Module and Course Profiles

1- MODULE 01
COMMUNICATION AND SOCIAL SCIENCE

Courses of the Module		
Course Code	Course Name	CP
Enla1011	Communicative English Skill	5
Enla 1012	Basic Writing Skill	5
Phil 1012	Reasoning Skills (Logic)	3
Cvet 1011	Civics and Ethical Education	5
	TOTAL	17 CP

Department of Civil Engineering	
Module Name	Communication and social science
Module Number	01
Total CP of the Module	17
Module Objectives	• Civil Engineers need to be able to communicate ideas effectively. Theobjective of this module is to equip students with written and oral skills needed for their studies, and in their working life later on. •
Module Competencies	i. Participate effectively in group discussions and team assignments, and oral and written communication. ii. Express their ideas and present their project successfully. iii. Develop good communicative skills and good in preparation of technical proposals and presentations.
Module Mode of Delivery	Basically on Semester Basis or Parallel approach
Module Learning and Teaching Method	The mode of the delivery of the module can be summarized as follows: Lecture Class room discussion Lectures supported by Audio and Videos Case studies Group Discussions Intensive Role play Debates Home Works

Module Assessment Techniques	Accounts 50% and final exam (summative) 50%, continuous assessment should comprise at least five (5) different assessment techniques.

Communicative English Skill

Course Code	Enla1011
Course Name	Communicative English Skill
Degree Program	B.Sc. in Civil Engineering

Module Name	Communication and social science		Module N^o		0ı

Study hours per week	Total CP				5 CP
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	5hrs	10hrs

Course Objectives	The aim of this course is to acquaint students with the skills of effective communication, listening skills and basic sets of managerial skills.
Course competence	Students shall develop: ☐Good communication skills. ☐Verbal and non-verbal communication skill. ☐Communicating skills useful at work. ☐Leadership, participation and conflict management skills. ☐Basic skill-sets of a manager. ☐Listening skill. ☐Oral presentation and public speech skills.

Course outline
Content

1.	Understanding communication.
2.	Communication channels and self-communication.
3.	Verbal and non-verbal communication.
4.	Communicating at work.
5.	Group leadership, participation and conflict management.
6.	Basic skill-sets of a manager.

7.	The listening skill.
8.	Oral presentation of project outcome and public speech.

Pre-requisite	None
Semester	I
Status of the Course	Compulsory
Learning Teaching Methods	Lectures, class works, assignments, group discussions, presentations
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Venables, J. (2002), Communication Skills for Engineers and Scientists, 3rd edition, Institution of Chemical Engineers. 2. Sharma, S.D. (2006), A Text Book of Professional Communication Skills and ESP for Engineers and Professionals, Sarup & Sons. 3. Hirsch, H.L. (2000), The Essence of Technical Communication for Engineers:

Basic Writing Skill

Course Code	EnLa1012				
Course Name	Basic Writing Skill				
Degree Program	B.Sc. in Civil Engineering				
Module Name	Communication and social science		Module Nº		01
Students Workload	**Total CP**			**5 CP**	
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	5hrs	8hrs
Course Objectives	The objective of the course is to improve and enhance writing skills in English. The student will develop advanced writing skills with emphases given to paragraph				
Course competence	Students shall be able familiar with the basic writing skills.				
Course Description/ Course Contents	1. Basic writing skills. 2. Principles of writing. 3. Patterns of paragraph development. 4. Mechanics of writing. 5. Essays of different discourse.				
Pre-requisite	EnLa 1021				
Semester	II				
Status of the Course	Compulsory				
Learning Teaching Methods	Gapped Lecture Assignments Brainstorming				
Assessment Techniques	**As per Bahir Dar University Academic Regulation**				

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Baker, B. A. and Baker, C. (2000), Writing with Contemporary Readings, Emc Pub. 2. Strong, W. and Lester, M. (1996), Writer's Choice Grammar and Composition, Student edition, McGraw-Hill/Glencoe. 3. Lanny, L. and Resnick, J. (2002), Text & Thought: An Integrated Approach to College Reading and Writing, 2nd edition, Longman. 4. Camp, S.C. and Satterwhite, M.L. (2004), College English and Communication, 8th edition, McGraw-Hill College. 5. John S. (2000). *The Oxford Guide to Writing and SjJeaking.* Oxford: OUP Oshima. A. and Hogue, A. *(1991).College Writing Skills:* McGraw Hill 6. Rudolph, F and Lass, A.H. (1996). *The Classic Guide to Better Writing.* New York 7. Solomon G/giorgis. (1991). *Writing for Academic Purpose.* AA U' printing press 8. Axelrod, B. and Cooper, R. (2001). *The St. Martin's Guide to Writing.6* ed. Boston: Bedford/St. Martin's

Civics & Ethical Education					
Course Code	CvEt 1011				
Course Title	Civics & Ethical Education				
Degree Program	B.Sc. in Civil Engineering				
Module Name	Communication and social science		Module N°		01
Students Workload	**Total CP**				**5 CP**
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	5hrs	8hrs
Competences to be Acquired/course level competences	**Objective** ☐ Students learn Core values of a democratic society and ethics in this course. **Outcome** ☐ Students will acquire concepts of a democratic society, values of citizenship and forms of governance in a given state.				
Course Objectives	☐ To help students to better understand the relationships among state, citizens and governing laws and a constitution. ☐ It will also help students to understand about the idea of Morality, Ethics and Civic virtues and professionalism				
Course Description	☐ The state , government and citizenship ☐ Learning about constitutions ☐ Constitutional Experience in Ethiopia ☐ Morality, Ethics and Civic virtues ☐ Professional ethics				
Course outline					
Content					

Chapter One: **Introduction to Civic and Ethical**
         Education
1.1 Basic definitions of civic and ethical education,
1.2 Basic objectives of learning civic and ethical education

Chapter Two: **Ethics**

2.1 Examine ethical issues in the context of business theory and practice

2.2 Jointly examine thoughtfully ideas and perspectives

in the field of   business ethics and extend these ideas/perspectives to administrative practice and decision making, Enhance our moral sensibility and expand our capacity for moral inquiry, dialogue, and decision.

2.3 making in ways that will be useful in our professional and civic lives

Chapter Three: **Society, State and Government**

3.1 Society and its engagement with the state,

3.2 Society and government policies,

3.3 State and government relations

Chapter Four: **Democracy**

4.1 History and development of democracy

4.2 Types of Democracy,

4.3 Values of Democracy.

Chapter Five: **Citizenship and Civic Participation**

5.1 Types of getting citizenship,

 5.2Active participation of civic societies in the affairs of their state.

Chapter Six: **Constitution and Constitutionalism**

6.1 Basic definitions of constitution and constitutionalism,

6.2 History and principles of Ethiopian constitution

Chapter Seven: **Human Rights**

7.1 Basic concepts and features of Human Rights,

7.2 Human Rights in the Ethiopian constitution.

Chapter Eight: **Applied Ethics and Civic Virtues**

8.1 More concepts on Ethics,

8.2 Types and Principles of civic Virtues

Chapter Nine: **International Relations and**
Contemporary Global Issues

9.1 Rules that govern international relations,

Pre-requisites	None
Semester	Year 1, Semester I
Status of Course	Compulsory

Mode of delivery	The mode of the delivery of the course combines the following methodologies:
	     Lecture
	     Case studies
	     Group Discussions
	     Intensive Role play
	     Debates
	Based on the above methodologies of teaching the course should have the following features:
	     Right balance between descriptive and normative contents
	     Highly Participatory and Competitive
	     Integration of the civic and ethic portions
	     Right balance between inductive and deductive Approaches

	Mode of delivery is Parallel
Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	**Suggested Course Reference Materials** The reference materials of this course comprises selected and policy documents **Policy/legal Documents**

	❑ **The FDRE Constitution, 1995**
	   ❑ **The FDRE Nationality Law, 2003**
	   ❑ **Criminal Code of Ethiopia, 2005**

	Reasoning Skill(Logic)				
Course Code	Phil1012				
Course Title	Reasoning Skill(Logic)				
Degree Program	B.Sc. in Civil Engineering				
Module	Communication and Social science				
CP Credits	**3 CP**				
Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	3hrs	0	0	2hrs	5hrs
Course Objectives	☐ Introduce the fundamental concepts of logic and logical reasoning ☐ To develop the skills required to construct arguments ☐ To develop the ability to evaluate critically ☐ To cultivate the habits of critical thinking				
Competences to be Acquired/Course level competences	**Outcome** ☐ Be able to critical thinking; ☐ Be able to construct sound arguments; ☐ Develop sensitivity to the clear and accurate use of languages.				
Course Description	☐ The nature of arguments ☐ Definitions ☐ Informal fallacies ☐ Syllogistic logic ☐ Propositional logic ☐ Induction				

Course Outline

Contents

Chapter One
   Introduction:
   1.1. What is logic and its uses. Nature of Arguments:
   1.2. Define arguments
   1.3. Non argument expressions
   1.4. Type of arguments (Deductive and Inductive)\
   1.5. Validity and Invalidity: Truth and Falsity
   1.6. Sound and Unsound Arguments
   1.7. Strength and weakness: Truth and Falsity
   1.8. Cogent and unclogging arguments
   1.9. Evaluating an arguments

Chapter Two
   Definitions:
2.1   Cognitive and Emotive meaning of terms Intension and Extension of term
2.2   Definitions and their purposes
2.3   Definitional Techniques
2.4   Criteria for lexical definition

Chapter Three
   Informal Fallacies:
   3.1 Fallacies of Relevance
   3.2   Fallacies of Weak Induction
   3.3 Fallacies of Presumptions
   3.4 Fallacies of Ambiguity
   3.5 Fallacies of Grammatical Analogy

Chapter Four
   Syllogistic Logic:
   4.1 Categorical Propositions: Standard Form and
        Types
   4.2 Square of Oppositions: Traditional and Modern
   4.3 Role of Immediate Inference and Formal fallacies
   4.4 Categories Syllogism: Standard Form, Mood and Figure
   4.5 Syllogistic Rules and Formal Fallacies
   4.6 Methods of Testing Validity

Chapter Five
   Prepositional Logic:
   5.1   Compound propositions and Prepositional
         Connectives
   5.2 Truth Functional Connectives & the Truth
        Values of Propositions
   5.3 Prepositional Type arguments and formal fallacies
   5.4 Symbolizing Prepositions and prepositional

arguments
5.5 Rule for prepositional logic: rule of implication and Rule of equivalence
5.6 Natural deduction

Chapter Six
Induction:
6.1 Analogy and legal and moral reasoning
6.2 Causality and Mill's Methods
Hypothetical Reasoning

Pre-requisites	None
Semester	Year 1, Semester I

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Teaching & Learning Methods	The mode of the delivery of the course combines the following methodologies: 　　　Lecture 　　　Class room discussion 　　　Case studies 　　　Group Discussions 　　　Intensive Role play 　　　Debates 　　　Home Works
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**
Literature	1. Hurley, P.J. (2005). A Concise Introduction to Logic, 6th Edition. 2. Belmarnt: Wadsworth Publishing Company. 3. Stephen, C. (2000). The Power of Logic. London and Toronoto: Mayfield Publishing Company. 4. Copi, Irving M. and Carl Cohen " Introduction to Logic" , New York: Macmillan Publishing company 2001 5. Fogilin, Robert J. " Understanding arguments: An Introduction to Informal Logic", New York: Harcourt Brace Jovanovich Publishing company 2001 6. Guttenplan , Samuel" The Language of Logic" : Oxford: Blackwell Publishers, 2000 7. Stephen C. " The Power of Logic" Londoan and Toronto: Mayfield Publishing Company, 2000 8. Walelign Emiru "Freshmen Logic" ,Addis Ababa:"Commercial Printing Enterprise, 2005 9. Simico N. D. and G.G. James " Elementary Logic" , Belmont Ca: 2nd ed. Wadswoth Publishing Company, 1999.

2- MODULE 02
MANAGEMENT AND ENTERPRENEURSHIP

Courses of the Module		
Course Code	Course Name	CP
IEng 5021	Entrepreneurship for Engineers	4
Econ 2021	Introduction to Economics	4
	TOTAL	8 CP

Department of Civil Engineering	
Module Name	**MANAGEMENT AND ENTERPRENEURSHIP**
Module Number	02
Total CP of the Module	8
Module Mode of Delivery	Basically on Semester Basis or Parallel approach

Module Learning and Teaching Method	The mode of the delivery of the module can be summarized as follows:
	     Lecture
	     Tutor
	     Case studies
	     Group Discussions
	     Debates
	     projects

Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**

Civil Engineering Regular Program				
Course Code	Econ1021			
Course Title	Introduction to Economics			
Degree Program	B. Sc. in Civil Engineering			
Module	**Management and entrepreneurship**			
CP Credits	**4 CP**			
Study Hours (per week)	Lecture	Tutorial	Practice or Laboratory	Home Study
	2hrs	3hrs	0	3hrs
Course Objectives & Competences to be Acquired	To introduce students to the basic principles and concepts of economics. This will enable students to easily communicate in common economic terms.			
Course Description/Course Contents	An introduction to economics and economy, • National income, employment and fiscal policy, • Money, banking and monetary policy. • Introduction to Macro economics, • Introduction microeconomics and product markets This course gives an intuitive understanding about the factors that drive the economic elements of a system. In completing this course students will develop basic skills which will be useful especially if students prefer to take the Construction Management & construction Equipment			
Pre-requisites	None			
Semester	Year 1, Semester 1			
Status of Course	Compulsory			
Teaching & Learning Methods	Lectures, tutorials			
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**			
Attendance Requirements	A student must attend at least 85 % of the classes			

Literature	1. Introduction to Economics by Stockman, South-Western College Pub; 2 edition (January 1999) 2. Introduction to Economics [STUDENT EDITION] by Edwin Dolan, Best Value; 1st ed. 2008 edition (2008) 3. Principles of Economics, 4th Edition by N. Gregory Mankiw, South-Western College Pub; 4 edition (February 2006)

Department of Civil Engineering	
Course Code	IEng 5021
Course Title	**Entrepreneurship for Engineers**
Degree Program	B.Sc. in Civil Engineering

Study hour per week	**4 CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	3hrs	8hrs

Course Objectives	The objective of the course is to equip students with efficient entrepreneurial skills in Engineering.
Competences to be Acquired/course level competences	Students shall demonstrate understanding of market identification and assessment techniques, new business idea development, fundamentals of finance & marketing, intellectual property protection, soliciting funding, and successful business partnership.
Course Description	- What it takes to be an entrepreneur - How to assess markets to identify new opportunities - How to value a new business idea - Fundamentals of Finance - Fundamentals of Marketing - How to protect intellectual property - How to put together a successful business plan - How to solicit funding - How to hire and grow a start-up business - How to partner for success.
Course outline	
Pre-requisites	**None**
Semester	Year 3, Semester I
Status of Course	Compulsory
Mode of delivery	Lectures, tutorials and projCP

Mode of assessment	**As per Bahir Dar University Academic Regulation**

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1 .Weichert, D., et al. (2001), Educating the Engineer for the 21st Century, 1st edition, Springer. 2. Schoonhoven, C. & Romanelli, E. (2001) The Entrepreneurship Dynamic: Origins of Entrepreneurship and the Evolution of Industries, 1st edition, Stanford Business Books. 3. Payne, A.C. et al. (1996), Management for Engineers, John Wiley & Sons.

3- MODULE 03
GENERAL ENGINEERING

Courses of the Module		
Course Code	Course Name	CP (CP)
GEng 1031	Introduction to Engineering Proffesion	2
MEng 2032	Mechanical Workshop Practice	2
MEng 1031	Engineering Drawing	5
coSc 1032	Introduction to Computer & Programming	4
	TOTAL	12 CP

Department of Civil Engineering	
Module Name	General Engineering Skills
Objectives	The objectives of this module is: □ To offer an introduction to the Engineering professionalism and basic Engineering skills particularly in the field of Civil Engineering. □ To introduce students to broader views of various Engineering disciplines □ To enable students to interpret and prepare drawings and visualize 3D objCP
Competencies	i. Prepare Engineering drawing manually. ii. Able to make basic computer programming. iii. Able to make informed decision in choice of Engineering discipline. iv. Develop ability to use and apply the techniques, skills and Engineering t o o l s n e c e s s a r y f o r E n g i n e e r i n g p r a c t i c e a n d general workshop safety and practice skill.
Module Mode of Delivery	Basically on Semester Basis or Parallel approach
Module Learning and Teaching Method	The mode of the delivery of the module can be summarized as follows: Lecture Tutorials Laboratory Practice Group Discussion Home Works
Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**

	Engineering Drawing	
Course Code	MEng 1031	
Course Name	Engineering Drawing	
Degree Program	B.Sc. in Civil Engineering	
Module	General Engineering	
Cp Credits	5 CP	
Study Hour per week	☐ Lecture…………………… 2 hrs ☐ Laboratory …………...…… 3 hr ☐ Home Study ………....… 5 hrs	
Objectives	☐ To provide students with the concepts of technical drawing. ☐ To provide students with the basic contents of technical drawing like projection, views, multi view and pictorial drawings, intersection and development.	
Competencies	At the end of the course, students would understand: ☐ The different types of projection techniques ☐ How to sketch multi – view drawings of any given pictorial drawings ☐ How to sketch pictorial drawings of given multi – view drawings ☐ Sketching auxiliary and sectional views as a supplement of multi – view drawings. ☐ How to find intersection lines of different geometries and development of surfaces.	

Course Description/ Course Contents
Content
1. Introduction: History of technical drawing and objective of the course
2. Theory of Projections: Types and classifications of projections
.3- Multi – View Drawings: Systems of projection; Choice of views, Laying out of views; Projection of lines, planar and non- planar lines; Tangent surfaces; Fillets; Rounds; Run-outs.
4. Pictorial Drawings: Comparison between multi-view and pictorial drawings; Axonometric; Oblique and central projections; Isometric and oblique drawings.
5. Auxiliary Views: Primary and secondary auxiliary views; Complete and partial auxiliary views
6. Sectional Views: Making sectional drawings; Types of sections; Conventional representations; Sectional auxiliary views; Sections in pictorial drawings

7. Intersections and Development of Simple Transition Pieces		
Pre request		NOON
semester		ONE
Status of the Course	Compulsary	
Module Learning and Teaching Method	Lecture Tutorials Group Discussion Laboratory HomeWorks	
Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**	
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be	
	penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be	
Literature	1. French, T. E. and Helsel, J. D. (2003), Mechanical Drawing: Board and CAD Techniques, Student Edition, 13th edition, Glencoe/McGraw-Hill. 2. Giesecke, F.E., Mitchell, A., Spencer, H.C. and et al. (2002), Technical Drawing, 12th edition, Prentice Hall.	

Introduction to Engineering Profession	
Course Code	GEng1031
Course Name	Introduction to Engineering Profession
Degree Program	B.Sc. in Civil Engineering
Module	General Engineering Skills
CP	2 CP
Study Hour per week	□ Lecture …………………………… 2 hrs □ tutor ……………………..0 hrs □ Home Study ………...……......... 2h rs
Objectives	□ Acquaint students with different areas of Engineering discipline. □ To introduce students to the concepts and field of Engineering as a whole. □ Explain the different types of Engineering profession.
Competencies	Students will be familiar with different areas of specialization of Engineering
Course Description/ Course Contents	□ An introduction to the Engineering profession □ Overview of different fields of Engineering. □ Engineering Ethics.

Course Content
Chapter 1: Introduction to Engineering Skill 1.1. What is Engineering? 1.2. Engineering Thinking 1.3. Problem solving strategies 1.4. Application of Engineering Experience **1.5. Failure – Design, Construction, Operation or Maintenance?** **1.6. Attributes of the Engineer**
Chapter 2: Engineering Career **2.1. What does an Engineer do?** 2.2. What types of Engineers are there? 2.3. How Does An Engineer Do Things?

Chapter 3: Engineering Design Methods 3.1. Elements of Engineering Design and the Process 3.2. Design Considerations 3.3. Design Methodology	
Chapter 4: Engineering Ethics 4.1. What is Engineering ethics? 4.2. Fundamental principles of Engineering Ethics 4.3. General rules (Fundamental Canon)	
Chapter 5: Engineering Disciplines 5.1 Engineering Disciplines 5.2 Seminar presentation.	

Pre-requisite	None
Semester	I
Module Learning and Teaching Method	Lecture Tutorials Group Discussion Home Works
Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**
Course Policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.

Literature	Landis, R. B. (2001), Studying Engineering, 2nd Edition, Discovery Press, Burbank, CA.

	References:
	    "Engineering in History", Richard Shelton Kirby, et al, Dover, 1990.
	    "Beyond Engineering: How Society Shapes Technology", Robert Pool, Oxford University Press,
	     1997.
	    "Engineering: An Introduction to a Creative Profession: Fifth Edition", Beakley, Evans, Keats,
	     Macmillan Publishing Company, 1986. .

Mechanical Workshop Practice			
Course Number	MEng 2032		
Course Title	Mechanical Workshop Practice		
Degree Program	BSc in Civil Engineering		
Module	General Engineering		
CP	2		
Contact Hours	Lecturer	Tutorial	Practice or Laboratory	Home study
	1	0	3	0
Course Objectives	The course is intended to give the student • practical training on basic workshop technology on bench work, sheet metal fabrication;		
Course Description	Introduction to Bench work; Wood work, Metal work, cutting with thread of conventional machine tools; Operation and maintenance of appliances and machines; Welding, brazing and soldering; Measuring and testing.		
Course Outline	Unite 1.Bench Work Unite2.Wood Work Unite3.Metal Work using Conventional Machines Unite4.Welding: Welding; Brazing; Soldering. Unite5.MeasuringandTesting		
Pre-requisites	None		
Semester	2nd		
Status of Course	Compulsory		
Teaching & Learning Methods	• Introductory lectures; • Workshop exercises • Individual advising on project work		
Evaluation & Grading System	As per Bahir Dar University Legislation		
Attendance Requirements	• 100% attendance during workshop sessions		
Literature:	Compiled Manual to be supplied by the instructor		

Department of Civil Engineering	
Course Code	Comp 2031
Course Name	Introduction to Computer and Programming
Degree Program	B.Sc. in Civil Engineering
Module	General Engineering Proffession
Cp Credits	5 CP
Study Hour per week	☐ Lecture …………………………………………… 2hrs ☐ Laboratory………………………………………… 3hrs ☐ Home Study …………...............................……........... 3hrs
Objectives	☐ To introduce students to computer based problem solving. ☐ To enable students to design, develop, compile and debug programs in a high level programming language. ☐ To enable students to develop programs to solve numerical Engineering problems.
Competencies	Students shall be familiar with computer and programming language and shall be able to plan, analyze and write computer programs for basic Engineering problems.
Course Description/ Course Contents	☐ Introduction to computers: hardware, software. ☐ Number representation in computers: fixed and floating–point numbers. ☐ Fundamental programming concepts: program organization, modularity in programming, algorithms, flow charts. ☐ Data types: intrinsic and user-defined data types, variables, initialization, assignment statements, control statements, loops. ☐ Input and output statements; files for input and output. ☐ Intrinsic and user-defined subprograms. ☐ Possible language: FORTRAN (latest version) or C^{++} or Visual Basic.
Pre-requisite	None
Semester	III
Status of the Course	Compulsory
Learning Teaching Methods	Lecture Laboratory Practice Group Discussion Home Works
Assessment Techniques	**As per Bahir Dar University Academic Regulation**

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Glassborow, F. (2004), A Beginners Introduction to Computer Programming, Wiley. 2. Chapman, S.J. (2003), Fortran 90/95 for Scientists and Engineers, 2nd edition, McGraw-Hill Science /Engineering /Math. 3. Brain, D.H. (1996). Fortran 90 for Scientists and Engineers 4. Smith, I.M. (1995). Programming in Fortran 90 5. Dida Midekso. (1994). Introduction to Computer Science. Addis Ababa printing press. 6. C++: An Introduction to Computing, 2nd edition (Adams, Leestma, and Nyhoff; Prentice-Hall, 1998) 7. Halterman, Richard. Fundamentals of Programming and Software Design in Java. 2001. 8. Thinking in C++, 4th Edition (Sunil K. Pandey GTBP1, New Delhi) 9. C++ How to program, Fifth Edition (By H. M. Deitel - Deitel & Associates, Inc., P. J. Deitel - Deitel & Associates,) 10. Java How to program, sixth Edition (By H. M. Deitel - Deitel & Associates, Inc., P. J. Deitel - Deitel & Associates,)

4- MODULE 04
APPLIED MATHEMATICS

Courses of the Module		
Course Code	Course Name	CP
Math 1041	Applied Mathematics I	6
Math 1042	Applied Mathematics II	6
Stat 1043	Probability and Statistics for Engineers	4
Math 2041	Applied Mathematics II	6
CEng 2042	Numerical Methods for Numerical and Computational Methods	4
	TOTAL	26CP

Civil Engineering Regular Program	
Module Number	**03**
Rationale and objective of the module	The primary objective of the module is to equip the student with a number of fundamental theories and techniques of mathematical science useful in engineering. Besides, the student will learn the fundamental theories of Probability and Statistics for Engineers.
Module Objective	Short narrative on the aims and characteristics of the module: The student shall acquire the fundamentals of linear algebra. Including ♦ Vector spaces, vector equations ♦ Systems of linear equations, matrices ♦ Analytical geometry ♦ Complex numbers\Complex number integrals ♦ Series ♦ Partial differential equations ♦ Probability theories ♦ Statistical analysis ♦ And basic Numerical and Computational Methods The students will be exposed to methods of solving ordinary differential equations as well..
Module Competencies	After completion of this module the students shall be able to; ☐ Model and analyze Engineering problems by applying concepts of calculus, vector algebra, and Probability and Statistics for Engineers
Module Mode of Delivery	Basically on Semester Basis or Parallel approach

Module Learning and Teaching Method	The mode of the delivery of the module can be summarized as follows: Lecture Tutorials Group Discussion Home Works
Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**

Civil Engineering Regular Program				
Course Code	Math 1041			
Course Title	Applied mathematics I			
Degree Program	B. Sc. in Civil Engineering			
Module	APPLIED ENGINEERING MATHEMATICS			
CP Credits	**6 CP**			
Study hours per week	Lecture	Tutorial	Practice or Laboratory	Home study
	3hrs	3hrs	0	6hrs
Course Objectives & Competences to be Acquired	The student will learn the basics of vectors, matrices, integrals and, sequences and series and solve problems within technical and scientific problems.			
Course objective	This course covers Vectors and vector spaces, Matrices and determinants, Limit and continuity, Derivatives and application of derivatives, Integration and Application of Integrs			

Course outline

Content

1. **Vectors and vector spaces**
   Plane Vector
   - Addition and scalar multiplication
   - Space vectors
   - Scalar product and vector product

   - Lines in plane
   - Lines in space, planes in space
   - Applications

2. **Matrices and determinants**
   - Matrix
   - Addition, scalar multiplication, product of matrices
   - Transpose
   - Determinant
   - Inverse
   - Applications

3. Limit and continuity

- ☐ Definition of limit and examples
- ☐ Basic limit theorems
- ☐ One-sided limits
- ☐ Infinite limits and limit at infinity
- ☐ L'Hopital's rule
- ☐ Continuity of a function.

