other self-studies and assignments: 80 hrs

Evaluation Scheme:
There will be mid-sem exam (closed book) of 30% but no final exam. Two assignments will carry 20%, class/peer review participation and interaction (20%), and individual preliminary research proposal and presentation (30%).

Grade "A" will be awarded if a student can demonstrate thorough knowledge and mastery of concepts and techniques and understanding of subject matter with high degree of skill to relate them in developing a research proposal. Grade "B" will be awarded if a student can demonstrate good knowledge and mastery of concepts and understanding of subject matter with good skill of relating them in developing research proposal. Grade "C" will be awarded if a student can demonstrate some knowledge of the concepts and understanding but lacks skill of relating them in developing research proposal. Grade "D" will be awarded if a student have poor understanding of concepts and techniques with no or little skill to relate them in research proposal. Grade "F" will be awarded if student demonstrates very poor and limited knowledge and understanding of concepts and lacks the skill to develop a research proposal.

Instructor(s): Prof. Rajendra P Shrestha and NRM faculty

School Recommendation:_____ ADRC Approval: _____
Academic Senate Approval: _____

ASIAN INSTITUTE OF TECHNOLOGY
SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
Field of Study: *Natural Resources Management*

ED76.16 Land Resources Management 3(3-0) **Semester: August**

Course objective:: Persisting land degradation problem with unsustainable land management practices and increasing competition for land for other purposes than food production has continuously challenged the food security and ecosystem. The objective of the course is to provide the concept and current issues in rural land management, techniques, and tools for conducting systematic land evaluation, and needed enabling environment to help make appropriate decisions related to sustainable land management to support food production and ecosystem functions.

Learning Outcomes: The students on completion of this courses will be able to:

1. Distinguish the types and issues of land resources in the region
2. Investigate human impacts on land resources
3. Analyze different land evaluation methods and apply appropriate method
4. Select and apply tools in land management
5. Analyze land use options and formulate sustainable land management strategies

Pre-requisite: None

Course Outline:

I. Concern, Issues and Types
   1. Concern for Land
   2. Land Resources issues
   3. Land Resource types

II. Land Resource and Soil Surveys
   1. Landscape Approach, Land Resource Inventories
   2. Ecological and Agro-ecological Surveys
   3. Soil survey

III. Human Impacts on land resource
   1. Land use change
   2. Land degrdation
   3. Key effects

IV. Methodology of Land Evaluation
   1. Principles and procedures of FAO Framework of land evaluation
   2. Land Capability Classification; Land Evaluation and Site Assessment; Agro-Ecological Zoning; Framework for Evaluation of Sustainable Land Management
   3. Principles, process and methods of land use planning

V. Tools in Land Management
   1. Role and process of Environmental Impact Assessments in land resources
   2. Participatory planning [Need for and perceptions; Participation in policy making]
   3. Land Resources Indicators

VI. Sustainable Land Management (SLM)
   1. SLM Concept, progress and barriers

2. Land tenure, Sustainable land use and food security
3. Scoioeconomic, policy and institutional framework

Laboratory Session(s): None

Learning Resources:

Textbooks: *No designated textbook, but class notes will be provided.*

Reference Books:

1. Davidson, D.A., 1992. *The Evaluation of Land Resources*, 2nd Edition, Longman Publication Group.
2. FAO, 2007, *Land Evaluation: Towards a Revised Framework*, Land and Water Discussion Paper 6. FAO, Rome.
3. Young, A., 1998. *Land Resources: Now and for the Future*, Cambridge University Press, Cambridge.
4. IBRD/WB, 2006. *Sustainable Land Management: Challenges, Opportunities and Trade-offs*, The World Bank, Washington, D.C.
5. World Bank, 2008. *Sustainable Land Management Sourcebook*, The International Bank for Reconstruction and Development / The World Bank, Washington D.C.
6. K. Deininger and D. Byerlee with J. Lindsay, A. Norton, H. Selod, and M. Stickler, 2011. *Rising Global Interest in Farmland: Can it yield sustainable and equitable benefits?*, The World Bank, Washington D.C.

Journals and Magazines:

1. International Journal of Applied Earth Observation and Geoinformation [Elsevier]
2. Natural Resources Forum [Wiley]
3. Soil Use and Management [Wiley]
4. Geoderma [Elsevier]
5. Journal of Land Use Science [Taylor & Francis]

Others: Relevant and selected articles will be distributed.

Teaching and Learning Methods:

Lectures; Interactive classroom discussions; Individual assignments to learn respective country's land management problems and situation; Group assignment to learn land management as integrated discipline; Classroom presentation of assignment.

