AEN 4102 SOIL AND WATER ENGINEERING

Lecturer Dr. Mulamba Peter

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

1. COURSE

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

Principles of soil erosion, sediment transport concept.Design, construction and management of channels. Silt traps and sediment basins. Drop boxes, spillways, siphons, and dissipation structures. Drainage principles, design of drainage system tiles, ditches, pipes and construction. Terraces and other conservation structures, in-situ water harvesting. Reservoir characteristics and design. Gender considerations insoil and water conservation

2. COURSE OBJECTIVES

To produce agricultural engineering graduates who:

- Understand concepts of soil and water engineering and its importance in agricultural development
- Are competent in design, installation and use of soil and water structures

3. READING LIST

- 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. Soil Erosion	• Soil detachment agencies • Rainfall erosivity • Erodibility	Lecture (2 hrs)	LCD Projector and Screen, BB/Chalk, Maps
LECTURE 2. Sediment transport	• USLE • Sediment transport concepts	Lecture (2 hrs)	LCD Projector and Screen, BB/Chalk
LECTURE 3. Sediment transport	• Suspended and bed load transport • Measurement of suspended and bed load sediment	Lecture (2 hrs	LCD Projector and Screen, BB/Chalk.
LECTURE 4 Sediment transport	• Design of silt traps and sediment basins • Maintenance of silt traps	Lecture (2 hrs	LCD Projector and Screen, BB/Chalk
LECTURE 5 Channels	• Flow in open channels o Uniform flow o Critical flow o Hydraulic drop o Hydraulic jump • Design of earth canals	Lecture (2 hrs)	LCD Projector and Screen, BB/Chalk.
LECTURE 6 Channels	• Design of lined canals • Maintenance of canals	Lecture (2 hrs)	LCD Projector and Screen, BB/Chalk,
LECTURE 7 Channels	• Design of : o drop boxes o spill ways o siphons o energy dissipation structures	Lecture (2 hrs)	LCD Projector and Screen, BB/Chalk
LECTURE 8 Drainage	• Drainage principles • Design of drainage system o tiles, o ditches, o pipes • Drainage construction.	Lecture (2 hrs)	LCD Projector and Screen, BB/Chalk
LECTURE 9 Soil and water Conservation structures	• Design of o Terraces o Grass water ways o Contour bunds	Lecture (2 hrs) Field trip to soil and water conservation site (8 hrs)	LCD Projector and Screen, BB/Chalk
LECTURE 10 Soil and water Conservation structures	• In-situ water harvesting principles • Design of in-situ water harvesting structures	Lecture (2 hrs)	LCD Projector and Screen, BB/Chalk Transport (30 seater)
LECTURE 11	• Types of reservoirs/dams	Lecture (2 hrs)	LCD Projector and

Reservoirs	• Design criteria o Location of reservoirs o Site investigations ▪ Geological ▪ Soil(texture, hydraulic conductivity, seepage) ▪ Demand ▪ Catchment area ▪ Reservoir volume ▪ Useful life	Field trip to reservoirs (10 hrs)	Screen, BB/Chalk
LECTURE 12 Reservoirs	o Hydrological analysis ▪ Runoff ▪ Determination of capacity (Mass curve) ▪ Flood routing o Gender considerations	Lecture (2 hrs) Laboratory • (hydraulic conductivity test (permeameter) • Compaction test (proctor test) (6 hrs)	LCD Projector and Screen, BB/Chalk Maps Flip charts, Markers, Graph paper
LECTURE 13 Reservoirs	• Design of earth ponds	Lecture (2 hrs)	LCD Projector and Screen, BB/Chalk
LECTURE 14 Reservoirs	• Design of earth dams o stability analysis o seepage o core o anchorage o spillway o water abstraction	Lecture (2 hrs)	LCD Projector and Screen, BB/Chalk Maps Flip charts, Markers, Graph paper
LECTURE 15 Reservoirs	• Construction of earth dams	Lecture (2 hrs) Field work- field method of hydraulic conductivity test (auger hole) (6 hrs)	LCD Projector and Screen, BB/Chalk Maps Flip charts, Markers, Graph paper

5. SUMMARY OF TIME NEEDED

Interactive lectures covering theory 30 hrs
Class and station-based practical 12hrs
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%