TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

MSc in ENERGY FOR SUSTAINABLE SOCIAL DEVELOPMENT

PULCHOWK

MANUAL

of

Elective Course II

ENERGY INTEGRATED SUSTAINABLE RURAL RECONSTRUCTION (Credits: 4)

(EG 853 AR)

JUNE 2016

Course Tutors

Prof. Sudarshan Raj Tiwari

Dr. Pranita Shrestha

Acknowledgements

I would like to appreciate the assistance of my co-tutor Dr. Pranita Shrestha in the development and delivery of the studio course on Energy Integrated Rural Reconstruction offered as an elective course (Second year, first semester) to MScESSD.

I would also like to recognize the contribution of Dr. Sushil Bahadur Bajracharya, the coordinator for MScESSD program in selecting the village of Dhoksan as project site and making necessary contacts with the local residents, school management, local investors and entrepreneurs as well as Bibeksheel Nepali, an NGO active in the area.

Also I would like to thank Bibeksheel Nepali and its managers/volunteers for their kindness in sharing the baseline data of population, economic activities, tourism, agriculture and land use and active participation in student works review.

 Sudarshan Raj Tiwari

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**Course Syllabus for M.Sc. Engineering in Energy for Sustainable Social Development**

**Energy Integrated Sustainable Rural Reconstruction**

(EG853AR)

Studio: 4 hrs Year: I

 Part: II

**Objective**:

The objectives of this planning and design studio course are to:

* Increase awareness of creating harmony between human settlement system in rural area and the natural systems of land, water and energy.
* Increase awareness for creating sustainability through integration of energy and natural resources as a part of rural reconstruction strategy both at the building and settlements level;
* explore a range of planning and design approaches to achieve sustainable energy and natural resources in planning, design and construction of rural buildings and settlements;
* apply knowledge and experience of previous years courses for collection, analysis and synthesis of necessary data for design and planning of sustainable post-earthquake reconstruction of rural buildings and settlement;
* foster ability to adapt strategies and action tools developed for energy integrated sustainable urban houses and towns for application to rural buildings and settlements in the context of post-earthquake reconstruction .
* foster ability to work as a team to develop rural reconstruction solutions for advocacy at community level.

**Description** **of the studio**:

As the nation prepares to respond to the massive destruction of rural buildings and settlements wrought by the Gorkha Earthquake with what looks like becoming an equally massive rebuilding, of houses and settlements with improved earthquake resistant construction and in locations with limited geological risks (land movement and landslides), it is imperative that buildings and settlements reconstructions also meet the developmental aspirations of the rural population while ensuring an efficient and sustainable energy and rational natural resource utilization system. The planning and design studio works is designed to explore ways to significantly and positively influence changes in the rural livelihoods, energy production and consumption and pattern of use of natural resources and to moderate and minimize the negative situation pertaining in energy, natural resources and environmental context of rural settlements. The planning and design exercise aims to support the impending massive rural reconstruction.

The aim of the studio course is to learn about ways to create sustainability through integration of energy and natural resources in the planning and construction of rural buildings and settlements. It will seek to learn about harmonizing the human settlement system with the natural system of land, water and energy. It will seek to create interdependencies between eco-system services and human settlement infrastructure services. The work will take an interpretive and adaptive approach using the resource materials that has been developed for urban contexts e.g. Green Homes, Green Cities, Alternate Energy, etc. adapted for rural reconstruction scenario in Nepal. Though the site of reference may be different, the students are expected to use the data and other information resources coming out of the four courses already taken by the students.

**Teaching and Examination Schedule:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.N. | Teaching Schedule | Examination Scheme | Total | Remarks |
| Course Code | Course Title | Credit | L | T | P | Total | Studio |
| Assessment MarksStudio Outputs | Final |
| Duration, h | Marks |
| 5 | xxESSD | Energy Integrated Sustainable Rural Reconstruction  | 4 | 0 | 0 | 4 | 4 | 100 | 0 | 0 | 100 |  |

Evaluation: Cumulative assessments will be made of interactions, presentations, drawings and written reports of assigned activities under each of the three parts of studio as detailed below. Attendance requirements will be as per TU regulations.

The studio dates are June 2 - June 22, 2016.

The first part of the Studio will develop and agree to a planning, design and building brief for the reconstruction of a rural settlement affected by the 2015 Gorkha Earthquake so as to integrate energy and sustainability issues into the ongoing rural reconstruction planning, design and building process.

The second part of the studio will be data collection from secondary sources and field visit to the village (optional), which will cover sources and consumption pattern of energy, energy demands, needs and potentials, nature and state of natural resources and environment of the village and its hinterland. Water, water bodies and channels, forests and their use, animal husbandry, agricultural and other primary economic activities. The variety and extent of data fields will be as required by the three briefs agreed in first part of the studio.

The third part of the studio will be prepare a plan and proposal of reconstruction that integrates energy and nature into the settlement plan (buildings, settlement, infrastructure and ecological services) that will be proposed to the community for review and follow up with the government.

References and Texts:

\*Urban Patterns for Green Economy - Working with Nature. UN HABITAT.