4. Derivative & application of derivatives

5. Inverse functions and their derivatives and application

- ☐ Inverse functions
- ☐ Inverse trigonometric functions
- ☐ Hyperbolic functions and their inverses
- ☐ Derivatives of inverse functions
- ☐ Derivatives of trigonometric functions and their inverses
- ☐ Derivatives of hyperbolic functions and their inverses
- ☐ Implicit differentiation, higher order derivatives
- ☐ Application of derivatives

6. Techniques of integration and their application

- ☐ Integration by parts
- ☐ Integration by substitution
- ☐ Trigonometric integral
- ☐ Trigonometric substitution
- ☐ Integration by partial fractions
- ☐ Improper integrals

          Application of Integrals

Pre-requisites	**None**
Semester	Year 1, Semester I
Status of Course	Compulsory
Mode of delivery	Lecture Tutorials Group Discussion Home Works
Mode of assessment	**As per Bahir Dar University Academic Regulation**

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Robert Ellis and Denny Gulick: Calculus with Analytic geometry 2. Sherman K. Stein and Anthony Barcellos: Calculus and Analytic geometry 3. A.C. Bajpai: Engineering Mathematics 4. Richard E. Johnson: Calculus with Analytic geometry 5. Frank Ayres: Calculus Schaum's outline series 6. Larson, R., Hostetler, R. P., and Edwards, B.H. (2005), Calculus with Analytic Geometry, 8th edition, Houghton Mifflin Company. 7. S.Lang (2004), Linear Algebra, 3rd edition, Springer. 8. Stewart, J. (2002), Calculus, 5th edition, Brooks Cole.

	Applied Mathematics II
Course Code	Math 1041
Course Title	Applied Mathematics II
Degree Program	B.Sc. in Civil Engineering
Module	**Applied Mathematics**

Study hour per week	**6CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	3hrs	**3hrs**	**0**	**6hrs**	**12hrs**

Course Objectives	Students will learn about representations of transdental functions in Taylor series and Maclaurain series. Moreover, student will be introduced the calculus of functions of several variables
Competences to be Acquired/course level competences	Students will learn the application of Taylor Series, Macluarian Series, Fouries Series in solving Engineering problems. Moreover, they will be able to differentiate and integrate functions of several variables during applications to various Engineering problems.
Course Description	This course covers sequences, series, power series, and Fourier series; differential and integrals calculus of functions of several variables and their applications, and multiple integral.

<div align="center">Course Outline</div>

<div align="center">**Course Contents**</div>

<div align="center">**Chapter 1: Sequence and series (30hrs.)**</div>

1.1. Definition and types of sequence
1.2. Convergence properties of sequences
1.3. Subsequence and limit points
1.4. Definition of infinite series
1.5. Convergence   and   divergence,   properties   of convergent series

1.6. Nonnegative term series
1.7. Tests of convergence (integral, comparison, ratio and root tests)
1.8. Alternating series and alternating series test
1.9. Absolute and conditional convergence
1.10. Generalized convergence tests

Chapter 2. Power series (14hrs.)

2.1. Definition of power series at any   and

2.2. Convergence and divergence, radius and interval of convergence

2.3. Algebraic operations on convergent power series

2.4. Differentiation and integration of power series

   Taylor series; Taylor polynomial and application

Chapter 3: Differential calculus of function of several variables (30hrs.)

3.1 Notations, examples, level curves and graphs

3.2 Limit and continuity

3.3 Partial derivatives; tangent lines, higher order partial derivatives.

3.4 Directional derivatives and gradients

3.5 Total differential and tangent planes

3.6 Applications: tangent plane approximation of values of a function

3.7 The chain rule, implicit differentiation

3.8 Relative extrema of functions of two variables

3.9 Largest and smallest values of a function on a given set

   ☐ Extreme values under constraint conditions: Lagrange's multiplier

Chapter 4: Multiple integrals (26hrs.)

4.1 Double integrals and their evaluation by iterated integrals

4.2 Double integrals in polar coordinates

4.3 Application: Area, center of mass of plane region, surface

4.4 Triple integrals in cylindrical and spherical coordinates

   Application: Volume, center of mass of solid region.

Pre-requisites	Math1041
Semester	Year 1, Semester II
Status of Course	Compulsory
Mode of delivery	Lecture Tutorials Group Discussion Home Works
Mode of assessment	**As per Bahir Dar University Academic Regulation**

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. [1]Ellis, R. and Gulick, D. (1998), Calculus with Analytic Geometry, 5th edition, Harcourt. 2. Ron Larson, Robert P. Hostetler, and Bruce H. Edwards, Calculus with analytic Geometry, 8th ed, 2005.
	3. C. Henry Edwards and David E. Penney, Calculus with analytic Geometry: 6th Edition, 2002. 4. Dennis G. Zill , A 1st course in Differential Equations, 5th ed. 2000. 5. [5]Erwin Kreyszig (2005), Advanced Engineering Mathematics, 9th edition, Wiley 6th

Applied Mathematics III	
Course code	Math 2041
Course Title	Advanced Mathematics
Degree Program	B.Sc. in Civil Engineering
Module	**Applied mathematics**

Study hour per week	**6 CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	
	3hrs	3hrs	0	6hrs	

Competences to be Acquired/course	☐ **Objective:** The objective of the course is to offer an introductory treatment of ordinary partial differential equations, vector analysis and complex analysis that arise in Engineering. Students shall understand the fundamental theories and applications of ordinary partial differential equations, vector and complex analyses in Civil Engineering.
level competences	At the end of this course, students will be able to solve ODEs and PDEs. Moreover, they will be able to use Complex Functions in Engineering Applications.
Course Description	☐ This course covers First order differential equations, second order differential equations, Vector differential calculus, Line and surface integral, Complex analytical functions and complex integrals, Taylor and Laurent Series, Integration by the method of residue

COURSE OUTLINE
Course content

1.   Ordinary Differential Equations, ODEs
     1.1 Ordinary Differential Equations of the first order
   1.1.1 Basic Concepts, modeling
   1.1.2 Separable Equations
        1.1.3 Homogeneous   Differential equations

.1.4 Exact Differential Equations

  1.2 Linear   first   Order   Differential   Equations **Ordinary Linear Differential equations of the second order**

       1.2.1 Homogeneous Linear Differential

                equations of the second order

       1.2.2 Method   for   solving   non homogeneous linear differential equations

  1.3 **Laplace Transforms**

       1.3.1 Laplace   Transform.   Inverse Transform. Linearity. s-Shifting

       1.3.2 Transforms   of   Derivatives   and

                Integrals. ODEs

       1.3.3 Differentiation and Integration of Transforms.

       1.3.4 Systems of ODEs

2. **Fourier series**

  2.1 Fourier series and integrals

  2.2 The complex Fourier series and integrals

  2.3 Forced Oscillations

  2.4 Fourier and Laplace transformations

  2.5 Fourier cosine and sine transformation

  2.6 Differentiation and integration of Laplace transformations.

3. **Vector calculus**

  3.1 Gradient of a scalar field

  3.2 Divergence of a vector field

  3.3 Curl of a vector field

  3.4 Line integrals

  3.5 Surface integrals

  3.6 Gauss   divergence   theorem   and   its application

4. **Complex analysis**

  4.1 Complex Analytic Functions.

  4.2 Complex Integrals.

     Integration by method of residue

Pre-requisites	Math1042
Semester	Year 2, Semester I
Status of Course	Compulsory
Mode of delivery	Lecture Tutorials Group Discussion
Assesment	**As per Bahir Dar University Academic Regulation**

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course.
REFERENCES	. 1. Erwin Kreyszig (2005). Advanced Engineering Mathematics. 9th edition, Wiley.

Department of Civil Engineering	
Course Code	Stat1043
Course Title	Probability and Statistics for Engineers
Degree Program	B.Sc. in Civil Engineering
Module	**Applied mathematics**

Study hour per week	**4CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	2hrs	0	3hrs	7hrs

Course Objectives	**After successful completion of this course the students shall have a general understanding of the:** ☐ Methods of collecting statistical data (specifically sampling techniques) ☐ Summarizing data (construction of frequency distributions) ☐ Basic concepts and computations of probability, ☐ Different probability distributions (continuous and discrete), ☐ Making inferences (estimation of population parameters and tests of hypotheses)
Competences to be Acquired/course level competences	Students will be able to: ☐ Understand the concepts of Probability and Statistics for Engineers. ☐ Acquire basic knowledge of fundamental probability distribution functions, discrete and continuous, univariate and multi-variate. ☐ Estimate and interpret correlation coefficient. ☐ Carry out point and interval estimations involving normal populations. ☐ Understand hypothesis testing and the meaning of the null hypothesis. ☐ Have an appreciation for Monte Carlo simulation techniques. ☐ Participate in Engineering projCP that embody probabilistic and statistical components.
Course Description	This course introduces ☐ Probability theory. ☐ Random variables and random distribution. ☐ Discrete and continuous density functions. ☐ Bivariate distribution. ☐ Introduction to statistics. ☐ Frequency distributions. ☐ Measures of central distribution and dispersion. ☐ Regression and correlation coefficients
Course Outline	
Course Content	

CHAPTER ONE: INTRODUCTION

Meaning of the Term Statistics; Some Basic Terminologies (Population, Sample, Parameter, Statistic, Qualitative variable, Quantitative variable-Discrete& Continuous); Descriptive & Inferential Statistics

CHAPTER TWO: FREQUENCY DISTRIBUTIONS Absolute   Frequency   Distributions
            (Discrete data, Continuous   data);   Relative Frequency   Distributions; Cumulative Frequency Distributions

CHAPTER THREE: NUMERICAL SUMMARIES OF DATA
PART A: The Arithmetic Mean (Simple, Weighted, and
        Combined); the Median; the mode; Quartiles.
PART B: The Range & Coefficient of the Range; The Interquartile Range & Coefficient of the Interquartile Range; The Standard deviation &
  Coefficient of Variation

CHAPTER FOUR: BASIC PROBABILITY CONCEPTS
*Elements of Set Theory; Combinatorial Problems
(Multiplication principle, Permutations, and Combinations); Some Probabilistic Terms (Random experiment, Outcome, Sample space, Event, Mutually exclusive, Exhaustive, Equally likely); Definition of Probability (Classical definition, Relative frequency definition, and Axiomatic definition); Additive Theorem of Probability; Conditional Probability; Multiplicative Theorem of Probability; Bayes' Formula; Independent Events

CHAPTER FIVE: RANDOM VARIABLES
General Notion of a Random Variable; Discrete Random Variables & Probability Mass Functions (Pdf); Continuous Random Variables & Probability Density Functions(Pdf);

Cumulative Distribution Function(Cdf); The Expected
Value of an R.V.; The Variance of an R.V.; Tchebichev's
Inequality

CHAPTER SIX: SPECIAL DISTRIBUTIONS
The Binomial Distribution; The Poisson Distribution; The Poisson Approximation to the Binomial Distribution; The Uniform (or Rectangular) Distribution; The Normal (or Gaussian) Distribution

Pre-requisites	None
Semester	Year 2, Semester I
Status of Course	Compulsory
Mode of delivery	Lecture Tutorials Group Discussion Home Works

Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	**REFERENCES** . 1) Bluman, A.G. Elementary Statistics: A Step by Step approach (3rd ed.). 2) DeGrot, M.H. (1989). Probability and Statistics (2nd ed.), Addfson-Wesley Publishin'g Co. 3) Johnson, R. (2005). Miller and Freund's Probability and Statistics for Engineers for Engineers
	4) Meyer P.L. (1989). Introductory Probability and Statistical Application (2nd ed.), Addison-Wesley. 5) Soong, T.T. (2004). Fundamentals of Probability and Statistics for Engineers for Engineers, John Wiley & Sons Ltd. 6) Spiegel, M.R. & Stephens, L.J. (2008). Schaum's Outlines: Theory and Problems of Statistics (4th ed.) McGraw-Hili Inc 7) Tijms, H. (2007). Understanding Probability (2nd ed.), Cambridge University Press.

Numerical and Computational Methods				
Course Code	CEng2042			
Course Title	Numerical and Computational Methods			
Degree Program	B.Sc. in Civil Engineering			
Module	**Applied mathematics**			
Study hour per week	**4CP**			
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	0	3hrs	3hrs	8hrs
Course Objectives	Enabling students to apply knowledge of linear algebra and differential equations in the context of Engineering problem-solving. Introduce classical and contemporary Engineering problems to students at the lower division level.			
Competences to be Acquired/course level competences	At the end of this course, students will be able to: ☐ To perform a range of matrix and vector operations. ☐ Solve mathematical models of Engineering systems and/or components. ☐ Find roots of nonlinear equations. ☐ Solve systems of linear and non-linear equations. ☐ Perform least-squares fitting of a curve to data. ☐ Numerically integrate ordinary differential equations.			
Course Description	This course covers ☐ Mathematical Modeling ☐ Roots of Equations ☐ Linear Algebraic Equations ☐ Curve Fitting ☐ Numerical Differentiation and Integration ☐ Numerical Solution ff ODE			

Course Outline
Content
1. Mathematical Modeling, Number System and Errors
2. Roots of Equations
3. Solution of Non-linear Equation: 3.1 Bisection method   3.2 Secant method;   3.3 Newton's method
4. Curve Fitting: 4.1 Least square Regression;   4.2 Interpolations   4.3 Fourier Approximations

5. **Solutions of Systems of Linear Algebraic Equations**: 5.1 Matrix-Inversion 5.2 Gauss-Siedle Iteration 5.3 Gaussian-Elimination 5.4 LU-Decomposition	
6. **Numerical Differentiation & Integration:** 6.1 Trapezoidal-Rule 6.2 Simpson's Rule; 6.3 Gauss-Quadrature; 6.4 Romberg's Integration	
7. **Eigen Values and Eigen Vectors**	
8. **Numerical Solution of ODEs**: 7.1. Euler's method; **7.2.** **Runge-Kutta method**	
9. Working with MAT LAB and Excel Application in Numerical Method	

Pre-requisites	Comp2064
Semester	Year 2, Semester II
Status of Course	Compulsory
Mode of delivery	Lecture Laboratory Practice Tutorials Group Discussion Home Works
Mode of assessment	**As per Bahir Dar University Academic Regulation**
	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to
Literature	REFERENCES . 1. Chapra C.S. and Canale P.R. (2005), " Numerical and Computational Methods for Engineers with Programming and Software Application", 5th edition, McGraw-Hill Education. **2. Rao, S.S. (2002), Applied Numerical and Computational**

5- MODULE 05
SURVEYING

Courses of the Module		
Course Code	Course Name	CP
CEng 2051	Surveying I	4
CEng 2052	Surveying II	4
	TOTAL	8 CP

Department of Civil Engineering	
Module Title	SURVEYING
Module Number	**06**
Rationale of the module	Measurement lies at the heart of every Engineering design. Before realizing any project on the ground, one has to take accurate measurement such as topographic, bathymetric and so on to accurately locate the point of implementation with reference to given sound datum. Hence, this module exposes the student with the know-how of geodetic measurement.
Module Objectives	☐ Learn theory and field work in construction and land surveying. ☐ Familiar with the use of surveying equipment and the preparation of field book records. ☐ Understand basic introduction to GIS and remote sensing. Moreover, interpretation of aerial imagery is also dealt with.
Module Competencies	After completion of this module the students shall be able to; ☐ understand surveying work principles, ☐ Use of surveying equipment and apply the knowledge through field practice.
Module Mode of Delivery	Basically on Semester Basis or Parallel approach
Module Learning and Teaching Method	The mode of the delivery of the module can be summarized as follows: Lecture Laboratory Practice Field Practice Tutorials Group Discussion Home Works
Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**

<table>
<tr><td colspan="6" align="center">**Department of Civil Engineering**</td></tr>
</table>

Course Code	CEng 2051
Course Title	Surveying I
Degree Program	B.Sc. in Civil Engineering
Module	Surveying

Study hour per week	4 CP				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	0	3hrs	3hrs	8hrs

Course Objectives	**Up on successful completion of the course, students will be able to:** ☐ Know basic principles of geodetic surveying and land information system. ☐ Accurately measure distances and angles using high precision and up-to-date surveying equipment at the end of this course.
Competences to be Acquired/course level competences	Student understand surveying work principles, use of surveying equipment and apply the knowledge through field practice
Course Description	☐ Introduction and Basic definitions ☐ units of measurement, theory of errors and their adjustments ☐ types of surveys ☐ measurement of angles, distance & heights ☐ bearing & azimuth of a line ☐ leveling;

<table>
<tr><td align="center">Course outline</td></tr>
<tr><td align="center">Course Content</td></tr>
</table>

Chapter One
INTRODUCTION
1.1 Definition
1.2 Need for Surveying
1.3 Types and Principles of Surveying
1.4 Sources of Error Precision and Correction

Chapter Two

MEASUREMENT OF HORIZONTAL DISTANCES

2.1. Introduction

2.2. Methods of Measurement

2.3. Chain Surveying/ Taping

2.3.1. Principle of Chain Surveying

2.3.2. Miscellaneous Taping and Ranging Operation

2.4. Sources of Errors Precaution and Corrections

     2.4.1. Sources of Errors

     2.4.2. Correction for Errors in tape Measurement

Chapter Three

MEASUREMENT OF VERTICAL DISTANCES

3.1. Introduction

3.2. Methods of leveling

3.3. Types of Spirit Level

  3.3.1. Differential Leveling

  3.3.2. Reciprocal Leveling

  3.3.3. Profile Leveling

  3.3.4. Cross-section Leveling

  3.3.5. Trigonometric Leveling

3.4. Errors and Mistakes in Leveling

Chapter Four

MEASUREMENT OF ANGLES AND DIRECTIONS

4.1. Introduction

4.2. Methods of Describing Directions

4.3. Methods of Describing angles

  4.3.1. Interior Angles

  4.3.2. Deflection Angles

  4.3.3. Angles to the Right

  4.3.4. Magnetic Compass

  4.3.4.1. Magnetic Declination

  4.3.4.2. Local Attraction

  4.3.5. Use and Adjustment of Theodolites

  4.3.5.1. Measurement of Horizontal Angles

  4.3.5.2. Measurement of Vertical Angles

  4.3.7. Tacheometry

4.3.7.1. Stadia Method

Chapter Five TRAVERSING PRINCIPLE

5.1. Introduction

5.2. Traversing by Compass and Theodolite

    5.2.1. Types of Traverse

    5.2.2. Compass Traverse

    5.2.3. Interior Angle Traverse

    5.2.4. Deflection Angle Traverse

    5.2.5. Angle to the right traverse

    5.2.6. Azimuth Traverse

   5.2.7. Stadia Traverse

  5.2.8. Plane table and Alidade

5.3. Traverse Computations

5.4. Sources of Errors and Precision Traversing

5.5. Checking adjusting traverse

5.6. Computation of Area

Pre-requisites	**None**
Semester	**I**
Status of Course	Compulsory
Mode of delivery	Lecture Field Practice Tutorials Group Discussion Home Works
Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be

	penalized.
	If you are having problems with the assignments or tests, contact the instructor as soon as possible.
	Students are expected to attend class regularly. A student who misses more than
	15% of the semester class is not eligible to sit for final exam. Punctuality is equally important.
	If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by
	no means.
Literature	1. Wolf, P. R. and Ghilani, C. D. (2006), Elementary Surveying: An Introduction to Geomatics, 11th edition, Prentice Hall 2. Uren, J. and Price, W.F. (2005), Surveying for Engineers, 4th edition, Palgrave Macmillan. 3. Chambers, Analysis of survey data 4. Ghilani,CharlesD., Elementary surveying 5. McCormack, Jack C., Surveying. 6. Boniface, Peter R., Civil surveying sample exams for the California special Civil engineer examination/ 7. Dr. A. M. Chandra, Surveying [2005], New Age International (P) Ltd., Publishers

Department of Civil Engineering	
Course Code	CEng 2052
Course Title	Surveying II
Degree Program	B.Sc. in Civil Engineering
Module	Surveying

Study hour per week	4CP				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	0	3hrs	3hrs	8hrs

Course Objectives	Students will learn theory and field work in construction and land surveying **Student Learning Outcome** **Students who successfully complete this course will be able to:** ☐ Understand surveying project fundamentals ☐ Obtain a full understanding of the nature of surveying data ☐ Understand their environment and terrain through topographic maps ☐ Understanding of role of photogrammetric surveying.
Competences to be Acquired/course level competences	Student understand surveying work principles, use of surveying equipment and apply the knowledge through field practice. ☐ Triangulation , ☐ Contour lines and Digital Terrain Model, ☐ Engineering Surveys and Setting out, GPS Surveying, ☐ Topographic Surveys and Mapping, ☐ Principles of Photogrammetric surveying, ☐ GIS and remote sensing.

