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

**Off-Grid Energy Solutions for Urban/Rural Areas**

 (ELECTIVE COURSE I)

Lecture: 3 hrs Year: I

Tutorial: 1 hr Part: B

Practical: 2 hrs

**Objective**:

* To provide the general understanding of the off-grid energy solution technologies, their economic, social and environmental viability in the rural and urban areas.
1. **Introduction: [8 hrs]**
* Off-grid energy solutions (OGES) available, introduction to economic, social and environmental viability.
* Role of OGES for rural electrification, energy access, energy security and other socio-economic developmental aspects.
1. **Socio-Economic Assessment of OGES: [10 hrs]**
* Overview of the Socio-Economic Assessment.
* Rural Renewable Energy Survey.
* Data Preparation
* Descriptive and Comparative Statistics
* Socio-Economic Conditions Affecting Attitudes OGES.
1. **Techno-Economic Viability of OGES: [10 hrs]**
* Technical aspects of Off-grid energy solutions.
* Energy Analysis, Sizing of Renewable Energy Systems, Energy Output of Renewable Energy Systems, Reliability of Renewable Energy Systems, Evaluation of Competing Engine Generator Systems, Social and Environmental Factors Beyond the Energy Analysis.
* Economic Analysis, Preparation of the Cost Stream and Estimation of NPV and IRR, Calculation of Levelized Energy Costs, Social and Environmental Factors Beyond Conventional Economic Analysis,
* Sensitivity Analysis.

1. **Study on the selected OGES: [16 hrs]**
* Solar PV System
* Micro Hydro System
* Wind Power System
* Others
1. **Issues and policy options for commercialization of OGES [6 hrs]**
2. **Case Study [10 hrs]**

**Text Books, References and Journals**

1. Aldo Vieira da Rosa, ***Fundamentals of Renewable Energy Processes***. Elsevier Academic Press, California, USA( ISBN 13: 978-0-12-088510-7), 2005.
2. Y. Goswami, ***Principles of Solar Engineering***, Talor and Francis, 2000
3. Daniel Kirschen and Goran Strbac, ***Fundamentals of*** ***Power System Economics***. John Wiley & Sons, Ltd (ISBN: 0-470-84572-4), 2004.
4. Mukund R. Patel, ***Wind and Solar Power Systems***. CRC Press, New York, USA, 1999.
5. Bent Sorensen, ***Renewable Energy Conversion, Transmission and Storage***.2007.
6. *Proceedings of International Conference on Role of Renewable Energy Technology for Rural Development, (RETRUD-98), IOE/AEPC/NESS, 1998.*
7. *Proceedings of Second International Conference on Renewable Energy Technology for Rural Development, (RETRUD-03), IOE, 2003.*
8. *Proceedings of First National Conference on Renewable Energy Technology for Rural Development, (RETRUD-06), 2006.*
9. *Proceedings of IOE Graduate Conference, Vol.1, ISSN 2350-8914, Nov 2013.*
10. *Proceedings of IOE Graduate Conference, Vol.2, ISSN 2350-8906, Oct 2014.*
11. **International Journal of Renewable Energy Technology**, Inderscience.
12. **Energy for Sustainable Development**, An International Journal, Elservier
13. **Renewable Energy**, An International Journal, Elservier.
14. **IPCC, *Fifth Assessment Report***, 2015