
PROCEEDINGS OF THE **U**NDERGRADUATE

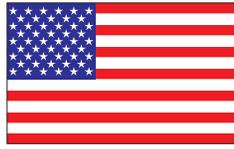
Natural Resource

CURRICULUM **R**EVIEW **W**ORKSHOP



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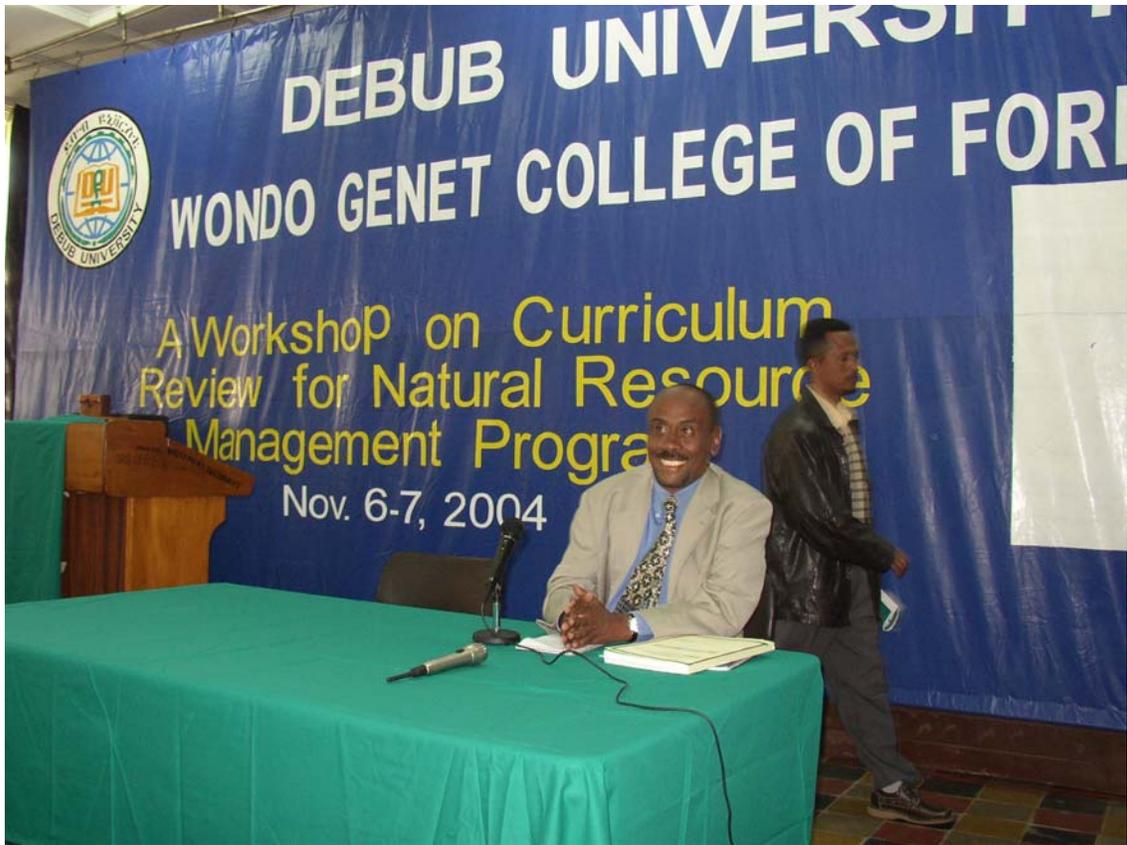
PROCEEDINGS OF THE UNDERGRADUATE NATURAL RESOURCE CURRICULUM REVIEW WORKSHOP

*Wondo Genet College of Forestry, Debub University,
November 6-7, 2004*



A collaborative program to strengthen Natural Resource Education between Debub University, Wondo Genet College of Forestry, and Oregon State University, College of Forestry

Sponsored by USAID Mission, Addis Ababa, Ethiopia



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Opening speech by Dr. Tesfaye Teshome, Vice President,
Academic Affairs and Research Vice President
Debut University

Invited guests, participants, ladies and gentlemen:

On behalf of Debut University and myself I welcome you all to this workshop on curriculum review for natural resource management programs organized by the Wondo Genet College of Forestry.

The diverse nature of climate and other resource types such as soil, forest, wildlife, biodiversity and water in Ethiopian have favored the development of mosaic of farming systems and human settlements in the country. Its natural resources are the basis for livelihoods. However, fast population growth, accompanied by high demand for resources, has accelerated the rate of land-use change and the loss of the natural resource base. As the loss of natural resources has accelerated in recent decades, it is important to increase awareness and take measures to counteract these losses in order to fulfill basic human needs and create a stable and habitable environment. In a country like Ethiopia where the population in rural areas comprises about 90% of the total population and high dependence on natural resources exist, it is worth considering the size, structure, and growth of the population and the farming system practiced. This will give clear insight on the felt needs of the various stakeholders of the society and help to effectively design the type of education and training programs an institution such as WGCF would like to launch. The following unwavering conditions and constraints of the sector are worth considering for client orientation:

- a massive deforestation which has resulted in massive soil erosion (1.5 billion tone of soil loss per year), degradation of land and declining soil fertility;
- low agricultural productivity which is manifested in terms of malnutrition, chronic poverty and food shortage crises;
- recurring droughts and famine;
- poor extension approaches not designed to fulfill complex objectives, constraints, production and consumption systems and difficulties in finding new ways to diversify incomes and land tenure issues.

The major steps the country must take to avert a worsening of the existing situation and create a conducive environment for economic growth in line with the “agriculture-led industrialization strategy” of the government is to train competent, efficient and skilled personnel capable of transforming the existing farming system into a vibrant economic system. It is my firm belief that trained professionals produced through the new programs initiated at Wondo Genet College of Forestry will significantly contribute towards poverty alleviation and the betterment of the livelihoods of the rural population in Ethiopia.

As it has been clearly indicated in the university strategic plan document, quality educational programs that have their own roots embedded in the crucial needs of the rural people are one of the major pillars of the college and the university at large, as they produce competent personnel equipped with problem solving capacity of the sector.

The crucial problems of all curricula developed so far are the question of relevance. A curriculum may be quality in its content; if it is irrelevant for use to society, however, its contribution to the regional and national economy would be very limited. In most cases, courses are not designed to fit the graduate profile of the stakeholder and the areas of specialization a student would like to study. For instance, all agriculture and forestry students take organic chemistry. As a matter of fact the course content of organic chemistry, which should be offered to animal science, plant science, and forestry students, must focus on different areas of interest, which fit the field of their respective specialization. For the forester, the carbon chain which makes the cellulose, lignin, and hemi-cellulose and the chemistry of other wood products (e.g., pulp, resin, gum, oil and paper) should be taught. Not only that, the extraction techniques of cellulose, lignin, hemi-cellulose, paper making, etc., should be discussed to enable foresters to produce essential forest products for society from the forest they grow. In contrast, organic chemistry should be taught to animal science students with more emphasis on the nutrition aspects of animal fat, meat, milk, egg, etc., so that a graduate student contributes to the future development of the food industries.

Development of educational programs and curricula therefore is not an end in itself, but it has an ultimate development objective that serves the farming community in particular and the society at large. The term “development objectives” means the overall objective of a program intended to contribute to society development in the long run. As these programs are to provide essential inputs into the development of the forestry and agricultural sectors which in turn are essential for the overall economy and national development. It is hard to make a simple demarcation of the objectives of the sector.

It is always wise to define the objective of the program and graduate profiles of the student; which, in turn, are based on the needs of the society. In logical framework approach terminology, the objective of the education and training programs of WGCF is the creation of capacity, which focuses on attainment of competence to carry out what is expected from the stakeholders with outputs obtained through natural resources management education, research and communication.

In the future, due to the introduction of market economy in the country, an increase in the number of commercial producers, processors, and distributors of agricultural and forest products can be seen. Knowledge of industrial processing of different forest and wildlife products and other natural resources to increase value-added products is currently scarce in the country and has got little attention at higher learning institutions such as WGCF. The lack of modern and simple forest and non-timber products processing technologies have contributed to high wastage of products that could otherwise be marketed for high prices. Such innovative interventions could have been well considered in the design of the curricula as cornerstones to encourage investment and putting in place the farming and business communities. To that effect, the design and content of the curriculum and the graduates of the college are expected to address these crucial societal demands to add relevance to the quality of education and training. By so doing the graduates would be practically oriented, demand driven, and would bring radical changes that will result in economic growth in the forestry and agricultural sectors.

The success of higher learning institutions is measured not by the number of graduating students but the impact they bring in terms of economic growth. This is reflected in various forms, particularly by the high demand for the graduates in different sectors. The

long-term implication of the educational programs in meeting the varying demands of the ultimate user or customer (the farmer, the urban dweller of the business community merchandising the products) is the central theme to look into when designing relevant curriculum and establishing a socially accountable higher learning institution.

Availability of educational facilities, particularly staff mix and profile and other educational inputs such as laboratory, library, and field experimental sites to expose students to real practical situations are crucial for realizing desired goals and objectives and creating educational excellence. Hence during your deliberation it is necessary to see the content and relevance of the curricula and their implementation plan in light of the facilities that should be put in place to realize the graduate profile to be attained at the end of the education programs.

The purpose of this curriculum review workshop is to evaluate and critically assess the relevance and contents of the curricula tabled by the college; hence it is my firm belief that all participants should be actively involved in suggesting and forwarding their valuable comments with the pure motive of enriching the contents of the same. Another purpose would also be to inform stakeholders and thereby create a forum to discussing and incorporating their own desires and expectations in the curricula from the inception and to let all partners and end-users own the programs for the same goal.

I hope you will enjoy the various presentations of this workshop. The outcomes of the review of the curricula from this workshop will hopefully show us a better way for launching these educational programs. Let me take this opportunity to reiterate that my office and the university will do its level best to revive educational development in forestry and natural resources management.

At this juncture, I would like to sincerely appreciate the role played by Dr. Badge Bishaw, Oregon State University and Dr. Abdu Abdelkadir, Head of the Wondo Genet College of Forestry as they have initiated the write-up of the concept paper, which was submitted to USAID for securing seed money. Most of the staff of WGCF, EARO, and the University are also appreciated for the facilitation of the approval of the joint project with WGCF. Oregon State University and FRC/EARO are also appreciated for their contribution to the launching of the Natural Resource Management Department and the development of today's programs.

I also appreciate the efforts made by all members of the curriculum committee who prepared the zero draft for further comments by high-caliber internationally recognized professors of Oregon State University. I believe that the comments and suggestions forwarded by all reviewers have been well recorded and incorporated. The final project, after being enriched by all participants will be submitted for funding organizations for long-term cooperation between involved parties.

Last but not least, I appreciate the organizing committee, the college and all participants for devoting their time and energy for this important workshop. I wish you all good deliberations and discussions. With these remarks I hereby officially declare that the workshop is opened.

Thank you.

SECTION I. PRESENTATION ON THE BACKGROUND OF THE PROJECT

Dr. Badege Bishaw
Director of International Programs
College of Forestry
Oregon State University

First of all I would like to thank all of you for taking time away from your busy schedules to be here participating in the Natural Resource Curriculum Review Workshop at the Wondo Genet College of Forestry. The need for natural resource education in Ethiopia is critical, as the country currently faces severe deforestation and environmental degradation. Degradation of natural resources, such as vegetation, soils, and water, leads to low agricultural productivity resulting in decreasing income and increasing food insecurity. The increase in population, about 2.9% per year, increases the demand for these natural resources, worsening the environmental degradation and poverty in the country.

The partnership, “**Strengthening Natural Resource Education and Research in Ethiopia**” was conceived about three years ago to address the serious natural resource issues that threaten the survival of the nation. The idea was initiated when Dr. Abdu Abdelkadir, Head of Wondo Genet College of Forestry spent his research leave at the College of Forestry, Oregon State University. There was also a visit to OSU by Dr. Demel Teketay, former Director General, Ethiopian Agricultural Research organization. A follow-up visit was made to Wondo Genet College of Forestry and FRC/EARO by faculty members from the College of Forestry, OSU, in July 2001. Through numerous communications and dialogue by e-mail, a Memorandum of Understanding was later signed between Debub University, Ethiopian Agricultural Research Organization, and Oregon State University to initiate this collaborative project.

This project addresses the preparation of trained professionals to better manage existing natural resources and develops sound research to address food insecurity and natural resource issues. To achieve these objectives the partnership has outlined four major activities. These are (1) natural resource curriculum development; (2) the preparation of problem-solving, applied-research proposals; (3) workshop on communications and scientific writing skills; and (4) workshop on communications, pedagogy, and the use of educational technology.

To accomplish the above activities, the partnership has established two task forces at Wondo Genet College of Forestry, Debub University (WGCF/DU), and three working groups at the Forestry Research Center in the Ethiopian Agricultural Research organization (FRC/EARO), respectively. The OSU Principal Investigator has been involved in need assessment surveys and the development of a natural resource curriculum at WGCF/DU. He has also been involved in the preparation of problem solving, applied research proposals in the different agro-ecological zones of the country with staff members of FRC/EARO. In addition, two OSU faculty members have conducted workshops on communications and scientific writing; and pedagogy and the use of educational technology for faculty and staff at WGCF and FRC. Through these workshops, 49 Ethiopian faculty and staff members have obtained short-term training

that has helped them improve their communications, writing, and teaching skills.

The partnership has also secured additional funding from the USAID Mission in Addis Ababa, Ethiopia, to run this curriculum workshop in order to get feed back from stakeholders and policy makers. I trust all of you will take this opportunity and provide us with your comments and suggestions to improve the natural resource curriculum at Wondo Genet College of Forestry.

Despite the many achievements, however, the partnership has faced major difficulties in communication. The Ethiopian partner institutions, both WGCF and FRC, have serious problems with internet communications. This has delayed communications between the partner institutions and limited exchange of information. We hope this problem will be resolved in the near future to facilitate more frequent communication and exchange of information among the partner institutions.

Finally, I would like to take this opportunity to thank the USAID Association Liaison Office for University Cooperation in Development, the USAID Mission in Addis Ababa, Ethiopia, Debu University Wondo Genet College of Forestry, the Ethiopian Agricultural Research Organization, Forestry Research Center, Oregon State University, College of Forestry and the Office of International programs for giving financial support and facilitating the project activities.

Badege Bishaw, PhD
Project Co-Director

PROCEDURES FOR THE PREPARATION OF THE DRAFT DOCUMENT

Dr. Zebene Asfaw, Head
Research and Publications
Wondo Genet College of Forestry
Debut University

A brief brainstorming exercise with the aim of the future expansion of the college was initiated by the head of the college. The first idea about opening a natural resource program was initiated during the brainstorming exercises among the college staff. To assess the potential and develop a new program in natural resource management, a task force consisting of six members, five from Wondo Genet College of Forestry, Debut University, and one from the College of Forestry, Oregon State University, was assembled in March 2003. As it was difficult to start from scratch, the task force agreed to conduct need analysis through inquiries. Hence the task force began by developing a checklist and conducting a survey aimed at understanding the human resources need in natural resource management. About 110 respondents representing different institutions and prominent professionals in natural resources and related fields were identified. The institutions considered included major departments in Oromia, Southern Nations, Nationalities and People Regional States, one Agricultural Bureau from Amhara Regional State, various organizations and offices at the federal level, universities, research institutions, NGOs, and prominent professionals.

During the survey 93 respondents were interviewed. The result of the survey indicated 18 different fields of specialization related to natural resources. The six fields most often identified, in order of ranking, were (1) Soil Conservation and Watershed Management, (2) Forestry, (3) Water Resource Management, (4) Wildlife and Fisheries, (5) Biodiversity, Nature Conservation and Ecotourism, and (6) Economics and Policy (social issues). Because Forestry Education is already well established at Wondo Genet College of Forestry, it was omitted from the ranking. Based on this finding, a curriculum for undergraduate program in General Natural Resources Management was prepared and reviewed by the staff of the college and some prominent professionals. The curriculum was then approved by the academic commission of the College. Debut University and the Ministry of Education accepted this undergraduate program in August 2003. Currently there are two batches of student in the program.

To assess the relevance of the new curriculum, the task force prepared a checklist and surveyed 150 summer students who have had rich experiences (7-21 years as semi-professional) in the field of agriculture and forestry. The feedback indicated that the curriculum is too broad and general. The respondents felt that such a broad approach might not allow the graduates to be employed in specialized fields/projects.

Then the task force went back to the original ranking results and raised the issue to the staff of the College at Wondo Genet. During the staff meeting, it was agreed that new programs should be developed, namely, Soil Resources and Watershed Management, Natural Resource Economics and Policy, Wildlife and Fisheries Management, and Nature Conservation and Ecotourism. To develop a curriculum for each individual program, a subcommittee was formed. The work of the subcommittee was compiled by

the task force and submitted for review to prominent scientists in the respective fields at Oregon State University.

This draft document was enriched by comments and suggestions from scientists at Oregon State University and others within the country. Then the draft document was distributed to the participants of this workshop two weeks ahead of time. The participants were selected based on their professional background and experiences.

The approach that will be followed for the workshop is as follows: An overview of the draft curriculum proposed for the individual departments, namely, Soil Resources and Watershed Management, Natural Resources Economics and Policy, Nature Conservation and Ecotourism, and Wildlife and Fisheries, will be presented by the members of task force responsible for curriculum development. The presentations will be mainly on the relevance of the respective department, the graduates' profile, graduates' career possibilities (sustainability and attractiveness of the program), and lists of proposed courses, including common and specialized courses.

Finally on behalf of the task force and myself I would like to thank all institutions and individuals who contributed to the success of this workshop.

Dr. Zebene Asfaw
Project Coordinator

SECTION II. PRESENTATIONS AND COMMENTS OF THE WORKING GROUP

2.1 Department of Soil Resources and Watershed Management

The group work was started after the presentation of an overview of the draft curriculum for this particular program. Points raised and discussed during the group work, as well as its presentation, are summarized as follows.

2.1.1. Naming the Department

The first issue raised by this group was about the name of the department. There were two different ideas. Some members within the group suggested that there is a need to modify the name of the department. This is because watershed management by itself is an approach that basically includes soil, water, community, livestock, etc. Names such as "Soil and Water Management" and "Land Resource Management" were suggested. Questions were raised over the differences between this department and the Soil and Water Management Department in DU. It was commented that the latter department deals mainly with engineering aspects. Further comments were that the name "Land Resources Management" is very general and has implications beyond soil and water resources. Such a department name might create additional expectations for the objectives of the program set by the college. On the other hand, there were strongly supporting ideas for the proposed name. After a long discussion, the group felt that the matter should be decided by the Wondo Genet College of Forestry.

2.1.2. Deleted courses

Introductory Soils (credit hours): Recommend deletion because student will attend major course, such as soil physics, soil chemistry, and soil biology

Introduction to Energy Resources Management (2 credit hours): Recommend deletion because part of it is covered in Environmental Sciences

Environmental Impact Assessment (2 credit hours): Agreed to delete it and instead suggested that all natural resource courses should deal with impact assessment.

Rural Water Supply and Sanitation (3 credit hours): delete the course, as it is more of an engineering course and less relevant to the proposed department. It is also commented that some concepts of the course be included in other courses.

2.1.3 Courses subjected to modification

Introduction to Agriculture (2 credit hours): as it is difficult to cover agriculture within two credit hours, this course should be classified into two courses: Introduction to Crop Production (2 credit hours) and Introduction to Livestock Production (2 credit hours);

Introduction to Forestry (3 credit hours): For a student specializing in Soil and Watershed Management, forestry courses are so important. Therefore, other relevant courses should be substituted for this course;

Ecosystem Studies (2 credit hours): recommended to be named as General

Ecology, as Ecosystem Studies is an advanced course;

Introduction to Climate (2 credit hours) to be renamed as Climatology;

Introduction to Wildlife and Fisheries (3 credit hours) recommended be handled with a course called "Ecotourism";

Remote Sensing and GIS (3 credit hours): presently the course is very crucial and timely. But photo interpretation should be emphasized and the credit hours should be raised to 4; or this can be two independent courses of 2 credits each.

Extension (2 credit hours): the name should be further modified, for example, "Forestry Extension" or "Agricultural extension." Hence, Natural Resource Extension was suggested as course name.

Soil and Water Conservation Measures (3 credit hours) this course is suggested to be modified as 'Soil and Water Conservation' with description including basic soil and water conservation principles and measures of course.

Integrated Watershed Management Planning (3 credit hours) suggested to be modified as 'Watershed Management Planning';

Entrepreneurship Development (3 credit hours): it is renamed to "Entrepreneurship"

Ecotourism (2 credit hours) needs to be merged with Introduction to Wildlife and Fisheries;

Land use Planning (3 credit hours): accepted as it is, but commented to include both land evaluation and the planning aspects.