Course	
Course Content	
1. Topographical Surveying	
1.1 Introduction 1.2. Contouring 1.2.1 Contour and contour interval 1.2.2 Characteristics of contours 1.2.3 Methods of contouring 1.2.4 Uses of contours	

2. Curves

    2.1. General

    2.2. Types of curves and their uses

    2.3. Circular curves

    2.4. Compound curves

    2.5. Reverse cures

    3.1. Transition curves

    3.2. Vertical curves

    3.3. Methods of setting out

3. Triangulation and Trilateration

    3.1. General

    3.2. Principle and uses

    3.3. Classification

    3.4. Triangulation figures and   arrangements

    3.5. Well-condition triangle

    3.6. Strength of figure

    3.7. Reconnaissance and selection of stations

    3.8. Inter-visibility of triangulation stations

    3.9. Signals and phase of signals

    3.10.   Base line and its extension

    3.11.   Triangulation computations

    3.12. Adjustments of Survey Observations

    3.13. Definitions

    3.14. Weights

    3.15. Least squares theory Adjustment problems

4. Photogrammetric

    4.1. General

    4.2. Aerial, terrestrial and close-range photogrammetric

    4.3. Different types of photographs

    4.4. Photo coordinate system

    4.5. Vertical photographs and definitions

    4.6. Scale of photograph and relief displacement

    4.7. Sterophotogrammetry

    4.8. Uses of photogrammetric

5. Introduction to GIS Application Software

Pre-requisites	CEng1081-surveying-I
Semester	Year 2, Semester I
Status of Course	Compulsory
Teaching & Learning Methods	Lecture Field Practice Tutorials Group Discussion Home Works

Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be
Literature	1. Wolf, P. R. and Ghilani, C. D. (2006), Elementary Surveying: An Introduction to Geomatics, 11th edition, Prentice Hall. 1.Uren, J. and Price, W.F. (2005), Surveying for Engineers, 4th edition, Palgrave

6- MODULE 06

ENGINEERING MECHANICS

Courses of the Module		
Course Code	Course Name	CP
CEng 1061	Engineering Mechanics I (Statics)	5
CEng 1062	Strength of MaterialS	6
Meng 1062	Engineering Mechanics II (Dynamics)	5
	TOTAL	16 CP

Civil Engineering Regular Program	
Module Title	**Engineering Mechanics**
Module Number	**06**
Rationale and objective of the module	Students shall learn to apply the equilibrium condition and understand the method of sections and its application in the determination of stress resultant in sections for simple and composite statically determinate systems. Students shall also be able to solve problems involving simple frictional phenomena, and master working principles of fixed systems.
Module Objectives	**The main objectives of the module are to:** □ Understand physical interaction of bodies with their surrounding and attain a state of rest & apply the principles of force systems for analyzing of static structures; □ Develop appropriate mathematical models that represent physical systems using appropriate coordinate systems; and □ Derive equations of motion that relate forces acting on systems and the resulting motion.
Module Competencies	After completion of this module the students shall be able to; i. apply basic principles of forces and equations of motions under static and dynamic loading conditions ii. develop appropriate mathematical models that represent physical systems
Module Learning and Teaching Method	Lecture, Tutorials Group Discussion, Home Works
Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**

Civil Engineering Program				
Course Code	CEng1061			
Course Title	Engineering Mechanics I (Statics)			
Degree Program	B.Sc. in Civil Engineering			
Study hour per week	**5 CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	5 hrs	10 hrs
Course Objectives	**Up on successful completion of the course, students will be able to:** ☐ Distinguish between concurrent, coplanar and space force systems ☐ Compute the resultant of coplanar and space force systems ☐ Draw free body diagrams, Analyze reactions and pin forces induced in coplanar and space systems using equilibrium equations and free body diagrams ☐ Determine the centroid and center of mass of plane areas & volumes ☐ Represent distributed force with equivalent resultant force which has the same effect as the distributed forces ☐ Draw shear force & bending moment diagrams ☐ Determine friction forces and their influence up on equilibrium of systems ☐ Apply sound analytical techniques and logical procedure in the solution of Engineering problems				
Competences to be Acquired/course level competences	☐ Ability to define and apply the concepts of equilibrium; ☐ Demonstrate familiarity with structural analysis of trusses, frames and beams and application of mechanics to Engineering problems.				
Course Description	This course presents the fundamental physical concepts, laws and Statics of particles: Resultants of coplanar and none-coplanar force systems, Equitation of equilibrium for coplanar and none-coplanar force systems. Statics of rigid bodies: Equilibrium of simple structures: trusses beams, frames and machines. Analysis of structures (truss, Frames and machines). Centroid & center of gravity, moment of inertial. Force in beams: shear force & bending moment diagrams. Static friction.				
Course outline					
Content					

Chapter 1: Scalars and Vectors

    1.1 Introduction

    1.2 Scalars and Vectors

    1.3 Operation with Vectors

        ☐ Vector Addition or Composition

        ☐ Vector Multiplication: Dot & Cross

Chapter 2: Force Systems

    2.1 Introduction

        I.   Two Dimensional Force Systems

    2.2 Rectangular Resolution of Forces

    2.3 Moment and Couple

    2.4 Resultants of general coplanar force systems

II.   Three Dimensional Force Systems

    2.5 Rectangular Components

    2.6 Moment and Couple

    2.7 Resultants

Chapter 3: Equilibrium

    3.1 Introduction

       I. Equilibrium in Two Dimensions

    3.2 System Isolation

    3.3 Equilibrium Conditions

       II. Equilibrium in Three Dimensions

    3.4 System Isolation

    3.5 Equilibrium Conditions

Chapter 4: Analysis of simple Structures

    4.1 Introduction

    4.2 Plane Trusses

        4.2.1 Method of Joints

        4.2.2 Method of Sections

    4.3 Frames and Simple Machines

Chapter 5: Internal Actions in beams

    5.1 Introduction

    5.2 Diagrammatic conventions and classification of beams

    5.3 Diagrammatic representations of internal actions in beams

    5.4 Types of loads and reactions

    5.5 Shear force and bending moment in beams

Chapter 6: Centroids

    6.1 Introduction,

    6.2 Center of gravity

    6.3 Centroids of lines, Areas, and Volumes

    6.4 Centroids of composite bodies

    6.5 Determination of centroid by integrations

Chapter 7: Area Moments of Inertia

    7.1 Introduction to area moments of inertia

    7.2 Moment of inertia of plane areas and curves

    7.3 Moments of inertia of Composite areas

    7.4 Products of Inertia and Rotation of Axes

Chapter 8: Friction
>   8.1 Introduction
>   8.2 Types of Friction
>   8.3 Characteristics of dry friction
>   8.4 Application of Friction in Machines

Pre-requisites	None
Semester	Year 1, Semester I
Status of Course	compulsury
Mode of delivery	Lecture Tutorials Group Discussion Home Works
Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Meriam, J.L. and Kraige, L.G., Engineering mechanics, 7th ed 2. Meriam, J.L. and Kraige, L.G., Engineering mechanics, 6th ed 3. Engineering Mechanics: Statics & Dynamics by Anthony M. Bedford, Wallace Fowler, Prentice Hall; 5 edition (July 2007) 4. Engineering Mechanics: Statics by Russell C. Hibbeler, Prentice Hall; 12 edition (January 7, 2009) 5. Schaum's Outline of Engineering Mechanics by E. W. Nelson, Charles L. Best, William G. McLean, McGraw-Hill; 5 edition (May 1997) 6. Engineering Mechanics - Statics and Dynamics by Anthony M Bedford, Wallace Fowler, Prentice Hall; 4 edition (August 2004)

Engineering Mechanics II (Dynamics)

Course Code	MEng1062				
Course Title	Engineering Mechanics II (Dynamics)				
Degree Program	B.Sc. in Civil Engineering				
Module	**Engineering Mechanics**				
CP Credits	**5 CP**				
Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	5hrs	10 hrs
Course Objectives	**Course Objectives** • To provide students with a clear and thorough presentation of the theory and applications of Engineering mechanics. • Select appropriate coordinate systems for physical systems and analyze motion variables such as position, velocity, and acceleration. • Conduct kinematic analysis for the velocity & acceleration of moving bodies. • Draw free-body-diagram for rigid body in motion • Apply principle of conservation of energy • Apply Newton's Law of Motion to rigid body motion • Apply principles of impulse and momentum of a rigid body				
Course Outcomes	**Student Learning Outcome** **Students who successfully complete this course will be able to:** ☐ Develop the fundamental equations that characterize the kinematics and Newtonian dynamics of a particle, systems of particles, and rigid bodies. ☐ Develop the ability to model and analyze the dynamic behavior of a particles, systems of particles, and rigid bodies ☐ Provide experience in the application of dynamic analysis to elementary problems in Engineering practice • Understand and apply basic principles that govern the motion of objCP. • Develop appropriate mathematical models that represent physical systems. • Derive equations of motion that relate forces acting on systems and the resulting motion.				
Competences to be Acquired/Course level competences	*This course prepares students to handle assignments related to fluid dynamics during their Hydraulics II as in flow through pipes and pumps and Hydropower course as in surge tank design and surge analysis.*				
Course Description	Basic equations of motion; Kinematics of particles and rigid bodies; Kinetics of particles and rigid bodies				
Course Outline					
Content					

Chapter 1: Introduction to Dynamics
    1.1 Basic concepts
    1.2 Equations of motion
    1.3 Gravitation

Chapter 2: **Kinematics of particles**
    2.1 Introduction
    2.2 Rectangular motion
    2.3 Plane curvilinear motion
    2.4 Coordinate systems
    2.5 Relative motion
    2.6 Constrained motion

Chapter 3: **Kinetics of Particles**
    3.1 Introduction
    3.2 Newton's second law
    3.3 Work Energy equation
    3.4 Impulse and Momentum
    3.5 Conservation of Energy and Momentum
    3.6 Special applications/Impact/

Chapter 4: **Kinematics of rigid bodies**
    4.1 Introduction
    4.2 Fixed axis rotation
    4.3 Absolute motion
    4.4 Relative motion

Chapter 5: **Kinetics of rigid bodies**
    5.1 Introduction
    5.2 General equations of motion
    5.3 Work Energy method
    5.4 Impulse and Momentum

Pre-requisites	CEng1051
Semester	Year 1, Semester II
Status of Course	Compulsory
Teaching & Learning Methods	Lecture
	Tutorials Group Discussion Home Works
Assessment/Evaluation	**As per Bahir Dar University** **Academic Regulation**

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	**Textbook:** [1]Meriam, J.L. andKraige,L. G., Engineering Mechanics - Dynamics, 6thEd., 2003. **Reference:** [2]Hibbeler, R.C., Engineering Mechanics-Dynamics,12thEd., 2012. [3]Beer, Johnston, Clausen, Eisenberg, Cornwell, Vector Mechanics for Engineers: Dynamics, 9th ed., 2004.

Civil Engineering					
Course Code	CEng1062				
Course Title	Strength of Materials				
Degree Program	B.Sc. in Civil Engineering				
Credit Hour, CP	6				
CP Credits,	6				
Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	3hrs	3hrs	0	6hrs	12hrs
Course Objectives & Competences to be Acquired	**Objective:** Develop and apply various analytical methods for determining the mechanical behavior of solid bodies (for example: stress, strain, strength, stiffness, deflection, and stability) subjected to various types of loading which include: axial loading, bending, shear, torsion, or a combination. **Outcome:** Students will be able to: Apply knowledge of mathematics, science, and Engineering dealing with mechanics of materials under axial loading, torsion, bending, and combined loading. Draw axial force, torque, shear and moment diagrams of simple members subject to combined loading. Compute stresses and strains in simple members subject to axial loading, torsion, bending, and combined loading. Compute deflection of beams. Compute buckling load of compressive members. Design components to meet desired needs in terms of strength and deflection. Develop and apply various analytical methods for determining the mechanical behavior of solid bodies (for example: stress, strain, strength, stiffness, deflection and stability) subjected to various types of loading which include: axial loading,				
	bending, shear, torsion, or a combination				
Course Description	This course introduces the properties and strength of materials i.e. Flexure, Shear, Torsion, Compound Stress analysis as well as Buckling of Compression Members.				
Course Outline					
Course Content					

Chapter 1. Mechanical Properties of
Material.
1.1 Introduction
1.2 Normal stress-strain.
1.3 Stress-Strain relation.
1.4 Shear stress and strain
1.5 Allowable stresses and factor of safety
1.6 Axially loaded members
1.7 Changes in Lengths of Axially
Loaded Members
1.8 Changes in Lengths under Non- uniform Conditions
1.9 Statically Indeterminate
Members
1.10 Thermal effect

Chapter 2. Flexural and Shearing
stresses.
   2.1 Introduction
     Types of Beams, Loads and
     Reactions.
   2.2 Relationship Between Loads Shear Forces and Bending Moments Shear Force and Bending
     Moment Diagram.
   2.3 Flexural Stresses in Beams
   2.4 Derivation of Bending stress equation for composite materials.
   2.5 Shearing Stresses in Beams

Chapter 3. Torsion of Circular Shafts &
Power Transmission.
   3.1 Introduction
   3.2 Torsion of circular shafts
   3.2 Non- Uniform Torsion
   3.3 Transformation of power by circular shafts.

Chapter 4. Compound Stresses.
4.1 Combined Stresses,
4.2 Plane Stress.
4.3 Principle Stresses Mohr's circle.

Chapter 5. Shear force and bending moment

Chapter 6. Buckling of Compression Members
6.1 Introduction
6.2 Buckling and Stability
6.3 Euler formulas for various boundary conditions.

Pre-requisites	CEng1061 – Engineering Mechanics I and Math1041
Semester	First year , second semester
Status of Course	Compulsory
Teaching & Learning Methods	Lecture Tutorials Group Discussion Home Works
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.

7- MODULE 07
BUILDING ENGINEERING

Courses of the Module		
Course Code	Course Name	CP
CEng 3071	Civil Engineering Workshop Practice	1
CEng 2071	Construction Materials	4
CEng 2072	Building Construction	4
CEng 2073	Fundamentals of Architecture	3
CEng 4072	Basic Electricity and Installation	3
	TOTAL	16 CP

Department of Civil Engineering	
Module Title	Building Engineering
Module Number	07
Rationale of the module	Since one of the basic necessities of the society is shelter, this module emphasizes on the Engineering skills required to design a building for residence. Moreover, the principles are equally applicable to the design of building for other purposes. The appropriate materials to be used for the construction of the buildings and the application of CAD software are also covered in this module

Module Objectives	Short narrative on the aims and characteristics of the module
	The students learn:
	☐ Operational sequencing and important subsoil characteristics,
	☐ How to complete excavations and how projCP are structured and sealed against water,
	☐ The elements of masonry and how to apply simple calculations to masonry walls,
	☐ to recognize structural and physical problems arising from the construction of walls, ceilings and roofs, the elementary frame structure used in sloped and flat roofs,
	☐ to read Civil Engineering plans and draw typical construction works according to accepted norms
	☐ And to learn Application Software for Civil Engineering.
	The student shall learn how to dimension buildings taking the following requirements:
	   ☐ Heat Insulation,
	   ☐ Moisture Protection,
	   ☐ Noise Insulation.
	Moreover , the production and mechanical properties of the main construction materials ,namely, cement and steel are treated in detail in this module.

Module Competencies	Students get basic knowledge on construction materials for Civil Engineering infrastructures; elements of building; and architectural drawings. Abel to prepare Drawings with computer aid focusing on Civil Engineering infrastructures;
Module Mode of Delivery	Basically on Semester Basis or Parallel approach

Module Learning and Teaching Method	The mode of the delivery of the module can be summarized as follows:
	   Lecture
	   Laboratory Practice
	   Civil Engineering
	   Workshop Practice
	   Tutorials
	   Group Discussion
	   Home Works

Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**

Department of Civil Engineering				

Course Code	CEng 2071			
Course Title	Construction Material			
Degree Program	B.Sc. in Civil Engineering			
Module	**Building Engineering**			
Study hour per week	**4 CP**			
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	-	3hrs	3hrs	8hrs
Course Objectives	To provide basic knowledge about the materials needed in the fields of construction			
Competences to be Acquired/course level competences	On successful completion of this subject students should be able to: (i) describe Engineering properties of concrete, steel and other materials related to their use in construction; (ii) assess the significance of environmental factors on the behavior and durability of concrete and steel; (iii) formulate Engineering solutions to problems associated with the use of concrete, steel and other materials; (iv) Prepare reports on practical exercises relevant to the manufacture and properties of concrete.			
Course Description	This course introduces the production, nature and characteristics of different construction materials and identifying them with respect to their suitability to different Engineering structures.			

Course outline				

Course Contents

1. Chapter One: Nature& Properties of construction Materials
    1.1. Classification & Natures of Materials
    1.2. Properties of Materials
    1.3. Behavior of materials under load

2. Cementing Materials
    2.1. Lime
 	
    2.2. Gypsum
    2.3. Cement
    2.4. Mortar

3. Concrete
       3.1. Materials for concrete
       3.2. Fresh concrete
              3.3. Hardened concrete

       3.4. Mix design
       3.5. Quality control

4. Building stone
       4.1. Classifications of stones
       4.2. Tests on building stones

5. Clay & clay products
       5.1. Bricks
       5.2. Tiles
       5.3. Other Types of Blocks
              5.3.1. Stabilized soil blocks
              5.3.2. Hollow Concrete Blocks

7. BITUMINOUS MATERIALS.

6. Metals & Timber
       6.1. Ferrous metals
       6.2. Non ferrous metals
       6.3 Timber

8. EDUCATIONAL TOUR
Industries in local which manufacture different Construction Materials, Tests on Different construction materials before use.

Pre-requisites		**None**
Semester		Year 2, Semester I
Status of Course		Compulsory
Mode of delivery		Lecture Civil Engineering Workshop Practice
	Group Discussion Home Works	
Mode of assessment		**As per Bahir Dar University Academic Regulation**

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	7. AbebeDinku, Construction Materials 8. Marotta, Theodore, W. Basic Construction Materials. (2005). Pearson Prentice Hall. 9. William P. Spencer. (2006). Construction Materials, Methods and Techniques. Thomson Delmar Learning, 2nd Edition 10. Illston J. M. Construction Materials: Their Nature and Behavior, Taylor & Francis; 3rd Edition, 2001 11. Parbinsingh, Civil Engineering Materials 12. Don a. Watson, Construction Materials and Processes 13. A.M. Neville and J.J.Brooks, Concrete Technology

Department of Civil Engineering

Course Code	CEng2072
Course Title	Building Construction
Degree Program	B.Sc. in Civil Engineering
Module	**Building Engineering**

Study hour per week	**4 CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	0	3hrs	3hrs	8hrs

Course Objectives	☐ To understand the fundamentals of construction planning and design procedures, and site selection. ☐ To develop skills and knowledge in the preparation of working drawings. ☐ To understand the concepts of various components of a low-rise building and their construction methods. ☐ To acquire a thorough understanding of the basics of framed structures, shell and dome structures and prefabricated building systems.
Competences to be Acquired/course level competences	Students will be able: ☐ Select building site, ☐ Prepare working drawing for buildings, ☐ Understand the basics of framed and dome structures
Course Description	The course introduces students with the different types of buildings, their components and methods of construction. The overall building processes beginning from site works will be covered

Course outline
Course Content

1. Types of Buildings

2. Building Drawings

3. Site Works

☐   Site Features
☐   Site Preparation
☐   Setting out

4- Foundations
☐   Shallow Foundations
☐   Deep Foundations

5-Walls

- ☐ Masonry
- ☐ Load Bearing Walls
- ☐ Cavity Walls
- ☐ Partition Walls

6-Floors

- ☐ Floor below ground level
- ☐ Floor above ground level
- ☐ Suspended Floor

7-Stairs

8-Doors and Windows

9-Roofs and Roof Coverings

10-Framed Structures

11-Prefabricated Building Systems

12-Powerhouse Construction

13-Shell and Dome Structures

Pre-requisites	CEng 2071
Semester	Year 2, Semester II
Mode of delivery	Lecture Civil Engineering Workshop Practice Group Discussion Home Works
Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as

	soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Edward Allen and Joseph, (2003),Fundamentals of Building Construction: Materials and Methods, Wiley publishers; 4th edition. 2. AbebeDinku , (2007), A text book of building construction, AAU Press. 3. Francis D. K. Ching and Cassandra Adams, (2000), Building Construction Illustrated, 3rd Edition, Wiley.

Department of Civil Engineering				
Course Code	CEng 2073			
Course Title	Fundamental of Architecture			
Degree Program	B.Sc. in Civil Engineering			
Module	**Building Engineering**			
Study hour per week	**3 CP**			
	Lecture	Tutorial	Practice or Laboratory	Home study
	1hr	0	3hrs	2hrs
Course Objectives	☐ To understand the fundamentals of construction planning and design procedures, and site selection. ☐ To develop skills and knowledge in the preparation of working drawings. ☐ To understand the concepts of various components of a low-rise building and their construction methods. ☐ To acquire a thorough understanding of the basics offramed structures, shell and dome structures andprefabricated building systems.			
Competences to be Acquired/course level competences	Students will be able to: Read architectural drawings, structural drawings, sanitary drawings			
Course Description	The course includes introduction to architecture with regards to climatic condition, landscape architecture and aesthetic design. It also includes space, structure and its function, construction of structure related to architecture. It also deals with the drawing of architectural, structural, plumbing, electrical and connection detail aspCP. Reviewing of plans and drawing of other Engineering structure are also included in the course.			

Course outline

Course Content

1. **Introduction to Architecture:**

   ☐ Definition of terms
   ☐ Principles of architecture
   ☐ Codes   and   minimum requirements
   ☐ Basic elements of Architecture
   ☐ Modifying   elements   of architecture
   ☐ Aesthetic Design
   ☐ Climatic and Site Condition
   ☐ Landscape Architecture

2. Space, Structure and Function:	
	☐ Space and Structure, Space and Function, Relationship between the specified terms Construction and Structure Related to Architecture: Types of structures related to architecture, Architectural breakthrough and famous structures, Role of architCP and Civil Engineers
3. Architectural Drawing:	
	Vicinity map, Site development plan, Floor plans, Elevations, Sectioning(long and short direction),Perspective, Different types of templates for architectural designs
4. Structural Drawing:	
	☐ Beam details, Column-Footing details, Foundation plans, Slab, staircase, and balusters, Roof framing detail
5. Electrical Drawing and Power Layout:	
	☐ Power Layout, Lighting layout, Riser diagram, Symbols and legends used in electrical drawings, Load schedule and computation
6. Sanitary Drawing:	
	☐ Plumbing layout, CWL and DWL, Isometric view of plumbing details, Plan and elevation of septic tanks, Symbols and legends used in sanitary drawings
7. Planning and Drawing of Building Accessories:	
	☐ Details of connections, Details of Toilet and bath, Roofing details
8. Review of Drawing for some Civil Engineering projCP:	
	☐ Road construction drawings, Bridge construction drawings, Other CE structure

Pre-requisites	None	
Semester	Year 2, Semester I	
Status of Course	Compulsory	
Mode of delivery	Lecture Laboratory Practice Group Discussion Home Works	
Mode of assessment	**As per Bahir Dar University Academic Regulation**	

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Lorraine Farrelly, (2007), TheFundamentals of Architecture, AVA Publishing. 2. MostafaAbd-El-Barr, Hesham El-Rewini ,(2004), Fundamentals of ComputerOrganization and Architecture, Wiley-Interscience. 3. Edward Allen, Joseph Iano, (2003),Fundamentals of Building Construction :Materials and Methods, Wiley publishers;4th edition. 4. Forrest Wilson, Ron Keenberg, and WilliamLoerke, (1990), Architecture: FundamentalIssues Van Nostrand Reinhold.

Civil Engineering Regular Program	
Course Code	CEng 3071
Course Title	Civil Engineering Workshop Practice
Degree Program	B. Sc. in Civil Engineering
Module	**Building Engineering**
CP Credits	**1 CP**

Study hour per week	Lecture	Tutorial	Practice or Laboratory	home study
	0	0	2	0

Course Objectives & Competences to be Acquired	Students shall learn detailed Civil Engineering Workshop Practice and skills in the field of construction and shall be able to produce some components
Course Description/Course Contents	• Plumbing • Woodwork • Concrete • Plastering • Masonry *This course will give the students a hands on experience on workshop activities which will be helpful during the later years of their study, more specifically when taking Engineering Management.*
Pre-requisites	None
Semester	Year 1, Semester 2
Status of Course	Compulsory
Teaching & Learning Methods	Lectures, tutorials, lab exercises
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**

Content
☐ Plumbing
☐ Woodwork
☐ Concrete work
☐ Plastering
☐ Masonry work
☐ Basic   electrical   installation
☐ Construction sites   which   have finished   or   unfinished work

Pre-requisite	None

Semester	Year I, Semester II

Civil Engineering Regular Program

Status of the Course	Compulsury
Learning Teaching Methods	Lecture Civil Engineering Workshop Practice Laboratory Practice Group Discussion Home Works
Assessment Techniques	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by No means.

Course Code	EEng 4072			
Course Title	Basic Electricity and Installation			
Degree Program	B. Sc. in Civil Engineering			
Module	**Building Engineering**			
CP Credits	**3 CP**			
Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study
	1hrs	3hrs	0	2hrs
Course Objectives & Competences to be Acquired	Students will learn the fundamentals of basic electricity and electric installation in the building and will acquire knowledge for supervision works.			
Course Description/Course Contents	Introduction, Electrical circuit elements or parameters, Alternating currents & Voltages, The transformer, Distribution systems & Basic Domestic Installation, Lighting Circuits and Components, Earthing, Design & bill of quantities			
Pre-requisites	None			
Semester	Year 4, Semester II			
Status of Course	Compulsory			
Teaching & Learning Methods	Lectures, class works, assignments			
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**			
Attendance Requirements	- Minimum of 85% during lectures - 100% during practical exercises & Lab.			
Literature	1. Boylsrad, Introduction to Circuit Analysis 2. k.B. Raina S.A. Bhattacharga, Electrical Design Estimating and Costing 3. EBCS-10, Electrical Installation of Buildings 4. J.B. Gupta, Electrical Installation Estimation and Costing 5. S.L. Uppal, Electrical Writing, Estimating and Costing			

8- MODULE 08

STRUCTURAL ANALYSIS

Courses of the Module		
Course Code	Course Name	CP
CEng 2081	Theory of structure I	5
CEng 2082	Theory of structure II	5
	TOTAL	10

Department of Civil Engineering	
Module Title	**Structural Analysis**
Module Number	**08**
Rationale of the module	To make the students able to identify material strength, stress analysis due to shear, bending, compression, and torsion. Analyze determinate structure and indeterminate structure and finally produce moment, shear, axial, and torsion diagram and calculate deflection.
Module Objectives	- Identify the properties of structural materials - Stress analysis in compression, tension, bending ,torsion members - Analyze and calculate deflection of determinate structures - Analyze Indeterminate structures using displacement methods and produce bending, shear, axial, and torsion diagram
Module Competencies	After completion of this module the students shall be able to; - Identify material structural properties - Able to calculate stress in structural members - Analyze determinate and indeterminate structures
Module Mode of Delivery	Basically on Semester Basis or Parallel approach

Civil Engineering Regular Program				
Course Code	CEng 2081			
Course Title	Theory of structure I			
Degree Program	B. Sc. in Civil Engineering			
Module	**Structural Analysis**			
CP Credits	**5 CP**			
Study Hours per week	Lecture	Tutorial	Practice or Laboratory	Home study
	2hrs	3hrs	0	5hrs
Course Objectives & Competences to be Acquired	The student shall learn the fundamentals of stability of structures and shall be able to determine deflection of beams using different methods. Additionally, the student shall demonstrate familiarity with the techniques used for the analysis of continuous beams.			
Course Description/Course Contents	- Statical determinacy and stability of structures. - Loads on structures. - Influence lines for determinate structures. - Deflection of structures. - Direct integration. - Area – moment. - Conjugate beam. - Virtual work. - Graphical multiplication. - Castigliano's theorem. - Maxwell-Betti law of reciprocal deflections. - Method of consistent deformations. Analysis of Indeterminate Structures by Method of Consistent Deformations, ☐ Energy Method, and ☐ Three Moment Equations			
Pre-requisites	Strength of Materials			
Semester	Year2, Semester I			
Status of Course	Compulsory			
Teaching & Learning Methods	Lectures, tutorials, assignments			

Assessment/ Evaluation	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent.

	does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Hibbler, R. C. Structural Analysis, 6th Edition, PrenticeHall, 2005. 2. Leet, M., et al. Fundamentals of Structural Analysis, 2nd Edition, McGraw Hill, 2004. 3. M.S. Williams, Structures: Theory and Analysis, Palgrave Macmillan., 1999 3. Theory of Structures by Aslam Kassimali 4. Full bibliographic citation; sources not older than 5 years (older only in very exceptional cases) 5. Nigussie Tebedge, Methods of Structural Analysis, 1983, AAU 6. Basic texts (e.g. Handout)

Civil Engineering Regular Program			
Course Code	CEng 2082		
Course Title	Theory of Structure II		
Degree Program	B. Sc. in Civil Engineering		
Module	**Structural Analysis**		
CP Credits	**5 CP**		
Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study
	2hrs	3hrs	0	5hrs
Course Objectives & Competences to be Acquired	**Objective:** This course provides an introduction to the analysis of indeterminate structural systems common in Civil Engineering. **Outcome:** Students will be able to: • Identify, formulate, and solve support reactions of trusses, beams, and frames. • Apply the displacement method to analyze statically indeterminate beams and frames. • Use approximate methods to evaluate the statically indeterminate structural responses. • Employ the stiffness method to solve complex trusses, beams, and frames. ☐ Analyze indeterminate structures using structural analysis soft-wares		
Pre-requisites	Theory of structures I		
Semester	Year2, Semester II		
Status of Course	Compulsory		
Teaching & Learning Methods	Lectures, tutorials		
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**		
Attendance Requirements	A student must attend at least 85 % of the classes		

Literature	1. Timoshenko, S. P and Young ,D.H., 'Theory of structures", McGraw Hill, USA 2. Popov, E. P "Engineering mechanics of solids "Prentice hall ,New Jersey,1990 3. Marshall and Nelson "Structures" Longman scientific &Technical pub 1990 4. Darkov, "Structural mechanics" ,Mir publications 5. Negussie Tebedge, "Statically indeterminate analysis"

Chapter I Analysis of indeterminate structures

1.1 Displacement Method

        a. Kinematic indeterminacy
  b. Slope deflection Method
  c. Moment Distribution Method d. Kani's Method
    i. Frames without Side Sway ii. Frames with Side Sway

1.2 Approximate Methods of indeterminate structures

Chapter 2 Influence lines for Indeterminate Structures.

