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

**Energy Integrated Sustainable Rural Reconstruction**

(EG 853 AR)

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;
* Introduce a range of planning and design tools 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 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 .
* 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 wrought by the Gorkha Earthquake with what looks like becoming an equally massive rebuilding, of houses and settlements. While the need to go for earthquake resistant construction and to build only on locations with limited geological risks (land movement and landslides) has been recognized, it is imperative to see 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 impending massive rural reconstruction has a potential 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. To do so, rural reconstruction planning needs to address issues of building, land use, infrastructure and micro-regional resources in a integrated way and to build sustainability in economic, social, environmental and ecological terms. The planning and design studio works is designed to explore professional ways to approach rural settlement reconstruction solutions so that such objectives and ends are achieved.

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 and the natural system particularly around 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. It will seek to experiment/develop rural planning bias that may replace LUTO (Land Use and Transport Organization), the dominant urban planning bias. The need for a new bias is felt because the rural reconstruction areas would not be expected to have as large a variety of land uses or transportation as the key infrastructure.

**Further details:**

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. Explorations on the issues of urbanization, urban-rural divide and the agenda of closing the gap may be made.

Because of widespread poverty and overuse/degradation of natural resources, the current energy 'demand' and sources, energy requirements and sourcing options, energy consumption pattern could not be a natural reflection of wished for options for the future of Nepal. The students are expected to adapt their field experience both from the previous two courses a community view point for setting up objectives of use and preservation of natural resources as well as the gradual build up of energy usages in rural life style. The following gives an idea of the 'traditional planning data' for the studio project:

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.

Energy embedded in building materials and technology.

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.

Recent NRA calls for rural housing has laid emphasis on multi-hazard reduction (landslide, flood, earthquake, fire, ...) and on the planning and design approach suited/ appropriate to both 'Nature and Culture' of the community. The building typologies must support the life and livelihood of the rural farmer along with their animals and crops and fodder storage. It planning and buildings both must be within the reach of the village, possibly in terms of materials, manpower and technology and also be possible within the rural economy - partial financial/technical assistance is expected to be inputed at the household level. It is not clear how the rural infrastructure will be supported - they may have to wait for the Government's Sector Departments to draw their programs.

**Teaching and Examination Schedule:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S.N. | Teaching Schedule | | | | | | | Examination Scheme | | | Total | Remarks |
| Course Code | Course Title | Credit | L | T | P | Total | Studio | | |
| Assessment Marks  Studio 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.

**Conduct of Studio:**

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 materials, energy, livelihood resources and sustainability issues into the ongoing rural reconstruction planning, design and building processes.

The second part of the studio will be data collection from secondary sources and from previous field visits to the villages, 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 resources, water bodies and channels; forests and their use, animal husbandry, agricultural and other primary economic activities, etc. 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 rural settlement plan (buildings, settlement, infrastructure and ecological services) that will be proposed to the community for review and to 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