Soil Erosion Assessment and Modeling (3 credit hours) - recommended to reduce the credit hours to two.

Soil and Plant Systems (3 credit hours) - from the course description, it seems clear that the course is designed to see soil and plant relation (the nutrient uptake, physiology, effect of soil on vegetation and vice versa, etc.). Therefore, the course must be changed to "Soil and Plant Nutrition"

Major Soils of the World and Tropical Soil Management (3 credit hours): The course description and objectives stated are meant to represent Soil Genesis and Classification. Therefore, the course needs to be modified to Soil Genesis and Classification.

Water Harvesting (4 credit hours): suggested to handle within 2 credit hours.

Social and Economic Aspects of Erosion and Soil and Water Conservation (3 credit hours); suggested to be renamed as Socioeconomics of Erosion and Soil and Water Conservation

Hydrology (2 credit hours): commented to be renamed as Introduction to Hydrology and raise credit hours to 3 credit hours.

Water Resources Management (3 credit hours): the course must include topics like "Wetland Water Management," "Lake Water Management," etc. Therefore, the course description should contain the above and related topics.

Resources Survey (2 credit hours): renamed it to "Surveying" and recommended making some modifications on description.

Reclamation of dry and degraded lands (3 credit hours): suggested to split the course into two, namely "Rehabilitation of Degraded Lands" and "Management of Dry- and Wetlands" (elective).

Agroforestry (3 credit hours, elective): the course should not be an elective. It should be a required course, as it deals with a lot of subject matter, including soil, vegetation, the watershed, etc.

2.1.4. New elective courses

In addition to the elective courses presented in the draft curriculum, such as silviculture, the following new courses are suggested:

- a. Environmental impact of forestry to soil and water resources
- b. The role forestry in watershed management
- c. Agroforestry for soil and watershed management
- d. Agroforestry principles and practices
- e. Indigenous Knowledge and Conflict Management
- f. Participatory Natural Resources Management
- g. The common forest management
- h. Forest Management
- i. Soil-Plant-Water Relationship
- j. Farm Forestry (including non-timber forest product)
- k. Farming Systems

2.1.5. General Comments

Generally, “common courses” are common to all the departments of a program. However, the common courses listed in the document, presented by the college, are not necessarily common for all four departments. Furthermore, the description of the same course may vary from department to department. For some departments, there are 63 common courses, whereas others have 55. Therefore, common courses to be delivered throughout the four departments should be the same and have the same description, and the objectives should be standardized by the college or university. Regarding the courses added, modified, merged, or split, the department should adopt or modify the objectives and the course descriptions of the courses accordingly.

2.2. Department of Nature Conservation and Ecotourism

The group work was started after the presentation of an overview of the draft curriculum for this particular program. Points raised and discussed during the group work as well as its presentation are summarized as follows.

2.2.1. Graduate profile

Well described, but the ecotourism part is not well reflected.

2.2.2. Renamed courses

	Course in document	Suggested course names
1	Wildlife Taxonomy	Principles of Taxonomy
2	Introductory Soils	Introduction to Soil Sciences
3	Computer use and programming	Computer use
4	Int. to climate	Climatology
5	Nature conservation Policy	Nature Conservation Strategies and policies
6	Renewable energy resources management	Sustainable energy resources
7	Environmental Impact Assessment and Management	Environmental Impact Assessment
8	Landscape ecology and design	Landscape ecology and planning

2.2.2. Elective courses

Regarding elective courses, the group suggested that the purpose should be clarified and elective courses should be with the range of 5-10 courses, with 2 courses per semester.

2.2.3. General comments

The group has agreed upon the need for the program for the very reason of natural resources degradation and depletion in the country. But some questions were raised such as, does the college has the capacity (staff, facilities, etc.) to launch four programs at one time? For the group, this was the point of uncertainty as splitting the programs in to such specific areas may not be worthy (and may affect career opportunities). The sustainability and the attractiveness of this department depend on presence of employers. So the document needs to include a clear course description and list of potential institutions to absorb the graduates or the types of works graduates are expected to do. If the employers are only government institutions, the sustainability will be under question, but if there are other open markets or if students are able to establish their own business, obviously it will be sustainable. In addition Ecotourism is a wider subject, therefore, should include Nature-based Ecotourism and Community-based Ecotourism.

2.3. Department of Natural Resources Economics and Policy

The group work was started after the presentation of an overview of the draft curriculum for this particular program. Points raised and discussed during the group work as well as its presentation are summarized as follows.

2.3.1. Courses deleted

Several courses are suggested to be deleted from the curriculum:

- a. Introduction to Statistics: - this course can be substituted by Statistics for Economists
- b. The political Economy of Rural Development (less relevant and part of the contents can be covered in other rural development course);
- c. Introduction to Ethiopian Economy (Redundant with other economics courses, no unique content in it);
- d. Globalization, the state and Economic Policy (globalization to be dealt together with International Economics and the rest in other policy courses).

2.3.2. Courses added

Senior Seminar and Senior Research courses were suggested to be added to the curriculum.

2.3.3. Courses merged

Courses entitled, "Public policy analysis and decision-making" (2 credit hours) and "Policy implementation, Monitoring and Evaluation" (2 credit hours) were recommended to be amalgamated under the new name, "Public policy analysis" (3 credit hours). Similarly, "Integrated Watershed Management" (3 credit hours) and "Land use planning" (3 credit hours) were suggested as one combined course, "Integrated Watershed Management" (6 credit hours). These courses were combined or merged mainly due to restrictions of total credit hours.

2.3.4. Courses modified

Previous course	Credit hours	Modified into	Credit hours (new)	Remarks
Int. to Agriculture	2	1-Live stock production	2	Agriculture with two credit hours is not sufficient.
		2-Crop production	2	
Natural resource and environmental economics I	3	1-Environmental economics and policy	2	In order to deal with specific topics, the two course is split into three courses
		2-Economics of non renewable resources	2	
Natural resource and environmental economics II	3	Economics of renewable resources	2	
Int. to Forestry	2	Int. to Forestry	3	Since the college is center of excellence for forestry, this course needs particular emphasis
Entrepreneurship development	3	Entrepreneurship development	2	Two credit hours is sufficient
International economics	2	International economics	3	To include international Economics and Globalization.
Mathematical programming	2	Mathematical programming	3	To cover all required topics.
Statistics for economics	2	Statistics for economics	3	To cover all required topics.
Mathematics for economists	2	Mathematics for economists	3	To cover all required topics.

2.3.5. Courses renamed

Previous name	Renamed as
Extension	Natural resource extension
Accounting for economists	Principles of accounting
Natural resource management and project planning	Natural resource project planning and analysis
Development economics and policy	Development and environment
Environmental variation and cost benefit analysis	Natural resource and environment valuation
Agricultural economics	Rural development

2.3.6. Courses as elective

Elective courses are not required, but due to the limitation of the total credit hours requirement for graduation, five elective courses were suggested:

- a. Ecosystem studies (3 credit hours);
- b. Remote sensing and GIS (3 credit hours);
- c. Ecotourism (3 credit hours);
- d. Introduction to history of economic thoughts (2 credit hours);
- e. Rural development (3 credit hours).

2.3.6. General comments

- a. The group suggested that the areas of competence of the graduates of this department should include Natural resource economist, socio-economist in natural resource, natural resource planning expert, natural resource policy analyst, researcher and Instructor.
- b. Descriptions for merged, modified, added and renamed courses should be revised;
- c. The format for course descriptions should be uniform for all courses;
- d. Senior seminar and senior research project courses should be added;
- e. If COPE is not to be arranged during summer time one more course should be taken as an elective course;
- f. Sequence of courses and semester course load should be worked out.

2.4. Department of Wildlife and Fisheries

The group work was started after the presentation of an overview of the draft curriculum for this particular program. Points raised and discussed during the group work as well as its presentation are summarized as follows.

2.4.1. Graduate Profile

The curriculum for undergraduate students in Wildlife and Fisheries Management needs to be designed in a way that properly addresses the following four issues:

Technical knowledge and skills: this needs to include, among others, knowledge and skill on global and national issues, identification and establishment of appropriate wildlife and fisheries areas, designing their management plan and implementing it.

Administrative and financial knowledge and skills: personnel and financial management skills

Institutional and legal knowledge and skills: this should include national and wildlife and fisheries resources management

Entrepreneurship knowledge and skills: this is required for the effective and efficient management of the wildlife and fisheries resources of Ethiopia.

2.4.2. Course deleted

Delete the course Wildlife Taxonomy from the curriculum

2.4.3. Courses renamed

- a. Rename Introduction to Agriculture course as Man and Wildlife or Man and Biological resources
- b. Rename Wildlife Genetics and Breeding course as Introduction to Genetics

2.4.4. Courses merged

- a. Wildlife Area Management and Wildlife Protected Area Management courses need to be modified, into two courses "**Wildlife Management I & II**". Wildlife **Management Course I** need to include wildlife management techniques, wildlife surveys, census methods translocation, reintroduction and restocking, and controlled hunting. The course **Wildlife Management II** need to include what has been proposed in the document as wildlife area management and wildlife protected area planning.
- b. Wildlife Resource Utilization and Wildlife Farm Establishment and Management courses were suggested to be modified as **Wildlife Resource Utilization**
- c. Wildlife Population Ecology and Behavioral Ecology course were suggested to be modified as **Wildlife Ecology**
- d. Introduction to Natural Resources Economics and Wildlife Economics courses were modified as **Wildlife or Natural Resources Economics** with emphasis on wildlife and fisheries.

2.4.5 Courses to be added

- a. Botany course were recommended to be considered, with emphasis on taxonomy of plants, vegetation/ habitat classification, and introduction to plant physiology
- b. Senior Project

2.4.6. Elective courses

Concerning elective courses, it was suggested that the course list should enable graduates to emphasize on either fisheries or wildlife. Ichthyology (3 credit hours), Wildlife Photography (2 credit hours) and Environmental education (2 credit hours) were suggested to be included as new elective courses.

2.4.7. General Comments

- a. **Game Management** needs to include sport hunting; establishment, development and management of game management areas; controlled hunting areas; intensive game reserve.
- b. The credit hours for **Ornithology, Herpetology, and Mammalogy** need to be raised from 2 to 3 each.
- c. **Prerequisite for Land Use Planning** should include GIS and remote sensing.
- d. **Introduction to Statistics** may be modified as **Applied Statistics**.
- e. The course, **Introduction to Computer Use and Programming**, has to emphasize basic computer knowledge and data analysis.
- f. Regarding **Rural Sociology and Development**, the description has to emphasize pastoral society.
- g. In **Remote Sensing and GIS** course, the use of GPS for Wildlife Management has to be emphasized.
- h. **Research Methods** course should give more emphasis on Wildlife and Fishery study approaches.
- i. The **Entrepreneurship** course should be developed with emphasis on Wildlife and Fisheries.
- j. Course description is needed to treat both **Introductions to Natural Resource Economics** and **Wildlife Economics** as one course.
- k. The course **Wildlife Policy and Law** is modified to Intuitional and Legislative Mechanisms; therefore, the course description has to be modified accordingly.
- l. Course description for **Wildlife Rangeland Ecology** need to be modified.
- m. In course description for **Introduction to zoology**, introduction to animal taxonomy need to be added.

SECTION III. PLENARY DISCUSSION AND RECOMMENDATIONS

The following points were raised for discussion by participants:

Are the departments broad enough to equip students with the necessary and adequate common and specialized courses so that graduates can secure jobs in this government employer oriented country?

Isn't it too early for the college to put all the four departments as independent programs rather than letting the already launched NRM department continue for some time to see the market for the graduates?

Does the college have the capacity, the funds, and other requirements to launch four essential and time-based programs at the same time? If that is so, what will be the fate of Natural Resources Management as a department or faculty?

How is the college trying to integrate the idea of women's participation/gender in the curriculum?

After a thorough discussion on the above and related points, the participants have reached a common understanding/conclusion on the following issues:

- In fact, these new programs could present both a challenge and an opportunity for the college. The challenge is that graduates may not have ample job opportunities for some time, until the practicality of being specialized/focused on one area is proven. It is also an opportunity for the college to create specializations and thereby create the market for the graduates and thereby expand itself into a university-college or a university. Furthermore, the graduate profiles of the programs presented by the college are in line with the gaps of knowledge where the government's strategic programs are focused and upon which it is currently taking action. Accordingly, the present Department of Natural Resources Management will be upgraded to a Faculty level.

As far as the extent to which the programs are both broad and focused enough, Natural Resources Economics and Policy and Soil Resources and Watershed Management are well focused and yet broad as needed to stand alone. Wildlife and Fisheries and Nature Conservation and Ecotourism can probably be merged into one, and the college may opt for one, since they are closely related. But if there is still room, the programs can also be launched independently.

Despite all the challenges and uncertainties (the capacity, readiness, strength, weaknesses, and expertise) of the college, these are areas where the country has been lacking qualified specialists and to which graduates can professionally fit.

Regarding graduates' employment opportunities, experts in these areas are in public demand, as well as to the government, as they are professionals of natural resources (important capitals upon which the majority of the Ethiopian population depends). They are experts that the country currently needs for the betterment of the public (rural) livelihood. Besides, the successful running and justification of the forestry program and the market for the college's graduates, as it has been observed so far, is quite satisfactory justification for launching these programs.

Most of all, these programs are timely, encouraging, and unique in the country and thus launching all four departments is quite justifiable, but by priority.

Therefore, the college has to seriously reexamine or look in to all the challenges, opportunities and stakeholder demands for each program to decide as to which program to open first.

The idea of participation, especially women's participation, can be more exclusively addressed in the department courses. Some courses will be prepared to incorporate the issue of gender equality and women's participation.

SECTION IV. FULL FLEDGED CURRICULUM PREPARED BASED ON WORKSHOP RECOMMENDATIONS

**DEBUB UNIVERSITY
WONDO GENET COLLEGE OF FORESTRY**

CURRICULUM FOR DEPARTMENT OF SOIL RESOURCE AND WATERSHED MANAGEMENT

1. Background

The diverse nature of climate, physiographic conditions, and soil types in Ethiopia has resulted in diverse types of land and water resources, which have favored the development of a mosaic of farming systems and human settlements in the country. However, these resources are being consumed at an increasing rate under the combined effect of population pressure, mismanagement of the resource, and the overutilization of the land cover.

Low capital investment, low and erratic rainfall patterns, a fast-growing population, lack of sufficient infrastructure, and low access to basic services, provide the usual detrimental combination of elements leading to chronic poverty, lack of income alternatives, accelerated depletion of the natural resource base, and severe food insecurity. The government of Ethiopia and the international community have increasingly turned their attention to finding original and sustainable multi-sectoral solutions to the complex problems associated with the development and productivity of drier and marginal areas. The development of agriculture and infrastructure in arid and semi-arid regions is possible only if adequate and productive soil and water conservation measures are implemented and integrated into land management practices.

2. Justification

Ethiopia has one of the richest water resource potentials in the world. Its water resources could be sufficient for domestic water supply, irrigation, and hydropower generation. Despite this fact, however, the contribution of irrigation for the development of agricultural practices is inadequate.

The most limiting factors to agricultural productivity in the country are soil fertility and moisture. Currently moisture conservation (water harvesting) is one of the main strategies of the government for the alleviation of poverty and food insecurity. To meet this demand, there is a high need for quality professionals in the field of soil resources and watershed management who can design and plan strategies for the sustainable utilization and management of these resources.

To combat soil and water degradation through proper use and conservation of natural resources, to promote a sound management of soil and water resources, and to coordinate efforts with the “agricultural development-led industrialization” strategy for the country, it is crucial to produce competent professionals in soil resources and watershed management. This program will make a significant contribution toward the alleviation of

poverty and the improved livelihood of rural peoples by integrating human needs into project planning and development through its multidisciplinary educational approach.

3. Objective

3.1. General Objective

The general objective of the curriculum for this department is to produce skilled and qualified experts and managers in soil and water through education, research, and extension for the development of the country.

3.2. Specific Objectives

Offer training to provide students with basic and applied knowledge in planning, designing, and implementing sustainable soil and water conservation, water harvesting and soil fertility management, environmental management, and rural water supply

Apply the acquired skill and knowledge in identifying various problems related to population, environment, soil, and water in various watershed areas

Initiate and actively participate in multidisciplinary research activities by creating an environment conducive to the participation of concerned stakeholders in the sustainable development of a defined watershed, and the alleviation of poverty and improved livelihood of communities

4. Graduate profile of Soil Resources and Watershed Management

Upon successful completion of the program, graduates are expected to:

1. Plan and design water-harvesting (moisture conservation) techniques that could be fundamentally important in supplementing drought-affected areas.
2. Plan and designing integrated soil and water management projects/programs, and develop a sustainable and wise use of scarce water and soil resources to improve the livelihood of the population at large.
3. Plan, design, and implement irrigation, drainage, rural water supply, and sanitation schemes, together with operation and maintenance
4. Contribute to development activities to combat soil degradation and better manage the soil and water resources by introducing new technologies in land-management practices
5. Demonstrate profound knowledge and understanding of the problems of soil and water and be able to contribute to the appropriate and sustainable exploitation of land and water, thereby resolving problems of resources deterioration
6. Coordinate and reconcile the various interest of stakeholders involved by maximizing the land-use potential of a watershed
7. Have increased understanding of the major processes involved in soil degradation and the capacity to design and implement relevant intervention
8. Have attained the knowledge and skills to assess and evaluate the potential and capacity of a watershed by designing and implementing appropriate land-evaluation techniques
9. Undertake basic and applied research on problems related to soil and water; teach courses on responsible soil and water management

5. Area of competence or career opportunities for Soil Resources and Watershed Management students:

High employment demands at international and national organization levels; graduates can pursue careers as planners, decision makers, academicians, consultants and professional managers in vegetation, soil, and water resources. They can be specialists in soil, vegetation, water, environmental, and rural development.

6. Admission Requirements

The requirements for admission and graduation are as per the university registrar's rules and regulations. The program demands students with a strong background in natural and social science; those who have a special concern for environmental and social issues are encouraged.

7. Evaluation Methods

In addition to the university's general examination regulations (mid- and final semester examinations), students will be evaluated on practical work (both in group and as individuals), field reports, and assignments

8. Graduation Requirements

The SRWM program runs for three academic years to qualify students for the award of a B.Sc. degree in SRWM. A candidate shall take all the required courses and score a cumulative grade point average (CGPA) of not less than 2.00 and no "F" grade in all the courses taken to fulfill the requirements for graduation.

9. Degree Awarded Upon Graduation

Up on successful completion of the program as indicated above the degree awarded will be the "Bachelor of Science in Soil Resources and Watershed Management."

10. Course category

The various courses to be offered in the SRWM program are categorized according to the relationship of their contents. Therefore courses that have some common boundaries or areas are grouped together.

10.1 Course Category 1

- Introduction to Crop Production
- Introduction to Livestock Production
- Introduction to Forestry
- Farming Systems
- Agroforestry Principles and Practices
- Non-timber Forest Products
- Introduction to Wildlife and Ecotourism

Introduction to Fisheries

10.2. Course Category 2

Natural Resources and Demography of Ethiopia

Introduction to Climate

General Ecology

Introduction to Environmental Science

10.3. Course Category 3

Surveying

Introduction to Computers and Programming

Remote Sensing

Geographic Information Systems

10.4. Course Category 4

Soil Chemistry

Soil Physics

Soil Biology

Geology

Soil Genesis and Classification

Soil and Plant Nutrition

10.5. Course Category 5

Introduction to Hydrology

Irrigation and Drainage

Water Harvesting

Water Resource Management

10.6. Course Category 6

Soil Erosion Assessment

Rehabilitation of Degraded Lands

Soil Conservation, Socioeconomics of Erosion and Soil and Water

Conservation

10.7. Course Category 7

Forest Management Planning

Dry and Wet Land Management

Land Use Planning

Watershed Management Planning

10.8. Course Category 8

Natural Resource Economics

Rural Sociology and Development

Extension in Natural Resource Management

Participatory Natural Resource Management

Natural Resource Policy and Legislation

Indigenous knowledge and Conflict Management

10.9. Course Category 9

Sophomore English
 Introduction to Statistics
 Research Methods
 Senior Seminar
 Senior Research Project

11. Course Coding

Coding of the courses offered by the department of SRWM is represented by “SRWM” followed by a three-digit figure. The first digit represents the year in which the course is offered to undergraduate students. The second digit represents the course category and the last digit corresponds with the semester within which the course is to be offered (odd consecutive number for first semester and even consecutive number for the second semester). The major area courses which are unique to the department are the major area courses whereas other relevant courses taken from other programs and departments within the university are supportive courses (some of the supportive courses from other departments retain the original code) assigned in the home department.