Time Distribution and Study Load:

Lecture: 45 h
Discussion/visuals: 10 h
Presentation: 4 h
Self-study and assignments: 80 h

Evaluation Scheme:

Both the midsem and final exam are closed book exams carrying 30% weight each. One individual assignment carries 10% weight, and one group assignment and presentation carries 20% weight.

Grade “A” will be awarded if a student can demonstrate thorough knowledge and mastery of concepts and techniques and understanding of subject matter with high degree of skill to relate with them real world examples. Grade “B” will be awarded if a student can demonstrate good knowledge and mastery of concepts and understanding of subject matter with good skill of relating them with real work cases. Grade “C” will be given if a student can demonstrate some knowledge of the concepts and understanding but lacks skill of relating them with real world cases. Grade “D” will be given if a student have poor understanding of concepts and techniques with no or little skill to relate with real world cases. Grade “F” will be given if student demonstrates very poor and limited knowledge and understanding of concepts and lacks the skill to relate with real world cases.

Instructor: Prof. Rajendra P Shrestha

School Recommendation:_____ ADRC Approval: _____

Academic Senate Approval: _____

ASIAN INSTITUTE OF TECHNOLOGY
SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
Field of Study: *Natural Resources Management*

ED76.17 Geospatial techniques in Natural Resources Management 3(2-3) Semester: January

Course objective: Natural resources monitoring, planning and management requires the use of location specific geographic data. Geospatial tools and techniques, Remote Sensing (RS), Geographic Information Systems (GIS), Global Positioning Systems (GPS), and spatial modeling are widely used to observe, quantify and analyze the issues related to natural resources resulting from various human-environment processes at multiple geographic scales. The objective of the course is to provide the students the concepts of geographic data/information, concepts and principle of remotes sensing, GIS, and GPS.

Learning Outcomes: The students on completion of this courses will be able to:

1. Differentiate geographic data representation and map projection
2. Compare various type of geospatial data and data generation techniques
3. Distinguish the principles, advantages and disadvantages of remote sensing, GIS, and GPS
4. Identify quality data for use in natural resources management
5. Determine and use geospatial techniques in solving the issues related to natural resources management

Pre-requisite: None

Course Outline:

I. Introduction to Geospatial data
   1. Data and Information
   2. Concept of measurements, spatial sampling, and errors
   3. Classification of spatial data

II. Geographic data representation and Map projection
   1. Spatial primitives and measurement levels
   2. Map projection types
   3. Data and methods of natural resources assessment

III. Remote Sensing and Global Positioning Systems (GPS) for Natural Resources monitoring
   1. Principle
   2. Types
   3. Scale and Resolution
   4. Image interpretation and classification
   5. Principle of GPS

III. Geographic Information Systems (GIS) for Natural Resources planning and management
   1. Introduction – Map vs GIS
   2. GIS Data structure, data input and field survey
   3. Database management

V. Geographic data Quality

1. Data Quality and Accuracy
2. Data integration
3. Data standardization and sharing

VI. Spatial Analysis and modeling
1. Geometric operation
2. Spatial statistics and spatial analysis
3. Spatial modeling

VII. Case studies
1. Land evaluation (forestry, agriculture)
2. Habitat mapping and modeling
3. Land use/cover options and climate adaptation
4. Land degradation mapping

Laboratory Sessions:

1. Introduction to computer facilities, hardware, software, natural resources data
2. Basic functions of ArcMap GIS
3. Working with tables
4. Query and logical operators
5. Geoprocessing /overlay
6. GPS data collection, interpolation
7. Remote sensing - Image display/enhancement of remote sensing data (ENVI software)
8. Visual techniques of image interpretation
9. Digital technique of feature extraction and classification
10. Accuracy assessment
11. Student project on natural resources assessment and planning
12. Map output
13. Student project (contd.)
14. Student project (contd.)
15. Presentation of output

Learning Resources:

Textbooks: *No designated textbook, but class notes will be provided.*

Reference Books:

1. Horning, N., J.A. Robinson, E.J. Sterling, W. Turner and S. Spector, 2010. *Remote Sensing for Ecology and Conservation*, Oxford University Press, Oxford.
2. Wilkie, D.S. and J.T. Finn, 1996. *Remote Sensing Imagery for Natural Resources Monitoring : A Guide for First-time Users*, Columbia University Press, New York.
3. Lo, C.P. and A.K.W., Yeung, 2007. *Concepts and Techniques of Geographic Information Systems*, Prentice Hall of India Pvt. Ltd., New Delhi.
4. DeMers, M.N., 2009. *Fundamentals of Geographic Information Systems*, Fourth edition, John Wiley and Sons, Inc., New York.

Journals and Magazines:

1. ISPRS International Journal of Geoinformation [MDPI open access publishing]
2. Remote Sensing [MDPI open access publishing]

3. Geocarto International [Taylor & Francis]
4. International Journal of Geographical Science [Taylor & Francis]
5. Photogrammetry & Remote Sensing [America Society for Photogrammetry and Remote Sensing]

Others: Relevant and selected articles will be distributed.