  2.1 Beams and Frames
  2.2 Truss
  2.2 Arches

Chapter 3 Introduction to Matrix Methods

  3 .1 Stiffness Method
  3.2 flexibility Method

Chapter 4 Introduction to Computer Oriented Structural Analysis

  4.1 The Flexibility Method
  4.2 The Stiffness Method

Pre-requisites Semester	CEng 2102, Theory of Structures I 4th
Status of Course	Compulsory
Teaching & Learning Methods	Lecture Tutorials Group Discussion Home Works
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**
Attendance Requirements	**Minimum 85%**

Literature	
	[1.] Hibbler, R. C. Structural Analysis, 6th & 8th Edition, PrenticeHall, 2005. [2.] Theory of Structures by Aslam Kassimali [3.] Nigussie Tebedge, Methods of Structural Analysis, 1983, AAU 4. Leet, M., et al. Fundamentals of Structural Analysis, 2nd Edition, McGraw Hill, 2004. 5. M.S. Williams, Structures: Theory and Analysis, Palgrave Macmillan., 1999 [6.] Building Codes, EBCS 1& 8, 1995

9- MODULE 09
DESIGN OF STRUCTURES

Courses of the Module		
Course Code	Course Name	CP
CEng 3091	Reinforced Concrete I	5
CEng 3092	Reinforced Concrete II	5
CEng 4092	Design of Steel and Timber Structures	5
CEng 5091	Fundamentals of Bridge Design	5
CEng 5093	Structural Design	5
	TOTAL	25

Department of Civil Engineering	
Module Title	**Design of Structures**
Module Number	[11]
Module Description	Structural concrete are mainly used to construct load bearing structures such as buildings and bridges. Hence, students should be made familiar with sections composed of concrete and steel as applied to frames and foundations.
Module Objectives	- Provide an introduction to the use of structural concrete as used in structures and foundations. Design steel and Timber structural members for tension, compression, bending, shear or torsion or the combined action of compression and bending, bending ,shear and torsion ☐ Design of connection and detail drawing ☐ Introduction to fundamentals of bridge design
Module Competencies	After completion of this module the students shall be able to; - comprehends structural mechanics of reinforced structure and apply the knowledge in the design of basic RC structural elements - design reinforced concrete components such as beams, slabs and columns Design steel structural members such as beams, columns and trusses ☐ Prepare detail drawings ☐ Classify ,select and design bridges
Module Mode of Delivery	Basically on Semester Basis or Parallel approach

Module Learning and Teaching Method	The mode of the delivery of the module can be summarized as follows:
	    Lecture, Tutorials
	    Construction Site Visit
	    Group Discussion, Home Works

Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**

Department of Civil Engineering	
Course Code	CEng 3091
Course Title	Reinforced Concrete Structures I
Degree Program	B.Sc. in Civil Engineering
Module Name	Design of Structures
CP Credits	5

Contact Hours per week	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs		5 hrs	10 hrs

Course Objectives & Competences to be Acquired	**Objective** This course provides an introduction to the use of structural concrete as used in structures and foundations. **Outcome** Students will be able to: • Analyze and design singly and doubly reinforced concrete beams under flexure, including regular (rectangular shaped) and T-beams. • Analyze and design structural concrete beams subjected to shear loading. • Conduct a service load analysis to control deflection and cracking of beams. • Analyze and design reinforced concrete columns and develop moment axial load interaction curves. • Determine bond length, lap splice and detailing requirements for reinforced concrete members.
Course Description	

Course Contents	**Chapter 1 Introduction to Reinforced Concrete Design**
	☐ Mechanical Properties of concrete and reinforcing steel.
	☐ Concrete Mix Design.
	Chapter 2 Basic Concepts of Design
	☐ Design Philosophy
	☐ Limit State Design (LSD) method.
	Chapter 3 Design of beams
	  ☐ Singly and doubly reinforced for Rectangular and T-sections.
	  ☐ Design Aids.
	  ☐Detailing of flexural reinforcement.
	  ☐Shear in beams - truss model. Bond, anchorage and development length.
	  ☐Detailing of shear reinforcement.
	Chapter 4 Design of Slabs
	  ☐One-way solid and ribbed slabs on ULS method.
	☐Two-way solid slabs.

Pre-requisites	CEng 2082, Theory of Structure II
Semister	**3rd year, firist semister**

Status of Course	**Compulsury**
Teaching & Learning Methods	Lecture Tutorials Construction Site Visit Group Discussion Home Works
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Arthur H Nelson, Design of concrete structures, McGraw-Hill, 14th Edition, 2010 2. James Macgregor, Reinforced Concrete Mechanics and Design, 5th Edition. 3. W.H. Mosley, R. Hulse, J.H Bungey, Reinforced Concrete Design, Palgrave Macmillan, 2007
	3. Jack C. McCormac, Design of Reinforced Concrete, McGraw-Hill, 2005 4. Ethiopian Building Code Standard 2 (EBCS 2), 1995 5. Any Related Book

Department of Civil Engineering					
Course Code	CEng3092				
Course Title	Reinforced Concrete Structures II				
Degree Program	B.Sc. in Civil Engineering				
Module	Design of Structures				
CP Credits	5				
Contact Hours	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs		5hrs	10 hrs
Course Objectives & Competences to be Acquired	**Objective** This course is designed to introduce students to the design of reinforced concrete components such as slabs and columns. **Outcome** Students will be able to design reinforced concrete of • Columns • Flat slabs, • Continuous beams, • Two way slab using yield line method • Torsion				
Course Description					

Course Outline	**Chapter 1. Columns**
	   - Short columns
	   - Combined axial force and bending
	   - Interaction diagrams, biaxial bending.
	   - Design aids.
	   - Slender columns.
	Chapter 2 Design of Flat slabs
	   - - Introduction
	   - - Load transfer in flat slabs
	   - - Distribution of moments in flat slabs
	   - - Practical analysis of flat slabs
	- - Design of flat slabs as per EBCS 2
	Chapter 3 Inelastic Moment Redistribution
	- Introduction
	- Non-linear analysis of indeterminate structures
	- Plastic hinge and collapse mechanisms
	- Moment redistribution as per EBCS 2 Continuous beams.
	Chapter 4 Yield Line Theory for Slabs
	- Introduction
	- Upper and lower bound theorems
	- Methods of yield line analysis
	- Moments along skewed line
	- EffCP of restrained corners
	Chapter 5 Torsion in Reinforced Concrete members
	Chapter 6 Introduction to Pre-stressed Concrete Structures
	- Introduction
	- Basic concepts of pre-stressed concrete
	- Analysis and design of pre-stressed members as per EBCS 2
	Chapter 7 Special Structural Elements
	- Introduction
	- Behavior of deep beams
	- Strut and tie models for the design of deep beams
	- Design of deep beams as per EBSC 2
	- Behavior of corbels
	- Strut and tie models for the design of corbels
	- Design of corbels as per EBSC 2

Pre-requisites	CEng3091 – Reinforced Concrete I
Semester	**3rd year, second semister**
Status of Course	**Compulsury**

Teaching & Learning Methods	Lecture Tutorials Construction Site Visit Group Discussion Home Works
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Arthur H Nelson, Design of concrete structures, McGraw-Hill, 14th Edition, 2010 2. James Macgregor Reinforced Concrete Mechanics and Design, 5th Edition. 3. W.H. Mosley, R. Hulse, J.H Bungey, Reinforced Concrete Design, Palgrave Macmillan, 2007 4. Jack C. McCormac, Design of Reinforced Concrete, McGraw-Hill, 2005 5. Ethiopian Building Code Standard 2 (EBCS 2), 1995 6. Any Related Book

Department of Civil Engineering	
Course Code	CEng 5091
Course Title	**Fundamentals of Bridge Design**
Degree Program	B.Sc. in Civil Engineering
Module	Design of Structures
CP Credits	*5cp*

Study hour per week	Lecture	Tutorial	Field Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	5hrs	10hrs

Course Objectives & Competences to be Acquired	Students should now the general principles to design a bridge
Course Description	

Course Contents	**Chapter 1Investigation for Bridge**
	    General Introduction
	    Elements of Bridge Project
	    Design Objectives
	    Design Philosophy and Specification
	    Site Selection and Data Collection
	    Site Investigation
	    Span Determination
	Chapter 2 Bridge Type and Selection
	    Bridge Classification [Reinforced concrete (slab, girder, and frame), arch, cable stayed and suspension.]
	    Geometry of bridges (length, cross-section).
	    Materials
	    Structural Arrangements
	Chapter 3 Bridge Loading and Design Methods
	    Gravity Loads
	    Lateral Loads
	    Forces due to Deformation

	Collision Loads
	Water Loads
	Chapter 4 Super Structure Design of Bridge
	    Concrete Deck Design
	    T-Girder
	    Box Girder Design
	    Overhang Design
	    Walkway and Handrail
	Chapter 5 Sub Structure Design Bridge
	    Elements of Sub Structure Design (Abutment, Pier)
	Chapter 6 Bearing and Railing
	    Bearing Design
	    Railing Design
	Chapter 7 Low Level Water Crossing and Culverts
	    Design of Low Level Water Crossing
	    Design of Culverts
	
	Chapter 8 Bridge Construction Methods and Maintenance (Optional)

Pre-requisites	, Reinforced Concrete Structure II and Engineering Hydrology
Semester	Fivth year firist semester
Status of Course	Compulsory

Teaching & Learning Methods	Lecture
	    Tutorials
	    Construction Site Visit
	    Group Discussion
	    Home Works

Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible.
	Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.

Literature	1. T.R. Jagadeesh and M.A. Jyaram, Design of Bridge Structures, Prentice-Hall of India Pvt. Ltd 2004
	2. Richard M. Barker and Jay A. Puckett, Design of Highway Bridges: An LRFD Approach, Wiley Publisher 2006
	3. AASHTO Design Specifications: SI Units 2nd Edition, 1998
	4. Ethiopian Roads Authority Manuals, 2004.

Department of Civil Engineering	
Course Code	CEng 4092
Course Title	Design of Steel & Timber Structure
Degree Program	B.Sc. in Civil Engineering
Module	Design of Structures
CP Credits	5 CP

Study hour per week	Lecture	Tutorial	Field Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	5hrs	10hrs

Course Objectives & Competences to be Acquired	**Objective** To introduce students to timber and steel structures as applied to various constructions such as bridges , trusses , buildings, etc **Outcome** Students will have the ability to design timber and steel structures, connections, and apply the EBCS for the design purpose.
Course Description	This course induces the structural design of steel and timber structural members subjected to tension, compression, bending and shearing stress, bending ,torsion and shearing, bending and axial compression uniaxial or biaxial stress using EBCS 3, 1995 and EBCS 5, 1995 codes and preparing detail drawings
Course Contents	□ Mechanical properties of structural steel. □ Structural shapes. □ Structural bolts. □ Ethiopian Building Code Standard 3 □ Standards for design of steel structures. □ Tension and compression members. □ Bending Members. □ Plate girders. □ Beam column members □ Structural connections. □Design of built up steel members. □Physical and mechanical properties of timber. Ethiopian Building Code Standards for design of timber.

Pre-requisites	, Theory Structure II
Semester	Fourt year second semester
Status of Course	Compulsory
Teaching & Learning Methods	Lecture Tutorials Construction Site Visit Group Discussion Home Works

Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. W.M.C. McKenzie, Design of structural Steel Work, Palgrave Macmillan.., 1998 2. W.M.C. McKenzie, Design of structural Timber, Palgrave Macmillan..,2000 3.R. L Brocken brough &F. S. Merritt, Structural Steel Designer's Handbook, McGraw-Hill, 1999 4. EBCS-3 Ethiopian Building Code Standard-Design of Steel Structures, 1995 5. EBCS-5: Ethiopian Building Code Standard – utilization of timber,1995

Civil Engineering Regular Program			
Course Code	CEng 5093		
Course Title	Structural Design		
Degree Program	B. Sc. in Civil Engineering		
Module	**Design of Structures**		
CP Credits	**5 CP**		
Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study
	2hrs	3hrs	0	5hrs
Course Objectives & Competences to be Acquired	The student will be introduced to lateral loading, Ethiopian Building Code Standards for lateral loading, Plastic analysis of frames, Composite steel – concrete structures, elastic stability theory and detailing and connections.		
Course Description/Course Contents	- Wind loads, earthquake loads, - Lateral load-resisting systems in buildings. - Stable arrangement of structural systems and distribution of lateral loads. - Plastic analysis for framed structures (plastic hinge and plastic zone theory). Simple strip method for slabs. - Composite steel – concrete structures. - Introduction to elastic stability theory. - Detailing and connections.		
Pre-requisites	Reinforced Concrete II		
Semester	Year 5, Semester I		
Status of Course	Compulsory		
Teaching & Learning Methods	lectures, tutorials, project work		
Assessment/ Evaluation	**As per Bahir Dar University Academic Regulation**		

Course policy	All students are expected to abide by the code of conduct of students and the

Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action.

While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized.

If you are having problems with the assignments or tests, contact the instructor as soon as possible.

Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important.

If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means. |
| Literature | 1. Jack C. McCormac. (2007). Structural Steel Design,

McGraw-Hill.

2. Arthur H Nilson. (2003). Design of concrete structures, McGraw-Hill.

3. EBCS 1, EBCS 2, and EBCS 8, The Ethiopian

Building Code of standards, 1995. |

10-   MODULE 10

SOIL MECHANICS AND GEOLOGY

Courses of the Module		
Course Code	Course Name	CP
CEng 2102	Soil Mechanics I	5
CEng 3101	Soil Mechanics II	5
CEng 2103	Engineering Geology	3
	TOTAL	13 CP

Department of Civil Engineering	
Module Name	Soil Mechanics and Geology
Module Number	10
Objectives	Civil Engineers need solid knowledge of soils and rocks to design infrastructure on/in soils and rocks. The objective of this module is to offer an introduction to the field of geotechnical Engineering, and to provide an understanding of the basic soil and rock behavior through experience with common soil laboratory testing procedures. This module is a prerequisite for the Foundation Engineering module.
Competency	The competency of this module is students will be able to solve several classical problems in Civil Engineering problems such as settlement, shear failure, load bearing capacity, earth pressure and stability problems related to the behaviors of soils and rocks.
Mode of delivery	Basically on Semester Basis or Parallel approach

Module learning teaching methods	The mode of the delivery of the module can be summarized as follows:
	    Lecture
	    Tutorials
	    Construction Site Visit
	    Group Discussion
	    Home Works

Module assessment techniques	**As per Bahir Dar University Academic Regulation**

Civil Engineering Regular Program	
Course Code	CEng2103
Course Title	Engineering Geology
Degree Program	B. Sc. in Civil Engineering
Module	**Soil Mechanics and Geology**
CP Credits	**3 CP**

Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study
	3hrs	0	0	3hrs

Course Objectives & Competences to be Acquired	The student shall learn the fundamentals of applied geology and importance of geology in civil engineering design.
Course Description/Course Contents	- Introduction: The earth & its interior, Geology & its applied branch, Importance of geology in Civil Engineering. - Minerals & rocks: Classification & types of minerals, rock forming minerals, types of rocks. - Geologic structures and their effect on structures: Folds, faults and joints. - Weathering and its implication: physical, chemical, biological weathering. - Earthquake and seismic design: Causes & classification of earthquakes, EffCP of earthquakes, precautionary measures. - Geological investigation: Phases and methods of investigation, geological considerations in structures (dams, reservoirs, tunnels, road &bridges, buildings)
Pre-requisites	None
Semester	Year 3, Semester I
Status of Course	Compulsory
Teaching & Learning Methods	Lectures, tutorials, class works, assignments

Assessment techniques	**As per Bahir Dar University Academic Regulation**
Attendance Requirements	Minimum of 80 % attendance during lectures and 100 % attendance during practical work sessions, except some unprecedented mishaps.

Literature	1. Bell, F.G. (2007), Engineering geology, 2nd edition, Butterworth-Heinemann.
	2. Kehew, A. E. (2006), Geology for Engineers and Environmental Scientists, 3rd edition, Prentice Hall.
	3. Press, F. Siever, R. Grotzinger, J., & Jordan, T. (2003), Understanding Earth, 4th edition, W. H. Freeman.

Department of Civil Engineering	
Course Code	CEng2102
Course Name	Soil Mechanics I
Degree Program	B.Sc. in Civil Engineering
Module	Soil Mechanics and Geology
Cp Credits	5 CP
Study Hour	☐ Lecture …………………………. 2hrs ☐ Laboratory …………………..… 3hrs ☐ Home Study ………..…….......... 5 hrs
Objectives	This course is designed to introduce Civil Engineering students to the properties and behavior of soil as an Engineering material and their application in the solution of certain Civil Engineering problems such as compressibility of soil, seepage, retaining walls and stability of slopes.
Competencies	The student will be able to: ☐ Evaluate and classify soils. ☐ Evaluate the state of stress in a soil mass. ☐ Calculate seepage volume through a soil mass. ☐ Estimate settlement magnitude of compressible soils. ☐ Evaluate lateral earth pressures on retaining walls. ☐ Perform slope stability analysis.
Course Description/	☐ Introductions: definitions, soil formations, common soil types. ☐ Simple soil properties and soil classifications: weight - volume relationships, grain size distribution, soil consistency. ☐ Engineering soil classifications. ☐ Soil water and seepage: soil water, permeability, flow nets, seepage, pressures and forces in soil water. ☐ Compressibility and consolidation of soils: general measurement of compressibility, consolidation of soils.
	☐ Stress distribution in soils and settlement analysis: stress distribution under own weight of soils and different loading conditions, elastic and consolidation settlement. **(Laboratory tests: specific gravity determination, grain - size analysis, consistency tests, permeability tests, consolidation tests.)**
Course outline	
Course content	

Chapter 1 Introduction
1.1. Definition of Soil Mechanics
1.2. Soil, Geotechnical Engineering and Soil Mechanics
1.3. Soil Mechanics and Foundation Engineering
1.4. Formation of soils
1.5. General types of soils

Chapter 2 Physical Characteristics of Soils
2.1. The phase diagram
2.2. Soil Phase Relationship
2.3. Particle Size Analysis
2.4. Consistency of Clay Soils
2.5. Index Properties of Soils
2.6. Classification of Soils

Chapter 3 Effective Stress and Pore
Water Pressure
3.1. Effective Stress Principles
3.2. Effect of Water Table Fluctuations on
Effective Stress
3.3. Effective Stress in a Soil Mass under
Hydrostatic Conditions
3.4. Effective Stresses in Soils Saturated By
Capillary Action
3.5. Effective Stress and Surcharge
3.6. Effective Stress and Seepage Pressure
3.7. Effective Stress in Partially Saturated Soils

Chapter 4 Soil Permeability and Seepage
4.1. Soil Permeability
4.2. Hydraulic Head
4.3. Darcy's Law
4.4. Determination of Coefficient of Permeability
4.5. Permeability of Stratified Soil Deposits

4.6. Seepage through Soils
4.7. Laplace's Equation
4.8. Stream and Potential Functions
4.9. Characteristics and Construction of Flow Net
4.10. Seepage through Earth Dams

Chapter 5 Compressibility and Consolidation of Soils 5.1. Initial, Primary and Secondary Consolidation 5.2. Basic Terms Related to Consolidation 5.3. Consolidation Test 5.4. Determination of Void Ratio in Consolidation Testes 5.5. Terzaghi's Theory of Consolidation 5.6. Determination of Coefficient of Consolidation 5.7. Pre-Consolidation	
6.Compaction **6.1** Field compaction tests 6.2 Field control of compaction	
Assessment techniques	**Continuous Assessment (50%)** **Final Exam (50%)**
Pre-requisite	CEng2151 & CEng1101
Semester	IV
Status of the Course	Compulsory
Learning teaching methods	Lecture, laboratory and field tests, field visits
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible.
	Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.

Literature	References:
	1. [1]Das, Braja, Principles of Geotechnical Engineering, 5th ed.,Brooks/Cole, 2002. 2. [2] Arora, D. K. (n.d.). Soil mechanics and Foundaion Engineering. Atkinson, J. (n.d.) 3. [3] Teferra, A. & Mesfin, L., Soil Mechanics, AAU. 4. Budhu M. (2000), Soil Mechanics and Foundations, Wiley and Sons. 5. Lambe, T. W., Whitman, R. V. (1999), Soil Mechanics, John Wiley & Sons Inc. 6. The Mechanics of Soils and Foundations (

Department of Civil Engineering	
Course Code	CEng3101
Course Name	Soil Mechanics II
Degree Program	B.Sc. in Civil Engineering
Module	Soil mechanics and Geology
Cp Credits	5 CP
Study Hour	☐ Lecture …………………………. 2hrs ☐ Laboratory …………………..…. 3hrs ☐ Home Study ………..………......... 5hrs
Objectives	Students will incorporate and utilize technology in Geotechnical analysis.
Competencies	Students will demonstrate an understanding of fundamental soil behaviour with applications in areas of earth pressures, changing stress, soil strength parameters, prediction of settlements, and prediction of bearing capacities. Students will understand common laboratory techniques.
Course Description/ Course Contents	☐ Shear strength of soils: shear resistance of soils, stress at a point and Mohr stress circle, shear characteristics of soils, Mohr-Coulomb failure criteria, shear tests. ☐ Contact pressure distribution: theoretical and approximate contact pressure distribution. ☐ Bearing capacity of soils: general determination of bearing capacity of soils using different methods. ☐ Lateral earth pressure: lateral earth pressure problems, earth pressure theories. 153 ☐ Slope stability problems: slope movements, slope stability analysis. **(Laboratory tests: direct shear test, triaxial compression test, unconfined compression test.)**

Pre-	Soil Mechanics I	
Semester	Third year ,semester I	
Status of the	Compulsory	
Learning teaching methods		Lecture, laboratory and field tests, field visits
Assessment techniques	Continuous assessment (quizzes, tests, class works, assignments, laboratory and field works and presentations) and final exam	
Course Policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. Minimum of 80 % attendance during lectures and 100 % attendance during practical work sessions, except some unprecedented mishaps. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.	
Literature	1. Das, Braja, *Principles of Geotechnical Engineering*, 5th ed.,Brooks/Cole, 2002. 2. Budhu M. (2000), Soil Mechanics and Foundations, Wiley and Sons. 3. Lambe, T. W., Whitman, R. V. (1999), Soil Mechanics, John Wiley & Sons Inc. 4. Teferra, A. & Mesfin, L., Soil Mechanics, AAU 5. Craig, R.F. (2004), Craig's Soil Mechanics, 7th edition, Taylor & Francis.	

11-   MODULE 11

DESIGN OF FOUNDATIONS

Courses of the Module		
Course Code	Course Name	CP
CEng 3112	Foundation Engineering I	5
CEng 4112	Foundation Engineering II	5
	TOTAL	10 CP

Department of Civil Engineering	
Module Name	Design of Foundations
Module Number	11
Objectives	In practice Civil Engineers are required to design and propose foundations for a variety of infrastructure. The purpose of this module is to provide the students with a solid knowledge and understanding of the principles governing the design and analysis of foundation systems for structures and to provide them with an opportunity to apply the design procedures learned in class to a "real life" foundation design project.
Competencies	Students will be able to understand and formulate a foundation design problem, able to compute the design bearing capacity of shallow and deep foundations, able to compute the settlement of shallow and deep foundations, able to analyze the forces on and stability of retaining walls, and able to develop the pressure and force diagrams needed to produce shear and moment diagrams for foundation design.
Mode of Delivery	Parallel
Learning Teaching Method	Lectures, tutorials, assignments, class works, mini projCP and field visits
Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**
	Continuous assessment (quizzes, tests, assignments, mini projCP, class works, reports and presentations) and final exam

Department of Civil Engineering	
Course Code	CEng3112
Course Name	Foundation Engineering I
Degree	B.Sc. in Civil Engineering
Module	Design of Foundations
Cp Credits	5
Study Hour	Lecture …………………………… 2hrs Tutorial …………………..……….. 3hrs Home Study ………...……........... 5 hrs per week
Objectives	To equip students with a sound knowledge about site exploration methods, selection of foundation type, analysis and design of shallow foundations and retaining structures.
Competencies	The student shall be able to: ☐ Plan a geotechnical site investigation program. ☐ Design different types of shallow foundations. ☐ Design earth retaining walls.
Course Description/ Course Contents	☐ Site exploration: purpose, plan and methods of soil explorations, evaluation of field tests data. ☐ Types of foundations and their selection. ☐ Introduction to Ethiopia standards and other standards in foundations area. ☐ Design of shallow foundations: isolated or spread footings, combined footings, strap or cantilevered footings, mat foundations, eccentrically and inclined loaded foundations. ☐ Analysis and design of retaining structures: conventional retaining walls, introduction to soil reinforcement techniques, sheet pile walls. ☐ Comparison of hand calculations with SAFE/PLAXIS/GEOSLOPE
Pre-requisite	Soil mechanics II and Reinforced concrete I
Semester	Third year second semester
Status of the Course	Compulsory
Mode of Delivery	Lectures, tutorials, assignments, class works, mini projCP and field visits
Mode of Assessment	Continuous assessment (quizzes, tests, assignments, mini projCP, class works, reports and presentations) and final exam

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Bowles, J. E., Foundation Analysis and Design, McGraw-Hill. 2. Das, B. M., Principles of Foundation Engineering, PWS pub. Co. 3. Tefera, A., Principles of Foundation Engineering, AAU.