\*Sustainable Urban Energy - a Sourcebook for Asia. UN HABITAT & IUTC.

\*Patterns for Green Economy - Leveraging Density. UN HABITAT.

\* Green Homes. UN HABITAT NEPAL & EU

Energy Integrated Sustainable Rural Reconstruction-

A Planning and Design Studio

Introduction to Course/ Studio

As the nation prepares to respond to the massive destruction of rural buildings wrought by the Gorkha Earthquake with what looks like becoming an equally massive rebuilding, of houses and settlements with improved earthquake resistant construction and in locations with limited geological risks (land movement and landslides), it is imperative that buildings and settlements reconstructions also meet the developmental aspirations of the rural population while ensuring an efficient and sustainable energy and rational natural resource utilization system. The planning and design studio works is designed to explore professional ways to significantly and positively influence changes in the rural livelihoods, energy production and consumption and pattern of use of natural resources utilization so as to moderate and minimize the negative situation pertaining in energy, natural resources and environmental context of rural settlements through planning and design exercise to support the impending massive rural reconstruction.

The aim of the studio course is to learn about ways to create sustainability through integration of energy and natural resources in the planning and construction of rural buildings and settlements. It will seek to learn about harmonizing the human settlement system with the natural system of land, water and energy. It will seek to create interdependencies between eco-system services and human settlement infrastructure services. The work will take an interpretive and adaptive approach using the resource materials that has been developed for urban contexts e.g. Green Homes, Green Cities, Alternate Energy, etc. adapted for rural reconstruction scenario in Nepal.

The first part of the Studio will develop and agree to a planning, design and building brief for the reconstruction of a rural settlement affected by the 2015 Gorkha Earthquake so as to integrate energy and sustainability issues into the ongoing rural reconstruction planning, design and building process.

The second part of the studio will be data collection from secondary sources and field visit to the village, which will cover sources and consumption pattern of energy, energy demands, needs and potentials, nature and state of natural resources and environment of the village and its hinterland. Water, water bodies and channels, forests and their use, animal husbandry, agricultural and other primary economic activities. The variety and extent of data fields will be as required by the three briefs.

The third part of the studio will be prepare a plan and proposal of reconstruction that integrates energy and nature into the settlement plan (buildings, settlement, infrastructure and ecological services) that will be proposed to the community for review and follow up with the government.

The Studio is offered as an Elective Course

The studio defines a village or rural settlement as one with small population (less than 10,000 person), having a major primary economic activity such as agriculture or forestry or fishing and with a large presence of nature and natural resources about it. They may be service villages such as related to tourism e.g. with rooming and eatery service specialization, but with the primary economic activity still as present.

Because of widespread poverty and overuse/degradation of natural resources, the current energy 'demand' and sources, energy requirements and sourcing options, Energy

What data will be collected and assessed?

Energy, Consumption pattern in residential, non-residential activities/livelihood activities, inside buildings and in public spaces (open spaces, streets, canals), in economic activity spaces (outside settlements), Sources of energy and concerns.

Natural resources, water/rivers/ponds, forest, agriculture - environmental reserves and resources, status and concerns.

Energy, Natural resources in water supply and sanitation, in electrification, transport and communication, current/wished for futures

Cases of integration of human and nature systems in the settlement area/ outside in the hinterland.

Social services (Education/Health), Economic services (e.g. agricultural services, tools, seeds, manures, etc) Environmental services, Cultural services

Key Issues for Discussion

The elective course will be run on studio mode. Students will prepare (i) planning brief, design brief, construction/implementation brief in consultation with available documentations PDNA and PDIF etc (ii) a energy sensitive building reconstruction, infrastructure and resettlement plan and (iii) a guideline for implementation including materials, manpower and management policy. The studio will consist of issue based short review lectures on energy, rural life-style and its future directions and expectation, resettlement and building mode - each to be followed by class discussion and desk work.

The following topics and issues will make up the syllabus:

a. Resettlement Planning and Reconstruction- the nature of problem - addressing reconstruction and development together - Urban-Rural divide - how real and the agenda of closing the gap? -Present life style, changes on and wished for future life style -

Rural reconstruction - how much of the services will need to be added to support future expectation? How 'urban' will the reconstructed rural settlement become? Is the future ultimately 'urban' - urban as harmony in complexity, diversity and heterogeneity.

b. Energy and Building, Energy in building materials, Energy in the household, Energy in non-residential functions, Energy in transportation/choices of modes, transport arteries and life style. Energy in Basic services - water supply, health, education.

Energy generation and distribution, use pattern. Public transport and energy.

Bringing energy concerns in planning - urban society and energy consumption and Energy

c. Planning - spatial planning/development planning - land use and services planning with transport artery as linkage

BASIC DOCUMENTS:

UNHABITAT > Urban Patterns for Green Economy (88 pages)

 Sustainable Urban Energy (204 pages)

 Sustainable Urban Energy Planning (83 pages)

UN Agenda for Sustainable Development (35 pages)

Others Chapter 17 - Village Plans and Rural settlements (US) (120 pages)

Jorgen Amdam Spatial planning in rural areas, Experience from the Norwegian Regional Development Research Program 1998 - 2004

 (15 pages)

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