Teaching and Learning Methods:
Lectures; Interactive classroom discussions; Weekly laboratory hands-on sessions to practice the techniques; daylong field visit; Group assignment to conduct real case study on application of geospatial techniques and presentation of the case study.

Time Distribution and Study Load:
Lecture: 30 hrs
Laboratory: 45 hrs
Presentation: 4 hrs
Other self-studies and field observation: 50 hrs

Evaluation Scheme:
Both midsem and final exam are closed book exams carrying 30% weight each. The group assignment, presentation and participation carries 20%, 10%, and 10% respectively.

Grade "A" will be awarded if a student can demonstrate thorough knowledge and mastery of concepts and techniques and understanding of subject matter with high degree of skill to relate with them real world examples. Grade "B" will be awarded if a student can demonstrate good knowledge and mastery of concepts and understanding of subject matter with good skill of relating them with real work cases. Grade "C" will be awarded if a student can demonstrate some knowledge of the concepts and understanding but lacks skill of relating them with real world cases. Grade "D" will be awarded if a student have poor understanding of concepts and techniques with no or little skill to relate with real world cases. Grade "F" will be awarded if student demonstrates very poor and limited knowledge and understanding of concepts and lacks the skill to relate with real world cases.

Instructor: Prof. Rajendra P. Shrestha

School Recommendation:_____ ADRC Approval: _____

Academic Senate Approval: _____

ASIAN INSTITUTE OF TECHNOLOGY
SCHOOL OF ENVIRONMENT, RESOURCES AND DEVELOPMENT
Field of Study: *Natural Resources Management*

ED76.XX Introduction to Natural Resources Economics 1(1-0) Semester: August

Course Objective:
The main objective of the course is to introduce natural resource use issues, and the economics concepts that can guide policy-makers to tackle them. Important concepts used by economists to evaluate policies will be presented and discussed throughout the course: efficiency, equity and sustainability. The course is designed to serve students coming from different academic background and with limited prior exposure to economic theory.

Learning Outcomes : The students will be able to :

- Identify the different types of natural resources and relate them to the adequate economic policy issue
- Model the consumers and suppliers behavior under competitive market
- Relate the demand and supply curves to the value of goods and services
- Realize a Cost-Benefit Analysis on simple development projects
- Identify efficient allocations of natural resources and policy instruments to reach efficiency

Prerequisite: None

Course Outline:

I. Introduction
1. Important issues in natural resource economics
2. Natural resources and the economy

II. Supply and demand
1. Modeling consumers and suppliers choices in a competitive market
2. Consumer and producer surplus
3. Value in economics

III. The use of value in Natural Resource Economics
1. Introduction to the concept of value in economics
2. Introduction to Cost-Benefit Analysis
3. Allocation of resources: overview of criteria and methods

Laboratory Session(s): none

Learning Resources:

Textbooks:
- Tietenberg, T., Lewis, L., 2009. Environmental & Natural Resource Economics, 8th ed. Pearson - Addison Wesley, Boston.
- Field, B.C., 2008. Natural Resource Economics: An Introduction, 2nd ed. Waveland Press, Long Grove.

Reference Books:

School Recommendation: _____ ADRC Approval: _____

Academic Senate Approval: _____

- Asafu-Adjaye, J., 2005. Environmental economics for non-economists: techniques and policies for sustainable development, 2nd ed. World Scientific Pub Co Inc.

Journals and Magazines:
Ecological Economics, Elsevier
Ecosystem Services, Elsevier
Environment & Development Economics, Cambridge University Press

Teaching and Learning Methods:
Lectures in classroom, quizzes and hand-on exercises, group work on one case study (project appraisal) and group presentation.

Time Distribution and Study Load:
Lecture (discussion) = 15 hours
Presentation: 3 hours
Self-study: 30 hours

Evaluation Scheme:
There will be no midsem exam. Final exam will carry 70% weight, and group work presentation will carry 30% weight.

Grade "A" will be awarded if a student can demonstrate thorough knowledge and mastery of concepts and techniques and understanding of subject matter with high degree of skill to relate them with real world examples. Grade "B" will be awarded if a student can demonstrate good knowledge and mastery of concepts and understanding of subject matter with good skill of relating them with real work cases. Grade "C" will be given if a student can demonstrate some knowledge of the concepts and understanding but lacks skill of relating them with real world cases. Grade "D" will be given if a student has poor understanding of concepts and techniques with no or little skill to relate with real world cases. Grade "F" will be given if student demonstrates very poor and limited knowledge and understanding of concepts and lacks the skill to relate with real world cases.

Instructor(s): Adjunct/Visiting Faculty