AEN 3204 WATER RESOURCES ENGINEERING

Lecturer  
Mr. Iwadra Michael  
MSc Water Resources Engineering (KULeuven, VUB, Belgium),  
MSc Hydrotechnics: Irrigation and Drainage Engineering (Moldavia),  
Fulltime Lecturer.

Course Type:  Core  (B.Sc. Agric. Engineering III)

1. COURSE DESCRIPTION

Course Credits (CU):  3 CU i.e. 45 Contact Hours per semester

Course Duration:  15 weeks (45 hours) i.e. 30 LH, 30 PH

COURSE DESCRIPTION
Water resource utilization and development, Hydrological cycle, rainfall analysis, infiltration, evaporation, run-off processes, Roof and Rock water harvesting. Ground water seepage, soil water capacity, draw-down, design of water wells. Well water pumping systems. Water resources development: weirs, flumes and stream gauge-instruments

2. COURSE OBJECTIVES

To produce agricultural engineering graduates who:
- Understand concepts of water resources engineering and its development
- Are competent in design, installation and use of water resources structures

3. RECOMMENDED REFERENCES FOR READING

4. COURSE CONTENT, METHODS OF INSTRUCTION, TOOLS AND EQUIPMENT REQUIRED

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| LECTURE 1. Introduction to water resources | Overview of global water resources  
Occurrence of fresh water resources  
Water resources and utilisation in Uganda | Interactive Lecture (2 hrs) | LCD Projector and Screen, BB/Chalk, Maps |
| LECTURE 2. Hydrological cycle | The hydrologic cycle  
Rainfall-runoff relationships  
Methods of determination of run-off (runoff coefficient, rational, phi-index, Curve Number, Unit hydrograph methods) | Lecture (2 hrs) | LCD Projector and Screen, BB/Chalk |
| LECTURE 3. Hydrological cycle | Evaporation, transpiration  
Infiltration | Lecture (2 hrs) | Projector and Screen, BB/Chalk |
| LECTURE 4 Water Harvesting | Design rainfall  
Roof water harvesting systems components  
Water storage systems and design/sizing | Lecture (2 hrs) | LCD Projector and Screen, BB/Chalk |
| LECTURE 5 Water Harvesting | Rock and hard surface harvesting systems | Lecture (2 hrs) | LCD Projector and Screen, BB/Chalk |
| LECTURE 6 Groundwater | Types of groundwater formations, aquifers  
Ground water seepage  
Darcy's Law, Hydraulic Conductivity, Transimisivity, storativity, groundwater potential | Lecture (2 hrs) | LCD Projector and Screen, BB/Chalk |
| LECTURE 7 Groundwater | Groundwater flow  
Draw down and Well flow equations | Lecture (2 hrs) | LCD Projector and Screen, BB/Chalk |
| LECTURE 8 Groundwater | Well pumping and recovery tests  
Interpretation of pumping tests (Theism method, Jacob-Cooper method, etc) | Lecture (2 hrs) | LCD Projector and Screen, BB/Chalk |
| LECTURE 9 Groundwater | Well design  
Protection of springs and shallow wells | Lecture (2 hrs) Field trip for roof water harvesting and well design and installation (8) | LCD Projector and Screen, BB/Chalk, Transport (30 |
### LECTURE 10
**Groundwater**
- Well water pumping systems
- **Lecture (2 hrs)**
- LCD Projector and Screen, BB/Chalk

### LECTURE 11
**Water resources development**
- Hydrometry
  - Water depth, level, volume measurement methods,
  - Gauging stations
- **Lecture (2 hrs)**
- Field trip for well design and installation (10 hrs)
- LCD Projector and Screen, BB/Chalk

### LECTURE 12
**Water resources development**
- Hydrometry
  - Velocity and discharge measurement
  - Float method
  - Chemical dilution, Allan’s method
  - Current meter method
- **Lecture (2 hrs)**
- Field work- depth, discharge and velocity measurement (6 hrs)
- LCD Projector and Screen, BB/Chalk

### LECTURE 13
**Water resources development**
- Weirs
  - Sharp crested weirs
  - Long crested weirs
- **Lecture (2 hrs)**
- LCD Projector and Screen, BB/Chalk

### LECTURE 14
**Water resources development**
- Flumes
  - Long throated flume
  - Short throated flume
  - H-flumes
  - Parshall flumes
- **Lecture (2 hrs)**
- LCD Projector and Screen, BB/Chalk

### LECTURE 15
**Water resources development**
- Flumes
  - H-flumes
  - Parshall flumes
- **Lecture (2 hrs)**
- Field work- weirs and flumes discharge measurement (6 hrs)
- LCD Projector and Screen, BB/Chalk

### 5. SUMMARY OF TIME NEEDED
- Interactive lectures covering theory: 30 hrs
- Class and station-based practical: 12 hrs
- Field visits: 18 hrs

### 6. OVERALL COURSE EVALUATION
- **Continuous Assessment Test**
  - At least 2 tests (first after lecture 8 and second after lecture 12)
  - Marked out of 20 each
- **Continuous Assessment (Assignments, practical, Field work)**
  - At least 1 assignment
  - Practical
  - Field trip by attendance
  - 20%
- Marked out of 20 each

Final examination

60%