12. List of Courses

The proposed courses of the department of **SRWM** are divided in to three sub sections, the **Supportive courses**, (50 credit hours), the **Major area courses** (58 credit hours) and the **Elective** (20 credit hours). The letter (E) in the bracket indicates elective courses. In any semester when the electives are more than one, students are required to take at least one as compulsory course.

No	Course No.	Course title	Credit Hours
		<i>I Supportive Courses</i>	
1	NaRM221	Introduction to Natural Resources and Demography of Ethiopia	3
2	FLEN 201	Sophomore English	3
3	Stat 273	Introduction to Statistics	3
4	SRWM 111	Introduction to Forestry	3
5	CEE11	Introduction to Civic and Ethical Education	3
6		Introduction to Crop Production	2
7		Introduction to Livestock Production	2
8	NaRM 215	Introduction to Climate	2
9	NaRM 213	General Ecology	2
10	NaRM 224	Introduction to Environmental Science	2
11	Comp 203	Introduction to Computer and Programming	3
12	SRWM 213	Introduction to Wildlife and Ecotourism	3
13	SRWM 237	Surveying	3
14	SRWM 231	Remote Sensing (RS)	2
15	NaRM 431	Extension in Natural Resource Management	2
16	SRWM 335	Geographic Information System (GIS)	2
17	NaRM 422	Natural Resource Policy and Legislation	3
18	Mgmt 414	Entrepreneurship Development	2
19	SRWM 272	Natural Resource Economics	3
20	SRWM 298	Research Methods	2
		TOTAL	50

<i>II Major Area Courses</i>			
1	SRWM 121	Soil Chemistry	3
2	SRWM 112	Introduction to Hydrology	3
3	SRWM 122	Soil Physics	2
4	SRWM 132	Introduction Geology	2
5	SRWM 241	Soil Biology	2
6	SRWM 235	Irrigation and Drainage	3
7	FaFo342	Agroforestry Practices and Systems	3
8	SRWM 249	Soil Genesis and Classification	3
9	SRWM 242	Soil and Plant Nutrition	3
10	SRWM 264	Soil Erosion Assessment and Modelling	3
11	NaRM 232	Rural Sociology and Development	3
12	NaRM 462	Water Harvesting Technology	2
13	SRWM 361	Rehabilitation of Degraded Lands	2
14	NaRM 465	Water Resources Management	3
15	SRWM 373	Watershed Management Planning	3
16	SRWM 367	Soil and Water Conservation	3
17	SRWM 366	Socio-economics of Erosion and Soil and Water Conservation	3
18	SRWM 378	Land use Planning	3
19	SRWM 392	Community Oriented Practical Education (COPE)	6
20	SRWM 399	Senior Seminar	1
21	SRWM 394	Senior Research Project	2
		TOTAL	58
<i>III Elective Courses</i>			
41	SRWM 372	Dry- and Wetlands Management	2
46	NaRM 332	Indigenous Knowledge and Conflict Management	3
47	NaRM 432	Participatory Natural Resource Management	3
49	PrFo 415	Forest Management Planning	3
50	SRWM 272	The Role of Forestry in Watershed Management	3
51	FaFo447	Farming Systems	2
52	FaFo 414	Non-Timber Forest Products	2
53	NaRM 242	Introduction to Fisheries and aquatic resources	2
		TOTAL	20
			108/128
		Grand Total Credit Hours	107/128

Course Sequences

Year I Semester 1st

Course No.	Course Title	Credit Hours
NaRM221	Introduction to Natural Resources and Demography of Ethiopia	3
FLEN 201	Sophomore English	3
Stat 273	Introduction to Statistics	3
SRWM 111	Introduction to Forestry	3
CEE 111	Introduction to Civic and Ethical Education	3
SRWM 143	Soil Chemistry	3
	Total	18

Year I Semester 2nd

Course No.	Course Title	Cr. Hrs
SRWM 152	Introduction to Hydrology	3
SRWM 144	Soil Physics	2
SRWM 146	Introduction to Geology	2
	Introduction to Crop Production	2
	Introduction to Livestock Production	2
NaRM 213	General Ecology	2
NaRM 215	Introduction to Climate	2
NaRM 224	Introduction to Environmental Science	2
FaFo 414	Non-Timber Forest Products (E)	2
NaRM 242	Introduction to fisheries and aquatic Resources (E)	2
	Total	21

Year II Semester 1st

Course No.	Course Title	Cr. Hrs
Comp 203	Introduction to Computer Science and Programming	3
SRWM 241	Soil Biology	2
SRWM 213	Introduction to Wildlife and Ecotourism	3
SRWM 235	Irrigation and drainage	3
SRWM 237	Surveying	3
SRWM 249	Soil Genesis and Classification	3
SRWM 231	Remote Sensing (RS)	2
FaFo 447	Farming System (E)	2
	Total	21

Year II Semester 2nd

Course No.	Course Title	Cr. Hrs
SRWM 242	Soil and plant nutrition	3
SRWM 264	Soil erosion assessment and modelling	3
NaRM 232	Rural Sociology and Development	3
SRWM 296	Research Methods	2
NaRM 462	Water harvesting Technology	2
SRWM 288	Natural resources Economics	3
PrFo 415	Forest Management Planning (E)	3
SRWM 272	The role of forestry in watershed management (E)	3
	Total	22

Year III Semester 1st

Course No.	Course Title	Cr. Hrs
SRWM 361	Rehabilitation of Degraded Lands	2
SRWM 373	Watershed Management Planning	3
NaRM 332	Indigenous Knowledge and Conflict Management (E)	3
NaRM 432	Participatory Natural Resources Management (E)	3
NaRM 465	Water resource management	3
SRWM 335	Geographic Information System (GIS)	2
SRWM 367	Soil and water conservation	3
SRWM 399	Senior Seminar	1
FaFo342	Agroforestry Practices and Systems	3
	Total	23

Year III Semester 2nd

Course No.	Course Title	Cr. Hrs
NaRM 431	Extension in Natural Resource Management	2
SRWM 372	Dry- and Wetlands Management (E)	2
NaRM 422	Natural Resource Policy and Legislation	3
Mgmt 414	Entrepreneurship Development	2
SRWM 366	Socio-economics of Erosion and soil and water conservation	3
SRWM 378	Land Use Planning	3
SRWM 392	Community Oriented Practical Education (COPE)	6
SRWM 394	Senior Research Project	2
	Total	23

13. Course Descriptions

Natural Resources and Demography of Ethiopia NaRM 221

Credit hours: 3; Year I; Semester: I

Geological processes and resulting features; drainage patterns and water resources; climate; soil resources; natural vegetation; wildlife; population: size, distribution, composition, characteristics, and settlement patterns; economic activities: agriculture, industry, fishing, and tourism.

Practical Sessions:

Field tours that will enable students to have firsthand information on all or at least most natural resources of Ethiopia are recommended. These tours can be integrated with other tours.

Sophomore English FLEN 201

Credit hours: 3; Year: I; Semester: I

Reading Skills: purpose of reading, selecting material to read, reading strategies and their functions, reading and summarizing; writing skills: academic style, structure and cohesion, stages of writing, types of writing; letter and CV writing: informal letters, formal letters, application, guidelines for writing CVs; group discussions: preparation, participation, and chairing; surveys, project/research and report writing: selecting a topic,

researching sources of information and note-taking, and writing the research report; oral presentations and public speeches: preparing a presentation/speech, giving a presentation/speech, evaluation and feedback.

Introduction to Statistics Stat 273

Credit hours: 3; Year: I; Semester: I

Definition and scope of statistics; data collection, organization, frequency distribution and graphical presentation; measure of central tendency, mean, median, mode and range; quartiles and percentiles; dispersion, variation, standard deviation and coefficient of variation; Probability (elementary probability and common probability distribution: binomial, Poisson, normal, student-t); sampling techniques and tests of hypothesis on the mean; liner correlation and regression.

Introduction to Forestry SRWM 111

Credit Hours: 3; Year: I; Semester: I

The concepts of forests, forest resources and forestry; regeneration; forest seed collection and handling; nursery establishment and management, seedling production; plantation, site selection and treatment; basics of forest ecology; management of forest resources, forest engineering, forest utilization; Impact of forest cover and deforestation on soil and water resources of a watershed.

Practical Sessions:

Silviculture and management exercises both for natural and plantation forests; inventory of regeneration distribution and variation in natural forest, comparison of two different catchments with and without forest cover.

Introduction to Civic and Ethical Education CEE 111

Credit hours: 3 Year: I; Semester: I

The course Civic and Ethical Education deals with the meaning and purpose of civics and ethics; survey of history of citizenship in general and citizenship in Ethiopia in particular; origin and evolution of constitutional practices; the state, citizenship and government; the history and practice of democratic governance in the world with specific attention to Africa; meaning and nature of fundamental human rights; harmful traditional practices and the state of human rights in the Federal Democratic Republic of Ethiopia (FDRE) The question of political pluralism; important societal values; skill-building mechanisms for democratization and management ; contemporary global issues. Ethics and morals, axiology (ethics and values), ethics and moral responsibility personality inequality and power; sex and gender; professional ethics.

Soil Chemistry SRWM 143

Credit hours: 3; year: I; Semester: I

Composition of the soil (inorganic and organic components), liquid and gas phases of the soil; chemical equilibrium in the soil, surface chemistry: surface interaction between the soil solid phase and the soil solution, adsorption of cations and anions by soil, solubility equilibrium and thermodynamic considerations, transport and accumulation of soluble soil components, chemical characterization of saline and alkali soils, pollution of soil and heavy and trace elements.

Practical Sessions:

Laboratory exercises at Awassa and Wondo Genet.

Introduction to Hydrology SRWM 152

Credit hours: 3; Year: I; Semester: II

Hydrologic cycle, precipitation; types of precipitation, measurement of rainfall; analysis and interrelation of precipitation data. Evaporation and transpiration, factors controlling evaporation and transpiration process, measurement of evaporation; Estimation of potential evaporation; Infiltration factors. Groundwater resources; groundwater in hydrologic cycle, different types of aquifers and their characteristics. Hydraulics of wells; steady and unsteady states of flow in confined and unconfined aquifers, unsteady flow in leaky aquifers, partially penetrating wells. Multiple well system pumping test. Design of pedometers, analysis and interpretation of data, groundwater exploration, design of tube wells. Screened and gravel wells, methods of construction based on drilling equipments, well development and maintenance; well failures and rehabilitation.

Practical Sessions:

Groundwater movement; Darcy's law, laboratory and field determination of hydraulic conductivity. Rainfall data collection and organization.

Soil Physics SRWM144

Credit hours: 2; Year: I; Semester: II

Principles of mechanics applied to soils, physical properties of soils and classification tests, Stokes law, soil compaction, consolidation characteristics and stress distribution in soils, shearing characteristics of soil, bearing capacity, slope stability, and compaction of soils.

Practical Sessions:

Field identification of soils, sieve analysis and hydrometer analysis, soil water analysis.

Introduction to Geology SRWM 1146

Credit hours: 2; Year: I; Semester: II

Earth's history; geological time scale (eras, period, epoch); materials of the earth (sedimentary, igneous and metamorphic rocks, minerals and elements); geological forces; endogenetic (diastrophism and volcanism) and exogenetic forces (denudation and aggradation); resourcefulness of geological processes; geological hazards

Introduction to Crop Production -----

Credit hours: 2; Year: I; Semester: II

The importance of an efficient productive agriculture; agriculture and agronomy; factors of crop production, crop improvement possibilities; classification systems of cereals and legumes; agronomic practices to improve crop production efficiency; cropping systems, planting methods, soil and soil fertility management, weed control methods, pest and diseases; cropping with present and future challenges of food production; the nature, scope and importance of horticulture; divisions of horticulture; horticultural plant classification; system of horticultural production.

Practical Sessions:

On campus evaluation of crop production practices, field tour (to be integrated with other tours).

Introduction to Livestock Production ----

Credit hours: 2; Year: I; Semester: II

Importance of livestock in the livelihood of the people; principles and practices of animal husbandry; production systems; breeds and breeding; population and distribution of livestock and poultry in Ethiopia; practices of feeds and feeding management;

maintenance of health, disease prevention and control' genetic improvement, and housing of dairy, poultry and small ruminants; the arts of caring, controlling and handling of modern and traditional beehives and bee colonies.

Practical Sessions:

On campus evaluation of dairy farming and beekeeping, field tour (to be integrated with other tours).

General Ecology NaRM213

Credit hours: 2; Year: I; Semester: II

Concept of ecology and the history of human-environment interaction; scope and relationship of ecology with other disciplines; ecology and the concept of ecosystem, ecosystem functioning (energy flow and nutrient cycling); adoption and evolution; the ecological stress concept; biological productivity; ecosystem changes

Practical Sessions:

Assessment of ecosystem productivity, both structural and functional evaluation

Introduction to Climate NaRM215

Credit hours: 2, Year: I, Semester: II

Weather and climate; atmospheric composition; nature and structure of atmosphere; function and importance of the atmosphere; elements and controls of climate; radiation (solar and ground) distribution; temperature (air temperature and soil temperature) recordings and interpretation; atmospheric or air pressure system; wind and turbulence (global and local); atmospheric moisture, types and measurements; precipitation: origin, forms, types, intensity, variability and measurements; climatic classification;

Practical Sessions:

Field practical works (within WGCF) and observing meteorological forecasting technologies in Addis Ababa.

Introduction to Environmental Science NaRM224

Credit hours: 2; Year: I; Semester: II

Earth/atmosphere system: atmospheric elements, human activities and the atmospheric environment; environmental impacts; agricultural and industrial wastes: concept of waste, agricultural wastes, industrial wastes, waste from food processing plants, municipal wastes, greenhouse effect and global warming, climatic change and ozone depletion, drought famine and desertification, pollution; measurement and control of environmental problems; monitoring of pollutants in fossil fuel flames; population and use of natural resources; reducing the environmental impact of current energy sources; increasing the contribution from low impact energy options.

Practical Sessions:

Assess possible areas of agricultural wastes; visit industrial and municipal wastes; practicing and conducting social survey on environmental issues; demonstrate and create awareness on how to reduce environmental impacts; Case study and group work on environmental issues.

Non-Timber Forest Products (E) FaFo 435

Credit hours: 2; Year: I; Semester II

Introduction to non-timber forest products (NTFP): production functions of forests and woodlands, classifications and types of NTFP; uses of NTFP: subsistence and commercial; collection and processing of NTFP; quality control: cleaning and grading; storage and transport; distribution of important NTFP producing plants in Ethiopia; potentials of NTFP in sustainable forest management; domestication and conservation

methods

Practical Sessions:

Field visits and practical in collection and processing of different types of NTFP in various agro-ecological zones and enterprises

Introduction to Fisheries and Aquatic Resources (E) NaRM 242

Credit hours: 2; Year: I; Semester: II

Major groups of fishes with emphasis on the freshwater fish species of Africa; the lake environment with emphasis to Ethiopian conditions; anatomy and physiology of fish; reproduction; food and feeding; age and growth; fishing gears; life-history strategies of fish; dynamics of population abundance and production; diseases and parasites of fish; freshwater fishpond cultures; fish as food.

Practical Sessions:

Collection of benthic and weed-bed fauna; collection of phytoplankton and zooplankton: identification of major groups of phytoplankton, zooplankton and benthos; identification of different fish species of some Rift Valley lakes of Ethiopia; anatomy and physiology of fish; age determination; demonstration of different fishing gears; visit to the fish market of Lack Awassa; stomach content analysis of fish; fecundity estimation; collection of fish fry from shallow waters; fisheries activities in some Rift Valley lakes of Ethiopia-field trip

Introduction to Computer and Programming Comp 203

Credit hours: 3; Year: II; Semester: I

Fundamentals of computer structure; PC-DOS and application programs; programs and flow charts; identifier declarations and variables; logic and conditional expression, program of input and output division of programs; elementary programming in a high level language; basics of software development.

Practical Sessions:

Exercise on introduction to MS-DOS; exercise on Microsoft Word: introduction, editing and formatting a document, using tables, using newspaper-style columns, using objects, mail merge, using templates and using styles and printing; exercise on Microsoft Excel; excel basics, entering and editing worksheet data, essential spreadsheet operations, creating and using formulas, worksheet formatting, chart features, working with graphics and lists and printing; exercise on Local Area Network (LAN) and Internet; using of LAN for resource sharing and use of server for backup, Internet browsing.

Soil Biology SRWM 241

Credit hours: 2; Year: II; Semester: I

Types of fauna and flora in the soils; ecosystem dynamics and the role of macro and meso fauna and flora; microbial diversity and their role. Herbivores, decomposers, and other soil organisms. Nutrient cycle: the carbon cycle; with emphasis on microbial physiology, organic matter and lignin decomposition, microbiology of hemi-celluloses and polysaccharides; nitrogen cycle, microbial of nutrient transformation, ecological interrelationships; rhizosphere and the role of root symbioses (nitrogen fixing bacteria and mycorrhizal fungi). Soil biodiversity management and its implication in improving agricultural and forest productivity.

Practical Sessions:

Laboratory assessment of nitrogen fixing bacteria and mycorrhizal fungi

Introduction to Wildlife and Ecotourism SRWM 213

Credit hours: 3; Year: II; Semester: I

Wildlife resources basic concepts of wildlife ecology, wildlife habitats; the influence of

ecological succession on wildlife population and community; distribution and abundance of wildlife resources across the different ecological regions/zones, the influence of different environmental factors on wildlife and its habitats; wildlife resources surveying; ecology of Ethiopia's wildlife; wildlife conservation and management; process of wildlife management; managing protected areas; guidelines to formulate wildlife management plan and evaluating its effectiveness; basic concepts of ecotourism; historical development of eco-tourism; the need to study ecotourism; ecotourism and human society; the art of ecotourism management; assessment of potential ecotourism sites (hydrological, relief, geological, recreational, biological, etc.); ecotourism and protected natural areas; databases for ecotourism sites selection and management; ecotourism demand and marketability; stakeholders-based ecotourism management; formulation of ecotourism management plan and evaluation of its effectiveness; contribution of ecotourism to sustainable natural resource management; ecotourism of Ethiopia; potentials, attempts, achievements and limitations of ecotourism at national level; its prospects and institutional set up.

Practical Sessions:

Collection of benthic and weed- bed fauna; collection of phytoplankton and zooplankton: identification of major groups of phytoplankton, zooplankton and benthos;

Irrigation and Drainage SRWM 235

Credit hours: 3; Year: II, Semester: I

Introduction: Concept and scope of irrigation science, uses and importance of irrigation, ill effects of irrigation. History and future development of irrigation in Ethiopia. Types of irrigation. Basic soil-water-plant relationship: soil moisture contents. Standards of irrigation water. Plant root characteristics and moisture extraction patterns. Consumptive use of water : water requirement of crops, irrigation requirement and irrigation efficiencies. Planning and design principles of irrigation systems: methods of surface irrigation, wild and controlled flooding methods, furrow and contour farming, criteria for the selection of the appropriate method of irrigation. Drainage and crop production, flow of water in soils, water movement above water table. Importance of drainage: drainage to control water logging, drainage to control salinization. Types of drainage: surface drainage system, subsurface drainage system, compound drainage system. Structure construction and maintenance of drainage: layout and design of surface drainage systems, maintenance of surface and subsurface drainage system, design of depth of subsurface drainage systems, design of spacing of subsurface drainage system, diameter and slope of pipe drain, economics of subsurface drains.

Practical Sessions:

Survey and identify potential water sources for irrigation, practice different techniques of irrigation, layout and design surface drainage techniques.

Surveying SRWM 237

Credit hours: 3; Semester: I; Year: II

Introduction: Concept of ground surveying need and purpose of ground surveying in soil, vegetation and water resource management, units of measurements, error and mistakes. Principles and techniques of surveying; Measurements in surveying: distance and angle measurements, fixing of survey stations and tie points. Leveling. Application of different tools for social surveying.

Practical Sessions:

Ground distance and area measurements using different techniques. Plotting and area

calculation. Compass surveying plotting and area calculation, measurements on topographic maps, demonstration on the use of GPS. Socioeconomic data collection.

Soils Genesis SRWM 249

Credit hours: 2; Year: II; Semester: I

Concepts of Soil Classification (Soil Taxonomy), Major Land forms and Environmental Management; The USDA Soil Classification System, FAO-UNESCO classification:- Diagnostic horizons and Diagnostic Properties, Major Soil Groupings and Soil Units; Tropical Soil Environment:- Soil Climate, Parent Material, Vegetation and Organic Matter, Soil Biology, Management Approaches; Nature and Management of Ethiopian Soils.