Department of Civil Engineering	
Course Code	CEng4112
Course Name	Foundation Engineering II
Degree Program	B.Sc. in Civil Engineering
Module	Design of Foundations
Cp Credits	5 CP
Study Hour	☐ Lecture …………………………. 2hrs ☐ Tutorial …………….………….. 3hrs ☐ Home Study ………...……........... 5 hrs
Objectives	To equip students with a sound knowledge about pile foundations, cofferdams and caissons, foundations of expansive soils and environmental issues in soil mechanics and foundation areas.
Competencies	The student shall be able to: ☐ Design deep foundations such as piles and pile raft foundations. ☐ Understand & interpret the behavior of expansive soils and be able to design foundations on expansive soils and take remedial measures. ☐ Understand the environmental issues in geotechnical Engineering.
Course Description/ Course Contents	☐ Pile foundations: classification, properties, pile capacity, negative skin friction, pile group, pile caps, batter piles, and laterally loaded piles. ☐ Introduction to piled raft foundations. ☐ Cofferdams and caissons (short exposure). ☐ Introduction to foundations of expansive soils: characteristics of expansive soils, Physical properties of expansive soils, mechanisms of swelling, methods of preventing heave damage, investigation of cracked buildings in expansive soil areas and the remedial measures. ☐ Environmental issues in soil mechanics and foundation areas: interference of retaining structures on the environments, effCP of burrow and fill sites on the environment, effCP of sanitary fill sites on the environment.
Pre-requisite	Foundation Enginering I
Semester	Fourth year second semester
Status of the Course	Compulsory
Mode of Delivery	Lectures, tutorials, assignments, class works, mini projCP and field visits
Mode of Assessment	Continuous assessment (quizzes, tests, assignments, mini projCP, class works, reports and presentations) and final exam

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Bowles, J. E., Foundation Analysis and Design, McGraw-Hill. 2. Das, B. M., Principles of Foundation Engineering, PWS pub. Co. 3. Tefera, A., Principles of Foundation Engineering, AAU. 4. Tomlinson, M.J. and Boorman, R. (2001), Foundation Design and Construction, 7th edition, Longman Group United Kingdom. 5. Coduto, D.P. (2001), Foundation Design: Principles and Practices, 2nd edition, Prentice Hall.

12-   MODULE 12

ROAD AND TRANSPORT ENGINEERING

Courses of the Module		
Course Code	Course Name	CP
CEng 2122	Transport Engineering	4
CEng 3121	Highway Engineering I	5
CEng 3122	Highway Engineering II	5
CEng 3124	Rail Way Engineering	4
	TOTAL CP	18

Department of Civil Engineering	
Module Title	Road and Transport Engineering Module
Module Number	12
Rationale of the module	☐ Students need to learn the basics of transport Engineering in order to design highways on the basis of sound data. ☐ To introduce students to the fundamental issues in transportation systems theory, analysis, and design. ☐ This module is highly justified for the very fact that it emphasizes on the underlying principles of geometric design of highways and the pavement necessary to carry the traffic load.
Module Objectives	☐ Familiarize students with the fundamentals of planning, analyzing, and designing of basic elements of an integrated surface transportation system. Basic elements of a surface transportation system. ☐ Equip students with the concepts and applications of geometric design for rural and urban highways. ☐ Make students acquainted with the principles of pavement analysis and design and help them acquire basic knowledge and practical prospective of highway materials, and construction practice. .

Module Competencies	☐ Students will be able to identify components of the different transportation modes and will be able to utilize design characteristics of the driver, pedestrian, vehicle, and roadway to design ☐ Students will be able to understand and apply the different geometric design control criteria, and be able to evaluate and modify the condition of an existing highway system. ☐ Students will also demonstrate knowledge of properties of highway materials, construction practice, and quality control.
Module Mode of Delivery	**Parallel**
Module Learning and Teaching Method	lectures, tutorials, lab and projCP
Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**

Department of Civil Engineering	
Course Code	CEng 2122
Course Title	Transport Engineering
Degree Program	B.Sc. in Civil Engineering
Module	Road and Transport Engineering Module

Study hour per week	**4 CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	3hrs	8hrs

Course Objectives	To introduce students to the fundamental issues in transportation systems theory, analysis, and design.
Competences to be Acquired/course level competences	**Students shall** ☐ Learn and understand transportation systems & their planning; and demonstrate ability to plan, analyze, and design the basic elements of an integrated surface transportation system. ☐ Design and analyze traffic volume studies. ☐ Design and analyze travel time and delay studies. ☐ Design and analyze traffic accident studies. ☐ Design and analyze parking studies
Course Description	☐ Introduction to transport systems: Highways, railways, airways, and waterways. ☐ Transport planning: elements of transport planning, urban transport planning, and evaluating transport alternatives. ☐ Driver, pedestrian, vehicle, and road characteristics. ☐ Traffic Engineering studies: spot speed studies, volume studies, travel time and delay studies parking studies and road traffic safety. ☐ Fundamental principles of traffic flow: traffic flow elements, and flow-density relationships. ☐ Traffic-control devices and systems: traffic signs, pavement markings and islands, and traffic signals.
	☐ Highway capacity: level of service, capacity of highways, and intersections.

| Course outline | **Chapter one**
  1.1 FUNDAMENTALS OF TRAFFIC FLOW.
    1.1.1   Speed, volume, density measurements
    1.1.2   Speed, density, flow relationships
    1.1.3   Vehicle/driver/roadway interactions
    1.1.4   Equations of motion for a single vehicle
1.2 TRAFFIC FLOW CHARACTERISTICS
    2.1.1   Flow characteristics
    2.1.2   Speed characteristics
    2.1.3   Density characteristics
1.3 STATISTICAL DISTRIBUTIONS OF TRAFFIC FLOW PARAMETERS
  1.31.Counting and interval distributions
  1.3.1 Headway distributions
  1.3.2 Speed distribution models
  1.3.3 Gap acceptance distributions
1.4 TRAFFIC STREAM MODELS
1.4.1 Speed-density models
1.4.2 Speed-flow models
1.4.3 Density-flow models
Chapter Two
 CAR FOLLOWING MODELS
2.1 Linear car following models
2.2 Traffic stability
2.3 Non-linear car following models
2.4 From car following to traffic stream models
2.5 Acceleration noise.
Chapter Three
 CONTINUUM FLOW MODELS
3.1 Simple continuum models
3.2 High order continuum models
Chapter Four
 TRAFFIC OPERATIONAL ANALYSIS TECHNIQUES
4.1 shock wave analysis
4.2 Definition of shock waves
4.3 Types of shockwaves
4.4 Calculation of shockwave speed
4.5 Shock wave at intersections
4.6 Shock wave along a highway
4.7 Applications of shockwave analysis
Chapter Five
 QUEUING ANALYSIS
5.1 Queuing systems
5.2 Deterministic queuing |

	5.3 Stochastic queuing
	5.4 Queuing models for roadways
	5.5 Queuing models for intersections
	5.6 Applications of queuing analysis
	Chapter Six
	TRAFFIC SIMULATION (PROBABILISTIC MODELING)
	6.1 Principles of Simulation
	6.2 Traffic flow simulation
	6.3 Steps in developing simulation models
	6.4 Commercially available models, simulation
	6.5 languages, applications
	Chapter Seven
	NETWORK FLOW SURVEILLANCE AND CONTROL
	7.1 Arterial traffic flow control
	7.2 Network traffic flow control
	Chapter Eight
	TRAFFIC FLOW MODELS FOR INTERSECTIONS
	8.1 Signalized Intersections – The HCM procedure
	8.2 Signalized intersections – saturation flow, capacity and LOS
	8.3 Signalized intersections – signal optimization
	8.4 Un signalized intersections – The HCM procedure
	8.5 Un signalized intersections – Gap acceptance
	Chapter Nine
	HIGHWAY FACILITIES AND PRINCIPLES FOR THEIR ANALYSIS
	9.1 Freeways – The HCM methods
	9.2 Freeway merging – Gap acceptance for merging
	9.3 Freeway weaving – Modeling and simulation
	9.4 Two-lane highways – The HCM procedure – Modeling and simulation
Pre-requisites	**None**
Semester	Year 3, Semester I
Status of Course	Compulsory
Mode of delivery	parallel
Mode of assessment	Tests, quiz, assignments, lab reports, presentations and exams
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible.

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Literature	Roess, R. P. and Prassas, E. (2004), Traffic Engineering, 3rd edition, Prentice-Hall. 2. Roess, R. P. and Falcocchio, J. C. (2004), Highway Transportation Engineering, 14. Pearson US Imports & PHIPEs.

Department of Civil Engineering	
Course Code	CEng3121
Course Title	Highway Engineering I
Degree Program	B.Sc. in Civil Engineering
Module	**Road and Transport Engineering**
CP Credits	**5 CP**

Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	5hrs	10 hrs

Course Objectives	Students will develop and apply concepts of geometric design for rural and urban highways.
Competences to be Acquired/Course level competences	☐ Students will demonstrate ability to design and evaluate various types of rural and urban highways ☐ Knowledge of geometric design of highways and streets. ☐ Knowledge of criteria for determining final highway alignment. ☐ Knowledge of interchange design.
Course Description	☐ Functional classification systems of highways ☐ Highway route selection: factors to be considered in highway route selection, steps in highway route surveys. ☐ Geometric design of highways: Design controls and criteria; ☐ Highway cross-section elements – lane and shoulders, sidewalks, medians, and pedestrian crossings; ☐ Elements of geometric design – sight distance, horizontal alignment: design of circular and transition curves; vertical alignment: grade selection and design of vertical curves; combinations of horizontal and vertical alignment; Intersections and interchanges. ☐ Drainage and drainage structures: surface and subsurface drainage facilities. ☐ Earthwork quantities and mass-haul diagram.

Course Outline	**1.1.1 Chapter I: Introduction to Transportation Planning**
	   Introduction,
	1.2 Basic elements of transportation planning,
	1.3 Planning data collection
	1.4 Transportation Systems Modeling
	   1.4.1 Trip Generation
	   1.4.2 Trip Distribution
	   1.4.3 Modal Split
	   1.4.4 Trip Assignment
	1.1.2 Chapter II: Introduction to Traffic Engineering
	2.7 Introduction to traffic Engineering,
	2.8 study areas of traffic Engineering,
	2.9 3-Es of traffic Engineering,
	2.10 traffic flow analysis,
	2.11 Highway capacity [L-O-S analysis].
	1.1.3 Chapter III: Highway Alignment and Surveys
	   Introduction
	3.1 Requirements of alignment,
	3.2 Factors Controlling Alignment,
	3.3 Engineering Surveys for Highway Location,
	3.4 Map Study, Reconnaissance,
	3.5 Preliminary Survey, Final location and detailed survey
	3.6 Highway Drawings and Report Profile,
	3.7 Steps in a new highway projCP
	1.1.4 Chapter IV: Highway Geometric Design
	   4.1 Principles of alignment
	   4.1.1 Tangents
	   4.1.2 Circular curves
	   4.1.3 Transition curves
	   4.1.4 Super elevation
	   4.1.5 Roads widening
	   4.1.6 Friction factors
	   4.2 **Vertical alignment**:
	   4.2.1 Principles of alignment
	   4.2.2 Grades
	   4.3 Vertical curves
	   4.3.1 Crest curves
	   4.3.2 Sag curves
	Chapter V: Comparison of hand calculations with EIL ROAD/EAGLE POINT Application Software

Pre-requisites	Surveying II andTransport Engineering
Semester	Year 3, Semester I
Status of Course	Compulsory
Teaching &	Lectures, tutorials and project.

Learning Methods	
Assessment/ Evaluation	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	Wright, P. H. and Karen, D. (2003), *Highway Engineering*, 7th edition, Wiley. 2. Rogers, M. (2003), *Highway Engineering*, Blackwell Science Ltd. 1. Mannering, F. L., Kilareski, W. P., & Washburn, S. S. (2004), *Principles of Highway Engineering and* 4.*Traffic Analysis*, 3rd edition, Wiley

Department of Civil Engineering	
Course Code	CEng3122
Course Title	Highway Engineering II
Degree Program	B.Sc. in Civil Engineering
Module	Road and Transport Engineering Module

Study hour per week	5 CP				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	0	3hrs	5hrs	10hrs

Course Objectives	At the end of the course, students would understand: ☐ Identify the classification of soil with respect to Engineering properties by laboratory works ☐ Differentiate materials used in base and sub-base construction that are available in the location of construction ☐ Select form every alternatives with what types of road to be constructed. ☐ Design structurally and efficiently flexible and rigid pavements ☐ Design drainage structure intelligently with the efficient and economical sections
Competences to be Acquired/course level competences	☐ Students will demonstrate ability to analyze and design both asphalt and concrete pavements. ☐ Knowledge of factors affecting the highway foundation structure ☐ Knowledge of flexible and rigid pavement design ☐ Knowledge of cost and economic life of roads ☐ Knowledge of overall highway design process.
Course Description	☐ Overview of pavement structures & types: ☐ Stresses in pavement structures. ☐ Traffic volume and loading ☐ Sub grade soils, special soil tests for pavement design, soil classification for highway purposes.

	☐ Unbound pavement materials. ☐ Stabilized pavement materials. ☐ Bituminous materials: sources and properties of binders; types of asphalt mixtures. ☐ Marshall Method of mix design, and surface treatments. ☐ Structural design of flexible pavements: AASHTO method of flexible pavement design; ☐ Design of flexible pavement structures using ERA and AACRA design procedures, ☐ Design of gravel surfaced road

Course outline	**CHAPTER-I INTRODUCTION TO HIGHWAY PAVEMENT**
	General [Functions, Characteristics, Types, Components, Design Process, Maintenance and Rehabilitation] Of Pavements
	CHAPTER-II HIGHWAY MATERIALS
	General,
	2.1 Highway materials:
	    2.1.1 Soils
	    2.1.2 Aggregates
	    2.1.3 Bituminous
	    2.1.4 Portland cement
	CHAPTER-III HIGH-TYPE BITUMINOUS PAVEMENTS
	General,
	3.1 Design of Paving Mixtures:
	    3.1.1 Fundamental Properties of Bituminous Mixes
	    3.1.2 Concept and Objectives of Asphalt Mix Design
	    3.1.3 Classification of Hot-Mix Paving
	    3.1.4 Steps in Paving Mix Design
	    3.1.5 Preparation of Mixture
	CHAPTER-IV FLEXIBLE PAVEMENT DESIGN
	General,
	4.1 Pavement Design Process,
	4.2 Parameters of Pavement Thickness Design:
	    4.2.1 Traffic
	    4.2.2 Sub grade
	    4.2.3 Climate or Environment
	    4.2.4 Use of design Catalog
	CHAPTER-V INTRODUCTION TO ROAD MAINTENANCE
	General,
	    5.1 the pavement management context,
	    5.2 pavement maintenance and rehabilitation, VIZIR 5.3 method of quality evaluation for paved roads.
	CHAPTER-VI HIGHWAY DRAINAGE DESIGN
	General,
	6.1 basic elements for highway drainage

	6.2 procedures for highway drainage design of ditches and culverts,
Pre-requisites	Highway Engineering I
Semester	Year 3, Semester I
Status of Course	Compulsory
Mode of delivery	Lectures, lab and project
Mode of assessment	Tests, quiz, assignments, lab reports, presentations and exams
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. Minimum of 80 % attendance during lectures and 100 % attendance during practical work sessions, except some unprecedented mishaps. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important.
Literature	1. Huang, Y.H. (2003), Pavement Analysis & Design, 2nd edition, Prentice-Hall. 2. Ritter L. J., Paquette, R.J. and Wright, P. H. (2003), Highway Engineering, 7th edition, John Wiley & Sons Inc. 3. Garber, N.J. & Hoel, L.A. (2001), Traffic & Highway Engineering, 3rd edition, 15. Thomson-Engineering

Civil Engineering Regular Program	
Course Code	CEng 3124
Course Title	Railway Engineering
Degree Program	B. Sc. in Civil Engineering
Module	**Road and Transport Engineering**
CP Credits	**4 CP**

Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study
	2hrs	3hrs	0	3hrs

Course Objectives & Competences to be Acquired	• Basic knowledge about rail way systems and train operation. Railway signaling, communication and control concepts of geometric design for rail ways, understand basic features of roadbed section, incorporate and utilize railway track technology design principles of rail, sleeper, fasteners, ballast, sub ballast and subgrade basic knowledge on freight & passenger transportation including train formation and organization of car flow understand the basics of railway system Engineering • *Acquire basic knowledge of railway subgrade characteristics and design requirements* • *Understand railway communication, signaling and control systems* • *Have knowledge of design of railway subgarde, railway line , rails, sleeper, ballast and sub ballast, stations* • *Acquire principles of design and construction of railway tunnel and bridge* • *Familiarize themselves with the different parts and components of in railway system Engineering* • *Participate* in railway projCP and develop interest in the field
Course Description/Course Contents	The course includes the detailed specification of roadway construction, its maintenance and rehabilitation. Introduction to road management system and the economic aspect of road construction are also a part of the course. It also deals with the method of road construction with respect to labor-based method

Content

1. Basics Of railway Engineering
1.1 Railway transportation system
1.2 Historic development of railway
1.3 Components of railway
1.4 General principle for railway construction and development
1.5 Railway classification and main technical standards
1.6 Railway signal, communication and control

2.   Railway Line and subgrade

I. Railroad line
2.1 Economic survey of railway line
2.2 Selection of main technical standards
2.3 Plane section
2.4 Longitudinal section

II. *Railroad subgrade*
2.5 Standard subgrade sections
2.6 Design of subgrade surface
2.7 Drainage of road bed
2.8 Safeguards and strengthening of roadbed

3. Railway Track Structures
3.1 Component and function of track structure
3.2 Rails
3.3 Sleepers
3.4 Ballast and sub ballast
3.5 Rail fastening system/ Union piece
3.6 Ballasted and slab track

4. Railway Station
4.1 Definition, Basic tasks and Classification of railway station
4.2 Distribution and location of station
4.3 Rules for station distribution and Location
4.4 Passing and overtaking stations
4.5 Intermediate station Layout
4.6 Main equipments and facilities

5. Switches & Turnouts
5.1 The Switches and their function
5.2 Main Types of switches and turnouts
5.3 Components of a single switch
5.4 Turnouts
5.5 Switch calculations and design
5.6 Railway Clearance

6. Introduction to tunnels & bridges
I. Tunnels
6.1. Definition and Function of Tunnel
6.2. Cross section and Notations in tunneling
6.3. Installations in tunnels
6.4. Uncertainties in tunneling

6.5. Tunnel Design methods

6.6. Tunneling techniques

II. Railway Bridges

6.7. Layout and components Railway Bridge

6.8. Bridge components: use and functionality

6.9. Deck Configuration

6.10. Types of bridges

6.11. Design Loadings for Railway Bridges

7. Organization of train operation

7.1. Train Formation

7.2. Organization of Car Flow and Freight- formation plan

7.3. Train Diagram & Carrying capacity

7.4. Organization of Station Operation

Pre-requisites	High way Engineering I and Theoty of Structures II
Semester	Year 3, Semester II
Status of Course	Compulsury

Mode of delivery	The mode of the delivery of the course will basically be student centered active learning and is summarized as follows:
	    Lecture
	    Tutorials
	    Group Discussion
	    Home Works

	Mode of delivery is Parallel
Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Modern railway Track (C. Esveld)
	2. Railroad Engineering (William W.Hay) 3. Railway Management and Engineering 4. AREMA standard 5. Chinese standard 6. Any Railway Engineering books

13-   MODULE 13

HYDROLOGY AND HYDRAULICS

Courses of the Module		
Course Code	Course Name	CP
HWRE 3131	Engineering Hydrology	5
HWRE 2131	Hydraulics I	4
HWRE 2132	Hydraulics II	4
HWRE 3133	Open Channel Hydraulics	4
	TOTAL	17 CP

Module Title	Hydrology and Hydraulics
Module Number	13
Rationale of the module	*A Civil engineer needs to understand the water cycle near the surface of the earth sinc affected by the same cycle. In order to design irrigation, water supply and hydropow available for direct use.*
	Water is delivered to the point of use either in closed conduits or open channels. The sizing of these conveyance structures requires sound understanding of continuity equation, conservation of momentum, and conservation of energy and their application. *This module is required in order to analyses such problems.*

Module Objectives	The main objectives of the module are to: □ Understand how elements of the hydrologic cycle impact in Civil and environmental Engineering systems. □ Understand how to use hydrology to design hydraulic systems. □ Understand the importance of a probabilistic approach of analysis. □ Understand how observations of the hydrologic cycle are made and how they can be appropriately used. □ Understand how to predict risks and reliabilities of flood control systems □ Be familiar with the field of hydraulics □ for given flows and conditions, be able to dimension pipes and channels; □ learn the fundamentals of sediment transport; □ learn the principles of flow modeling in hydraulic Engineering; □ gain understanding of the methods and applications of hydraulic research
Module Competencies	After completion of this module the students shall be able to; □ Analysis of Hydrological methods, water supply and elementary

	hydraulic structures
Module Mode of Delivery	Parallel
Module Learning and Teaching Method	Lectures, tutorials, laboratory, exercises, Project
Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**

Department of Civil Engineering	
Course Code	HWRE 2131
Course Title	Hydraulics I
Degree Program	B.Sc. in Civil Engineering
Module	**Hydrology & Hydraulics**

Study hour per week	**4 CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	0	3hrs	3hrs	8hrs

Course Objectives	☐ To introduce junior Civil Engineers to fluid mechanics at a more fundamental level and with a more mathematical approach
Competences to be Acquired/course level competences	Students will be able to: ☐ Understand the mechanical properties of fluids (density, viscosity, stress/strain relationship) and their relation to molecular properties. ☐ Discern between laminar and turbulent flow. ☐ Compute forces on structures (e.g. dams) resulting from fluid pressure. ☐ Understand fluid pressure distributions in moving fluids. ☐ Perform control volume analyses of mass, momentum, and energy conservation in accordance with Reynolds Transport Theorem. ☐ Understand and compute drag and lift forces.
Course Description	☐ Properties of fluids. ☐ Hydrostatics: Euler´s basic equation, relative equilibrium. ☐ Manometry. ☐ Hydrostatic forces on plane and curved surfaces. Tensile stress in pipes. ☐ Buoyancy and stability of floating bodies. Kinematics of fluid flow. ☐ Flow net analysis.
	☐ *Continuity and Bernoulli´s equations.* ☐ *Impulse and momentum principle and itsapplications.* ☐ *Boundary layer theory: concepts, growth, energy and momentum thickness, laminar sub-layer*

Course outline	CHAPTER 1: INTRODUCTION CHAPTER 2: FLUID PROPERTIES 2.0 General description 2.1 Properties of fluids 2.2 Physical Properties 2.3 Pressure, compressibility & Elasticity 2.4 Surface tension & capillarity CHAPTER -3 HYDROSTATICS OF FLUIDS 3.0 Introduction 3.1 Hydrostatic pressure at a point 3.2 Basic Equation of Hydrostatics 3.3 Measurement of pressure 3.4 Hydrostatic pressure on plane & curved Surfaces 3.4.1 Hydrostatic forces on plane Surfaces: 3.4.2 Hydrostatic forces on curved surfaces 3.5 Buoyancy & Stability of Floating & Submerged bodies: 3.6 Relative Equilibrium of liquids CHAPTE- 4 KINEMATICS OF FLUID FLOW 4.0 Introduction 4.1 Dimensions of Flow 4.2 Describing the pattern of flow 4.3 Types of flow 4.4 Continuity equation 4.5 Stream function & Velocity potential 4.6 Flow Nets CHAPTER-5 DYNAMICS OF FLUID FLOW 5.0 Introduction 5.1 Forces influencing fluid motion 5.2 Equation of Motion 5.3 Hydraulics grade line & Energy grade line 5.4 Impulse – momentum equation
Pre-requisites	**Applied Mathematics I; Engineering Mechanics I**
Semester	Year II, Semester I
Status of Course	Compulsory
Mode of delivery	Lectures, tutorials, Lab., exercises
Mode of assessment	**As per Bahir Dar University Academic Regulation**

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. Minimum of 80 % attendance during lectures and 100 % attendance during practical work sessions, except some unprecedented mishaps. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important.
Literature	1. Crowe, Roberson and Elger. Engineering Fluid Mechanics, 8th Edition, John Wiley & Sons, 2005. 2. Streeter V., Fluid Mechanics, 1997

.Department of Civil Engineering	
Course Code	HWRE 2132
Course Title	Hydraulics II
Degree Program	B.Sc. in Civil Engineering
Module	**Hydrology & Hydraulics**
CP Credits	**4 CP**

Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs		3hrs	3hrs	8hrs

Course Objectives	☐ The aim of this course is to familirze the students with pipe flows, flows in pipe networks, free-surface flows, applications of physical modelling, and fundamentals of water hammer analysis.
Competences to be Acquired/Course level competences	☐ Ability to analyze and design piping systems, including water distribution systems,Ability to analyze and design open channel flow facilities, including conveyance, systems, hydraulic jumps and backwater curves,Be familiar with hydraulics and design of pump stations, Familiarity with the design and analysis of culverts. Laboratory ☐ Ability to identify various pieces of hydraulic equipment such as pumps, valves, pipe, sizes and material of construction, Ability to operate hydraulic equipment such as pumps, valves and meters, Ability to conduct hydraulic experiments; and to collect, analyze and interpret collected,data, Ability to use computer to solve complex hydraulic problems.
Course Description	☐ Open channel flow: definition, elements of flow, computation. ☐ Energy and momentum principles in open channel flow: specific e nergy and specific force, critical flow, Channel transitions, hydraulic jump. ☐ Hydraulic models: dimensional analysis and hydraulic similitude,methods of
	investigation on scale models, model building. ☐ Closed-conduit flow: head loss equation, energy and pressure grade lines, laminar flow in pipes. ☐ Network design and analysis. Hydraulic machines: pumps and turbines ☐ types, velocity triangles, work done, efficiency, specific speed, and performance characteristics. ☐ Pump – pipe systems. ☐ Introduction to water hammer analysis.

