

Wollo University
Kombolcha Institute of Technology
Department of Hydraulic Engineering

Hydraulic Structures & Hydropower Engineering Module				
Course Title	Basics of Hydropower Engineering			
Course Code	WRIE3154			
Degree Program	B.Sc in Water Resources and Irrigation Engineering			
Module name	Hydraulic Structures			
Module Coordinator	Name: <u>Wasihun Deribe</u> Office location : <u>WRIE Department Office</u> Mobile:; e-mail: Consultation Hours: _____			
Instructor Name	Name: <u>Endalkachew Y.</u> Office location: <u>Informatics Building, Room 203</u> Mobile:; e-mail: <u>eyesheawas@gmail.com</u> Consultation Hours: <u>Monday & Friday 10-12 :00 am</u>			
ECTS	3 ECTS			
Contact Hours (per week)	Lecture	Tutorial	Lab/Practical	Home study
	2	0	0	3
Course Objectives & Competences to be Acquired	The main objective of this course is to equip students with the basic principles of hydropower development and preliminary design of component structures in a hydropower scheme.			
Course Description/Course Contents	Introduction: sources of energy; hydropower & its development; Estimation of water power potential: firm & secondary power load prediction and demand assessment. Classification and types of hydropower development: selection of site; layouts for each type & capacity computations. Water conveyance structures: intakes, canals & tunnels; fore bay & surge tanks (water hammer analysis); penstocks; anchor blocks. Powerhouse: classification of different types; turbines-types & selection governing mechanism; cavitation's, generators and other equipment's selection of suitable equipment & compatibility: operation and organization; draft tubes and tailrace. Status, potential and study of hydropower development in Ethiopia. Alternative energy sources: Wind energy, solar energy and Technology for Biogas			
Pre-requisites	Dam Engineering I			
Status of Course	core			
Schedule/Syllabus				
Week	Contents			Teaching Materials
	1. Introduction(Lec=2hrs) 1.1. sources of energy			
	2. small scale hydropower(Lec=8hrs, Tut=10hrs) 2.1 status of small hydropower 2.2 place of small hydro power in a power system 2.3 Estimation of small hydropower potential at different locations in Ethiopia. 2.3.1 Flow duration curve 2.3.2 firm power 2.3.3 secondary power 2.3.4 load factor, 2.3.5 capacity factor 2.3.6 Utilization factor.			

	3. Small, mini, and micro hydro schemes(Lec=5hrs, Tut=5hrs) 3.1 Identification of civil works for Small, mini, and micro hydro schemes for various head. 3.2 Location of civil works for small, mini, micro hydro schemes for various head. 3.3 Layout of civil works for small, mini, micro hydro schemes for various head. 3.4 Design of civil works for small, mini, micro hydro schemes for various head. 3.5 Construction of civil works for small, mini, micro hydro schemes for various head. 3.6 Maintenance of civil works for small, mini, micro hydro schemes for various head.	
	4. Turbine and Generators for small hydro plants (Lec=5hrs, Tut=5hrs) 4.1 Design of turbine for small hydro plants 4.2 Operation of turbine for small hydro plants 4.3 maintenance and working details of turbine for small hydro plants 4.4 Design of generator for small hydro plants 4.5 Operation of generator for small hydro plants 4.6 maintenance and working details of generator for small hydro plants 4.7 Details of other equipment needed for small hydropower schemes 4.8 Portable equipment for tapping small hydro power from transient sources.	
	5. Policy for small hydro power generation and utilization in Ethiopia(Lec=3hrs) 5.1. Case studies for small hydro power generation in other countries..	
Teaching & Learning Methods	Lecture, tutorials, discussion, individual work, problem solving, project work	
Assessment	10% Quizes = Chapter 1,2&3 20% Tests = All Chapter 10% assignments = Chapter 2,3,4&5 10% project work 50% Final-exam = Chapters 4,5&6	
Attendance Requirements	A student must attend at least 75 % of the classes	
Literature	<ul style="list-style-type: none"> • Small and Mini Hydropower System Fritz New York 1984 • Hydraulic structures by Novak P • Water power engineering B.B Lal • Solar Energy Conversion Solar Cell NevilleAmsterdam 1995 • Solar Energy Utilization. Rai D.G Khanna,2004 • Non-Conventional Energy Sources Rai G.D. North America, 2004 • Wind Energy Basics: A Guide to Small and Micro Wind System Gipe Paw U.S.A 1999 	