Practical Sessions:

Observation of soil Catena and diagnostic horizons around Wondo Genet and Rift Valley areas, survey of different soil types in central and southern parts of Ethiopia

Remote Sensing (RS) SRWM231

Credit hours: 2 Year II; Semester: I

Background: history of space based RS, space-borne and airborne RS, spatial data acquisition, perception of color; multispectral scanners, sensor types, platforms, some operational space borne multispectral scanners; Electro Magnetic Energy (EME): EMR interaction with the atmosphere and earth's surface in detail; Spectral response curve: Spectral properties of vegetation, soil and water; Introduction to aerial photograph: photographic processes, geometry of aerial photography, photogrammetry; scale of a photograph: point and average photo scales, displacement and distortions on air photo, distance and angle measurements; Aerial photo interpretation: basic photo interpretation elements, spatial aspects of photo interpretation, temporal aspect of photo interpretation, mapping from aerial photographs, area measurements from aerial photographs, stereoscopic vision, stereogram; Application of aerial photography in natural resources management, monitoring; Satellite Image processing: image enhancement and visualization, Histogram, Single multiple band image display, color composite, Filter operations, Noise reduction, Visual image interpretation, image classification, non-supervised and supervised image classifications, change detection, surface hydrology and slope inventory, land capability classification and land use pattern mapping; Environmental assessment; validation of the result; problems in image classification; Applications of remote sensing in natural resources management.

Practical Sessions:

Application of the photo interpretation elements in aerial photo interpretation, Determination of photo scale and exercise distance and angle measurements on photographs, height and slop measurement on aerial photographs, Map production using photographs, digital image enhancement, Image enhancement and filter operations, exercise visual image interpretation using analog and digital satellite images, exercise supervised and non supervised satellite image classification and land-use pattern mapping.

Farming Systems FaFo 447

Credit hours: 2; Year: 4; Semester: I

Concepts of farming systems; general characteristics and farming systems in Ethiopia; key ingredients of FSR: their Interaction and interrelationships; operational modes for FSR; comparing experiment station based research and FSR; commonly identified stages of FSR; the descriptive and diagnostic stage: natural environment, the socio-

economic environment, agriculture; data collection methods: formal survey and informal survey; planning stage: the on farm data collection stage, use local-level information gathering and planning (PRA/RRA, participatory action research) tools, stakeholder analysis; the assessment and recommendation stage; analysis and interpretation of data and evaluation; reviewing and monitoring needs in FSR; practices and monitoring criteria for FSR; out puts of FSR.

Practical Sessions:

Conducting field practices on farming systems analysis in the vicinities of WGCF and Langano. Analyzing and synthesizing different stages of on-farm research on the bases of different cases from literature and field visits.

Soil and Plant Systems SRWM 242

Credit hours: 3; Semester: II; Year: II

Development and functioning of plant roots in the soil; types, amount and functions of compound released in to rhizosphere by soil grown plants; mineralization and immobilization to the rhizosphere. Dynamic nature of nutrient uptake: nutrient in the soil solution; role of mass flow and diffusing; role of root density; symbiosis and other association for nutrient capturing; mycorrhizal and N-fixation bacteria; soil water; Managing soil fertility for plant productivity.

Practical Sessions:

Assessing different root types and associated symbiotic structure on them. Conducting experiments to assess plant growth under various fertility levels

Soil Erosion Assessment and Modeling SRWM 264

Credit hours: 2; Year: II; Semester: II

Land degradation and distribution of soil erosion, processes and mechanics of soil erosion: types of erosion, landslides and subsurface flow, factors influencing soil erosion: Erosivity, erodibility, physiography, vegetation cover, erosion hazard assessment: generalized assessments and assessment by land capability classification, soil erosion measurement: field and laboratory measurements, modeling soil erosion: the empirical and physically based models, model validation.

Practical Sessions:

Field and laboratory measurements, modelling soil erosion

Rural Sociology and Development NaRM 232

Credit hours: 3; Year: II; Semester: II

Basic concepts and perspectives of sociology and society in general; the origin of rural sociology; the widening scope of rural sociology; defining the rural; determinants of rural social formation; the institution of family and primary group interaction; social stratification in rural communities; rural and urban communities a continuum or a dichotomy. Social changes in rural societies; forms of social change; globalization and rural societies; rural development (general and as applied to Ethiopia); what is development? the elements of rural development.

Research Methods SRWM 296

Credit hours: 2; Year: II; Semester: II

Philosophy of science; scientific method; process of empirical research; purpose and methodology of scientific research; problem identification and prioritization; developing research proposal; planning and performing of experiments, data collection, compilation

and analysis; analysis of interrelates among problems and causes, preparation of research report.

Practical Sessions:

Periodical reports on causes of water and soil problems, possible solutions and recommendations. Proposal writing and budget estimation practices and survey of water and soil resource management.

Water Harvesting Technology NaRM 462

Credit hours: 2; Year: II; Semester: II

Introduction: Definition, scope and application. Water harvesting principles: water requirements for farm and domestic uses, techniques for moisture conservation in farming system. Water harvesting practices: structures for harvesting and storage
Introduction: Hydrologic cycle: hydrologic processes; definition, water budgeting, energy budgeting. Hydrologic unit; catchment area, physical parameters, cover characteristics. Planning rainwater harvesting: Planning based on water balance accounting; estimating runoff production from catchment area; estimating rainfall and evapotranspiration. Technologies for water harvesting: small earth dams/embankments; small farm ponds; sediment storage dams; Design model rainfall multiplier and water harvesting systems for crop production and trees. Principles of hand dug wells. Water harvesting techniques for tree planting: water collection trenches; herring bones; eyebrow basins; half-moons; improved pits; hillside terraces level inward slope and double slope terraces.

Practical Sessions:

Practicing different moisture conservation techniques, visiting water harvesting structures and storage, plan, design and implement the various water harvesting technologies

Natural Resource Economics SRWM 288

Credit hours: 3; Year: II; Semester: II

Introduction: the evolution, scope and nature of economics in natural resource management, natural resources and the environment as economic resources, natural and environmental resource base of Ethiopia; mathematical concepts: derivatives, the integral, matrix algebra, equilibrium and dynamic analysis, growth models, optimization; sustainable development; the economic system and the environment: welfare economics and the environment, optimal utilization of natural and environmental resources, efficiency, equity, market and the role of government in resource allocation; valuation: the need to value the environment, types of economic values, valuation techniques, valuing benefits; microeconomic aspects of natural resource management: demand, supply, production theory, optimal rate of production, concepts of cost.

Forest Management Planning PrFo 415

Credit Hours: 3; Year: II; Semester: II

Definition of terms; Basic concepts and place of forest management in forestry; Forest policy and factors to consider to formulate forest policy principle of forest management planning and its control means; Elements of forest management of uneven-aged (management under the selection felling system); Site and density as crucial factor for timber production; Normal forest theory and forest regulation of even-aged and uneven-aged stands; Decision making in forestry.

Practical Sessions:

Practical Sessions: are requirement of the course and need to be undertaken in all major topics by all students for better understanding of topics discussed in forest Management:

Preparation of forest management plan by: Formulating management objectives; Description of the forest resource and Data Collection; Analysis and yield and growth calculation; Estimating required labor and Setting priorities among alternative courses of action to be undertaken and finally preparation of prescription on compartment level.

The Role of Forestry in Watershed Management (E) 274

Credit Hours: 3; Year: II; Semester: II

Concept of forest management: tropical natural forest management; conservation; production and plantation. State of natural forest and their contribution to watershed management in Ethiopia. Links between local community and forest. Soil and water losses from forest stands. Role of farm forestry in watershed management.

Rehabilitation of Degraded Lands SRWM 361

Credit hours: 2; Year: III; Semester: I

Introduction: Concept of reclamation of degraded and dry land, dry land ecology. Characteristics of degraded and dry land: vegetation distribution and variation, regeneration variation, Degraded and dry land management: dry land productivity management and improvement, rehabilitation of degraded areas, effect of fire on dry land ecosystem

Practical Sessions:

Surveying and determination of regeneration variation of vegetation covered areas and degraded land, evaluation of regeneration distribution of different species in dry land sites.

Watershed Management Planning NRM 373

Credit hours: 3; Year: III; Semester: I

Introduction: definition, the need for watershed management planning; watershed planning approach and basic concepts: involving different stakeholders in watershed management planning, planning approaches, planning level, components of watershed management planning; major steps and procedures of watershed management planning: determining main objective and priorities, conceptual framework, data collection and verification information for activities, data analysis, and document preparation; preparation of integrated watershed management plan: formulation of management alternatives, strategies, recommendation on implementations, production of integrated watershed management plan for decision-making, monitoring and evaluation.

Practical Sessions:

Site selection for the project; setting objectives; resources, stakeholders and problem identification; designing a conceptual framework for the analysis of the watershed management planning; designing project plan that involves different stakeholders; watershed survey, data collection and generation of relevant information; production and presentation of integrated watershed management plan; the students are expected to carryout participatory watershed management plan in a unit area, and present the final working document, using all or some of the above practical exercises.

Indigenous Knowledge and Conflict Management (E) NaRM 332

Credit Hours: 3; Year: III; Semester: I

Theoretical background to the concept of conflict: the dialectical, functional, exchange and structural models of conflict; the causes, the function and consequence of conflict; ways of converting conflict to cooperation: formal and informal mechanisms of conflict

resolution, proactive and reactive approaches to conflict in natural resource management; common property management mechanisms; the concept of indigenous knowledge, survey of traditional systems of resource management; some common features of traditional resource management as opposed to scientific method; indigenous systems of resource management by resource types; indigenous and scientific knowledge systems: complementary or contradictory; limitation of indigenous knowledge: power disparities between social groups. Fire as a tool in traditional resource management.

Practical Sessions:

Video show from best experiences; field visit: Observation, discussion and interview
Field visit to some selected sites of known indigenous practices of resource management

Participatory Natural Resource Management (E) NaRM 432

Credit hours: 3; Year: III; Semester: I

The concept of participation in natural resource management; strategies for participation; Methods of promoting participation; participatory methods; stakeholder analysis; local-level information gathering and planning (PRA/RRA, participatory action research); project/program planning tools; multi-stakeholder collaboration; large group interventions; joint/collaborative natural resource management; monitoring and evaluation of participation; institutional support for participation.

Practical Sessions:

A participatory project preparation on a selected topic

Water Resources Management NaRM 465

Credit hours: 3; Year: III; Semester: I

Introduction to water resource engineering; water resources of the world and Ethiopia; the potential and utilization of water resources in Ethiopia; function of water in land development and social planning; uses of water resources (consumptive/non-consumptive; single and multiple purpose uses, compatibility of different uses); water supply and demand assessment; systems approach in water resources; optimization techniques – linear programming (graphical method, simplex method, Big-M-Method), dynamic programming; water resources planning and management models; wetland water management; lack water management; deterministic river basin models; integrated river basin development; water resources project formulation; concept of master plan; legal, administrative and institutional aspects of water resource planning in Ethiopia.

Practical Sessions:

Development of a water resource management project for a selected basin

Geographic Information System (GIS) SRWM 335

Credit hours: 2; Year: III, Semester: I

Introduction to concepts and systems: electromagnetic energy and spectrum, image characteristics, remote sensing systems, and sources of remote sensing information; interpretation of images: interaction between light and matter, photo mosaic, stereo-pairs of images, black-and white images, IR-color images; digital image processing: structure of digital images, image processing overview, image enhancement, and information extraction; introduction: definition, capabilities of GIS, components of GIS, questions a GIS can answer, sample GIS applications in NRM; basic map concepts: types of map information, map features, fundamental map representation techniques, and topology;

procedures for simple GIS-Projects: geographic database, organizing map information, and designing database; input of data in to GIS: data sources, and data entry techniques; spatial data quality control: errors and their sources, correcting spatial data; attribute data: sources of attribute data, input, linking attributes to geographic features; managing the database: projection/ transformation/ geo-referencing, coordinate systems; geographic analysis: analytical characteristics of GIS, steps for performing geographic analysis; presentation of the results of geographic analysis.

Practical Sessions:

Interpretation of Images; information extraction from digital images; designing a geographic database; data capturing techniques: digitizing (using digitizer and graphic monitor), data capturing using GPS, extraction of information from images, importing existing data; spatial data control; attributing data input and linking them with geographic features; geographic data analysis, presentation of results of analysis; carrying out one GIS project, which includes all or some of the above individual exercises (for example, resources survey, land cover monitoring of a given area, preparing land use plan for one particular area).

Soil and Water Conservation NRWM 367

Credit hours: 3; Year: III; Semester: I

Strategies for erosion control: soil loss tolerance, principles of soil conservation, approaches to soil conservation; indigenous and exotic soil and water conservation measures: rotation, cover crops, strip cropping, multiple cropping, high density planting, mulching, re vegetation and area closure; soil management: organic matter addition, tillage practices, and soil stabilizers; mechanical measures: contouring, contour bunds, terraces, waterways, stabilization structures, windbreaks, and geotextiles; implementing soil and water conservation: suitability to various land use, types and agro-ecological zones, socioeconomic and political settings, legislative instruments.

Practical Sessions:

Observe indigenous and exotic soil and water conservation measures in the local areas (field tour). After assessing soil erosion and agro-climatic condition of a given area, they will recommend appropriate soil and water conservation measures.

Senior Seminar SRWM 341

Credit hours: 1 hours; Year: III; Semester: I

Developing researchable ideas, problem identification and proposal writing by students in consultation with advisors nominated by the department, oral presentation of the proposal for evolution, comments and approvals.

Agroforestry Practices and Systems FaFo342

Credit hours: 3; Year: III; Semester: I

Historical development of agroforestry; classification of agroforestry systems and practices; major agroforestry systems and practices in the tropics and Ethiopia; multipurpose species for agroforestry: species identification, selection and tree management; tree-crop interactions; the role of Agroforestry in the land uses systems: soil conservation and land productivity, soil fertility maintenance; agroforestry for livestock production, and socio-economic issues in agroforestry; tools and methods for characterization and diagnosis; designing and developing agroforestry interventions; monitoring and evaluation of agroforestry interventions; agro forestry experiments and data analyses; agroforestry extension.

Practical Sessions:

Practical exercises in the college's agroforestry demonstration plot, visits to farmer fields, project on the development of agroforestry for a given site, identification of MPTS.

Extension in Natural Resource Management NaRM 431

Credit hours: 2; Year: III Semester: II

Philosophy; principles and purposes of extension; principles of adult learning; communication: its role, process, diffusion and adoption models, innovation, skills and barriers to effective communications; developing participatory extension program in natural resource management; strategies for participation and participatory methods; extension methods: individual, group, mass methods; how to work with people: working with formal and informal leaders; extension campaign in natural resource management; extension program: planning, organization, implementing, monitoring and evaluation; The role of government and NGO's in extension.

Practical Sessions:

Case study on participatory natural resource management program planning on specific topic and area

Dry- and Wetlands Management SRWM 372

Credit Hours: 2; Year: III; Semester: II

Characteristics of dry and wetland ecosystems: peculiarities of dry and wetland and values; dry and wetland ecosystem functions, productivity and growth limiting factors; dry and wetland ecosystems restoration, methods and practices of dry and wetland ecosystem management; the socioeconomic environment; wetland management conventions; assessment of needs, constraints and options of dry and wetland management in Ethiopia

Practical Sessions:

Field evaluation and characterization of dry and wetland ecosystems and ecosystem functions.

Natural Resource Policy and Legislation NaRM 442

Credit hours: 3; Year: III; Semester: II

Introducing the concept of public policy and the formation processes; evolutionary or dynamic nature of public policy making; implementation of public policy: the role of different actors in preparation, decisions and implementation phases; the place of natural resource policies in public policies; the relationship between natural resource policies and other public policies; review of selected regional, national and international policies and programs in natural resources and environment (to be presented and debated); basic principles of legislation; property rights and natural resources; laws and regulations of natural resources in Ethiopia and the constraints during implementation; consequences of institutional/policy failures in natural resource management in Ethiopia.

Practical Sessions:

Indoor policy making and evaluation exercises will be given.

Entrepreneurship Development Management (E) 414

Credit Hours: 2; Year: III; Semester: II

This course discusses entrepreneurship theory; characteristics and background of entrepreneurs; issues related to starting a new venture; financing a new venture and other related issues with particular emphasis to the Ethiopian economic environment. The course has lecture component, case analysis and individual project work to be

presented in class.

Socio-economics of Erosion and Soil and Water Conservation SRWM 342

Credit hours: 3; Year: III; Semester: II

Causes and consequences of land degradation; actors in land degradation; social and cultural aspects: perceptions about erosion and acceptance of conservation measures; land tenure and carrying capacity; formal and informal methods of data collection in soil and water conservation; monitoring and evaluation at watershed, project, and farm level: NPV, cost-benefit ratio, and multicriteria analysis as an alternative evaluation method.

Practical Sessions: Formal and informal survey on erosion and soil and water conservation around the local farmers. Evaluation of soil and water conservation measures.

Land Use Planning SRWM 378

Credit hours: 3; Year: III; Semester: II

The nature and scope of LUP: concepts and definitions, decisions on land use, principal goals, focus, and levels of LUP; an overview of the planning process: steps, the need for flexibility, planning as an iterative process; land evaluation (LE): definitions, systems, principles, and procedures; selection and description of land utilization types; Land use requirements; Land units, characteristics and qualities; matching and land suitability classification; environmental, economic and social analysis; LE and LUP. Introduction and concepts of watershed; hydrologic cycle and water resources; Identification of watershed problems, objectives and priorities (biophysical, socioeconomic, institutional and cultural data collection and analysis.) Planning approaches and basics: plan formulation, recommendation, implementation, monitoring and evaluation.

Practical Sessions:

As watershed surveying, planning and management is a continuous process, the student should apply the theories in step-by-step practical exercises in the surrounding communities.

Community Oriented Practical Education COPE SRWM 392

Credit hours: 6; Year: III; Semester: II

This is a practical attachment whereby the students go to different organizations to acquire practical skills in applying the knowledge and experiences they developed during their stay in the department; with close supervision of the department and the development project institution or organization where they are involved. This field service will assist the students to be exposed to working environment, which has a significant contribution for their future careers.

Practical Sessions:

Practical exercises in the college's agroforestry demonstration plot, visits to farmer fields, project on the development of agroforestry for a given site, identification of MPTS.

Senior Research Project SRWM 394

Credit Hours: 2; Year: III; Semester: II

Problem identification related to soil, vegetation and water resources, formulation of concept and ideas, Proposal writing, data collection and organizing, sampling designs, data analysis and report writing in consultation with an advisor assigned by the department.

DEBUB UNIVERSITY
WONDO GENET COLLEGE OF FORESTRY

**CURRICULUM FOR DEPARTMENT OF NATURE CONSERVATION
AND ECOTOURISM**

1. Background

As the worldwide loss of natural resources has accelerated in recent decades, awareness has increased concerning the potentially disastrous consequences of this trend for the earth's ecological functions and the fulfillment of basic human development needs. This is particularly evident in largely agrarian societies, where people depend directly on natural resources to a far greater extent than do those in more industrialized societies.

In Ethiopia, natural resources are the direct basis for livelihoods. This enormous dependence on resources brings with it a particular vulnerability for every unwise management decision. Environmental degradation that leads to the destruction of the ecosystems must therefore be viewed as a serious threat to the country's future. Most of Ethiopia's ecosystems are coming under increasing pressure, and it has become more evident that ways must be found to raise production and incomes, while simultaneously learning how to better manage the resource base. Even so, Ethiopia still contains a wealth of diverse ecosystems; hence the opportunity still exists for proactive intervention. Not only is the natural environment among the richest in the world, but much of this endowment still remains. To prevent declining productivity due to environmental degradation, conservation-based practices must be established through all methods of securing livelihoods. The international dimension of the current nature- and community-based ecotourism industry is highly encouraging. In addition to its cultural heritage, Ethiopia is endowed with rich natural landscapes and biological diversity that will be a huge venue for the ecotourism industry in the 21st century.

The setting aside of landscapes and biological resources for ecotourism has the potential to contribute to the restoration of degraded areas. When human activities are halted, wildlife conservation areas and other landscapes often see a restoration of native vegetation, which will again contribute to the development of watershed and stable hydrological effects and conservation of soils. The current national conservation strategy of Ethiopia focuses on the conservation of natural resources and emphasizes a concern over resource degradation and devaluation. This concern is reflected in the Rural Development Policy and Strategy (2002), which is based on conservation and the appropriate use of natural resources, as well as in the Food Security Strategy (2002), which again recognizes environmental resources sustainability as a critical factor in economic development. The strategic plan of Debus University also envisages that Wondo Genet College of Forestry will become a university College, with more programs open at both the graduate and undergraduate level. New training programs in the area of community-based natural resource management are imperative for achieving these goals. Hence, the study of conservation-based utilization of natural resources and nature-based tourism development is of increasing importance.

Wondo Genet College of Forestry, with its human resources and physical facilities, is an ideal place to launch a new program in *nature conservation and ecotourism*. Other programs within the College will support and enhance this new department and help it achieve its objectives.