Course Outline	**Chapter One: Open Channel Flow**
	    1.0 Types of Flow in Open Channel
	    1.1 Uniform Flow in Open Channel
	    1.2 Channel of Efficient Cross-section
	    1.3 Energy & Momentum Principles in Open Channel Flow
	    1.4 The Hydraulic Jump
	Chapter Two: Dimensional Analysis and Similitude
	    2.1 Dimensional Analysis
	    2.2 Dimensional Homogeneity
	    2.3 Methods of Dimensional Analysis
	    2.4 Model Analysis & Similitude
	Chapter Three: Closed Conduit Flow
	    3.1 Pipe Friction Formula, Laminar & Turbulent Flow
	    3.2 Pipes in Series, Parallel and Branching pipes
	    3.3 Network of Pipes
	    3.4 Introduction to Water Hammer Analysis
	Chapter Four: Hydraulic Machines
	    4.1 Pump Types
	    4.2 Turbine Types
	    4.3 Head on pumps and turbines
	    4.4 Specific Speed of pumps and turbines
	    4.5 Performance of pumps and turbines
	    4.6 Cavitation

Pre-requisites	Hydraulics I, HWRE 2131
Semester	Year II, Semester II
Status of Course	Compulsory
Teaching & Learning Methods	Lectures, tutorials,Lab.
Assessment/ Evaluation	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and

	submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. Minimum of 85 % attendance during lectures and 100 % attendance during practical work sessions, except some unprecedented mishaps. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important.
Literature	**Crowe, Roberson and Elger. Engineering Fluid Mechanics, 8th Edition, John Wiley & Sons, 2005.** 3. **Streeter W., Fluid Mechanics, 1997**

Civil Engineering Regular Program	
Course Code	HWRE 3133
Course Title	Open Channel Hydraulics
Degree Program	B. Sc. in Civil Engineering
Module	**Hydrology and Hydraulics**
CP Credits	**4 CP**

Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study
	2hrs	3hrs	0	3hrs

Course Objectives & Competences to be Acquired	The objective of this course is to provide students knowledge on the parameters governing the flow through open-channels, and the types of water-surface-profiles. Students at the end of the course should be in a position to understand the principles of open channels flows, use the available energy of flow wherever possible and at the same time they should be in a position to determine water surface profile of open channel flows.
Course Description	☐ *Flow computations: critical flow, uniform flow.* ☐ *Gradually varied flow: differential equations of gradually varied flow; gradually varied flow profiles, computations of gradually varied flow* ☐ *Rapidly varied flow: flow characteristics, flow over spillways, flow under gates, hydraulic jump and its use as energy dissipater.* ☐ *Sediment transport and design of stable channels:sediment transport in open channels, hydraulic properties of sediments, mode of sediment transport, design of stable channels*

Course outline	**Chapter One: Open Channel Flow**
	    1.1 Open Channel Flow and Its Classification
	    1.2 Basic Hydraulics Principles
	    1.3 Specific Energy and Critical Depth
	    1.4 Critical State of Flow
	    1.5 Flow Computation Formulas
	Chapter Two: Gradually Varied Flow (GVF)
	    2.1 General Equation for GVF
	    2.2 Classification of Flow Profile
	    2.3 GVF Computations
	Chapter Three: Rapidly Varied Flow (RVF)
	    1.1 RVF VS GVF
	    1.2 Flow Over Spillways
	    1.3 Hydraulic Jump and Its Use as Energy Dissipater
	    1.4 Flow Under gates
	Chapter Four: Sediment Transport in Open Channels
	    1.1 Characteristics of Sediment
	    1.2 Hydraulic properties of Sediment
	    1.3 Mode of Sediment Transport
	    1.4 Design of Stable Channel
	Chapter: Creating Water Profiles using Excel or related softwares

Pre-requisites	**Hydraulics II**
Semester	Year III, Semester I
Status of Course	Compulsory
Mode of delivery	Lectures, tutorials, lab., exercises
Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as

	soon as possible. Students are expected to attend class regularly. Minimum of 85 % attendance during lectures and 100 % attendance during practical work sessions, except some unprecedented mishaps. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important.
Literature	☐ Henderson, F. M. *Open Channel Flow, Macmillan,* ☐ Subhash C. Jain. (2000). *Open Channel Hydraulics*, John & Wiley. ☐ Hubert Chanson (2004), *Hydraulics of Open Channel Flow.*

Department of Civil Engineering	
Course Code	HWRE 3131
Course title	Engineering Hydrology
Degree Program	B.Sc. in Civil Engineering
Module	**Hydrology & Hydraulics**

Study hour per week	**5CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	5hrs	10hrs

Course Objectives	☐ Understand how observations of the hydrologic cycle are made and how they can be appropriately used. ☐ Understand how to predict risks and reliabilities of flood control systems.
Competences to be Acquired/course level competences	Students will be able to: ☐ Complete a water balance on a watershed. ☐ Understand how to obtain process and use hydrologic data from various sources. ☐ Understand measurements techniques of the components of the hydrologic cycle and the associated errors, advantages, and limitations. ☐ Understand the significance of global and local precipitation patterns. ☐ Use unit hydrographs for Engineering applications. ☐ Apply standard river and reservoir routing techniques
Course Description	☐ Basic hydrological concepts: the hydrologic cycle. ☐ Precipitation, Evaporation and sediment stream flow: factors affecting, measurement. ☐ Areal rainfall estimation, Intensity-Duration-Frequency curves, and runoff: stage-discharge relations, rating curves.

	☐ Hydrographs, Unit hydrographs, S-hydrographs, Synthetic UH, flow-duration curves. ☐ Processing of hydrological data, frequency analysis of floods. ☐ Flood routing through reservoirs and river channels. ☐ Spillway design flood estimation. ☐ Estimation of reservoir capacity. ☐ Groundwater: occurrence and movement, ☐ Darcy's law, determination of ground water flow parameters, hydraulics of wells.

Course outline	**CHAPTER ONE**
	1.1 General
	1.2 Meteorological data
	1.2.1 Principle of data analysis
	1.3 Hydrological data
	1.3.1 Missing data and comparison with the precipitation data
	CHAPTER TWO
	RAINFALL-RUNOFF RELATIONSHIPS (APPLICATION OF DIFFERENT RAINFALL RUNOFF MODELS)
	2.1 HYDROLOGICAL MODELS
	2.2 DETERMINISTIC HYDROLOGICAL MODELS
	2.2.1 Empirical (Black Box) Models
	2.2.2 Lumped Conceptual Models
	2.2.3 Distributed Process Description Based Models
	2.3 STOCHASTIC TIME SERIES MODELS
	2.4 RATIONAL METHOD
	2.4.1 Runoff Coefficient
	2.4.2 Rainfall intensity
	2.4.3 Time of Concentration
	2.5 SCS CURVE NUMBER METHOD
	2.6 TIME-AREA METHOD
	2.7 STREAM FLOW HYDROGRAPH
	2.7.1 Hydrograph Analysis
	2.7.2 Factors affecting flood hydrograph
	2.7.3 Effective Rainfall
	2.7.4 Separation of Base Flow and Runoff
	2.8 THE UNIT HYDROGRAPH (UH)
	2.8.1 Derivation of the Unit Hydrograph from single storms
	2.8.2 Changing of the Duration of the UH
	2.9 APPLICATIONS OF UNIT HYDROGRAPH
	2.10 SYNTHETIC UNIT HYDROGRAPHS
	2.10.1 Snyder's method
	2.11 UH FROM A COMPLEX STORM
	2.12 INSTANTANEOUS UNIT HYDROGRAPH (IUH)
	2.13 DIMENSIONLESS UNIT HYDROGRAPH

2.14   HYDROLOGY OF UNGAUGED CATCHMENTS

CHAPTER THREE

FLOOD ROUTING

3.1   GENERAL

3.2   SIMPLE NON-STORAGE ROUTING

3.3   STORAGE ROUTING

3.4   RESERVOIR OR LEVEL POOL ROUTING

3.5   CHANNEL ROUTING

3.5.1   MUSKINGUM METHOD OF ROUTING

3.5.2   APPLICATION OF THE MUSKINGUM METHOD

3.6   HYDRAULIC ROUTING

CHAPTER FOUR

FREQUENCY ANALYSIS (PROBABILITY IN HYDROLOGY)

4.1   GENERAL

4.2   FLOW FREQUENCY

4.3   FLOOD PROBABILITY

4.3.1   Selection of Data

4.3.2   Plotting Positions

4.3.3   Theoretical Distributions of Floods

4.3.4   Extreme-Value Type I Distribution (Gumbel's Method)

4.3.5   Gumball's Equation for Practical Use

4.3.6   Confidence Limits for the fitted data

4.3.7   Log-Pearson Type III Distribution

4.4   REGIONAL FREQUENCY ANALYSIS

4.5   LOW FLOW ANALYSIS

4.5.1   Definitions and Basic Concepts

4.5.2   Low flow frequency analysis

4.5.3   Drought analysis

4.6   PRECIPITATION PROBABILITY

4.7   RISK, RELIABILITY AND SAFETY FACTOR

CHAPTER FIVE

STOCHASTIC HYDROLOGY

5.1   INTRODUCTION.

5.2   TIME SERIES

5.3   PROPERTIES OF TIME SERIES

5.4   ANALYSIS OF HYDROLOGIC TIME SERIES

5.4.1   Trend component

5.4.2   Periodic component

5.4.3   Stochastic component

5.5   TIME SERIES SYNTHESIS

	5.6.1 Purely random stochastic models
	5.6.2 Autoregressive models
	5.6.3 First order Markov process with periodicity: Thomas - Fiering model
	5.6.4 Moving average models
	5.6.5 ARMA models
	5.7 THE USES OF STOCHASTIC MODELS
	CHAPTER SEVEN
	RESERVOIR CAPACITY DETERMINATION
	7.1 MASS CURVE (RIPPLE'S) METHOD:
	7.2 RESERVOIRS AND SEDIMENTS
	7.3 SEDIMENT LOAD PREDICTION
	CHAPTER EIGHT
	URBAN HYDROLOGY
	8.1 CATCHMENT RESPONSE MODIFICATIONS
	8.2 URBAN DEVELOPMENT PLANNING
	8.3 DRAINAGE DESIGN
Pre-requisites	**CEng2151, Hydraulics II**
Semester	Year III, Semester I
Status of Course	Compulsory
Mode of delivery	Lectures, tutorials,exercises
Mode of assessment	**As per Bahir Dar University Academic Regulation**

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Hydrology principles, analysis and design, by H.M Raghunath, 1995 2. Elzabeth M.Shaw (1994), Hydrology in practice, 3rd edition 3. Ray K.Linseley, JR etal, (1982), Hydrology for Engineers, 3rd edition 4. Stochastic Hydrology, Dr. P. Jayarami reddy 1997, New Delhi 5. Flood frequency analysis, A.Ramachandrarao Kahled H. Hamed 6. Engineering hydrology, Second edition, K Subramanaya 7. Ven Te Chow and Maidment (1988). Engineering Hydrology. McGraw-Hill.

14-   MODULE 14

DESIGN OF HYDRAULIC STRUCTURES AND IRRIGATION

Courses of the Module		
Course Code	Course Name	CP
HWRE 3142	Hydraulic Structures I	5
HWRE 4142	Hydraulic Structures II	5
HWRE 5141	Hydropower Development	5
HWRE 4144	Irrigation Engineering	5
	TOTAL	20 CP

Department of Civil Engineering					
Module Title	**Design of Hydraulic Structures & Irrigation**				
Module Number	14				
Total Study Hours in the Module	Lecture	Tut	Pra/Lab	Home Study	Total Hour
Rationale of the module	☐ In order to insure food security and alleviate poverty, water resources should be developed economically. Water storage and conveyance structures are employed to this end. Hence, this module elucidates techniques employed to design such structures safely and economically. ☐ In order to ensure food self-efficiency in the face of increasing population, it is essential to harvest crops at least twice or more times annually.In order to ensure so, irrigation assisted farming is mandatory in times of deficiency of rainfall. Hence, this module is justified since it exposes the students with various methods of irrigation systems and the infrastructure required for the same purpose. This module is required in order to analyses such problems.				

Module Objectives	The module has the objective of introducing the students to:
	
	☐ To expose students to water storage structures such as dams, construction materials for dams, dam appurtenant structures and related ones. These include
	    ☐ Intake structures,
	    ☐ Outlet structures,
	    ☐ Energy dissipating structures,
	    ☐ Water diversion structures, and so on.
	☐ To exposed to river training measures, river morphology, soil conservation structures, and design of weirs on alluvial foundations.
	☐ Methods of estimating crop water requirement,
	☐ Methods of application of irrigation water such as sprinkler and drip irrigation systems
	☐ Diversion structures such as weirs and barrages

Module Competencies	After completion of this module the students shall be able to; ☐ Student can make analysis and design of hydraulic structures such as dams, spillways, and flood control structures. Student can design water works infrastructures like irrigation
Module Mode of Delivery	Parallel
Module Learning and Teaching Method	Lectures, tutorials, exercises, Project
Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**

Department of Civil Engineering					
Course Code	HWRE 3142					
Course Title	Hydraulic Structures I					
Degree Program	B.Sc. in Civil Engineering					
Module	**Design of Hydraulic Structures & Irrigation**					
Study hour per week	**5 CP**					
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	5hrs	10hrs
Course Objectives	☐ The course provides students with basic principles of design of dams and its appurtenant structures.					
Competences to be Acquired/course level competences	Students will be able to: ☐ Select appropriate type of dams for a given site ☐ Design different types of dams ☐ Check and appreciate safety of dams					
Course Description	☐ Classification of hydraulic structures. ☐ Location and selection of appropriate type of dam and spillway. ☐ Data collection. ☐ Foundations of dams and their treatment. ☐ Design and stability analysis of dams: gravity dams, earth dams, and rock-fill dams. ☐ Principles of design of arch and buttress dams ☐ Design and hydraulic calculation of spillways: ogee spillway, siphon spillway, shaft spillway and side channel spillway. ☐ Spillway crest gates. ☐ Terminal structures.					

	☐ *Outlet and intake structures.* ☐ *Methods of stream diversion during construction.* ☐ **Hydraulic structures In Hydropower Stations**

Course outline	**1. Elements of Dam Engineering**
	1.1. Introduction
	1.2. Dam Structures and Reservoirs
	1.3. Storage Components
	1.4. Reservoirs
	1.5. Classification of Dams
	1.6. General Characteristics of Embankment Dams
	1.7. Characteristics of Concrete Dams
	1.8. Site investigation, Selection of Sites and Type of Dams
	2. Design Principles of Dams
	2.1. Concrete Dams
	    2.1.1. Force Acting On Concrete Dams
	    2.1.2. Design and Analysis Of Gravity Dams
	2.2. Embankment Dams
	    2.2.1. Classification of Embankment Dams
	    2.2.2. Causes of Failure of Earth Dams
	    2.2.3. Design Principles
	2.3. River Diversion During Construction
	3. Dam Outlet Works
	3.1. Spillways and Its Design Principles
	3.2. Energy Dissipaters
	3.3. Dam Outlets or Sluices ways
	4. Hydraulic structures In Hydropower Stations
	4.1. Introduction
	4.2. Classification of Hydropower plant
	4.3. Prinicipal Components of Hydroelectric Scheme
	4.4. Hydraulic Turbines
	5. Comparison of hand calculations with GEOSLOPE Application Software

Pre-requisites	**Soil Mechanics II and Engineering Hydrology**
Semester	Year III, Semester II
Status of Course	Compulsory
Mode of delivery	Lectures, tutorials, exercises
Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and

	submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. P. Novak, A. I. B. Moffat, and C. Nallan (2001) Hydraulic structures. (3rd Edition) Publisher: Taylor and Francis 2. Walter. O. Wunderlich (2004) Hydraulic structures: Probabilistic approaches to maintenance. Publisher: American Society of Civil Engineer) 3. F. Yazdandoost and Jalal Attari (2004) Hydraulics of Dams and River Structures: Publisher: Taylor and Francis; William P. Creager (2006) Engineering for Dams –Vol-I (New Edition) Hesperides Press

Civil Engineering Regular Program	
Course Code	HWRE 4142
Course Title	Hydraulic Structures II
Degree Program	B. Sc. in Civil Engineering
Module	**Design of Hydraulics Structures and Irrigation**
CP Credits	**5 CP**

Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study
	2hrs	3hrs	0	5hrs

Course Objectives & Competences to be Acquired	As the students are equipped in the first course of this module with the knowledge of what Dams & Reservoirs are, this course will make the students know about designs of Over-flow structures, Diversion-tunnels, Diversion-channels, and Coffer-Dams. By the end of the semester, students should be confident enough to tackle problems pertaining to Hydraulic-Structures.
Course Description/	☐ River Morphology: cross-sectional index, meandering index, development process of alluvial streams, self adjustment of cross sections, alluvial cones and fans, stream delta, stream confluence, meandering and braided stream. ☐ Design of riverbanks and bed erosion protection works: drops, bottom sills, groins, or spurs, ripraps, revetments, gabions, and natural protection (planting of vegetation). ☐ Flood protection methods: dykes, flood diversion structures, storage ponds, etc. ☐ Diversion structures: types of diversion structures, design of diversion weirs and barrages. ☐ Seepage: critical exit gradient, Lane's theory of weighted creep length, Khosla's theory of seepage, flow nets, causes of failure by piping and uplift, safety against uplift and piping. ☐ Silt exclusion devices: silt excluder, silt ejector.. - .

Course Outline	**1. INTRODUCTION TO RIVER HYDRAULICS**
	  1.1 Development process of alluvial stream
	  1.2 River Morphology
	  1.3 Meandering and braided stream
	2. RIVER TRAINING AND DEVELOPMENT
	  2.1 Introduction
	  2.2 Objective and purpose of river training
	  2.3 Different types river training work
	    2.3.1 Marginal Embankment (levee)
	    2.3.2 Groynes or spurs
	    2.3.3 Pitched Island
	    2.3.4 Bank erosion protection
	    2.3.5 Guide bank
	    2.3.6 Artificial cutoff
	  2.4 River navigation
	 3. DIVERSION HEAD WORK
	  3.1 Introduction
	  3.2 Head Work for Diversion River
	  3.3 Weir types and component
	  3.4 Cause of Failures of Weir and their remedies
	  3.5 Components of barrage
	  3.6 Design of weirs and Barrages: Theory of Seepage
	    3.6.1 Khosla's theory of seepage
	    3.6.2 Exit and critical Gradient
	    3.6.3 Silt Excluder device

Pre-requisites	Hydraulics Structure I
Semester	Year IV, Semester I
Status of Course	Compulsory
Teaching & Learning Methods	Lectures, tutorials, project.
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality

	is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. **Arora, Hydraulic Structures.** 2. **Guarg, Irrigation Engineering & Hydraulic structures.** 3. **U.S.B.R, Design of small Dams.** 4. **Thomas, The Engineering of large dams.** 5. **Vicher & Hager (1998), Dam Hydraulics.** 6. **Jansen (1988), Advanced dam Eng'g for design construction &Rehabilitation.** 7. **Davis & Sorenson, Handbook of hydraulics.** 8. **Daryl B.Simon and Fuat Sentirk, Sediment transport and technology** 9. **S.N Ghosh, Flood control and Drainage Engineering.**

Civil Engineering Regular Program			
Course Code	HWRE 4144		
Course Title	Irrigation Engineering		
Degree Program	B. Sc. in Civil Engineering		
Module	**Design of Hydraulics Structures and Irrigation**		
CP Credits	**5 CP**		
Contact Hours (per semester)	Lecture	Tutorial	Practice or Laboratory	Home study
	2hrs	3hrs	0	5hrs
Course Objectives & Competences to be Acquired	The objective of this course is to understand the concepts of irrigation engineering and to know about the relationship between soil, water and plant, optimization of water for irrigation and the design criteria for irrigation canals. Successful students in this course will be able to describe the water requirement of various crops, designing irrigation canals in actual field conditions and also expected to use software based on this course.		
Course Description	☐ Feasibility studies of irrigation projCP. ☐ Soil-Plant-Water relationship: soil water potential, moisture stress of plants, soil moisture and plant growth, crop-water requirement. ☐ Land grading and field layout: land grading, survey and design, constructionproce dures and equipment, contour bench leveling. ☐ Water application techniques: border, furrow, sprinkler, drip and check-basin irrigation methods, irrigation efficiency. ☐ Salt problems in irrigated agriculture: saline and alkaline soils, quality of irrigation water, water logging and land reclamation process. ☐ Water conveyance and control: irrigation distribution systems, methods of water measurement and related hydraulic structures. ☐ Design and construction of subsurface drainage: drain materials and layout, filter design. ☐ Operation of irrigation systems: irrigation frequency		

Course outline	1) **INTRODUCTION**
	  1.1 Definition and Scope of Irrigation
	  1.2 Benefits and Ill-EffCP of Irrigation
	  1.3 Irrigation Development in Ethiopia
	  1.4 Standards of Irrigation Water
	  1.5 Procedures for Feasibility Studies of Irrigation ProjCP
	2) **SOIL-PLANT-WATER RELATIONSHIP**
	  2.1 Soil-Water Potential
	  2.2 Moisture Stress of Plants
	  2.3 Soil Moisture and Plant Growth
	3) **CROP-WATER REQUIREMENT**
	  3.1 Reference Evapotranspiration
	  3.2 Crop Water Requirements/Consumptive Use
	  3.3 Irrigation Efficiency and Irrigation Frequency
	4) **WATER APPLICATION TECHNIQUES**
	  4.1 Land Grading, Survey and Design
	  4.2 Border
	  4.3 Furrow
	  4.4 Check-Basin
	  4.5 Drip
	  4.6 Sprinkler
	5) **WATER CONVEYANCE AND CONTROL**
	  5.1 Irrigation Distribution Systems
	  5.2 Methods of Water Measurement
	  5.3 Related Hydraulic Structures
	6) **SURFACE DRAINAGE AND SUB-SURFACE DRAINAGE**
	  6.1 Salt Problems in Irrigation Agriculture
	  6.2 Saline and Alkaline Soils, Quality of Irrigation Water
	  6.3 Water Logging and Land Reclamation Process
	  6.4 Surface and Sub Surface Drainage Design and Construction

Pre-requisites	Hydraulics Structure I
Semester	Year 4, Semester II
Status of Course	Compulsory
Mode of delivery	Lectures, exercises
Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic

	dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action.
	While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized.
	If you are having problems with the assignments or tests, contact the instructor as soon as possible.
	Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important.
	If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Laycock A. (2007). *Irrigation System: Design, Planning and Construction.* Oxford University Press. 2. Michael, A.M. (1999). *Irrigation, Theory and Practice.1/e.* South Asia Book s.

Department of Civil Engineering				
Course Code	Wre 5141			
Course Title	Hydropower Development			
Degree Program	B.Sc. in Civil Engineering			
Study hour per week	**Total CP**			**5 CP**
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	5hrs	10hrs
Competences to be Acquired/course level competences	The student is able to • Select appropriate site for hydropower development • Assess the hydropower potential of a given river • Design basic layout and elements of a hydropower plant			
Course Objectives	The objective of the course is to introduce the fundamentals of design, construction, operation and maintenance of hydropower systems and infrastructure. Students will demonstrate understanding of hydraulic power as a source of energy, and be able to select appropriate site for hydropower development, understand different types of hydropower development arrangements, assess hydropower potential, perform hydrologic analysis of water storage alternatives for power production and design basic layout and elements of a hydropower plant.			
Course Description	• Water as a source of energy. • Estimation of waterpower potential: flow duration curves. • Electrical loads on turbines: load curve, load factor, firm and secondary power. • Classification of hydroelectric power plants: run-of-river, storage and pumped storage plants • Design of Power intakes, canals, tunnels, foreBay, surge tanks, penstocks. • Layout of powerhouse and accessories: cavitation requirements, draft tube, electromechanical equipment. • Planning and design of small hydropower plants.			
Course outline				
Content				

1. Introduction
1.1. Sources of Energy
1.2. Merits and Demerits of Hydropower

2. Development of Hydropower
2.1. Hydropower Status in the World
2.2. Hydropower potential & Status in Ethiopia

3. Estimation of Water Power Potential
3.1. Water Power Potential
3.2. Firm and Secondary Power
3.3. Load Prediction and Demand Assessment

4. Classification and Types of Hydropower Development

4.1. Classification and Basis

4.2. Site selection ,Layouts and Capacity Computation

4.3. Storage and Pondage

5. Water Conveyance Structures

5.1. Intakes, Canals and Tunnels

5.2. Water Hammer Analysis

5.3. Surge Tanks

5.4. Forebays

5.5. Penstocks

5.6. Anchors

6. Power house and Hydropower Machines

6.1. Layout of powerhouse and accessories

6.2. Impulse, Momentum and Power of a Turbine

6.3. Design Consideration for Hydraulic Machines

6.4. Types of Turbines

6.5. Draft Tubes, draft Heads

6.6. Dimensioning of Turbines

6.7. Generator and Governors

7. Planning and design of small hydropower plants

Pre-requisites	Hydraulics Structure II
Semester	Year 5, Semester I
Status of Course	Compulsury

Mode of delivery	The mode of the delivery of the course will basically be student centered active learning and is summarized as follows:
	    Lecture
	    Tutorials
	    Group Discussion
	    Home Works

	Mode of delivery is Parallel
Mode of assessment	**As per Bahir Dar University Academic Regulation**

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Harvey, A. and Brown, A. (2004). Micro- Hydro Design Manual. Practical Action. 2. P. Novak (2007). Hydraulic Structures. 1/e .Taylor & Francis.

