Masters in Renewable Energy, M.Sc.
(Renewable Energy)
University of Dar es Salaam

Course description:
The course has specialization in bio-energy, hydropower, solar and wind energy, and Energy efficiency in buildings. The programme consists of course work and dissertation and the duration is 18 months.

Tuition Fee:
1st year: US$ 3,849
2nd year US$ 4,024. There are student direct costs for stationery and books of US$ 150 and 400 respectively per anum; and thesis production of US$ 300 at the end.

Student stipend: Minimum US$300 per month.

Admission regulations (Minimum entry qualification):
Lower second class first degree (Bachelors degree) in engineering, applied and basic sciences, and other related fields from a recognized university, knowledge of English language.

Start date:
September every year. As an exception, in 2008 there were two intakes in May and September.

Link for on-line application:
www.udsm.ac.tz

UNIVERSITY OF DAR ES SALAAM
COLLEGE OF ENGINEERING AND TECHNOLOGY

MASTERS OF SCIENCE IN RENEWABLE ENERGY PROGRAMME

STRUCTURE OF THE COURSE

Semester 1
RE511: Solar Energy *(Introduction)*
RE512: Bio Energy *(Introduction)*
RE513: Hydropower *(Introduction)*
RE514: Other Forms of Renewable Energy
RE515: Electrical Energy Systems

Semester 2
RE521: Optimization of Energy Systems
RE522: Energy Policy ~~and Institutional Framework~~ and Planning
RE523: Project Planning and ~~Management, Tendering and Procurement~~ Implementation
RE524: Entrepreneurship

Semester 3
Solar Energy *(Specialisation)*
RE6111: Solar Cell Technology
RE6112: Electrical Energy Conversion in Photovoltaic Systems
RE6113: Solar Thermal Technology

Bio Energy *(Specialisation)*
Bio energy group to split their course content and enrich!
RE6121: Bio Energy Resource Production and Management
RE6122: Biomass Conversion Technologies
RE6123: Bio Liquid Fuels and Applications in Engines

Hydropower *(Specialisation)*
RE6131: Hydropower Resource and Management
RE6132: Hydropower Conversion Technology (Mechanical and electrical Aspects)
RE6133: Hydropower Plants (Civil Aspects)

Sustainable and Energy efficient Building *(Specialisation)*
RE6141: Energy Comfort and Buildings
RE6142: Low Energy Architecture
RE6143: Specialist Modules

Other Renewable Energies *(Specialisation)*
RE6151: Wind Energy
RE6152: Geothermal Energy
RE6153: Ocean Energy Sources (Wave and Tidal Energy)

Sustainable and Energy efficient Building (Specialisation from PREA)
RE6141: Energy Comfort and Buildings
RE6142: Low Energy Architecture
RE6143: Daylighting and Energy Efficiency

Other Renewable Energies *(Specialisation)*
RE6151: Wind Energy
RE6152: Geothermal Energy
RE6153: Ocean Energy Sources (Wave and Tidal Energy)

Semester 4
RE621: Solar Energy *(Dissertation)*
RE622: Bio Energy *(Dissertation)*
RE623: Hydropower *(Dissertation)*
*RE6**: Energy efficient Building (Dissertation)* ***(Specialisation from PREA)***

LABORATORIES AND PRACTICALS

Semester 1
- Centrifugal and piston pump performance
- Water turbine characteristic
- Diesel engine characteristics
- Calorific values of fuels
- Characteristics of refrigerators/heat pumps
- Heat transfer

Introduction to Meteorology
- General circulation of the atmosphere: heat transfer mechanisms
- Global and local effects on climate and weather
- Dynamics and predictability of atmospheric motions on different scales: global, synoptic, mesoscale, microscale
- Vertical structure of the atmosphere: lapse rates and instability
- Atmospheric boundary layer and turbulence: scales of motion and vertical transfer mechanisms
- Surface energy budget over infinite surfaces: effect of obstacles and changes of surface
- Use of meteorological measurements in assessment of energy potential
- Data routinely available from surface and satellite measurements: climatological records; representativity
- Response characteristics of instruments: sensitivity; linearity; response time
- Methods of measurement and application of observations of: solar radiation; thermal radiation; radiation temperature; wind velocity; turbulence; drag forces; air temperature; humidity; evaporation.

Semester 3

- Biomass cook stove characteristics and performance
- Hydraulic ram pump characteristics
- Air conditioning
- Solar collector heat loss
- Wind turbine characteristics for electricity generation and pumping; pump matching
- Muscle power-hand pump tests
- Calibration or inter-comparison of instruments used in measuring solar and thermal radiation, wind speed and turbulence
- Field measurements using these instruments
  - Solar and thermal radiation
  - Wind speed and turbulence

(Specialisation from PREA)

- Simulation of sunlighting
- Simulation of ventilation
- Building model construction
- insulation/transmission of heat
- Absorption, reflection, dispersion and transmission of light

TUTORIALS

During the first three semesters (1, 3, and 3) there will be tutorials and seminars to support the academic programme.