2. Justification

Growing population densities lead to a scarcity of resources and widespread changes in land uses. The transition to sustainable economic growth requires a broad-based change in thinking about natural resources and in the ways that decisions are made about investment and proper utilization. To ensure that future generations can benefit from the earth's natural resources, a better and wiser management of these resources is needed.

Ethiopia is said to be home to a diversity of natural resources; however these resources have not been effectively conserved and managed so as to generate a sound economic return for the country. This is mainly attributed to a lack of skilled professional natural resource managers in this area. To this end, the Department of Nature Conservation and Ecotourism will contribute to the development of skilled and trained personnel in this field.

Before the current problems create severe consequences for the natural resources of the country, as well as irreversible economic burdens on rural communities, Ethiopia must produce competent professionals in the area of conservation-based natural resource management. These natural resource professionals will enable proper planning, empowering and advising the management of rural lands so that all activities are conservation based. To meet these demands, the new department will offer multidisciplinary educational opportunities through the provision of broad and diversified knowledge in the techniques of nature conservation and ecotourism.

3. The objective of this department

3.1. General Objectives

The main objective of this department is to produce resource conservationists who are multidisciplinary in approach and able to assist in the development of a holistic, sustainable, nature-based tourism industry.

3.2. Specific objectives

- Offer training in nature conservation and ecotourism that will assist in establishing a strategic natural resource and land-use planning system.
- Improve the knowledge, skill, and attitude of students in order to better contribute to the empowerment of local communities in the sustainable use of resources
- Produce graduates who can conduct systematic research to examine and understand the complexity of factors involved in ecosystem management and the ecotourism industry
- Offer training that will enable graduates to be involved in policy formulation and implementation processes
- Generate problem-solving and need-based knowledge and skills to improve the quality of education and the livelihoods of local communities

Provide consultancy services and become involved nationally and internationally in this field

4. Graduate profile

The graduates should provide insight into the opportunities and limitations of the natural resource base of the country in order to advise sustainable management of the resources. They are expected to have broad and substantive knowledge of wildlife and wildlife management geared towards sustainable income generation schemes. This will enable them to be able to analyze information and apply it toward re-enforcing government institutions, while also assisting with the development and start-up of self-help initiatives, including private entrepreneurship. On completion of the courses graduates are expected to know:

The Conservation of Natural Resources and Strategy (2002) which basis on conservation and appropriate use of natural resources, the Food Security Strategy (2002), which again recognizes environmental resources sustainability as a critical factor in economic development, indicates a point of concern on resource degradation and devaluation

Provide an insight in to the opportunity and limitations of the natural resource base in order to advise local development within the framework of national conservation plans, policies and strategies

Apply the acquired knowledge and skill in identifying key actors in nature conservation in their respective interest fields and play a role in creating a conducive environment for resource-use systems that conserve nature

Apply the acquired knowledge, skill, and attitude toward participatory management systems that better help achieve the national conservation strategy and rural development policy of the country

Combine indigenous and modern knowledge systems to develop a deeper understanding of the full range of nature conservation concerns and associated income-generation schemes, including community-based ecotourism

Have the basic skills to conduct action-oriented research independently in his/her profession and write clear reports to scientific standards

Involve in project planning, monitoring, and evaluation components in terms of conservation of nature and community-based ecotourism and provide feedback to the community and to policy makers

Introduce innovative knowledge and skill in nature and community- based ecotourism

Introduce better land-use planning and more appropriate matching of production technologies to local ecological constraints

Strategically develop planning at different levels to ensure that the country's unique biological heritage is not needlessly sacrificed

Assist local communities to develop the nature- and community-based ecotourism industry

Make an effort in proper planning, empowering, and advising rural land management and community based ecotourism so that all activities will be conservation based

Involve in decision-making (policy) processes related to natural resources.

5. Resources

5.1. Physical Facilities

There are physical facilities in Wondo Genet College of Forestry available for undergraduate training programs in different departments. Other programs within the College are important assets that will complement and support the new department. Lecture rooms, equipped laboratories, a well-stocked library, GIS laboratories furnished with latest and most highly advanced equipment and software, and computer lab and field stations are at hand for teaching and research.

But some of these facilities are limited and will need to be re-enforced by additional capacity-building activities. In addition, since natural resource management is a multi-disciplinary field, some of the material and staff resources for training are expected from external sources. In this regard, the faculty of Agriculture in Awassa, which belongs to the same university, will enrich the program through lectures and sharing of field facilities. The university as a whole will conduct the core part of the program. Collaborating government organizations will also participate in teaching and field training. Expatriate staff from other international universities, such as Oregon State University (OSU), will be involved in training from the outset. However, the future staff training and human resource development plan must consider the human resource requirements for the new department.

5.2. Financial Resources

The program will be run by government support and other financial assistance from donors.

6. Rules and Regulations

All the academic rules and regulations of Debu University will also apply for this department.

6.1. Admission Rules

For admission in the department candidates should successfully complete the 10+2 preparatory program and pass the university entrance examination, or have earned a diploma from a technical college and fulfill the requirements for advanced standing.

6.2. Evaluation Methods

Student evaluation will include two major examinations (mid-semester and final), practical assignments, quizzes, and field evaluations. This will take a form of continuous assessment. As this program may basically focus on extended practical exercises, the achievement of students in field practical exercises and subsequent reports will be an important component of the evaluation process.

6.3. Graduation Requirement

To qualify for award of the degree in the department, a candidate shall take all the

required courses and score a cumulative GPA of not less than 2.00.

7. Degree Awarded upon Graduation

Up on successful completion of the program as indicated in section above the degree will be awarded as be awarded the degree of “Bachelor of Science in Nature Conservation and Ecotourism.”

8. Course Coding

Coding of courses offered by the department of Nature Conservation and Ecotourism is represented by NCET” and followed by a three-digit number. The first digit indicates the year of the study; the second digit represents the category of the department and the third digit shows the semester in which the course is offered. Non departmental courses from other departments of the university are retained with original code assigned in the home departments.

9. Course Design

The minimum total credit hour requirement for successful completion is 108 credit hours. The courses are identified in three major focus areas. These are Major courses (53 credit hours including COPE), Common Courses (50 credit hours) and Elective Courses (12 credit hours).

10. Course Schedule

The courses proposed for the department of Nature Conservation and Ecotourism are indicated in the table below. When there are two or more elective courses in the same semester, it is compulsory for the student to take the minimum requirement.

List of Courses and Categories in the Department of Nature Conservation and Ecotourism

No	Course title	Credit Hours
	Courses Category 1	
1	Tourism Marketing and Administration	3
2	Tourism and Recreational Area Management	3
3	Nature Reserve and wildlife Management	3
4	Urban Forestry (E)	2
5	Communication skills in tourism	2
6	Introduction to Forestry	3
	Courses Category 2	
7	Principles of Taxonomy	2
8	Ecosystem Management	3
9	Landscape Ecology	3
10	Restoration Ecology	2
11	General Ecology	2
12	Introduction to Environmental Science	2
13	Energy Resources Management (E)	2
14	Environmental Impact Assessment (E)	3
15	Introduction to Wildlife and Fisheries	3
	Courses Category 3	
16	Natural Resources and Environmental Economics I	2

17	Nature conservation policy	3
18	Management Accounting	3
19	Introduction to Anthropology	3
20	Physical Geography and Demography	3
21	Participatory Natural Resource Management	3
22	Natural Resources and Environmental Economics II	3
23	Indigenous knowledge and conflict management	3
24	Rural Sociology and Development	3
25	Extension	2
	Courses Category 4	
26	Introduction to climatology	2
27	Integrated Watershed Management	3
28	Introduction to Computer Use	3
29	Introduction to Agriculture	2
30	Introduction to Soil Sciences	2
31	Surveying and Mapping	3
32	Soil And Water Conservation	2
34	GIS and remote sensing	2
35	Land use planning	3
36	Project planning (E)	3
	Courses Category 5	
37	Introduction To Statistics	3
38	Introduction to Civic and Ethical Education	3
39	Entrepreneurship Development	3
40	Research Methods	3
41	Communication Skills in Tourism II (E)	3
42	Sophomore English	3

COPE with 6 Credit hours

Dept. NCET; Year I; Semester I

Code	Course title	Credit hours
Stat 273	Introduction to Statistics	3
CEED111	Introduction to Civic and Ethical Education	3
FLEN 201	Sophomore English	3
Comp203	Introduction to Computer Use	3
NCET143	Introduction to Agriculture	2
NCET145	Introduction to Forestry	3

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Dept. NCET; Year I; Semester II

Code	Course title	Credit hours
NaRM215	Introduction to climatology	2
NCET132	Introduction to Anthropology	3
NCET142	Surveying and Mapping	3
PISc 242	Introduction to soil sciences	2
NaRM213	General Ecology	2
NaRM232	Rural Sociology and Development	3
NCET122	Principles of Taxonomy	2
		17

Dept. NCET; Year II; Semester I

Code	Course title	Credit hours
NCET221	Ecosystem Management	3
NCET241	Land use planning	3
NaRM 352	GIS and remote sensing	2
NCET223	Introduction to Wildlife and Fisheries	3
NaRM461	Soil and Water Conservation	2
NCET 211	Communication skills in Tourism I	2
NCET231	Physical Geography and Demography	3

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Dept. NCET; Year II; Semester II

Code	Course title	Credit hours
NaRM 432	Participatory Natural Resource Management	3
NCET212	Tourism and Recreational Area Management	3
NaRM332	Indigenous knowledge and conflict management	3
NaRM353	Natural Resources and Environmental Economics I	2
NaRM 311	Restoration Ecology	2
NaRM 431	Extension	2
NCET222	Energy Resources Management (E)	2
NaRM224	Introduction to Environmental Science (E)	2
NCET252	Communication Skills in Tourism II (E)	3
		19/22

*COPE during summer with 6 credit hours***Dept. NCET; Year III; Semester I**

Code	Course title	Credit hours
NaRM411	Environmental Impact Assessment	3
NCET351	Research Methods	3
NaRM463	Integrated Watershed Management	3
NCET311	Nature Reserve and wildlife Management	3
NaRM454	Natural Resources and Environmental Economics II	3

15/17

Dept. NCET; Year III; Semester II

Code	Course title	Credit hours
Mgmt414	Entrepreneurship Development	3
NCET332	Nature conservation policy	3
NCET334	Management Accounting	3
NCET312	Tourism Marketing and Administration	3
NCET322	Landscape Ecology	3
NCET314	Urban Forestry (Elective)	2
NCET342	Project planning (Elective)	3

17/20

11. Course Descriptions

Introduction to Statistics Stat 273

Credit hours: 3; Year: I; Semester: I

Descriptive statistics; probability; discrete random variables and probability distributions; continuous random variables and probability distributions; sampling distributions; point and interval estimation.

Introduction to Civic and Ethical Education CEED 111

Credit hours: 3; Year: I; Semester: I

The course, Civic and Ethical Education, deals with the meaning and purpose of civics and ethics; survey of history of citizenship in general and citizenship in Ethiopian context in particular; origin and evolution of constitutional practices; the state, citizenship and government; the history and practice of democratic governance in the world with specific attention to Africa; meaning and nature of fundamental human rights; harmful traditional practices and the state of human rights in the Federal Democratic Republic of Ethiopia (FDRE) The question of political pluralism; important societal values; skill-building mechanisms for democratization and management ; contemporary global issues. Ethics and morals, axiology (ethics and values), ethics and moral responsibility, personality inequality and power; sex and gender; professional ethics.

Sophomore English FLEN 201

Credit hours: 3; Year: I; Semester: I

Reading Skills: purpose of reading, selecting material to read, reading strategies and their functions, reading and summarizing; writing skills: academic style, structure and cohesion, stages of writing, types of writing; Letter and CV writing: informal letters, formal letters, application, guidelines for writing CVs; Group discussions: preparation, participating, and chairing; Surveys, project/research and report writing: selecting a topic, researching sources of information and note-taking, and writing the research report; Oral presentations and Public speeches: preparing a presentation/a speech, giving the presentation/the speech, evaluation and feedback.

Introduction to Computer Use and Programming Comp203

Credit hours: 3;Year: I; Semester: I

Introduction to computers; evolution of a computer; generation of computers; application of computers; the system concept of a computer; computer hardware; computer software; data communication and networks; application of computers; introduction to

MS-DOS, Microsoft Windows basics, Microsoft word and spreadsheet processing.

Practical Sessions:

Exercise on introduction to MS-DOS; exercise on Microsoft Word: introduction, editing and formatting a document, using tables, using newspaper-style columns, using objects, mail merge, using templates and using styles and printing; Exercise on Microsoft Excel; Excel basics, entering and editing worksheet data, essential spreadsheet operations, creating and using formulas, worksheet formatting, chart features, working with graphics and lists and printing; exercise on Local Area Network (LAN) and Internet; using of LAN for resource sharing resources and use of server for backup, Internet browsing.

Introduction to Agriculture

Credit hours: 2;Year: I; Semester: I

Introduction: general principles and practices of animal science, agronomy, and horticulture in Ethiopia; Agro-ecological zonation of Ethiopia: impact on major crops and livestock production, and associated land use systems. Livestock production system in nomadic pastoralists; Potentials and constraints in mixed farming system.

Practical Sessions:

On-campus evaluation of dairy farming and beekeeping

Introduction to Forestry NREP152

Credit Hours: 3;Year: I; Semester: I

The concepts of forests, forest resources and forestry; regeneration; forest seed collection and handling; nursery establishment and management, seedling production; plantation, site selection and treatment; basics of forest ecology; silviculture and management of forest resources.

Introduction to Climatology NaRM 215

Credit hours: 2;Year: I; Semester: II

Weather and climate; atmospheric composition; nature and structure of atmosphere; function and importance of the atmosphere; elements and controls of climate; radiation (solar and ground) distribution; temperature (air temperature and soil temperature) recordings and interpretation; atmospheric or air pressure system; wind and turbulence (global and local); atmospheric moisture, types and measurements; precipitation: origin, forms, types, intensity, variability and measurements; climatic classification;

Practical Sessions:

Field practical works (within WGCF) and observing meteorological forecasting technologies in Addis Ababa.

Introduction to Anthropology NCET 132

Credit hours: 3; Year: I; Semester: II

Origin and development of anthropology; anthropological perspectives and founding fathers of anthropology; major areas of anthropology: physical, cultural and social; relation and deference between anthropology and psychology; concepts of culture: relativism, diffusion, borrowing, and cultural museum; culture and communication: ingrained social and cultural values of both verbal and nonverbal communication; major schools of thought in anthropology; major modes of subsistence and cultural connotation: reciprocity and market exchange; social organizations and their evolution: family, kinship, clan, ethnicity, marriage. Anthropological perspectives on law and social

control; anthropology and its force for modernity: tourism development; gender status and social change, and anthropological ethics.

Practical Sessions:

Video show from best experience

Field visit: observation, discussion, interview and then, class presentation as well as discussion.

Survey and Mapping NCET 142

Credit hours: 3; Year: I; Semester: II

Introduction to surveying; units of measurements; errors and mistakes in surveying; distance measurement; setting out right angles; obstacles in distance measurement; offsets; chain surveying; field booking and plotting; compass traversing; introduction to compass; taking bearing with compass; compass traversing; field booking and plotting; map reading: introduction to topographic map; scale of map, distance and bearing measurement on topographic maps, contour lines; enlarging/reducing a map to a desired scale. Introduction to GPS: principles, limitation and uses of GPS in NRM; layout (mark) the desired field position of new construction from plan to the ground.

Practical Sessions:

Taping over level ground. Determination of pacing factor. Direct and indirect ranging out. Measuring slopes and taping on hilly ground. Setting out right angles. Measuring distances under obstruction. Chain surveying, plotting and area calculation. Technique of taking bearings with compass, compass surveying, plotting and area calculation. Distance, angle and slope measurement on topographic map. Enlarging/reducing a map. Demonstration to GPS, recording location of features using GPS, transferring field data in to map. Layout (mark) the field position of new construction from plan to the ground using compass and measuring tape. Demonstration to clinometer method (grade-line method).

Introduction to Soil Sciences PISc242

Credit hours: 2; Year: I; Semester: II

Historical background on the development of soil science; soil forming factors, weathering processes, soil profile and its horizon development and formation; physical properties of mineral soils; chemical properties of mineral soils; management and reclamation of acid and salt-affected soils; soil colloids, soil water forms, organic matter of mineral soils; essential plant nutrients; soil survey and modern systems of soil classification (USDA and FAO-UNESCO systems) and their applications in the classification of Ethiopian soils.

Practical Sessions:

Identification of minerals and field observation of weathering rocks and minerals; identification and description of soil profiles and horizons in the field; feel / field method of soil texture, structure, and consistence determination; determination of organic matter, soil pH, and water movement in different textural classes of soils; Identification of different soil types in and around Wondo Genet.

General Ecology NaRM 213

Credit hours: 2; Year: I; Semester: II

Concept of ecology and the history of man-environment interaction; scope and relationship of ecology with other disciplines; ecology and the concept of ecosystem,

ecosystem functioning (energy flow and nutrient cycling); adaptation and evolution; the ecological stress concept; biological productivity; ecosystem changes.

Practical Sessions:

Assessment of ecosystem productivity, both structural and functional evaluation.

Rural Sociology and Development NaRM 232

Credit hours: 3; Year: I; Semester: II

Basic concepts and perspectives of sociology and society in general; the origin of rural sociology; the widening scope of rural sociology; defining the rural; determinants of rural social formation; the institution of family and primary group interaction; social stratification in rural communities; rural and urban communities a continuum or a dichotomy. Social changes in rural societies; forms of social change; globalization and rural societies; rural development (general and as applied to Ethiopia); what is development? The elements of rural development.

Principles of Taxonomy NCET 122

Credit hours: 2; Year: I; Semester: II

Historical background and development of taxonomy; principles of systematic classification; taxonomic hierarchies; the basic concepts of taxonomy; evidences of taxonomy, Naming of the most important flora and fauna in the wild; Key classification, identification and nomenclature techniques in higher forms of wildlife; biological (morphological) parts as a means of taxonomic classification and identification; taxonomy, taxidermy and wildlife management; Taxonomy of Ethiopian wildlife.

Practical Sessions:

Specimen collection and taxidermy preparation; naming of the most important flora and fauna in the wild; field trip to potential areas for flora and fauna classification and characterization.

Ecosystem Management NCET 221

Credit Hours: 3; Year: II; Semester: I

Characteristics of ecosystems: ecosystem functions and components; Ecosystem management and biodiversity conservation, methods and practices ecosystem management and biodiversity conservation; the socioeconomic environment; conventions; assessment of needs, constraints and options of ecosystem management and biodiversity conservation in Ethiopia.

Practical Sessions:

Field evaluation and characterization of ecosystems and ecosystem functions and components. Assessment of biological diversity and identification of local hotspots.

Land-use planning NCET 241

Credit Hours: 3; Year: II; Semester: I

Course prerequisites: Surveying and Mapping and Project Planning and Management

The purpose, nature and scope of land use planning; land use planning in Ethiopia: land use planning and land evaluation; basic concepts and principles in land evaluations; selection and descriptions of land use types; land requirements of land utilization types; land units characteristics and qualities; matching and physical land suitability classification; economic, social, and environmental impact analysis; planning land-use

on the bases of land evaluation results

Practical Sessions:

Land capability classification adapted to Ethiopian condition and FAO land evaluation procedure

GIS and remote Sensing NaRM 352

Credit hours: 2; Year: II; Semester: I

Introduction to concepts and systems, electromagnetic energy and spectrum; image characteristics, remote sensing systems, and sources of remote sensing information; interpretation of images: interaction between light and matter, photo mosaic, stereo-pairs of images, black-and white images, IR-color images; digital image processing: structure of digital images, image processing overview, image enhancement, and information extraction; introduction: definition, capabilities of GIS, components of GIS, questions a GIS can answer, sample GIS applications in NRM; basic map concepts: types of map information, map features, fundamental map representation techniques, and topology; procedures for simple GIS-Projects: geographic database, organizing map information, and designing database; input of data in to GIS: data sources, and data entry techniques; spatial data quality control: errors and their sources, correcting spatial data; attribute data: sources of attribute data, input, linking attributes to geographic features; managing the database: projection/ transformation/ geo-referencing, coordinate systems; geographic analysis: analytical characteristics of GIS, steps for performing geographic analysis; presentation of the results of geographic analysis.

Introduction to Wildlife and Fisheries NCET 223

Credit hours: 3; Year: II; Semester: I

Wildlife resources, basic concepts of wildlife ecology, wildlife habitats; the influence of ecological succession on wildlife population and community; distribution and abundance of wildlife resources across the different ecological regions/zones, the influence of different environmental factors on wildlife and its habitats; wildlife resources surveying; ecology of Ethiopia's wildlife; wildlife conservation and management; process of wildlife management; managing protected areas; guidelines to formulate wildlife management plan and evaluating its effectiveness; major groups of fishes with emphasis on the fresh water fish species of Africa; the lake environment with emphasis to Ethiopian conditions; anatomy and physiology of fish; reproduction; food and feeding; age and growth; fishing gears; life-history strategies of fish; dynamics of population abundance and production; diseases and parasites of fish; fresh water fishpond cultures; fish as food.