15-   MODULE 15
SANITARY AND ENVIROMENTAL ENGINEERING

Courses of the Module		
Course Code	Course Name	CP
HWRE 4152	Water Supply and Sewerage system	5
HWRE5152	Environmental Engineering	4
HWRE 4152	Wastewater Treatment and Solid Waste Management	4
HWRE 5151	Water Treatment	4
	TOTAL	17 CP

	Department of Civil Engineering
Module Title	Sanitary & Environmental Engineering
Module Number	15
Rationale of the module	Every citizen in a given country vie1s to get potable water. Hence, the raw water from surface or ground water should be treated to an acceptable standard. Moreover, in urban areas excess storm water should be catered for safely in order to minimize the damaging effCP of flood. Hence, this module is included to give the students familiarity on these issues from a Civil Engineering point of view.
Module Objectives	To give students an introduction to water supply and quality issues, water treatment systems and urban drainage:. ☐ conduct analysis and design of hydraulics infrastructure including pipelines, storm sewers and channels, and detention basins. ☐ Introduce basic chemical and biological water quality concepts; ☐ Introduce the fundamentals of unit processes in WQ management;
Module Competencies	After completion of this module the students shall be able to; ☐ Analyze and Design water supply, water treatment and sewerage treatment systems. ☐ Apply environmental concept in Design
Module Mode of Delivery	Parallel

Module Learning and Teaching Method	Lectures, tutorials, laboratory, exercises, Project
Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**

Department of Civil Engineering				

Course Code	HWRE 4152			
Course Title	Water Supply and sewerage System			
Degree Program	B.Sc. in Civil Engineering			
Module	**Sanitary & Environmental Engineering**			

Study hour per week	**5 CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	5hrs	10 hrs

Course Objectives	☐ to familiarize the students with the design of water supply systems, demand projection, design of storm water drainage, and identification of water supply sources.
Competences to be Acquired/course level competences	Students will be able to: ☐ Learn how to identify the sources of potable water, how to design pipes and pipe networks and how to develop wells. Moreover, the student learns how to design storm and combined sewers
Course Description	☐ Demand for Water: Quantity of Water for different uses. ☐ Sources of water. ☐ Surface water abstraction. ☐ Design of wells ☐ Collection and distribution of water: types of water intakes, distribution systems, service reservoirs. ☐ Pipelines and appurtenances, pumping. ☐ Plumbing Water supply and drainage of buildings. ☐ Quantity of Sanitary sewage.
	☐ Quantity of storm water and urban drainage . ☐ Hydraulics of sewers. ☐ Design of sewer systems. ☐ Sewage pipes and appurtenances. ☐ Loads on buried pipes. ☐ Organization and Administration of water supply and sewer projCP..

| Course outline | 1. **DEMAND FOR WATER**
   1.1 Variation and Factors Affecting demand
   1.2 Quantity of Water for Domestic and Industrial Uses
   1.3 Fire Demand
2. **METHODS OF FORECASTING POPULATION**

3. **SOURCES OF WATER**
   3.1 Types
   3.2 Source Selection Criteria
4. **COLLECTION AND DISTRIBUTION OF WATER**
   4.1. Intakes
   4.2. Methods of Distribution
   4.3. Service Reservoirs
   4.4. Pipes Used in Water Distribution Systems
      4.4.1. Pipe Materials
      4.4.2. Determination of Pipe Sizes
      4.4.3. Energy Losses in Pipes
      4.4.4. Pipe Appurtenances
   4.5. Pipes System
      4.5.1. Methods of Laying Distribution Pipes
      4.5.2. Analysis of Water distribution Systems
5. INTRODUCTION TO WATER TREATMENT
   5.1. Preliminary Treatment methods
   5.2. Coagulation-Sedimentation
   5.3. Filtration
   5.4. Disinfection
   5.5. Miscellaneous Methods of Water Treatment
6. PHYSICAL, CHEMICAL AND BIOLOGICAL ANALYSIS OF WATER
7. WATER, SANITATION AND HEALTH RELATIONSHIP
8. INTRODUCTION TO WATER CARRIAGE SANITATION SYSTEMS
   8.1. Septic Tanks
   8.2. Sewerage Systems
9. INTRODUCTION TO NON-WATER CARRIAGE SANITATION SYSTEMS
   9.1. Dry Pit
      Latrine
   9.2. Solid Waste Management
   10. WATER SUPPLY PROJECT PREPARATION |

	11. Comparison of hand calculations with WATER CAD/EPNATE Application Software
Pre-requisites	**Engineering Hydrology**
Semester	Year 4, Semester II
Status of Course	Compulsory
Mode of delivery	Lectures, tutorials, Project, exercises

Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Water Supply and Sanitation. Steel & Terence 2. Environmental Engineering. Peavy, Rowe & Techobanoglous 3. Water & Waste Water Engineering.Vol1&2, Fair, Geyer & Okun 4. Water, Waste & Health in Hot Climates. Feacham, Mc Garry & Mara 5. Environmental Health Engineering in the Tropics.Caircross & Feacham 6. Small Community Water Supplies. Hofkes.

DepartmentofCivilEngineering					
Course Code	**HWRE 5152**				
CourseTitle	Environmental Impact Assessment(EIA)				
DegreeProgram	B.Sc. inCivil Engineering				
Module	**Sanitary and Environmental Engineering**				
CPCredits	**2CP**				
Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study	TotalHour
	2hrs	0	0	2hrs	4hrs
CourseObjectives	The aim of this course is to: - introduce students to the EIA process - provide students with a clear methodology commonly used in preparing successful EIA including public participation - understand the relationship between EIA and development decisions; - understand the ways in which EIA can contribute to sustainable development and a healthy environment - enable students to prepare a full EIA report				
Competencesto be Acquired/Course level competences	Thestudent isableto: - Understand the environmental impact assessment process - Prepare an environmental impact assessment report - Understand the importance of protecting the environment				
CourseDescription	- Introduction to Environmental Impact Assessment (EIA) - Public Participation in the EIA process - Describing the existing environment and baseline conditions - Methods for impact identification and prediction - Significance of impacts, mitigation and monitoring - EIA Process - Description of EIA Impacts: Social Impacts, Economic Impacts, Noise Impacts, Landscape Impacts, Traffic Impacts, Cultural Impacts, Air Impacts, Soil Impacts, Surface Water Impacts, Groundwater Impacts, Biological and Biodiversity Impacts, Human Health Impacts - Environmental Management Systems				
Pre-requisites	None				
Semester	Year5, SemesterII				
Status ofCourse	Compulsory				
Teaching&Learning Methods	Lectures, project				
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**				

Coursepolicy	Allstudentsareexpectedtoabidebythecodeofconductofstudentsandthe Senate Legislation of the University throughout this course. Academic dishonestincluding cheating,fabrication,andplagiarismwillnot betoleratedat any stageduringyourstudiesandwillbereportedtoconcernedbodiesfor action. Whileteamworkishighly encouraged,dependenceandcopying onesworkand submitting other'sworkisconsideredasseriousactofcheating andshallbe penalized. Ifyouare having problemswiththeassignmentsortests,contacttheinstructor as soon as possible. Studentsare expectedto attendclassregularly.Astudentwhomissesmorethan 15%ofthesemesterclassisnoteligibletositforfinalexam.Punctualityis equallyimportant. Ifyoumustbring a cellphoneto class, makesurethat itis absolutelysilentand does not disturb anyone.Theteaching-learningprocess shall bedisrupted byno means.
Literature	1. Morgan, R (1999). Environmental impact Assessment. A methodological perspective. Great Britain 2. Therrivel, R and Morris, P (2001). Methods of Environmental Impact Assessment. 2nd ed. Spon press. Great Britain 3. Petts, J (1999). Handbook of Environmental Impact Assessment, Vol 2. Blackwell publisher. London

Department of Civil Engineering	
Course Code	**HWRE 5151**
CourseTitle	Water Treatment
DegreeProgram	B.Sc. inCivil Engineering
Module	**Sanitary and Environmental Engineering**

Study hour per week	4CP				
	Lecture	Tutorial	Practice or Laboratory	Home study	TotalHour
	3hrs	0	2hrs	3hrs	8hrs

CourseObjectives	The objective of the course is to: - introduce students to the quality of drinking water - provide students a general knowledge on water purification methods - enable students to select and design appropriate water treatment unit processes - enable students to determine free chlorine residuals for break-point chlorination and the kinetics of pathogen kill
Competencesto be Acquired/courselevel competences	Students willbeable to: - analyse water quality, describe water quality standards for various purposes, and design water treatment units process
CourseDescription	- Introduction to drinking water treatment - Water quality: Physical, chemical, and bacteriological water quality parameters - Drinking water quality standards - Examination of water quality - Preliminary water treatment methods: Screening, Aeration - Plain Sedimentation: Sedimentation theory, type of sedimentation tank and hydraulic design of sedimentation tank - Coagulation and flocculation: Process description, Chemicals used as coagulants, Rapid mixing units, Slow mixing units, Secondary clarifier - Filtration: Filter Hydraulic, Slow sand filtration (SSF), Rapid sand filtration (RSF), Roughing Filtration - Disinfection: Methods of disinfection, Disinfection by chlorination - Water Softening and other Miscellaneous treatment methods: Water softening, Iron and manganese removal, water conditioning
Pre-requisites	**Water Supplyand UrbanDrainage**
Semester	Year5,SemesterI
Status ofCourse	Compulsory
Modeofdelivery	Lectures, tutorials, project,exercises
Modeofassessment	**As per Bahir Dar University Academic Regulation**

Coursepolicy	Allstudentsareexpectedtoabidebythecodeofconductofstudentsandthe Senate Legislation of the Universitythroughout thiscourse. Academic dishonestincluding cheating,fabrication,andplagiarismwillnot betoleratedat any stageduringyourstudiesandwillbereportedtoconcernedbodiesfor action. Whileteamworkishighly encouraged,dependenceandcopying onesworkand submitting other'sworkisconsideredasseriousactofcheating andshallbe penalized. Ifyouare having problemswiththeassignmentsortests,contacttheinstructor as soon as possible. Studentsare expectedto attendclassregularly.Astudentwhomissesmorethan 15%ofthesemesterclassisnoteligibletositforfinalexam.Punctualityis equallyimportant. Ifyoumustbring a cellphoneto class, makesurethat itis absolutelysilentand does not disturb anyone.Theteaching-learningprocess shall bedisrupted byno means.
Literature	1. Kawamura, Susumu,Integrated Design ofWaterTreatmentFacilities,JohnWiley&Sons, 2000. 2. Environmental Engineering (Vol. I) - Water Supply Engineering, Eleventh Edition, Santosh Kumar Garg, Khanna Publisher, 1999. 3. Environmental Engineering, Howard S. Peavy, McGraw-HiL, 1985. 4. Environmental Engineering–I, Water Supply Engineering, B.C. Punmia, Laxmi publication LTD, 1995.4. 5. UnitOperations and Processesin EnvironmentalEngineering, Second Edition, ReynoldsT. and RichardsP., PWS publishingcomp.

Department of Civil Engineering	
Course Code	**HWRE 4152**
CourseTitle	Waste water Treatment and Solid Waste Management
DegreeProgram	B.Sc. in Civil Engineering
Module	**Sanitary and Environmental Engineering**
Study hour per week	**4CP**

Lecture	Tutorial	Practice or Lab	Home study	TotalHour
3hrs	0	2hrs	3hrs	8hrs

CourseObjectives	The aim of this course is to: - Provide the studentwiththebasic theory and design of unitprocessesemployed forwastewatertreatment. - provide the student with the basic understanding on functional elements of solid waste management

Competencesto be Acquired/courselevel competences	Students will bea ble to: - Analyze and design wastewater treatment systems. - Understand effluent and sludge treatment and disposal methods; and integrated solid waste management

CourseDescription	- **Introduction to WastewaterTreatment**
	    GeneralaboutWastewater Treatment
	    WastewaterTreatmentStandards
	    Flow SheetsforWastewaterTreatmentSystems
	
	- **Characteristics ofWastewater**
	    Physical, Chemicaland Bacteriological Characteristicof Wastewater
	    Measurement ofConcentration ofContaminants inWastewater
	    MathematicalModel forthe BOD Curve
	- **Preliminary and primaryWastewater Treatment Methods**
	    Preliminary treatment
	    PrimaryWastewatertreatment
	- **Secondary/Biologicalandtertiary Wastewatertreatment**
	    Microorganisms and Their Role in WastewaterTreatment
	    Bacterial Growth Kinetics
	    Types of BiologicalProcess forWastewaterTreatment
	    TertiaryTreatmentProcesses
	- **WastewaterEffluent Disposal Techniques**
	    Land DisposalandTreatment
	    DisposalbyDilutionand Oxygen SagCurve
	- **Sludge Treatmentand Disposal Overview**
	    Sludge Treatment Methods
	    Disposaland ReuseOptions
	- **SolidWaste Management**
	    Source, Types, Composition, and Properties of Solid Waste
	    Solid Waste Generation and Collection Rates
	    Waste Handling and Separation, Storage, and Processing at the Source
	    Collection of Solid Waste
	    Separation, Processing and Transformation of Solid Waste
	    Transfer and Transport
	    Disposal of Solid Waste and Residual Matter (Design of Landfill)

Pre-requisites	**Water Supplyand UrbanDrainage**
Semester	Year5,SemesterI
Status ofCourse	Compulsory
Modeofdelivery	Lectures, tutorials, project,exercises
Modeofassessment	**As per Bahir Dar University Academic Regulation**

Coursepolicy	Allstudentsareexpectedtoabidebythecodeofconductofstudentsandthe Senate LegislationoftheUniversity throughout this course. Academic dishonestincluding cheating,fabrication,andplagiarismwillnot betoleratedat any stageduringyourstudiesandwillbereportedtoconcernedbodiesfor action. Whileteamworkishighly encouraged,dependenceandcopying onesworkand submitting other'sworkisconsideredasseriousactofcheating andshallbe penalized. Ifyouare having problemswiththeassignmentsortests,contacttheinstructor as soon as possible. Studentsare expectedto attendclassregularly.Astudentwhomissesmorethan 15%ofthesemesterclassisnoteligibletositforfinalexam.Punctualityis equallyimportant. Ifyoumustbring a cellphoneto class, makesurethat itis absolutelysilentand does not disturb anyone.Theteaching-learningprocess shall bedisrupted byno means.
Literature	1. Kawamura, Susumu,Integrated Design ofWaterTreatmentFacilities,JohnWiley&Sons, 2000. 2. Introduction to EnvironmentalEngineering,Third edition, Davis M.and CornwellD., McGraw-Hill. 3. UnitOperations and Processesin EnvironmentalEngineering, Second Edition, ReynoldsT. and RichardsP., PWS publishingcomp. 4. WastewaterEngineering,Treatmentand Reuse–Metcalfand Eddy, (2003),4thEdition,TataMcGraw HillEdition,TataMcGraw HillPublishingCo. Ltd. 5. Tchobanoglous, G., Theisen, H., Vigil, S. Integrated Solid Waste Management: Engineering Principles and Management Issues. McGraw-Hill, Inc, 1993.

16-   MODULE 16

CONSTRUCTION PLANNING AND MANAGEMENT

Courses of the Module		
Course Code	Course Name	CP
CEng 3162	Contract Administration, Specification and Quantity Survey	4
CEng 5162	Construction Management	4
CEng 5164	Construction Equipment	3
CEng 5161	Engineering Economics	3
	TOTAL	14 CP

Department of Civil Engineering	
Module Title	Construction Planning and Management
Module Number	16
Rationale of the module	Justification of the module A Civil Engineering project involves the deployment of huge material resources and human resources. The Construction could be either labour intensive or machine-intensive. One way or the other there is a need to develop know-how how to manage these resources scientifically in order to economize on both time and resources. This module elucidates techniques and methodologies on how to effectively make use of the usually scanty resources available for construction.
Module Objectives	Short narrative on the aims and characteristics of the module ☐ The student will get familiarity with various construction methods for building excavations, bridges, streets, etc. and organize project works into tasks in order to schedule construction equipment and arrange the sequence of construction operations at the planning stage. ☐ Moreover, the gets acquainted with official contracting terms for the award of construction performance contracts. Calculation of performance indicators and establishing critical path network. The student will be able to describe the framework of typical company forms and cooperative ventures.

Module Competencies	After completion of this module the students shall be able to; ☐ Comprehend basic gridlines, contract, formulation, administration, and planning management techniques.
Module Mode of Delivery	Parallel
Module Learning and Teaching Method	lectures, tutorials, and projCP, class works, assignments, group discussions, presentations.
Module Assessment	**As per Bahir Dar University Academic Regulation**

	Engineering Economics
Course Code	CEng 5161
Course Title	Engineering Economics
Degree Program	B.Sc. in Civil Engineering
Module	**CONSTRUCTION PLANNING AND MANAGEMENT**
Study hour per week	3 cp

Lecture	Tutorial	Lab.	Home	Total
2hrs	2hrs		2hrs	6hrs

Course Objectives	☐ Understand the basic concepts of Engineering economics. ☐ Understand the time value of money. ☐ Understand the concepts behind benefit-cost analyses. ☐ Understand the concept of depreciation.
Competences to be Acquired/course level competences	**The competencies to be acquired by the student in this course are:** ☐ Describe the most common modes of transport and their socioeconomic implications. ☐ Calculate present and future worth and rates of return on investment. ☐ Choose among investment alternatives. ☐ Develop benefit-cost analyses. ☐ Calculate depreciation of different machinery and infrastructure assets ☐ Prepare a simple economic feasibility study
Course Description	Investment; time value of money: Interest; present worth; rate of return; future worth. Costing: Cost centers; labor cost; investment cost; running cost; equipment cost, Depreciation accounting, Economic analysis: Benefit cost analysis; Sensitivity analysis; inflation effCP; case study: economic analysis of hydropower development: economic analysis of multi-purpose projCP, Project appraisal.
Course Outline	**Course Contents**

	1. 1 Introduction to Economics. 2. Basic concepts 3. Annual, discrete and periodic compounding 4. Present and future worth 5. Rate of return and payback periods 6. Benefit-cost ratio 7. Depreciation and equipment replacement
Pre-requisites	**None**
Semester	Year 5, Semester I
Status of Course	Compulsory
Mode of delivery	Lectures, tutorials
Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. A Collin and William B, 1982, Engineering Cost Analysis, Courtland Ledbetter, Harper and Row Publishers. 2. Bill G. Eppes & Daniel E. Whitema, 1977Cost Accounting for the Construction Firm.

Department of Civil Engineering	
Course Code	CEng 5202
Course Title	Contract Administration, specification & Quantity Survey
Degree Program	B.Sc. in Civil Engineering
Module	**Construction Planning and Management**

Study hour per week	**4 CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	3hrs	8hrs

Course Objectives	Students will gain knowledge in the legal aspCP of contracts and bidding; types of construction documents including bonds; interpretation of technical building specifications and their application to selection and installation of materials, equipment and systems.
Competences to be Acquired/course level competences	The student will be able to ♦ Prepare tender documents ♦ Prepare take-off sheets ♦ Settle claims
Course Description	☐ At the completion of this course you should be able to: ☐ Explain the design and construction process and the roles of the different participants. ☐ Identify the different types of specification formats used in the construction industry. ☐ Outline the relationship between the documents which makeup the Construction Documents. ☐ Describe the different types of contracts, the number of contracts, the method of contractor selection and the basis for contractor payment. ☐ Explain the bidding process, including the documents included in the bidding requirements ☐ Describe the Conditions of the Contract, their purpose, content, and

	relationship to other parts of the Project Manual.
	☐ Explain the distinct roles of Drawings and Specifications. ☐ Describe the various methods of specifying. ☐ Explain the intent of a warranty, the various types, and the relationships between the parties involved in warranting specific parts of a project. ☐ Describe the types and purpose of construction bonds and insurance. ☐ Explain the concept of multiple prime contracts in a construction project. ☐ Explain the Negotiated Contract delivery method with special emphasis on the use of fast-tracked construction. ☐ Explain the concept of "Design-Build" as a construction delivery system and the preparation of the contract documents to facilitate this process.
	Course Contents 1. The law of contract as applied to Civil Engineering constructions 2. Types of Civil Engineering construction contracts 3. Contract documents 4. Conditions of contract 5. Administration of contract, settlement of claims 6. Bidding theory, Preparation of tender, Tender appraisal 7. Types of specifications, Specification writing, 8. Quantity surveying: material take off preparation and writing of bill of quantities; 9. Project cost estimation 10. Site supervision 11. Measurement and value of work.
Pre-requisites	**Building Construction**
Semester	Year 3, Semester II
Status of Course	Compulsory
Mode of delivery	Lectures, tutorials
Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent

Department of Civil Engineering	

Course Code	CEng 5164
Course Title	Construction Equipment
Degree Program	B.Sc. in Civil Engineering
Module	**Construction Planning and Management**

Study hour per week	**3 CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	3hrs	0	0	3hrs	6hrs

Course Objectives	☐ To know the most common types of construction equipments. ☐ To have a knowledge for selection of an appropriate construction equipment ☐ To understand the concepts of depreciation and production rates for construction equipments safety.
Competences to be Acquired/course level competences	At the end of this course, students will be able to properly select foundation equipment, concreting equipment, compactors, paving equipment. Moreover, students will understand the management of construction equipment.
Course Description	Course Description: This course includes the types of construction equipment; Compressors and pumps; Equipment for earth work: Trenching, dredging and tunneling equipment, Power excavators and cranes; Foundation equipment; Concreting equipment; Compactors and paving equipment; Aggregate production equipment; Choosing construction equipment; Construction equipment schedule, Management of construction equipment: Finance, maintenance, safety.
Course Outline	Course Outline ↯ Types of construction equipment ↯ Compressors and pumps ↯ Equipment for earth work: Trenching, dredging and tunneling equipment, ↯ Power excavators and cranes; ↯ Foundation equipment ↯ Concreting equipment ↯ Compactors and paving equipment ↯ Aggregate production equipment ↯ Choosing construction equipment ↯ Construction equipment schedule ↯ Management of construction equipment ↯ Finance, maintenance, safety
Pre-requisites	**Construction Materials**
Semester	Year 5, Semester II

Status of Course	Compulsory
Mode of delivery	Lectures, tutorials
Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Robert L Peurifoy, Clifford J. Schexnayder, and Aviad Shapira, (2005), Construction Planning, Equipment, and Methods, Mcgraw-Hill Series in Civil Engineering**.** 2.Schaufelberger, J.E., (1999), Construction Equipment Management, Prentice-Hall. 3.Nunally, S.W., (2000), Managing Construction Equipment, Prentice-Hall.

Department of Civil Engineering	
Course Code	CEng 5162
Course Title	Construction Management
Degree Program	B.Sc. in Civil Engineering
Module	**Construction Planning and Management**

Study hour per week	**5 CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	2hrs	3hrs	0	5hrs	10hrs

Course Objectives	By the End of this course Students should: • Be aware of the size/scope of the construction industry, and the role of the organizations which are involved in Construction Project • Know about different phases of construction project, contract administration and procedures for public project • Know the steps that lead to successful construction project • Be familiar with aspect of construction project management such as: Project planning; progress; monitoring; construction and risk management ;cost control; claims and disputes • Understand the role/complexity of construction project management, by completing cost estimation, project planning & sequencing exercises for example project(s)
Competences to be Acquired/course level competences	Students will learn how to prepare TOR for project implementation; techniques of project management and planning ; site organization and basics of insurance in the construction industry.
Course Description	Course Description: This course includes the types of construction equipment; Compressors and pumps; Equipment for earth work: Trenching, dredging and tunneling equipment, Power excavators and cranes; Foundation equipment; Concreting equipment; Compactors and paving equipment; Aggregate production equipment; Choosing construction equipment; Construction equipment schedule, Management of construction equipment: Finance, maintenance, safety.