GUEST LECTURES

Throughout the year it is intended to hold a series of guest lectures by visiting experts, including academics, industrialists and members of the Government organizations and non-government agencies, to cover topics relevant to the course. It is also planned to arrange visits to places of relevant interest.

DISSERTATION

Semester 4 will be devoted to a special project, designed to suit the student's background and relevant to their own country's needs. If possible the student might find it beneficial to bring sufficient local information to carry out the investigation.

University	University of Dar es Salaam
Module Title	Low Energy Buildings Design
Module sequence number	SD 682
Module level	
Home academic department	Department of Structural Engineering
Teaching mode	Coursework, laboratory demonstration,
Credit points	3 Units
Prerequisites and corequisites	B.Sc.(Civil Engineering, Architecture, Environmental Engineering, Mechanical Engineering, Energy Engineering, Electrical Engineering, Physics, Geophysics, Building Economics)
Module rationale	To be able to create and evaluate energy efficient buildings
Module summary	
Keywords	Design, low energy, buildings.
Module aim	- To equip students with an understanding of the design principals and techniques used to create energy efficient buildings and enable them to make informed critical evaluations of low energy architectural proposals. - To enable students understand how low energy buildings affect the design decisions - Introduce students to the interdependence of design, cultural, technological and scientific factors in producing low energy buildings.
Learning outcomes	Having successfully completed this module, students will be able to evaluate, propose and develop low energy concepts.
Syllabus	Renewable energy concept in the heating and cooling systems in buildings, landforms, building envelope, elements, and building forms as relates to energy, thermal mass, building energy management system, smart energy systems, innovative materials for low energy buildings. Energy in urban environment,

Hard and software requirements	Light simulation software Internal and external climatic elements measurement kit Programme to interpret the collected data
Teaching and learning material	Books European Passive Solar Handbook, preliminary edition. Edited by P Achard and R Gicquel. Commission of the European Communities, 1986. M Santamouris and D. Asimakoloulos. Passive Cooling of Buildings. James and James, London, 1996. F. Allard, editor. Natural ventilation in Buildings. James and James, 1999. E. Maldonado, editor. Efficient Ventilation Techniques for Buildings. DG TREN, THERMIE report, University of Porto, 2000. Chapter 1 Low Energy Architecture TAREB Integration with Building Service Sandberg, M. "What is Ventilation Efficiency?" Building and Environment, vol.16 (1981), pp.123- 135. Review of Low Energy Cooling Technologies", Annex 28 of the International Energy Agency, Energy Conservation in Buildings and Community Systems Programme. Natural Resources Canada, December de 1995. Mark Zimmermann e Johnny Andersson. "Case Study Buildings, Low Energy Cooling", Annex 28 of the International Energy Agency, Energy Conservation in Buildings and Community Systems Programme. EMPA, Switzerland, 1998.
Assessment	Examination, Coursework and Dissertation

University	University of Dar es Salaam
Module Title	**Energy, Comfort and Buildings**
Module sequence number	SD 683
Module level	
Home academic department	Department of Structural Engineering
Teaching mode	Coursework, laboratory demonstration,
Credit points	3 Units
Prerequisites and corequisites	B.Sc.(Civil Engineering, Architecture, Environmental Engineering, Mechanical Engineering, Energy Engineering, Electrical Engineering, Physics, Geophysics, Building Economics)
Module rationale	To be able to relate energy with the climate
Module summary	Looks at climate, thermal balance, lighting and visual comfort
Keywords	Energy, Environment, buildings and climate.
Module aim	- To develop an understanding of the concept of low energy buildings in the context of renewable energy without sacrificing occupant comfort in buildings - To appreciate the techniques and design principles for energy efficient buildings. - To equip students with an understanding of the design principals and techniques used to create energy efficient buildings
Learning outcomes	Having successfully completed this module, students will be able to evaluate, propose and develop low energy concepts in relation to climate.
Syllabus	Energy, Environment and climate: Looks at climatic zones and climatic factors, effect of climate in buildings, measurement of energy in buildings, thermal balance, heating and cooling, buildings and environment, integration of renewable energies in buildings. Energy Consumption for human comfort, related standards, adaptive approach, Energy balances, lighting and visual comfort, indoor day lighting improvement.
Hard and software requirements	Light simulation software Internal and external climatic elements measurement kit Programme to interpret the collected data
Teaching and learning	Books

material	Yeang, K. Bioclimatic Skyscrapers Artemis, London, Zürich, München, 1994 Koenigsberger, Ingersoll, Mayhew, Szokolay Manual of Tropical Housing and Building Longman, London, 1974 Recknagel, H., Sprenger, E., Schramek, E.R. Taschenbuch für Heizung + Klima Technik R. Oldenbourg Verlag, München, Wien, 1995 Daniels, Klaus Advanced Building Systems; A Technical Guide for Architects and Engineers Birkhäuser Verlag, Basel, 2003
Assessment	Examination, Coursework and Dissertation