Practical Sessions:

Collection of benthic and weed- bed fauna; collection of phytoplankton and zooplankton: identification of major groups of phytoplankton, zooplankton and benthos; identification of different fish species of some Rift Valley lakes of Ethiopia; anatomy and physiology of fish; age determination; demonstration of different fishing gears; visit to the fish market of Lack Awassa; stomach content analysis of fish; fecundity estimation; collection of fish fry from shallow waters; fisheries activities in some Rift Valley lakes of Ethiopia--field trip

Soil and Water Conservation NaRM462

Credit hours: 2; Year: II; Semester: I

Effects of population growth on agriculture and other major socio-economic development; water behavior in relation to soil texture; soil erosion and erosion process; physical and human factors influencing soil erosion; models of soil erosion;

measurement and assessment methods of soil erosion; strategies and types of soil conservation practices including indigenous soil and water conservation practices and their suitability to various land use types and agro-ecological zones; indigenous soil and water conservation and management practices.

Practical Sessions:

Field observation of the different types of soil erosion; practical application of Universal Soil Loss Equation; assessment of soil erosion in the field; propose suitable conservation measures based on USLE; the use of line level to laying out soil conservation structures; construct soil bund, *fanyajuu* terraces and cutoff drains; study tour to Hossana and Wolayta

Communication Skills in Tourism I NCET 211

Credit hours: 2; Year: I; Semester: I

Basic concepts of communication skills in tourism; tour operation and approach; the role of tour operators and guides in the tourism industry; skills to set up and run travel agencies; creating, developing and consuming tourism images; travel agency skills and competency control and supervision in tourism communication; advertisement and interpretation skills in tourism; influences of socio-cultural and political aspects for the development of communication skills in tourism; tourism communication skills in developing countries; communication skills in tourism contexts of Ethiopia.

Physical Geography and Demography NCET 231

Credit hours: 3; Year: II; Semester: I

Origin of the earth; materials of the earth's crust; forces in the land form; topographic features; elements and controls of climate; distribution of climatic types; water resources natural vegetation; wildlife; major components of population change (fertility; mortality and migration); determinants and consequences of population change; population size composition and distribution and factors affecting population distribution.

Participatory Natural Resource Management NaRM 432

Credit hours: 3; Year: II; Semester: II

The concept of participation in natural resource management; strategies for participation; Methods of promoting participation; participatory methods; stakeholder analysis; local-level information gathering and planning (PRA/RRA, participatory action research); project/program planning tools; multi-stakeholder collaboration; large group interventions; joint/collaborative natural resource management; monitoring and evaluation of participation; institutional support for participation.

Practical Sessions:

A participatory project preparation on a selected topic

Tourism and Recreational Area Management NCET 212

Credit hours: 3; Year: II; Semester: II

Historical background and development of tourism; nature and characteristics of the tourism industry; forms of tourism and their implications (the economic impacts of ecotourism (conflicts and resolutions), social and environmental impacts of tourism); the art of tourism and recreational areas management (planning, monitoring and evaluating of tourist recreational areas); tourism policy and development; recreational resources assessment and monitoring techniques, environmental management for alpine tourism and resorts; community based tourism and recreational area management for nature

conservation and women's development; biogeography and ecotourism; tourism and recreational areas management in Ethiopia (history, potential, attempts, achievements, constraints and opportunities).

Practical Sessions:

Field trip to tourist recreational areas of Ethiopia, film show recorded on the global tourism industry management and development.

Indigenous Knowledge and Conflict Management NaRM 332

Credit Hours: 3; Year: II; Semester: II

Theoretical background to the concept of conflict: the dialectical, functional, exchange and structural models of conflict; the causes, the function and consequence of conflict; ways of converting conflict to cooperation: formal and informal mechanisms of conflict resolution, proactive and reactive approaches to conflict in natural resource management; common property management mechanisms; the concept of indigenous knowledge, survey of traditional systems of resource management; some common features of traditional resource management as opposed to scientific method; indigenous systems of resource management by resource types; indigenous and scientific knowledge systems: complementary or contradictory; limitation of indigenous knowledge: power disparities between social groups. Fire as a tool in traditional resource management.

Practical Session

Video show from best experiences. Field visit: observation, discussion and interview
Field visit to some selected sites of known indigenous practices of resource management

Natural Resource and Environmental Economics I NaRM 352

Credit hours: 2; Year: II; Semester: II

Introduction: the evolution, scope and nature of economics in natural resource management, natural resources and the environment as economic resources, natural and environmental resource base of Ethiopia; mathematical concepts: derivatives, the integral, matrix algebra, equilibrium and dynamic analysis, growth models, optimization; sustainable development; the economic system and the environment: welfare economics and the environment, optimal utilization of natural and environmental resources, efficiency, equity, market and the role of government in resource allocation; valuation: the need to value the environment, types of economic values, valuation techniques, valuing benefits; microeconomic aspects of natural resource management: demand, supply, production theory, optimal rate of production, concepts of cost.

Restoration Ecology NaRM 311

Credit Hours: 2; Year: II; Semester: II

Characteristics of disturbed ecosystems: ecosystem functions, productivity and growth limiting factors; silvicultural characteristics of degraded and dry lands; principles of ecosystem stabilization and ecological restoration, requirements and values; the socioeconomic environment; assessment of needs, constraints and options of restoration; problems and priorities in restoration; community involvement in management of restoration areas; methods and practices of restoration; the role of mycorrhiza in ecological restoration.

Practical Sessions:

Field evaluation of disturbed ecosystems and ecosystem functions. Woodland resource

assessment and developing management plan.

Extension NaRM 431

Credit hours: 2; Year: II; Semester: II

Philosophy, principles and purposes of extension; principles of adult learning; communication: its role, process, diffusion and adoption models, innovation, skills and barriers to effective communications; extension methods: individual, group, mass methods; how to work with people: working with formal and informal leaders; extension campaign in natural resource management; extension program: planning, organization, implementing, monitoring and evaluation; The role of government and NGO's in extension.

Energy Resources Management NCET 222

Credit hours: 2; Year: II; Semester: II

Introduction of the basic concept of energy principles; Non-renewable energy resources and their management; renewable energy resources; non-biological renewable energy source (solar energy, wind power, water power): types, potential, appropriateness, implication to natural resource management, applicable technologies, its environmental impacts; biological renewable energy resource (Biofuel, Biogas technology): types, potential, appropriateness, implication to natural resource management, applicable technologies, its environmental impacts; planning biomass fuel energy program: area selection, survey, demand supply assessment, energy conservation technology, energy cost end price, interventions; policy and socio-economic issues related to energy: sectoral and institutional barriers, in balance of demand and supply, lack of people's participation.

Practical Sessions:

Visit to biogas technology at campus. Visit and training of improved stoves technology at users/demonstration center. Survey of household energy source assessment

Communication Skills in Tourism II NCET 252

Credit hours: 3; Year: II; Semester: II

Introduction to language and communication; essentials of language communication; elements of language and communication; characteristic, structural and functional views of language and communication; communication competence; types of communication (interpersonal, group and public); written and oral communication; communication approach; communicative activities; descriptive models of communication (Schraman model of communication; microscopy model; the Reach and Bate Son model; the Wesley-Maclean model); basic components and concepts; rules of speaking; language to social context.

Introduction to Environmental Science NaRM 224

Credit hours: 2; Year: II; Semester: II

Earth/ atmosphere system: atmospheric elements, human activities and the atmospheric environment; environmental impacts; agricultural and industrial wastes: concept of waste, agricultural wastes, industrial wastes, waste from food processing plants, municipal wastes, green house effect and global warming, climatic change and ozone depletion drought famine and desertification, pollution; measurement and control of environmental problems; monitoring of pollutants in fossil fuel flames; population and use of natural resources; reducing the environmental impact of current energy sources; increasing the contribution from low impact energy options.

Practical Sessions:

Assess possible areas of agricultural wastes; visit industrial and municipal wastes; practicing and conducting social survey on environmental issues; demonstrate and create awareness on how to reduce environmental impacts; case study and group work on environmental issues.

Environmental Impact Assessment NaRM 411

Credit hours: 3; Year: III; Semester: I

Consequences of environmental degradation; sustainable development; concepts and importance of environmental regulations used in general practice; environmental quality (EQ), EQ attributes; resource and accounts; format for envisagement; principles and elements of environmental assessment: types of environmental assessments, when to use them, data/information required, how data/information should be collected and analyzed and communicated; impact analysis checklist and network analysis; impact index; actual case study of EIA of development projects taking different exemplary cases; environmental monitoring, mitigation measures; social impact assessment, scope and state of development of social impact assessment; format of social impact assessment; forecasting methods; EIA legislation, procedures and practice.

Research Methods NCET 351

Credit hours: 3; Year: III; Semester: I

Philosophy of science; scientific method; process of empirical research; purpose and methodology of scientific research; problem identification and prioritization; developing research proposal; data collection, compilation and analysis; Categorical data analysis, analysis of interrelates among problems and causes, preparation of research report.

Practical Sessions:

Periodical reports on causes of natural resource degradation and its causes, possible solutions and recommendations: Proposal writing and budget estimation practices and survey of resources.

Integrated Watershed Management NaRM 463

Credit hours: 3; Year: III; Semester: I

Introduction: definition, the need for watershed management; Watershed approach and basic concepts: involving different stakeholders in watershed management, planning approaches, planning level, components of watershed management planning; Major steps and procedures of watershed management planning: determining main objective and priorities, conceptual framework, data collection and verification information for activities, data analysis, and document preparation; Preparation of integrated watershed management plan: formulation of management alternatives, strategies, recommendation on implementations, production of integrated watershed management plan for decision-making, monitoring and evaluation.

Practical Sessions:

Site selection for the project; Setting objectives; Resources, stakeholders and problem identification; Designing a conceptual framework for the analysis of the watershed management planning; Designing project plan that involves different stakeholders; Watershed survey, data collection and generation of relevant information; Production and presentation of integrated watershed management plan; The students are expected to carryout Integrated watershed management plan in a unit area, and present the final

working document, using all or some of the above practical exercises.

Nature Reserve and Wildlife Management NCET 311

Credit hours: 3; Year: III; Semester: I

Basic concepts of nature reserve and wildlife management; management of natural resources in nature reserves and wildlife protected areas; nature reserves for migratory species; Conservation of natural systems (hydrology atmosphere, lithosphere and biosphere); types of nature reserves and wildlife conservation areas; reasons for conserving nature and wildlife resources; process of nature reserve and wildlife management; managing nature reserves and wildlife protected areas in the tropics; selection of sites for nature reserves and wildlife protected areas; databases for nature reserve and wildlife areas management; guidelines to formulate nature reserve/wildlife areas management plan and evaluating its effectiveness; community based nature and wildlife conservation and management; nature reserves and wildlife management in Ethiopia: attempts, achievements, limitations and opportunities.

Practical Sessions:

Field trip to potential nature reserves and wildlife protected areas of Ethiopia, Film show recorded on the global situation of the aforementioned context.

Natural Resource and Environmental Economics II NaRM 454

Credit hours: 3; Year: III; Semester: I

Natural resource allocation and environmental problems; the need to invest in natural resources improvement; property rights regimes in natural resource management; the population problem; measures of scarcity; approaches to costing: interest rates, depreciation, tax; cost-benefit analysis in natural resource management: benefits and costs, criteria for evaluating projects, welfare economics and cost benefit analysis; project planning, treatment of uncertainty; economics of natural resources: the economics of renewable and non-renewable resources, the economics of environmental pollution control; environment and international trade; macroeconomic aspects of natural resource management: economy and environment, natural resources and the national account, economic development and the environment policies for natural resources, and the environment; case study.

COPE (Summer) NCET 353

Credit hours: 6; Year: III; Semester: II

Entrepreneurship Development Mgmt 414

Credit Hours: 3; Year: III; Semester: II

Entrepreneurship and entrepreneurs; historical perspectives of entrepreneurship; motivation and entrepreneurship; the role of entrepreneurship in socio-economic development; entrepreneurial competencies; marketing and planning; legal aspects of entrepreneurship.

Nature Conservation Policy NCET 332

Credit hours: 3; Year: III; Semester: II

Introducing the concept of public policy and the formation processes; evolutionary or dynamic nature of public policy making; implementation of public policy: the role of different actors in preparation, decisions and implementation phases; the place of natural resource policies in public policies; the relationship between natural resource policies and other public policies; review of selected regional, national and international

policies and programs in natural resources and environment (to be presented and debated); basic principles of legislation; property rights and natural resources; laws and regulations of natural resources in Ethiopia and the constraints during implementation; consequences of institutional/policy failures in natural resource management in Ethiopia.

Practical Sessions:

Indoor policy making and evaluation exercises will be given.

Management Accounting NCET 334

Credit hours: 3; Year: III; Semester: II

Basic concepts of Management Accounting; Cost-volume-profit analysis; managing tourism industry in a competitive environment; planning and budgeting for tourism industry; making investment decision; measuring and controlling divisional performance; strategic and operational management accounting.

Tourism Marketing and Administration NCET 312

Credit hours: 3; Year: III; Semester: II

Basic concepts of Tourism Promotion and Administration; tourism images, culture and power; Reasons for focusing on tourism images; gender in tourism promotion and administration; the structure and organization of travel and tourism industry; the hospitality sector (accommodation/facility and catering services); visitors attractions and their management; structure and role of public sector tourism; tourism design and promotion; demand assessment for leisure and tourism promotion; hotels management and tourism promotion; finance and labor administration in tourism; tourism promotion, development and administration of Ethiopia (Opportunities, achievements, limitations and future prospects).

Landscape ecology NCET 322

Credit hours: 3; Year: III; Semester: II

Defining Landscape ecology, Landscape concepts, Major themes in landscape ecology; Important Components and structure of the landscape matrix; Processes in the landscape; the ecological foundations of landscape management; the landscape continuum model, application of ecological principles to sustainable management of landscape; social dimensions in adaptive landscape management.

Urban Forestry NCET 314

Credit hours: 2; Year III; Semester: II

Arboriculture: definition and concept; value of urban trees and forest; tree selection and propagation for roadside and recreation parks plantations; tree planting, planting pattern and establishment for roadside and recreation parks. Tree management: pruning and preservation and repair; diagnosis and control of tree problems. Arboricultural challenges of the roadside plantations.

Practical sessions:

Field trip to nearby towns; conduct a survey on extent of damages on trees and people's perceptions and attitude on recreation urban parks and roadside trees.

Project planning NCET 342

Credit hours: 3; Year III; Semester: II

Concept of development and planning; systems and levels of planning; functional relationships between plans, programs, and projects; concept of development projects; phases of a project: project identification, formulation, appraisal, implementation, and

monitoring (implementation, effectiveness, and validating monitoring) and evaluation (ongoing, interim, terminal, and ex-post evaluation); framework of a project document; Logical Framework Approach (LFA); feasibility studies from financial, economic, technical, environmental and social perspectives; investment criteria in project planning and other cognate sectors; valuation techniques for project inputs, outputs, outcomes, and impacts; cost-benefit analysis of development projects; cost effectiveness analysis.

DEBUB UNIVERSITY
WONDO GENET COLLEGE OF FORESTRY

**CURRICULUM FOR DEPARTMENT OF NATURAL RESOURCE ECONOMICS
AND POLICY**

1. Background

The technical field practitioners working in different parts of Ethiopia have acknowledged the alarming rate of natural resource degradation. The challenge in attempting to reverse the situation has not been so much the technical knowledge, but rather how to deal with socioeconomic components for the practical application of resource management approaches. The survey carried out as part of the expansion of natural resource education and research in the country found that there is a need to focus on socioeconomic issues, which have not received adequate attention in the past. The Government of the Ethiopia has developed a policy direction that is described as “agricultural development-led industrialization.” Attention has been given to agriculture in rural development policies and strategies. The implementation of these strategies demands human resources that can play a leading role. In Ethiopia, agriculture is the largest economic activity, and it depends on the condition of natural resources. For the development of the agricultural sector, it is necessary to have experts capable of properly managing and facilitating the use of natural resources. The realization of the development vision for the country will become more possible when national capacity is created for properly managing the soil, vegetation, water, and other resources. Management and decision making must be conducted in a way that meets the socioeconomic needs of the people while sustaining the natural resources on which society depends. Researchers are needed who can monitor and evaluate the Government policy and make recommendations toward better action, reflecting the dynamic nature of public policies.

Recognizing the shortage of trained personnel for research and development in the country, the Ethiopian Government is engaged in the expansion of education programs in virtually all fields of study. In this regard, Wondo Genet College of Forestry is no exception. The number of students joining higher educational programs has been increasing each academic year, indicating the need for trained personnel in diversified areas of study. This is essential in order to provide opportunities for students entering the College to have alternatives among the different areas of study in natural resource management.

In addition to other departments of natural resource education and research, the Department of Natural Resource Economics and Policy (NREP) has been designed to fill the gap in trained professionals who can take on leadership roles in natural resource management in Ethiopia. The underlying assumption of studies in this department is that natural resources cannot supply goods and services to the extent possible to satisfy the maximum needs of society since natural resources are limited. Professionals working in the area of natural resource management should be encouraged to recognize that the problem is not simply a lack of natural resources, but it is also strongly linked to managing and utilizing for the best option or combination of objectives among alternative

uses. It is therefore necessary to prioritize needs and satisfy them in an order that is based on reliable reasoning.

Due to a lack of trained experts for decision making who are able to take into account the possible consequences of a course of action chosen, degradation of natural resources has been continuing at an alarming rate in Ethiopia. Therefore, the country needs capable professionals to facilitate and promote the socioeconomic and policy decision-making processes required for the optimization of the available natural resources. Additionally, these professionals will assist in making policy decisions about the creation of guidelines that are beneficial to society.

Therefore, the NREP department focuses on producing well-qualified, skilled, and competent natural resource professionals who will address

- The link between allocating natural resources for various uses and the processes of degradation

- Micro-and macro-economic aspects of natural resource management

- Economic valuation of natural resource conservation

- Benefit-cost analysis of natural resource management activities

- Optimization of economic benefits and environmental quality

- Property rights, policy, and legislation in natural resource management

- Alternative natural resource management approaches that need policy decisions

- Identification of relevant socioeconomic problems in natural resource conservation and use

- Practical application of knowledge, experience, and skills developed on the basis of specific contexts

2. Why NREP at Wondo Genet

Wondo Genet has an all rounded potential to be center of excellence in linking natural resource education and research to satisfy human needs in a sustainable manner. There is fertile ground in the College to produce professionals who are well equipped with the theoretical knowledge and practical skills to engage in overcoming natural resource-related problems in the country by working together with the diverse social groups. Geographically, Wondo Genet has been an ideal place for training in natural resources. The surrounding environment provides an ideal environment for learning to deal with many issues related to nature. Students have a relatively close contact with the natural environment, which means that, upon completion of their studies, they have also essentially gained life experience in natural resources over three years' time. This fact has also been enhanced by transferring the Faculty of Forestry from Alemaya University to the College. Of course, the College has more than 25 years of experience in teaching and research in *forestry*, including the diploma program.

This experience also provides input on how to handle educational and research programs in natural resource management. This is important for the extension of the existing education and research programs in forestry to accommodate study of the socioeconomic aspects, not only of forest resources, but also of other natural resources. To begin the department, it is possible to utilize the already existing staff, infrastructure, and facilities, although further improvements will be needed.

Currently, the College is running Development Oriented Interdisciplinary Action Research Program, in which the needs of society are addressed through research emphasizing practical action, imbued with the notion that a problem-oriented approach is

necessary in order to change the socioeconomic situation of the country. This places a lot of emphasis on strengthening the department by bringing practical knowledge to the students and stimulating the teaching-learning process. In this way the students can gain tangible practical skills as well as an understanding of socioeconomic and policy issues in natural resource management.

The Government's engagement in expansion of educational programs and increasing the number of students in higher education also has an effect on the College. The number of students placed to Wondo Genet College of Forestry has increased steadily in the last few years. To accommodate the students, there is a need to diversify the fields of study offered in natural resource management at the College.

3. Objectives

3.1 General objective

The main objective of this department is to produce Natural Resource Economics and Policy professionals who can apply multidisciplinary approaches and assist in decision-making regarding natural resource management.

3.2 Specific objectives

- Offer training in natural resource economics and policy that will assist to establish a strategic natural resource management and land use planning system

- Improve the knowledge, skill and attitude of students to enable them contribute to empowerment of the local communities in the sustainable use of resources

- Produce graduates that can involve in research to enable systematically examine and understand the complexity of factors involved in natural resource management

- Offer training that will enable the graduates to involve in policy formulation and implementation processes

- Generate problem-oriented and need-based knowledge and skills to improve quality of education and livelihood of the local communities

- Provide consultancy services and participate, nationally and internationally, in areas of natural resource and environmental management.