Course Outline	**Course Contents** 1. Construction in the national economy 2. Parties in construction industry 3. Construction and consulting organizations 4. Design and construction procedure of public projCP 5. Preparation of TOR 6. Project management and planning techniques 7. Financial project appraisal and cash-flow analysis 8. Personnel management 9. Site organizations 10. Insurance in construction industry 11. Individual/Group term paper preparation and presentation.
Pre-requisites	Contract Administration, Specification and Quantity Survey
Semester	Year 5, Semester II
Status of Course	Compulsory
Mode of delivery	Lectures, tutorials
Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 15% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Donald S. Barrie, Boyd C Paulson, and Boyd Paulson Professional Construction Management**,** McGraw-Hill 3 edition, 1991

	2. Abebe Dinku, Construction Management and Finance, AAU Press, 2003 3. Daniel W. Halpin, Construction Management, Wiley; 3 edition, 2005 4. Richard H. Clough, Glenn A. Sears, and S. Keoki Sears, Construction Project Management , Wiley; 4/e , 2000 5. Alan Griffith, Paul Watson, Construction Management, Palgrave Macmillan, 2003

17-   MODULE 17

ADVANCED ENGINEERING/ELECTIVE

Courses of the Module			
Course Code		Course Name	CP
HWRE 5171	ELECTIVE I	Water Resource Development	5
CEng 5173		Reinforced Concrete Design III	5
CEng 5175		Theory of Structures III	5
CEng 5172	ELECTIVE II	Highway Engineering III	5
CEng 5174		Introduction to Finite Element Methods	5
		TOTAL	25 CP

Department of Civil Engineering	
Module Title	**Advanced Engineering**
Module Category	**Elective**
Module Number	**17**
Rationale of the module	The study of advanced structural Engineering involves the analysis and design of special structures using concrete and steel structures .
Module Objectives	☐ Analysis of special structures such as curved beam, oblique support, non prismatic members, irregular frames shell structures ☐ Estimation of lateral load using Ethiopian Building Codes and using advanced analysis methods for lateral load distribution in high rise buildings and plan and design lateral load resisting systems ☐ Use advanced analysis methods such as strip f method of slab design for irregular shaped slabs and using plastic analysis for framed structures. ☐ Apply the principle of reinforced concrete design to shell structures, shear walls, water tankers, Bunkers and silos.
Module Competencies	After completion of this module the students shall be able to; ☐ Analyze special structures such as curved beam , non prismatic members, high rise buildings, oblique supports ☐ Determine lateral loads on high rise buildings and device lateral load resisting system and distribute lateral load ☐ Design and detail special reinforced concrete structures such as shell, bunkers, Silos, and Water tankers
Module Mode of Delivery	Semester based or Parallel
Module Learning and Teaching Method	Lectures, tutorials, Project work and Presentation
Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**

Civil Engineering Regular Program				
Course Code	CEng 5175			
Course Title	Theory of structure III			
Degree Program	B. Sc. in Civil Engineering			
Module	**Elective**			
CP Credits	**5 CP**			
Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study
	2hrs	3hrs	0	5hrs
Competences to be Acquired/course level competences	Student gets basic knowledge to • Classify structures w.r.t static and kinematic methods • Perform indeterminate structural analysis using the matrix flexibility methods • Perform indeterminate structural analysis using the matrix stiffness methods • Use the Direct Stiffness Method to perform structural analysis • Employ the techniques to overcome special problem types			
Course Objectives	Fundamental principles of matrix methods of structural analysis. Energy concepts. Flexibility method: Basic concepts, flexibility of prismatic members, system flexibility, solution procedure. Stiffness method: Basic concepts, stiffness of prismatic members, axis transformation and system stiffness, direct stiffness method. Non prismatic members. Curved members. Elastic supports. Oblique supports. Discontinuities in members. Offset connection.			

1. Fundamental Principles of Structural Analysis

1.1. Introduction
1.2. Deformations in framed structures
1.3. Action and Displacements
1.4. Equilibrium and Compatibility
1.5. Principle of Superposition
1.6. Structural Analysis Methods
1.7. Action and Displacement Equations
1.8. Flexibility and Stiffness Matrices
1.9. Equivalent Joint Load
1.10.   Energy Methods

2. The Flexibility Method

2.1. Basic Concepts
2.2. Flexibility of Prismatic Members
2.3. Action Transformation and System Flexibility
Equation
2.4. Formalized Solution Procedures

3. The Stiffness Method

3.1. Basic Concepts
3.2. Basic concepts
3.3. Stiffness of Prismatic Members
3.4. Axis Transformation and Master Stiffness
Equation
3.5. Formalized Solution Procedures
3.6. Direct Stiffness Method & Solution Procedure

4. Additional Topics for the Stiffness Method

4.1. Curved Members,
4.2. Non Prismatic Members,
4.3. Oblique Supports Elastic Supports,
4.4. Discontinuities in Members,
4.5. Offset Connection (rigid offsets)

Pre-requisites	Theory of Structures II
Semester	Year 5, Semester I
Status of Course	Elective
Mode of delivery	The mode of the delivery of the course will basically be student centered active learning and is summarized as follows: Lecture Tutorials Group Discussion Home Works
	Mode of delivery is Parallel
Mode of assessment	**As per Bahir Dar University Academic Regulation**

Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Matrix Analysis of Framed Structures by Weaver & Gere 2. Matrix Structural Analysis by McGuire & Gallagher

Civil Engineering Regular Program				
Course Code	CEng 5253			
Course Title	Reinforced Concrete Design III			
Degree Program	B. Sc. in Civil Engineering			
Module	**Elective**			
CP Credits	**5 CP**			
Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study
	2hrs	3hrs	0	5hrs
Competences to be Acquired/course level competences	Students will have developed the following skills: 1. An ability to carry out the structural design of curved beams, haunched beams, deep beams, and corbels in the ultimate limit state and verify the satisfaction of serviceability limit state requirements, 2. An ability to carry out structural design of structural walls for shear and flexure in the ultimate limit state and verify the satisfaction of serviceability limit state requirements, 3. Understand the basics in the analysis and design of pre-stressed concrete beams and 4. Understand the basics in the analysis and design of water retaining structures, bunkers and Silos.			
Course Objectives	At the end of the course, the student will: • Be able to carry out structural design of curved beams, haunched beams, deep beams, and corbels in the ultimate limit state and verify the satisfaction of serviceability limit state requirements, • Be able to carry out the structural design of structural walls for flexure and shear in the ultimate limit state and verify the satisfaction of serviceability limit state requirements, • Be able to understand the basic concept in pre-stressed concrete design which includes method of pre-stressing, materials and permissible stresses, loss of pre-stress and bending stress analysis of simple and composite sections, • Be able to carry out the structural design of water retaining structures and verify the satisfaction of serviceability limit state requirements • • Be introduced to structural design of bunkers and silos			

Course Description	1. Design of curved beam, haunched beam, deep beam and corbels, 2. Shear wall design and detailing, 3. Introduction to pre-stressed concrete design and 4. Design of water retaining structures, bunkers and silos.

Course outline

Content
1. Deep Beams and Corbels   1.1. Strut and Tie model   1.2. Behavior of deep beams and corbels   1.3. Design of deep beams   1.4. Design of corbels
2. Curved Beams and Hunched Beams   2.1. Introduction   2.2. Design of curved beams   2.3. Design of haunched beams
3. Design of Concrete walls   3.1. Introduction   3.2. Design of plain concrete walls   3.3. Design of reinforced concrete walls   3.4. Detailing of reinforced concrete wall
4. Introduction to Pre-stressed concrete design   4.1. Introduction   4.2. Methods of pre-stressing   4.3. Materials and Permissible Stresses   4.4. Analysis and design of pre-stressed concrete
5. Water retaining Structures   5.1. Introduction   5.2. Joints in water tanks   5.3. Circular and Rectangular tanks
6. Bunkers and Silos   6.1. Introduction   6.2. Bunkers   6.3. Silos

Pre-requisites	Reinforced concrete Structures II
Semester	Year 5, Semester II
Status of Course	Elective

Mode of delivery	The mode of the delivery of the course will basically be student centered active learning and is summarized as follows:
	    Lecture
	    Tutorials
	    Group Discussion
	    Home Works

	Mode of delivery is Parallel

Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Reinforced Concrete: Mechanics and Design, by James G MacGregor and James K Wight. 2. Design of Concrete Structures, by Arthur H. Nilson, David Darwin and Charles W. Dolan. 3. Yield Line Analysis of Slabs, L.L. Jones and R.H. Wood 4. The Mechanics of Pre-stressed Concrete, S.K. Mallick and K.S. Ranges 5. Ethiopian Building Code Standards 2, Structural Use of Concrete

Civil Engineering Regular Program	
Course Code	CEng 5173
Course Title	Highway Engineering III
Degree Program	B. Sc. in Civil Engineering
Module	**Elective**
CP Credits	**5 CP**

Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study
	2hrs	3hrs	0	5hrs

Course Objectives & Competences to be Acquired	The objective of this course is to introduce the student to advanced and specialized areas of highway engineering.
Course Description/Course Contents	• Road Construction:- earthwork operations and equipment; construction of sub-bases, bases, and low-cost surfaces; and high-type bituminous pavements. • Road Maintenance and Rehabilitation:- surface condition survey: surface distresses, roughness and friction; structural condition; routine and periodic maintenance of pavement structures and gravel roads, roadsides, drainage structures, traffic control and safety devices; and design of overlays. • Introduction to pavement management system. • Labor based method of road construction and maintenance: basic concepts of technology choice; technical and economic feasibility of labor based method; social and economic benefits of labor based method.

Course content
Chapter one   Road Construction   1.1 Earthwork operation and equipment,   1.2 construction of sub-bases, bases,   1.3 bituminous pavement,   Chapter two   Road Maintenance and Rehabilitation   2.1 Surface condition survey,   2.2 roughness and frictional structural condition,

2.3 drainage check,

2.4 traffic control and safety devices

2.5 design of overlays

Chapter three

Introduction to Road Management System

3.1 Economic Aspect of Road Construction

3.2 Choosing between alternatives influencing material cost and labor

3.3 Labor Based Method of Road Construction

3.4 Basic concept of technology application,

3.5 feasibility study of road construction and development,

3.6 economic study of the labor-based method of construction

Pre-requisites	High way Engineering II
Semester	Year 5, Semester II
Status of Course	Elective

Mode of delivery	The mode of the delivery of the course will basically be student centered active learning and is summarized as follows:
	    Lecture
	    Tutorials
	    Group Discussion
	    Home Works

	Mode of delivery is Parallel
Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	O'Flaherty, C. A. (2001), Highways: The Location, Design, Construction and Maintenance of Road Pavements, 4th edition, Butterworth-Heinemann

Civil Engineering Regular Program	
Course Code	HWRE 5171
Course Title	Water Resources Development
Degree Program	B. Sc. in Civil Engineering
Module	**Elective**
CP Credits	**5 CP**

Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study
	2hrs	3hrs	0	5hrs

Course Objectives & Competences to be Acquired	The objective of the course is to introduce students about planning, design, and operation of water resources development system using mathematical optimization methods and models. At the end of the course, students will be able to understand the role of water in land development and social panning, to understand integrated river basin development, to understand the different phases of project planning and study, and to understand method of multipurpose river basin planning.
Course Contents	Assessment of surface and sub-surface _ water resources and their development _ Planning of water resources projCP Sustainability of water resources development – Planning and operation tools Project formulation: reconnaissance, prefeasibility, – and feasibility studies, final design. – Trans-boundary water issues

Pre-requisites	Hydraulics I and Engineering Hydrology
Semester	Year 5, Semester I
Status of Course	Elective
Mode of delivery	The mode of the delivery of the course will basically be student centered active learning and is summarized as follows: 　　Lecture 　　Tutorials 　　Group Discussion 　　Home Works
	Mode of delivery is Parallel

Mode of assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to attend class regularly. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important. If you must bring a cell phone to class, make sure that it is absolutely silent and does not disturb any one. The teaching-learning process shall be disrupted by no means.
Literature	1. Larry W. Mays. (2005). Water Resources Engineering. Wiley. 2. David A. Chin. (2006). Water Resources Engineering. Prentice Hall. 3. Loucks, Daniel P. and Eelco van Beek. (2005). Water Resources Systems 4. Planning and Management: An Introduction to Methods, Models and Applications. UNESCO.

Civil Engineering Regular Program	
Course Code	CEng 5174
Course Title	Introduction to Finite Element Methods
Degree Program	B. Sc. in Civil Engineering
Module	**Elective**
CP Credits	**5 CP**
Study hour per week	Lecture / Tutorial / Practice or Laboratory / Home study
	2hrs / 3hrs / 0 / 5hrs
Course Objectives & Competences to be Acquired	The objective of the course is to introduce the students about the **Basic Concepts of Finite Elements** and their **Formulation.** After the end of the course the students will acquire knowledge how linear structural analysis will be performed using the Finite Element Method (FEM) as a discretization tool.
Course Description/Course Contents	Basic concepts of structural modeling. Finite element discretization: interpretations. Review of the direct stiffness Method (DSM) of structural analysis. Bar and Beam Elements, Two-Dimensional Problems, Finite Element Modeling and Solution Techniques, mathematical interpretation of finite elements: Shape functions. Structural and continuum elements. Isoperimetric elements.
Pre-requisites	Theory of structure II
Semester	Year 5, Semester II
Status of Course	Elective
Teaching & Learning Methods	lectures, tutorials, assignments
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**
Attendance Requirements	A student must attend at least 85 % of the classes
Literature	1. O. C. Zienkiewicz and R. L. Taylor, The Finite Element Method, 4th ed (McGraw-Hill, New York, 1989) 2. J. N. Reddy, An Introduction To The Finite Element Method, Second Edition (McGraw-Hill, New York, 1993). 3. R. D. Cook, Finite Element Modeling For Stress Analysis (John Wiley & Sons, Inc, New York, 1995). 4. K. J. Bathe, Finite Element Procedures (Prentice Hall, Englewood Cliffs,

	NJ, 1996). 5. T. R. Chandrupatla and A. D. Belegundu, Introduction To Finite Elements in Enginerring. 3rd ed (Prentice Hall, Upper Saddle River, NJ, 2002) 6. R. D. Cook, D. S. Malkus, M. E. Plesha, and R. J. Witt, Concepts and Applications of Finite Element Analysis, 4th ed (John Wiley & Sons, Inc., New York, 2002). 7. S. Moaveni, Finite Element Analysis – Theory and Application with ANSYS, 2nd ed (prentice – Hall, Upper saddle River, NJ, 2002).

18-   MODULE 18

CIVIL ENGINEERING PROJECT

Courses of the Module		
Course Code	Course Name	CP
CEng 5262	Civil Engineering Project Design	15
CEng 3181	Technical Reports Writing and Research Methodology	3
CEng 3182	Software's in Civil Engineering	3
	TOTAL	21

Civil Engineering Regular Program	
Module Number	**18**
Module Objectives	The Final Year Project (Bachelor's Thesis) is the culmination of the program and should develop and demonstrate independent, methodological abilities as well as provide the students with their first research experience
Module Competencies	After completion of this module the students shall be able to; ☐ Identify problems regarding Civil Engineering in the society ☐ Propose and select in the order of priority ☐ Analyze and Design ☐ Write Technical Report ☐ Present and initiate its implementation
Rationale and objective of the module	The Bachelor Thesis/Project work will allow a student to apply the knowledge and skills acquired from previous courses in solving selected water resources and environmental engineering problems. The thesis can be done individually or in group. The thesis work shall be concluded with a written report and a presentation.
Module Learning and Teaching Method	Lectures, tutorials, Project work and Presentation
Module Description	Bachelor's Thesis can be set in consultation between the Professor and the student. Some works in cooperation with the industry are also possible.
Civil engineering program	

Course Code	CEng5181
Course Name	Technical Report Writing and Research Methodology
Degree Program	B.Sc. in Civil Engineering
Module	Civil Engineering Project
Cp Credits	3 CP
Study Hour	- Lecture …………………………………. 1hrs - tutorial-------------3hrs - Home Study ………..…………........... 2hrs.
Objectives	The objective of the course is to equip students with effective report writing skills and research methodologies. Students shall develop solid technical report and paper/thesis writing skills, analysis and data interpretation techniques, and research methodologies.
Competencies	Students shall develop good technical report and paper/thesis writing skills, analysis and data interpretation techniques, and research methodologies.
Course Description/ Course Contents	- Report overview: features, functions, and classification of reports. - Communication: definition, processes, barriers, and communication channels. - Distinguishing features of a technical report. - A technical report: rational of a research report. - Guidelines on identification of semester project. - The research process: data sources, data collection, text organization, the write- up. - Preparation of bibliography.
Pre-requisite	Basic Writing Skill
Semester	5 year, Semester I
Status of the Course	Compulsory
Learning Teaching Methods	Lectures, class works, assignments, group discussions, presentations
Assessment Techniques	Continuous assessment and final exam
Course policy	All students are expected to abide by the code of conduct of students and the

	Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action.
	While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized.
	If you are having problems with the assignments or tests, contact the instructor as soon as possible.
	Students are expected to attend class regularly. Minimum of 80 % attendance during lectures and 100 % attendance during presentation, except some unprecedented mishaps. A student who misses more than 20% of the semester class is not eligible to sit for final exam. Punctuality is equally important.
Literature	1. Alley, M. (1999), The Craft of Editing: A Guide for Managers, Scientists, and Engineers, 1st edition, Springer 2. Ranjit Kumar , (1999), Research Methodology: A Step-by-Step Guide for Beginners , Sage Publications Ltd

Department of Civil Engineering	
Course Code	CEng3182
Course Title	Software's in Civil Engineering
Degree Program	B.Sc. in Civil Engineering
Module	**Civil Engineering Project**

Study hour per week	**3CP**				
	Lecture	Tutorial	Practice or Laboratory	Home study	Total Hour
	0	0	3hrs	3hrs	6hrs

Course Objectives	Objective Students will learn Application Software for Civil Engineering
Competences to be Acquired/course level competences	At end of this course students will be able to Prepare Civil Engineering drawings using Auto CAD software.
Course Description	This course covers ☐ Auto cad SAP ETABS Other civil engineering software's

Course Outline	
Course Content	
1. Introduction to Latest AutoCAD software The users interface: Tool bars' The menu bars, shortcut menus, command windows, design center, tool palates, customize the drawing environment, start, organize, and save drawings.	
2. Control the drawing views: change views. Choose a work process: create single-view drawing, create multiple-view layouts.	
3. Create & modify object: control the properties of object include layer, line type, color, line weight, and plot style. Use precision tools, draw geometric object, plot and publish drawing.	
4. Project	

Pre-requisites	
Semester	Year 3, Semester II
Status of Course	Compulsory

Mode of delivery	Lectures, Lab, class works, assignments
Assessment	**As per Bahir Dar University Academic Regulation**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest

Civil Engineering Regular Program	
Course Code	CEng 5262
Course Title	Final Year Project
Degree Program	B. Sc. in Civil Engineering
Module	**Civil Engineering Project**
CP Credits	**15 CP**

Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study
	0	0	15hrs	15hr per week

Course Objectives & Competences to be Acquired	To enable students bring together the various knowledge and skills in composition of scientific research proposals, data collection, analysis and evaluation; styles of thesis and scientific paper writing, including paper organization, style, grammar and appearance in addition to technical content; seminar preparation and presentation.
Course Description/Course Contents	Historical development, general features of a report, editing and style in technical report writing, creating effective documents, technical report as a specialized branch of communication. Types of reports, visual displays and presentation, the nature of research, research method, data collection, analysis and interpretation of data, and the research report.
Pre-requisites	Completion of nine semester and passing grade in all core courses
Semester	Year 5, Semester II
Status of Course	Compulsory
Teaching & Learning Methods	*Project Work and Consultation*
Assessment/Evaluation	**- As per Bahir Dar University Academic Regulation**

	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Academic dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or tests, contact the instructor as soon as possible. Students are expected to report their progress regularly. 100 % attendance during Consultation, progress report, presentation and , except some unprecedented mishaps. Punctuality is equally important.
Literature	Full bibliographic citation; sources not older than 5 years (older only in very exceptional cases) - Basic texts (e.g. textbooks) - Recommended supplementary literature - Journals & Articles - Previous Related Project works.

19- MODULE 19

INTERNSHIP

Courses of the Module		
Course Code	Course Name	CP
CEng 4181	Holistic Exam	2
CEng 4183	Internship	30
	TOTAL	32 CP

Department of Civil Engineering	
Module Title	**Internship**
Module Category	
Module Number	**19**
Rationale of the module	In the Bachelor's study program, the student has to leave for a one semester internship (industry placement) after the successful completion of the holistic examination to be conducted at the end of the 6th Semester. Civil Engineers need efficient entrepreneurial skills and the ability to manage and liaise with a wide variety of people.
Module Objectives	The objectives of the internship are expansion of knowledge and acquaintance with industry in the field of Civil Engineering, consolidation and deepening of existing knowledge in Civil Engineering design and construction, involvement in planning, steering and management of design & construction processes and acquiring hands-on training in practical skills typical for Civil Engineering. The objective of the module is to equip students with the necessary business, social, and interpersonal skills to operate effectively in organizational environments in their future career.
Module Competencies	- Apply existing knowledge in Civil Engineering design and construction, - involve in planning, steering and - manage design & construction processes - acquire hands-on training in practical skills typical for Civil Engineering - demonstrate understanding of market identification and assessment techniques, new business idea development, fundamentals of finance & marketing, intellectual property protection, soliciting funding, and successful business partnership

Module Mode of Delivery	Parallel
Module Learning and Teaching Method	Lecture, class works, assignments &hands on practice at the industry
Module Assessment Techniques	**As per Bahir Dar University Academic Regulation**

Civil Engineering Regular Program	
Course Code	CEng 4181
Course Title	Holistic Examination
Degree Program	B. Sc. in Civil Engineering
Module	**Internship**
CP Credits	**2 CP**

Study hour per week	Lecture	Tutorial	Practice or Laboratory	Home study
	0	2hrs		2hrs

Course Objectives & Competences to be Acquired	• Recall of the basic scientific and engineering phenomena and design principles relevant to approach engineering projCP • Qualitative description of methods for problem analysis, infrastructure project planning and design • Application of fundamental design criteria and design methods on common engineering project tasks
Course Description/Course Contents	The Holistic Exam is intended to proof the students' capability to interlink special knowledge and skills obtained through theoretical (classroom courses) and practical (workshop, laboratory & computer exercises) education in individual study program modules over the first 3 years of studies. The holistic exam thus forces the students' to: · carefully review the study program subjCP of the first six study semesters · understand the relevance of phenomena and design principles learned in individual study program modules on complex engineering projCP · apply knowledge and skills obtained in individual courses on real world type problems and projCP
Pre-requisites	Taking all six semester courses and having pass grade
Semester	Year 4, Semester I
Status of Course	Compulsory
Teaching & Learning Methods	Exam
Assessment/Evaluation	**As per Bahir Dar University Academic Regulation**

Attendance Requirements	N/A
Literature	All courses lecture material and reference books

Department of Civil Engineering	
Course Code	CEng 4183
Course Title	Internship
Degree Program	B.Sc. in Civil Engineering
Module	**Internship**
CP Credits	**30 CP**

Study hour per week	Lecture	tutorial	Industry Practice	Home study	Total Hour
	0	0	40 hrs	20hrs	

Course Objectives	☐ To integrate classroom learning with field experience ☐ To gain work experience in the student's career field ☐ Provide exposure to advanced skills and knowledge ☐ To develop foundation for workplace competencies ☐ Provide exposure to job opportunities and potentials ☐ To clarify and confirm career goals ☐ To increase understanding of workplace culture
Competences to be Acquired/Course level competences	Internship experiences require a three-way working relationship among an employer, the School and the student. Effective communication between all parties is essential to the development of successful Internship experiences

Course Description	☐ Internship Performance
	☐ Employer Evaluations
	    a. Mid-Term Evaluation
	    b. Final Evaluation
	☐ Final Internship Presentation
	☐ Program Objectives
	☐ Resume and Cover Letter Assignment
	☐ Employability Skills Workshops
	☐ Work Ethic Assignment
	☐ The student Thank Letter to Employer

Course Objectives	At the end of the course, students would understand: ☐ Identify the classification of soil with respect to Engineering properties by laboratory works ☐ Differentiate materials used in base and sub-base construction that are available in the location of construction ☐ Select form every alternatives with what types of road to be constructed. ☐ Design structurally and efficiently flexible and rigid pavements ☐ Design drainage structure intelligently with the efficient and economical sections
Competences to be Acquired/course level competences	☐ Students will demonstrate ability to analyze and design both asphalt and Concrete pavements. ☐ Knowledge of factors affecting the highway foundation structure ☐ Knowledge of flexible and rigid pavement design ☐ Knowledge of cost and economic life of roads ☐ Knowledge of overall highway design process.
Course Description	☐ Overview of pavement structures & types: ☐ Stresses in pavement structures. ☐ Traffic volume and loading ☐ Sub grade soils, special soil tests for pavement design, soil classification for highway purposes.
	☐ Job Search Assignment The student should submit a computer-written, 1-2 page description about the searched job answering these questions: a. The job or career field the student has chosen. b. Average salaries and typical benefits in the student's career field. c. Education required. d. Experience required. e. Description of job or career field provided by the web site. f. Description of term of employment g. Overall Professionalism of Internship report h. Internship Assessment Document
Course Outline	
Pre-requisites	
Semester	Year 4, Semester I
Status of Course	Compulsory
Teaching & Learning Methods	Lectures, tutorials
	Assignment **Points Available**

Assessment/ Evaluation	1. Internship Performance	(30)
	*Employer Evaluations	
	*Students final presentation	
	2. Program Objectives	(35)
	3. Resume and Cover Letter Assignment	(5)
	4. Work Ethic Assignment	(5)
	5. Student's thank letter to the Employer	(5)
	6. Job Search Assignment	(5)
	7. Overall Professionalism of Report	(5)
	8. Performance Assessment	(5)
	TOTAL	**100**
Course policy	All students are expected to abide by the code of conduct of students and the Senate Legislation of the University throughout this course. Students must also respect the code of conduct of intuitions while practicing internship.	
	dishonest including cheating, fabrication, and plagiarism will not be tolerated at any stage during your studies and will be reported to concerned bodies for action. While team work is highly encouraged, dependence and copying ones work and submitting other's work is considered as serious act of cheating and shall be penalized. If you are having problems with the assignments or project reports, contact your mentor as soon as possible. Students are expected to attend Internship program regularly. 100 % attendance during internship practice & Mentor visit,	
Literature	Manuals and any industrial guide lines may be used.	