Draft Content for lectures of EG501J, Renewable Energy 1 (Solar & Geothermal)

3 lectures (one hour each) per week.

Jefferson Gomes (Geothermal Energy (Part II))

- Week 10: **General Overview of the Energy Mix**
    - Lecture1: *General Introduction to course content, aims and delivery.*
    - Lecture 2: *Production and demand*
    - Lecture 3: *Energy conversion: Reapplication of fundamental phy*sics
- Week 11: **Geothermal Energy**
    - Lecture1: *Geothermal sources*
    - Lecture 2: *Power & heat generation*
    - Lecture 3: *Environmental impact*
- Week 12: **Engineering Thermodynamics**
    - Lecture1: Fundamentals: *First and second Laws, Mollier diagrams, internal Energy, enthalpy and entropy*
    - Lecture 2: *Vapour power systems: Carnot and Rankine cycles*
    - Lecture 3: *Refrigeration and heat pumps*
- Week 13: **Geothermal System Design**
    - Lecture1: *Multi-fluids displacement in geothermal rock matrix (Darcy's law)*
    - Lecture 2: *Geothermal reservoir modelling & simulation*
    - Lecture 3: *Oral Presentations*

Khaled Ahmed (Solar Energy (Part I))

- Week 14: **Solar Energy**
    - Lecture1: *Sun solar spectrum, effects of earth's atmosphere, orbit and rotation on insolation.*
    - Lecture 2: *Types of solar energy*
    - Lecture 3: *Externalities of solar energy conversion*

- Week 15: **Concentrated solar power generation**
    - Lecture1: *Construction and types*
    - Lecture 2: *Efficiency, testing, and operation*
    - Lecture 3: *Cost considerations of solar energy conversion*
- Week 16: **Photovoltaic (PV) solar energy**
    - Lecture1: *Fundamentals of solar cells: types of solar cells, semiconducting materials*
    - Lecture 2: *PV cell interconnection, module structure and module fabrication, I-V characteristics, output power*
    - Lecture 3: *PV cells wired in series and parallel, shaded and faulty cell effects, system integration*
- Week 17: **Power electronics devices for PV**
    - Lecture1: *DC/DC Converters*
    - Lecture 2: *Maximum Power Point Tracker*
    - Lecture 3: *Power Converters*
- Week 18: **Isolated PV systems & storage**
    - Lecture1: *System structure*
    - Lecture 2: *Control methods and parallel operation*
    - Lecture 3: *Isolated system example using MATLAB Simulation*
- Week 19: **Grid-connected PV systems**
    - Lecture1: *Network integration and control structure*
    - Lecture 2: *Connection standards, codes, challenges and practice*
    - Lecture 3: *Grid-connect example using MATLAB Simulation*
- Week 20: **A detailed design project of a PV energy conversion based system.**
    - Lecture1: *Project design specifications and system layout*
    - Lecture 2: *Control and hardware design*
    - Lecture 3: *Project results under different conditions using MATLAB Simulation*

Some useful dates:

Week 10: 15 September - 19 September. Commencement of Teaching 1st half session.

Week 14: 13 October - 17 October, Stating the Solar Energy lectures.

Week 21: 01 December – 05 December. Revision Week/Exam diet starting 8th December.

Tutorial Timetable:
Week 11 (22 September 2014) - Week 13 (06 October 2014)

Week 15 (20 October 2014) - Week 20 (24 November 2014)

Wed, 11:00-12:00.

Room allocation:
Currently allocated: MT013 (Meston building).