4. Graduate profile

The Department of Natural Resource Economics and Policy graduates should be able to

1. Analyze environments and plan integrated interventions for optimal resource use and hence for economic development
2. Provide information on social, economic, and environmental impacts of alternative natural resource management policies and programs
3. Apply the basic policy and legal instruments required for natural resource conservation and development; recognize the role of institutions in natural resource management
4. Show the interdependence between the economy and the environment, and the application of the theory of natural resource management and be able to advise policy makers on the effect of making more use of these resources
5. Systematically assess and evaluate the resource base for its sustainability under a given ecological and socioeconomic conditions.

6. Investigate the rural and social structures and their influence on sustainable rural development
7. Quantify the benefits and costs of various elements of the natural resource base and make recommendations on the optimal use for increased production.
8. Provide insight on the opportunities and limitations of the natural resource base in order to advise on local sustainable development
9. Incorporate environmental costs and benefits in the national accounting.
10. Conduct research geared towards the management of natural resources for economic development
11. Formulate, design and develop natural resource development projects and undertake monitoring and evaluation activities; plan and organize environmental impact assessment activities.
12. Investigate and describe economic aspects of environmental degradation.

Areas of competence for natural resource economics and policy graduates

Expert position	Activities
1. Socio-economist in natural resource	<ul style="list-style-type: none"> - Socioeconomic surveys for soil and water conservation, afforestation/reforestation, biodiversity conservation, common property resource management, wildlife management, etc. - Project planning and analysis - Integrating customary laws and traditional practices with conventional approaches and government laws and regulations - Natural resource extension
2. Natural resource economist	<ul style="list-style-type: none"> - Eco-valuation (economic valuation of ecosystem and natural resources) - Environmental impact analysis - Strategy and program formulation - Policy analysis - Designing an appropriate implementation and monitoring and evaluation mechanism of policies, strategies and action programs - Natural resource surveys
3. Natural resource planning expert	<ul style="list-style-type: none"> - Decision-making support among alternative land uses (from both socio-economic and policy perspectives)
4. Natural resource policy analyst	<ul style="list-style-type: none"> - Analysis of natural resources and related policies and legislations
5. Researcher	<ul style="list-style-type: none"> - Natural resource economics and policy issues
6. Instructor	<ul style="list-style-type: none"> - Natural resource economics and policy issues

5. Admission Requirements

Generally, prospective students of the department have to fulfill the admission requirements of Debu University. The NREP Department has a multidisciplinary nature. However, to join the department, it is also necessary for the students to have a strong background in mathematics, as well as other natural and social sciences, and possess an inclination towards socioeconomic and policy aspects of natural resource management.

6. Evaluation Methods

In the NREP Department, student evaluation is not just a one-step activity, but a process. In addition to the two major examinations (mid-semester and final), there is also a continuous monitoring of the state of understanding through assignments, term papers, and tests. Active involvement in practical exercises and report writing are important components of the evaluation process.

7. Graduation Requirements

When all the required courses are taken as indicated in this document, with no 'F' grade in any of the courses taken, and with a cumulative grade point average (CGPA) of not less than 2.00, a student is said to fulfill the requirements for graduation.

8. Degree Awarded Upon Graduation

After fulfilling the requirements for graduation, students will be awarded the degree of "Bachelor of Science in Natural Resource Economics and Policy." Special mentions such as "with Distinction" or "with Great Distinction" will be made based on the CGPA requirements set by the University.

9. Course Coding

Code of courses whose home base is the department begins with NREP and followed by a three-digit number. The first number indicates the year of study; the second shows category of the course and the third corresponds to the semester, an odd number for first semester whereas even number for the second semester in any of the academic years) within which the course is offered. Regarding course category, basic *economics* courses are given the number **one**, and the number **two** is used to identify the *pure economics* courses. Number **three**; **four** and **five** are assigned to *resource economics*, *social and policy*, and *other course* categories respectively. Courses in the last category include those that cannot be grouped easily into areas of studies as they involve two or more components of the general study, and courses that remain to be just one in a given category. Courses in each category are indicated below.

Category 1: Mathematics for Economics, Statistics for Economics, Mathematical Programming, and Principles of Accounting

Category 2: Microeconomics I, Macroeconomics I, Microeconomics II, Introduction to History of Economic Thought, Macroeconomics II, Introduction to Marketing

Category 3: Natural Resource and Environmental Valuation, The Economics of Renewable Resources, The Economics of Non-renewable Resources, The Economics of Forest Resources, Environmental Economics and Policy, Natural Resource Project Planning and Analysis,

Category 4: Rural Development, Introduction to Public Policy and Law, Property Rights and Natural Resource Management, Public Policy Analysis

Category 5: Research Methods for Economics and Policy, International Economics and Globalization, Introduction to Wildlife and Fisheries, Development and Environment, Senior Seminar in Natural Resource Economics and Policy, Introduction to Forestry, Senior Research Project in NREP

These courses are known as the major courses whereas other important courses taken from other departments of the College and the University are known as supportive courses. Courses in the latter category retain the original code assigned in the home department.

10. LIST OF COURSES

The courses proposed for the Department of Natural Resource Economics and Policy are indicated in the table below. The letter 'E' in the bracket indicates elective courses. Where there are two elective courses in the same semester, it is compulsory for the students to select at least one. Where there is just one elective course, it is up to each student to decide whether to take the course or not.

No.	Course No.	Course Title	Credit Hours
Major courses			
1	NREP 111	Mathematics for Economics	3
2	NREP 113	Statistics for Economics	3
3	NREP 151	Introduction to Forestry	3
4	NREP 152	Introduction to Wildlife and Fisheries	3
5	NREP 112	Mathematical Programming	2
6	NREP 114	Principles of Accounting	3
7	NREP 122	Microeconomics I	3
8	NREP 221	Macroeconomics I	3
9	NREP 222	Introduction to History of Economic Thought (E)	2
10	NREP 224	Microeconomics II	3
11	NREP 232	Natural Resource and Environmental Valuation	3
12	NREP 242	Introduction to Public Policy and Law	2
13	NREP 244	Rural Development (E)	3
14	NREP 252	Research for Economics and Policy	2
15	NREP 226	Macroeconomics II	3
16	NREP 234	The Economics of Renewable Resources	2
17	NREP 331	The Economics of Non-renewable Resources	2
18	NREP 333	The Economics of Forest Resources	3
19	NREP 321	Introduction to Marketing	2
20	NREP 335	Environmental Economics and Policy	2
21	NREP 341	Property Rights and Natural Resource Management	2
22	NREP 351	Senior Seminar in Natural Resource Economics and Policy	1
23	NREP 332	Natural Resource Project Planning and Analysis	3
24	NREP 352	International Economics and Globalization	3
25	NREP 354	Development and Environment	3
26	NREP 342	Public Policy Analysis	3
27	NREP 356	Senior Research Project in Natural Resource Economics and Policy	2

COPE (Community-Oriented Practical Education) in natural resource management with 6 credit hours will be held during summer vacation at the end of the second year second semester.

Total			69
Supportive courses			
1	NaRM 221	Introduction to Natural Resources and Demography of Ethiopia	3
2	FLEn 201	Sophomore English	3
3	CEEd 201	Introduction to Civic and Ethical Education	3
4	ARSc ____	Livestock Production	2
5	PISc ____	Crop Production	2
6	NaRM 224	Introduction to Environmental Science	2
7	PISc 242	Introductory Soils	2
8	Comp 203	Introduction to Computer Science and Programming	3
9	NaRM 232	Rural Sociology and Development	3
10	Econ 352	Introduction to Econometrics	3
11	NaRM 461	Erosion and Soil and Water Conservation	3
12	NaRM 313	Ecosystem Studies (E)	2
13	NaRM 352	Remote Sensing (RS) and Geographic Information Systems (GIS) (E)	3
14	NaRM 411	Environmental Impact Assessment	2
15	NaRM 463	Integrated Watershed Management Planning	3
16	NaRM 452	Ecotourism (E)	2
17	NaRM 431	Extension in Natural Resource Management	2
18	Mgmt 414	Entrepreneurship Development	3
Total			46
Grand Total			115

11. Sequence of Courses

Department: Natural Resource Economics and Policy Year: I Semester: 1st

Course No.	Course Title	Credit Hours
NaRM 221	Introduction to Natural Resources and Demography of Ethiopia	3
FLEn 201	Sophomore English	3
NREP 111	Mathematics for Economists	3
NREP 113	Statistics for Economists	3
NREP 151	Introduction to Forestry	3
CEEd 201	Introduction to Civic and Ethical Education	3
Total		18

Department: Natural Resource Economics and Policy Year: I Semester: 2nd

Course No.	Course Title	Credit Hours
ARSc ____	Livestock Production	2
PISc ____	Crop Production	2
NaRM 224	Introduction to Environmental Science	2
NREP 152	Introduction to Wildlife and Fisheries	3
NREP 112	Mathematical Programming	2
NREP 114	Principles of Accounting	3
NREP 122	Microeconomics I	3
PISc 242	Introductory Soils	2
Total		19

Department: Natural Resource Economics and Policy Year: II Semester: 1st

Course No.	Course Title	Credit Hours
Comp 203	Introduction to Computer Science and Programming	3
NaRM 232	Rural Sociology and Development	3
NREP 221	Macroeconomics I	3

Econ 352	Introduction to Econometrics	3
NaRM 461	Erosion and Soil and Water Conservation	3
NaRM 313	Ecosystem Studies (E)	2
NaRM 352	Remote Sensing (RS) and Geographic Information Systems (GIS) (E)	3
Total		20/18/17

Department: Natural Resource Economics and Policy Year: II Semester: 2nd

Course No.	Course Title	Credit Hours
NREP 222	Introduction to History of Economic Thought (E)	2
NREP 224	Microeconomics II	3
NREP 232	Natural Resource and Environmental Valuation	3
NREP 242	Introduction to Public Policy and Law	2
NREP 244	Rural Development (E)	3
NREP 252	Research Methods for Economics and Policy	2
NREP 226	Macroeconomics II	3
NREP 234	The Economics of Renewable Resources	2
Total		20/18/16

Department: Natural Resource Economics and Policy Year: III Semester: 1st

Course No.	Course Title	Credit Hours
NREP 331	The Economics of Non-renewable Resources	2
NaRM 411	Environmental Impact Assessment	2
NaRM 463	Integrated Watershed Management Planning	3
NREP 333	The Economics of Forest Resources	3
NaRM 452	Ecotourism (E)	2
NREP 321	Introduction to Marketing	2
NREP 335	Environmental Economics and Policy	2
NREP 341	Property Rights and Natural Resource Management	2
NREP 351	Senior Seminar in Natural Resource Economics and Policy	1
Total		19/17

Department: Natural Resource Economics and Policy Year: III Semester: 2nd

Course No.	Course Title	Credit Hours
NaRM 431	Extension in Natural Resource Management NaRM 232	2
NREP 332	Natural Resource Project Planning and Analysis	3
NREP 352	International Economics and Globalization	3
Mgmt 414	Entrepreneurship Development	2
NREP 354	Development and Environment NaRM 232	3
NREP 342	Public Policy Analysis NREP 335, NREP 341	3
NREP 356	Senior Research Project in Natural Resource Economics and Policy NREP 351	2
Total		18

12. Course Descriptions

Introduction to Natural Resources and Demography of Ethiopia NaRM221

Credit hours: 3; Year: I; Semester: I

Geological processes and resulting features; drainage patterns and water resources; climate; soil resources; natural vegetation; wildlife; population: size, distribution, composition, characteristics, and settlement patterns; economic activities: agriculture, industry, fishing, and tourism.

Practical Sessions:

Field tours that will enable students to have first hand information on all or at least most natural resources of Ethiopia are recommended. These tours can be integrated with other tours.

Sophomore English FLEn 201

Credit hours 3; Year I; Semester: I

Reading Skills: purpose of reading, selecting material to read, reading strategies and their functions, reading and summarizing; writing skills: academic style, structure and cohesion, stages of writing, types of writing; Letter and CV writing: informal letters, formal letters, application, guidelines for writing CVs; Group discussions: preparation, participating, and chairing; Surveys, project/research and report writing: selecting a topic, researching sources of information and note-taking, and writing the research report; oral presentations and public speeches: preparing a presentation/speech, giving the presentation/speech, evaluation and feedback.

Mathematics for Economists NREP 111

Credit Hours: 3; Year: I; Semester: I

Introduction: mathematical theorems, set theory, relations, functions; review of matrix algebra and its application to input output model analysis; Cramer's rule application to input output model; Eigen values and Eigen vectors; equilibrium analysis; dynamic analysis: statistics and dynamics, differential equations; growth models; optimization: utility function; application of differential and difference equations to growth models; differential calculus and its application to optimization problems and comparative static analysis; the envelop theorem; constrained and unconstrained optimization; integral calculus and its application to inter-temporal choice models, consumer and producer surplus analysis

NREP 113 Statistics for Economists

Credit Hours: 3; Year: I; Semester: I

Definition and scope of statistics; data collection, organization, frequency distribution and graphical presentation; measure of central tendency, mean, median, mode and range; elementary probability theory, random variables and probability distributions, binomial distribution, Poisson distributions, normal distribution, student-t distribution, joint and conditional probability distributions, sampling methods and sampling distributions, Analysis of variance, estimation, hypothesis testing, regression and correlation analysis, estimation, forecasting.

Introduction to Forestry NREP 151

Credit Hours: 3; Year: I; Semester: I

The concepts of forests, forest resources and forestry; regeneration; forest seed

collection and handling; nursery establishment and management, seedling production; plantation, site selection and treatment; basics of forest ecology; silviculture and management of forest resources (plantations and natural forests); agroforestry: concept, aims and potentials, agroforestry systems and practices, roles in land use systems, management of agroforestry systems; social/community forestry – principles and practices; forest resource of Ethiopia; the economic contribution of forest resources in Ethiopia.

Practical Sessions:

Silviculture and management exercises both for natural and plantation forests; survey and report writing on agroforestry systems including the traditional/indigenous ways of management.

Introduction to Civic and Ethical Education CEEd 201

Credit Hours: 3; Year I; Semester: I

The course, Civic and Ethical Education, deals with the meaning and purpose of civics and ethics; survey of history of citizenship in general and citizenship in Ethiopian context in particular; origin and evolution of constitutional practices; the state, citizenship and government; the history and practice of democratic governance in the world with specific attention to Africa; meaning and nature of fundamental human rights; harmful traditional practices and the state of human rights in the Federal Democratic Republic of Ethiopia (FDRE), the question of political pluralism; important societal values; skill-building mechanisms for democratization and management; contemporary global issues; ethics and morals, axiology (ethics and values), ethics and moral responsibility, personality inequality and power; sex and gender; professional ethics.

Livestock Production ARSc ____

Credit Hours: 2; Year: I; Semester: II

Importance of livestock in the economy; principles and practices of animal husbandry; production systems; breeds and breeding; population and distribution of livestock and poultry in Ethiopia; practices of feeds and feeding management; maintenance of health, disease prevention and control; genetic improvement, and housing of dairy, poultry and small ruminants; the arts of caring, controlling and handling of modern and traditional beehives and bee colonies.

Practical Sessions:

- On-campus evaluation of dairy farming and beekeeping
- Field tour: to be integrated with other tours

Crop Production PISc ____

Credit Hours: 2; Year: I; Semester: II

The importance of an efficient productive agriculture; agriculture and agronomy; factors of crop production; crop improvement possibilities; classification systems of cereals and legumes; agronomic practices to improve crop production efficiency; cropping systems, planting methods, soil and soil fertility management, weed control methods, pest and diseases; coping with present and future challenges of food production; the nature, scope and importance of horticulture; divisions of horticulture; horticultural plant classification; systems of horticultural production.

Practical Sessions:

- On-campus evaluation of crop production practices
- Field tour: to be integrated with other tours

Introduction to Environmental Science NaRM 224

Credit Hours: 2; Year: I; Semester: II; prerequisite: NaRM 221, NREP 151

Earth/ atmosphere system: atmospheric elements, human activities and the atmospheric environment; environmental impacts; agricultural and industrial wastes: concept of waste, agricultural wastes, industrial wastes, waste from food processing plants, municipal wastes, green house effect and global warming, climatic change and ozone depletion drought famine and desertification, pollution; measurement and control of environmental problems; monitoring of pollutants in fossil fuel flames; population and use of natural resources; reducing the environmental impact of current energy sources; increasing the contribution from low impact energy options.

Practical Sessions:

Assess possible areas of agricultural wastes; visit industrial and municipal wastes; practicing and conducting social survey on environmental issues; demonstrate and create awareness on how to reduce environmental impacts; Case study and group work on environmental issue.

Introduction to Wildlife and Fisheries NREP 152

Credit Hours: 3; Year: I; Semester: II; prerequisite: NaRM 221

Wildlife resources basic concepts of wildlife ecology, wildlife habitats; the influence of ecological succession on wildlife population and community; distribution and abundance of wildlife resources across the different ecological regions/zones, the influence of different environmental factors on wildlife and its habitats; wildlife resources surveying; ecology of Ethiopia's wildlife; wildlife conservation and management; process of wildlife management; managing protected areas; guidelines to formulate wildlife management plan and evaluating its effectiveness; major groups of fishes with emphasis on the fresh water fish species of Africa; the lake environment with emphasis to Ethiopian conditions; anatomy and physiology of fish; reproduction; food and feeding; age and growth; fishing gears; life-history strategies of fish; dynamics of population abundance and production; diseases and parasites of fish; fresh water fishpond cultures; fish as food.

Practical Sessions:

Collection of benthic and weed – bed fauna; collection of phytoplankton and zooplankton: identification of major groups of phytoplankton, zooplankton and benthos; identification of different fish species of some Rift Valley lakes of Ethiopia; anatomy and physiology of fish; age determination; demonstration of different fishing gears; visit to the fish market of Lack Awassa; stomach content analysis of fish; fecundity estimation; collection of fish fry from shallow waters; fisheries activities in some Rift Valley lakes of Ethiopia--field trip.

Mathematical Programming NREP 112

Credit Hours: 2; Year: I; Semester: II; prerequisite: NREP 111

Introduction to models and modeling, optimization techniques; Linear programming and its applications, integer programming; non linear programming; Lagrange multipliers, the interpretation of shadow prices, introduction to bio economic simulation, multiple objective programming, optimal location, transport model; application of linear programming and dynamic programming to management problems of natural resource management, application of goal programming to rural decision making problems

Principles of Accounting NREP 114**Credit Hours: 3; Year: I; Semester: II**

Accounting concepts, techniques and principles, the accounting cycle, deferrals and accruals, and principles of accounting for accounting system design; application of fundamental accounting principles: accounting for assets (cash, receivable, inventories and cost of goods sold, plant assets and depreciation and depletion, intangible assets, accounting for current liabilities and introduction to cost accounting).

Microeconomics I NREP 122**Credit Hours: 2; Year: I; Semester: II; prerequisite: NREP 111, NREP 113**

Introduction; theory of demand and supply: market equilibrium, shocking the equilibrium, effects of government interventions; demand and supply model and its applications; consumer behavior: preferences, utility, budget constraint, constrained consumer choice, application of consumer theory; theory of cost: measuring costs, short run costs, long run costs, cost of multiple goods production; theory of the firm: ownership and firm management, production, productivity and technical change; perfect competition: competition, profit maximization, short and long run competition; monopoly; monopolistic competition; factor pricing; general equilibrium theory: trading between two people, competitive exchange, production and trading, efficiency and equity; game theory.

Introductory Soils PISc 242**Credit Hours: 2; Year: I; Semester: II; prerequisite: NaRM 221**

Historical background on the development of soil science; soil forming factors, weathering processes, soil profile and its horizon development and formation; physical properties of mineral soils; chemical properties of mineral soils; management and reclamation of acid and salt-affected soils; soil colloids, soil water forms, organic matter of mineral soils; essential plant nutrients; soil survey and modern systems of soil classification (USDA and FAO-UNESCO systems) and their applications in the classification of Ethiopian soils.

Practical Sessions:

Identification of minerals and field observation of weathering rocks and minerals; identification and description of soil profiles and horizons in the field; feel / field method of soil texture, structure, and consistence determination; determination of organic matter, soil pH, and water movement in different textural classes of soils; Identification of different soil types in and around Wondo Genet.

Introduction to Computer Science and Programming Comp 203**Credit Hours: 3; Year: II; Semester: I**

Fundamentals of computer structure; PC-DOS and application programs; programs and flow charts; identifier declarations and variables; logic and conditional expression, program of input and output division of programs; elementary programming in a high level language; basics of software development.

