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 andstream 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

- Einstein, H A. 1942. Formolas for transportation of bed load. Trans. ASCE, Volume 107.
- Garde, R J and Ranga Raju, K G ,2000. Mechanics of Sediment Transport. New age International Publishers
- Haan, C. T., B. J. Barfield and J. C. Hayes, 1994. Design Hydrology and Sedimentology for Small Catchments. Academic Press, INC., San Diego, California.
- Hudson, N., 1981. Soil Conservation. BT Batsford, London
- Chadwick, A, Morfett, J, and Borthwick, M, 2004. Hydraulics in Civil and Environmental Engineering. Spon Press
- Chow V. T., Maidment R. M. and L.W. Mays, 1988. Applied Hydrology. McGraw-Hill, Inc.
- ILRI Publication 20, 1978. Discharge Measurement Structures.
- Julien, P, 2002. River Mechanics. CambridgeUniversity Press
- Mays, L (2001) Water Resources Engineering. First Edition, John Wiley and Sons.
- Morgan, R. P. C., 1986. Soil Erosion and Conservation. Longman Group UK.
- Linsley, R K and Franzini, J B (1979) Water Resources Engineering. Third Edition, McGraw Hill, Inc.
- Raghunath, H M, 2002. Ground Water (Second Edition), New Age International Pvt. Ltd
- Ritzema H. P., 1994. Drainage Principles and Applications. Publ. 14. ILRI, Wageningen.
- Schwab G. O., R. K. Frevert, T. W. Edminster and K. K. Barnes, 1981. Soil and Water Conservation Engineering. John Wiley and & Sons.
- Smith, G.N. (1990). Elements of Soil Mechanics. Blackwell Science, 6th Edition or latest Edition.
- Sturm, T W, 2001. Open Channel Hydraulics. McGraw Hill
- Subramanya, K ,2002. Flow in Open Channels. Second edition, Tata McGraw Hill
- UESCO, 1994. Soil and Groundwater Pollution from Agricultural Activities.
- Wanielista, M., Kersten, R., and Eaglin, R. (1997). Hydrology, Water Quantity and Quality Control. John Wiley, 1st Edition.

- Wilson, E. M., 1990. Engineering Hydrology. Macmillan Press, London.

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

Lecture	CONTENT	METHOD OF INSTRUCTION / Time allocated	TOOLS / EQUIPMENT NEEDED
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	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

		hrs)	seater)
LECTURE 10 Groundwater	• Well water pumping systems	Lecture (2 hrs)	LCD Projector and Screen, BB/Chalk
LECTURE 11 Water resources development	• Hydrometry o Water depth, level, volume measurement methods, o 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 o Velocity and discharge measurement o Float method o Chemical dilution, Allan's method o Current meter method	Lecture (2 hrs) Field work- depth, discharge and velocity measurement (6 hrs)	LCD Projector and Screen, BB/Chalk Transport (30 seater) Current meter Tapes, Sounding rod
LECTURE 13 Water resources development	• Weirs o Sharp crested weirs o Long crested weirs	Lecture (2 hrs)	LCD Projector and Screen, BB/Chalk
LECTURE 14 Water resources development	• Flumes o Long throated flume o Short throated flume o H-flumes o Parshal flumes	Lecture (2 hrs)	LCD Projector and Screen, BB/Chalk Maps Flip charts, Markers, Graph paper
LECTURE 15 Water resources development	• Flumes o H-flumes o Parshal 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 20%

- At least 2 tests (first after lecture 8 and second after lecture 12)
- Marked out of 20 each

Continuous Assessment (Assignments, practical, Field work) 20%

- At least 1 assignment
- Practical
- Field trip by attendance

- Marked out of 20 each

Final examination 60%