Practical Sessions:

Exercise on introduction to MS-DOS; Exercise on Microsoft Word: Introduction, editing and formatting a document, using tables, using newspaper-style columns, using objects, mail merge, using templates and using styles and printing; Exercise on Microsoft Excel; excel basics, entering and editing worksheet data, essential spreadsheet operations, creating and using formulas, worksheet formatting, chart features, working with graphics and lists and printing; Exercise on Local Area Network (LAN) and Internet; using of LAN for resource sharing resources and use of server for backup, Internet browsing.

Rural Sociology and Development NaRM 232

Credit Hours: 3; Year: II; Semester: I

Basic concepts and perspectives of sociology and society in general; the origin of rural sociology; the widening scope of rural sociology; defining the rural; determinants of rural social formation; the institution of family and primary group interaction; social stratification in rural communities; rural and urban communities a continuum or a dichotomy. Social changes in rural societies; forms of social change; globalization and rural societies; rural development (general and as applied to Ethiopia); definition of development; elements of rural development.

Macroeconomics I NREP 221

Credit Hours: 3; Year: II; Semester: I

Introduction: definition, macroeconomic questions; Measurement of macroeconomic variables: national income and product accounts, gross domestic product personal and personal disposable income, measuring price changes, price index; introduction to income determination; the multiplier; macroeconomic models; the static equilibrium model; demand side equation; introduction to monetary and fiscal policy; supply side equilibrium; monetary, fiscal and income policy, the business cycle

Introduction to Econometrics Econ 352

Credit Hours: 3; Year: II; Semester: I; prerequisite: NREP 113

Introducing the theory and practice of econometrics; simple linear regression model; ordinary least squares and maximum likelihood estimation; inference and analysis of residues; Multiple linear regression; classical models of estimation and inference; tests of linear restrictions emanating from economic theory; problems of multi collinearity; heteroscedasticity and autocorrelation; discussion on problems of introducing lagged dependent variables and errors in variables with instrumental variable estimation; elements of time series econometrics; simple simultaneous equation model specification and problems of identification and methods of estimation; limited dependent and dummy variables.

Erosion and Soil and Water Conservation NaRM 461

Credit Hours: 3; Year: II; Semester: I; Prerequisite: PISc242

Effects of population growth on agriculture and other major socio-economic development; water behavior in relation to soil texture; soil erosion and erosion process; physical and human factors influencing soil erosion; models of soil erosion; measurement and assessment methods of soil erosion; strategies and types of soil conservation practices including indigenous soil and water conservation practices and their suitability to various land use types and agro-ecological zones; indigenous soil and water conservation and management practices.

Practical Sessions:

Field observation of the different types of soil erosion; practical application of Universal Soil Loss Equation; assessment of soil erosion in the field; propose suitable conservation measures based on USLE; the use of line level to laying out soil conservation structures; construct soil bund, *fanyajuu* terraces and cutoff drains; study tour to Hossana and Wolayta.

Ecosystem Studies NaRM 313

Credit Hours: 2; Year: II; Semester: I; prerequisite: PISc242, NaRM213

Ecosystem concepts and classification; indicators of ecosystem health; evolution of

agriculture; agricultural ecosystems: low inputs and high input agricultural practices; agro-ecosystems concepts and practical strategies; the ecological foundations of agro-ecosystems sustainability; forest ecosystem management; important components and processes in forest ecosystems; application of ecological principles to sustainable management of forest ecosystems; forest structure and dynamics, and their manipulation for a range of management objectives; community involvement in ecosystem management; fire and its effects on ecosystem functions.

Practical Sessions:

Evaluation of different ecosystem management practices based on ecosystem functions

Remote Sensing (RS) and Geographic Information Systems (GIS) NaRM 352

Credit Hours: 3; Year: II; Semester: I

Introduction to concepts and systems: electromagnetic energy and spectrum, image characteristics, remote sensing systems, and sources of remote sensing information; interpretation of images: interaction between light and matter, photo mosaic, stereo-pairs of images, black-and white images, IR-color images; digital image processing: structure of digital images, image processing overview, image enhancement, and information extraction; introduction: definition, capabilities of GIS, components of GIS, questions a GIS can answer, sample GIS applications in NRM; basic map concepts: types of map information, map features, fundamental map representation techniques, and topology; procedures for simple GIS-Projects: geographic database, organizing map information, and designing database; input of data in to GIS: data sources, and data entry techniques; spatial data quality control: errors and their sources, correcting spatial data; attribute data: sources of attribute data, input, linking attributes to geographic features; managing the database: projection/ transformation/ geo-referencing, coordinate systems; geographic analysis: analytical characteristics of GIS, steps for performing geographic analysis; presentation of the results of geographic analysis.

Practical Sessions:

Interpretation of Images; digital image enhancement, information extraction from digital images; designing a geographic database; data capturing techniques: digitizing (using digitizer and graphic monitor), data capturing using GPS, extraction of information from images, importing existing data; spatial data control; attribute data input and linking them with geographic features; geographic data analysis, presentation of results of analysis; carry out one GIS-project work, which includes all or some of the above individual exercises (for example, carry out resources survey, land cover monitoring of a given area, preparing land use plan for one particular area).

Introduction to History of Economic Thought NREP 222

Credit Hours: 2; Year: II; Semester: II

Introduction; Schools of Political Economy: The pre-classical schools, The Classical Schools; Neo-classical schools: Anglo-American Schools, Continental Neoclassicism; Alternative Schools: Heterodox Traditions; Keynesians

Microeconomics II NREP 224

Credit Hours: 3; Year: II; Semester: II; prerequisite: NREP 122

Factor markets: competitive factor market, market power and factor market, vertical integration; monopoly: profit maximization, monopoly and its effects, causes of monopoly; monopsony: profit maximization, its application; production; pareto efficiency; price and output under oligopoly; welfare economics, externalities: competition under

externality, externalities and market structure, economic measures and externality reduction; common property, its over use and solutions; public goods: types, market for public goods, valuation of public goods.

Natural Resource and Environmental Valuation NREP 232

Credit Hours: 3; Year: II; Semester: II; prerequisite: NaRM 224

Introduction: value concept, value types, value paradox; dimensions of value; the theory of environmental valuation; environmental values and valuation techniques: contingent valuation, hedonic pricing, travel cost method; ethics and the environment; environmental accounting; the economic basis of cost benefit analysis; input output identification and valuation; identification of costs and benefits; valuation of costs and benefits; accounting of shadow prices; shadow rate of discount, wage rate and exchange rate, investment decision making, risk and uncertainty

Introduction to Public Policy and Law NREP 242

Credit Hours: 2; Year: II; Semester: II; prerequisite: NaRM 232

Definition, basic characteristic and types of Public Policy; why study Public policy; the need of society for Public Policy; Policy Making as Government Responsibility; values (concepts of values) and Public Policy; Public Policy Process in Developed and Developing countries; Interdisciplinary nature of public policy; stages in public policy process; formal and informal actors (interest groups) in public policy process; Desirable task allocation between politicians and experts (technocrats) in public policy process. Introduction to the principles of law; morality and law; principles of legality and elements of proof; contract; punishment and justification for punishment.

Rural Development NREP 244

Credit Hours: 3; Year: II; Semester: II; prerequisite: NaRM 232

Introduction: specific features of agricultural production, the origins and development of ideas of agricultural development, sources of agricultural growth, getting agriculture moving, role of agriculture in economic development, structural transformation, agriculture -industry linkages and intersectoral flow of resources, the relation between population and food supplies, dualistic economic development, agriculture in industrialized countries, world trade in agricultural commodities, food security and agricultural policy analysis, the political economy of peasant mode of production, assumptions of conventional economics and peasant agriculture, risk aversion behavior of farm households, time allocation and the new home economics, farm size and productivity, supply response, and factors markets in rural areas.

Research Methods for Economics and Policy NREP 252

Credit Hours: 2; Year: II; Semester: II; prerequisite: Econ 352

Definition of research; types of research; scientific methods for social and economic research; dimensions of research and research designs; principles and problems of research in economics; systematic methods of research project proposal; basic steps in qualitative research: problem identification, research objectives, hypothesis formulation in research, survey design and methods, data collection, processing of statistical information, analysis, interpretation of data; the use of software in research; literature survey and citation; research report writing.

Macroeconomics II NREP 226

Credit Hours: 3; Year: II; Semester: II; NREP 221

Consumption and consumer expenditure; the monetary sector; Money: definition and

theory of money demand; money supply: money and the creation of bank deposits, money stock and its control; interest rates; inflation; balance of payments; exchange rate systems; economic policy: fiscal policy, monetary policy; IMF policies: structural adjustment and its consequences; monetary and fiscal policy in the open economy.

The Economics of Renewable Resources NREP 234

Credit Hours: 2; Year: II; Semester: II; prerequisite: NREP 152

Basic economic concepts of natural resources; property rights, externalities, pollution and other environmental problems; concepts of sustainability and natural resource scarcity; sustainable development, principles to establish a sustainable society, and ethics for sustainable development; population and resource use; economics of land and water resources, forestry and agriculture, and wildlife and fisheries; economic valuation methods for environmental and resource values (direct and indirect methods).

The Economics of Non-renewable Resources NREP 331

Credit Hours: 2; Year: III; Semester: I; prerequisite: NREP 234

Basic economic concepts of natural resources; concepts of sustainability and natural resource scarcity; economics of depletable non-recyclable resources (oil, gas, coal, uranium) and depletable recyclable resources (minerals); efficient allocation of non-renewable resources, transition to a renewable substitute; methods to evaluate and efficiently allocate non-renewable resources.

Environmental Impact Assessment NaRM 411

Credit Hours: 2; Year: III; Semester: I; prerequisite: NaRM 224

Consequences of environmental degradation; sustainable development; concepts and importance of environmental regulations used in general practice; environmental quality (EQ), EQ attributes; resource and accounts; format for envisagement; principles and elements of environmental assessment: types of environmental assessments, when to use them, data/information required, how data/information should be collected and analyzed and communicated; impact analysis checklist and network analysis; impact index; actual case study of EIA of development projects taking different exemplary cases; environmental monitoring, mitigation measures; social impact assessment, scope and state of development of social impact assessment; format of social impact assessment; forecasting methods; EIA legislation, procedures and practice.

Practical Sessions:

An educational tour to a selected development project to carry out EIA practices and reporting

Integrated Watershed Management Planning NaRM 463

Credit Hours: 3; Year: III; Semester: I; prerequisite: NaRM 352

Introduction: definition, the need for watershed management planning; Watershed planning approach and basic concepts: involving different stakeholders in watershed management planning, planning approaches, planning level, components of watershed management planning; the basics of land use planning: land use types, land qualities and characteristics, decision-making in land use planning; major steps and procedures of watershed management planning: determining main objective and priorities, conceptual framework, data collection and verification information for activities, data analysis, and document preparation; preparation of integrated watershed management plan: formulation of management alternatives, strategies, recommendation on implementations, production of integrated watershed management plan for decision-making, monitoring and evaluation.

Practical Sessions:

Site selection for the project; Setting objectives; Resources, stakeholders and problem identification; Designing a conceptual framework for the analysis of the watershed management planning; Designing project plan that involves different stakeholders; Watershed survey, data collection and generation of relevant information; Production and presentation of integrated watershed management plan; The students are expected to carryout Integrated watershed management plan in a unit area, and present the final working document, using all or some of the above practical exercises.

The Economics of Forest Resources NREP 333

Credit Hours: 3; Year: III; Semester: I; prerequisite: NREP 234

Introduction: the dimensions in forest economics. Plantation vs. multiple-use forest resources, wood vs. non-wood products in forestry, the economics of even-aged plantation forests: investment criteria for plantation forestry; determination of optimal rotation length; economics of plantation Silviculture; sustained yield and the normal forest; the economics of multiple use forests: the concept of sustainable forest management; the values of forest resources; valuation of non-market forest benefits; multiple production functions and equilibria; assessing trade-offs in multiple use management; the economics of deforestation.

Ecotourism NaRM 452

Credit Hours: 2; Year: III; Semester: I

Basic concepts of ecotourism; historical development of eco-tourism; the need to study ecotourism; ecotourism and human society; the art of ecotourism management; Assessment of potential ecotourism sites (hydrological, relief, geological, recreational, biological, etc.); ecotourism and protected natural areas; databases for ecotourism sites selection and management; ecotourism demand and marketability; stakeholders-based ecotourism management; formulation of ecotourism management plan and evaluation of its effectiveness; contribution of ecotourism to sustainable natural resource management; Ecotourism of Ethiopia; potentials, attempts, achievements and limitations of ecotourism at national level; its prospects and institutional set-up.

Practical Sessions:

Study field tour to some selected nature based potential ecotourism areas/sites of Ethiopia; assessment of potential ecotourism sites and formulation of ecotourism management plan, film shows recorded on nature-based tourism.

Introduction to Marketing NREP 321

Credit Hours: 2; Year: III; Semester: I

Introduction: definition, scope, characteristic and the importance of marketing; principles of marketing, nature of agricultural products and markets, economic theory and input and out marketing; types of markets and middle men, the marketing tools, "the four Ps", marketing functions such as grading, transport, storage; marketing costs and margins, price determination; problems of agricultural product marketing, government intervention, globalization, contractual agreement, and vertical integration and agricultural markets.

Environmental Economics and Policy NREP 335

Credit Hours: 2; Year: III; Semester: I; prerequisite: NREP 242

Basic concepts and definitions: environment and environmental problems, welfare and social welfare, concerns of social welfare, welfare economics, environmental economics;

social welfare as policy objective: historical background, objectives of public expenditure; determination of social welfare: individual and social preference system, the Pareto Optimum, compensation criteria, social welfare functions; economics of environmental quality: economic systems and environmental externalities, monetary evaluation of the environment, social optimum level of environmental quality; major issues in environmental policies: global issues, local issues; environmental policy instruments: environmental monitoring and information systems, economic institutions and rules, environmental regulations, market-based mechanisms; economics analysis of environmental policies: cost-benefit analysis, environmental policy analysis criteria (static and dynamic efficiency, cost-effectiveness, equity, sensitivity and flexibility).

Property Rights and Natural Resource Management NREP 341

Credit Hours: 2; Year: III; Semester: I; prerequisite: NREP 242

Property defined (contemporary and classical views of property; origin of the institutions of property); Marxian and classical understanding of property relations; the role of the state in property rights allocations and implementations; types of property regimes (private, common, state), open-access nature of property and resource degradation; common property regime and natural resource management; differing views; tragedy of the commons, and tragedy of enclosure; advantages and limitation of common property; property rights and the institutional deficit/failure; customary resource utilization and the formal property relations in Ethiopia; Property rights as policy tool and conflict management instrument for NRM; JFM/PRM and the question of property rights in Ethiopia.

Senior Seminar in Natural Resource Economics and Policy NREP 351

Credit Hours: 1; Year: III; Semester: I; prerequisite: NREP 252

Identification of a relevant senior research problem and proposal writing by the students in consultation with advisors nominated by the Department; oral presentation of the proposal for evaluation, comments and approval.

Extension in Natural Resource Management NaRM 431

Credit Hours: 2; Year: III; Semester: II

Philosophy, principles and purposes of extension; principles of adult learning; communication: its role, process, diffusion and adoption models, innovation, skills and barriers to effective communications; developing participatory extension program in natural resource management; strategies for participation and participatory methods; extension methods: individual, group, mass methods; how to work with people: working with formal and informal leaders; extension campaign in natural resource management; extension program: planning, organization, implementing, monitoring and evaluation; The role of government and NGOs in extension.

Practical session:

Case study on participatory natural resource management program planning on specific topic and area.

Natural Resource Project Planning and Analysis NREP 332

Credit Hours: 3; Year: III; Semester: II

Concept of development and planning; systems and levels of planning; functional relationships between plans, programs, and projects; concept of development projects; phases of a project: project identification, formulation, appraisal, implementation, and monitoring (implementation, effectiveness, and validating monitoring) and evaluation

(ongoing, interim, terminal, and ex-post evaluation); framework of a project document; Logical Framework Approach (LFA); feasibility studies from financial, economic, technical, environmental and social perspectives; investment criteria in project planning and other cognate sectors; valuation techniques for project inputs, outputs, outcomes, and impacts; cost-benefit analysis of development projects

International Economics and Globalization NREP 352

Credit Hours: 3; Year: III; Semester: II

Introduction: emergence and growth of economic interdependence; theories of international trade; comparative advantage, economic efficiency, factor substitution, imperfect competition and international trade; trade policy: evolution, instruments (customs, tariffs, quota, subsidies), uses; commercial policies; protection and free trade; international monetary theory and policy: foreign exchange and exchange rate systems, balance of payments; international trade and development; world trade organizations; international trade and environmental concerns; different interpretation/conceptualization of globalization; the hyper-globalists, the skeptics, and the transformation lists; the new global order (WTO); the North-south divide and globalization; rapid internationalization of capital and its implication to developing world particularly Africa. The nation state (sovereignty) in the face of fast growing globalization (the limits of sovereignty); the challenge to indigenous institutions; the nation state's economic policy in the face of growing globalization.

Entrepreneurship Development Mgmt 414

Credit Hours: 2; Year: III; Semester: II

This course discusses entrepreneurship theory; characteristics and background of entrepreneurs; issues related to starting a new venture; financing a new venture and other related issues with particular emphasis to the Ethiopian economic environment. The course has lecture component, case analysis and individual project work to be presented in class.

Development and Environment NREP 354

Credit Hours: 3; Year: III; Semester: II

Economic growth and development; the concept of sustainable development; attaining sustainable economic behavior; dimensions of the problem of development in developing countries; role of agriculture in economic development; macroeconomic policies and their influence on development; models and theories of development; conceptual and methodological issues of development; mobilizing foreign resources; problems of development vis-à-vis possibilities and prospects; development planning; the concept of environment; relationship between environment, natural resources and economic growth; poverty and the environment; policy instruments to combine growth with a good environment;

Public Policy Analysis NREP 342

Credit Hours: 3; Year: III; Semester: II

Systems of governments and policy making; policy making under democracy and dictatorship; the concepts and the place of values and ethics in policy analysis; theories and approaches of policy analysis: systems theory, elite theory, group theory; Comprehensive Rationalist theory, Incrementalist, game theory, government institution theory, and Interactive /society-centered/ theory; actors and level of influences in policy making; policy recommendations; Policy implementation, requirements and responsibilities (instruments); Legal and organizational requirements for policy

implementation; issues and constraints in policy implementation. Principles and functions of monitoring: compliance, auditing, accounting and explanation; sources of information for monitoring. The importance and place of evaluation in the policy process; methods of evaluation; policy evaluation in developing countries, exercise and limitation; strategies for improving evaluation: consequences of evaluation.

Senior Research Project in Natural Resource Economics and Policy NREP 356

Credit Hours: 2; Year: III; Semester: II; Prerequisite: NREP 381

Data collection based on the proposal prepared as a requirement for the course NREP 381, analysis and report writing in consultation with an advisor assigned by the Department, submission of finally commented research report of the findings as a partial requirement for the degree in the Department.

Community Oriented Practical Education (COPE)

Credit Hours: 6; Year: II; Semester: Summer vacation

This is a practical attachment whereby the students go to different organizations to get practical skill in applying the knowledge and experience developed during their stay in the Department; a close supervision by the Department is part of the practice; the students will be familiar with the working system for their future carrier and it will enable them to critically look at what they learn in the College.

DEBUB UNIVERSITY
WONDO GENET COLLEGE OF FORESTRY

CURRICULUM FOR DEPARTMENT OF WILDLIFE AND FISHERIES

1. Background

A shortage of professional field practitioners in various fields of study is one of the most common problems in Ethiopia. This, in turn, has contributed to different kinds of socioeconomic and biophysical problems that seriously affect people's lives, especially in rural areas of Ethiopia. Natural resources degradation is one of the problems challenging land productivity in Ethiopia, and recurrent drought and famine have hit different parts of the country.

To combat and reverse the effects of the aforementioned problems, the Federal government of Ethiopia has given due emphasis in its educational policy to resolving the problem of shortages of trained personnel in various fields of study and to fill the gaps of professionals for different developmental sectors.

This is why the government has designed human capacity-building policy as its major concern and it has been expanding the capacity of higher learning institutions to absorb the maximum number of students in different disciplines. Indicators are evident in the number of new universities and colleges opened and expanded in order to implement the new educational policy of the country.

Debub University is one of the institutions of higher learning newly opened by the Federal Government of Ethiopia to contribute to the training of human resources in the country. This university was established by combining different colleges and newly opened faculties. Wondo Genet College of Forestry (WGCF) is one of the colleges embraced under Debub University upon its inception. The college is diversifying fields of training and is proposing the development of four new departments to address the need for trained personnel in key areas in the country. To this end, the college has completed developing curricula in four fields of study. Among these four proposed departments is the department of *Wildlife and Fisheries Resources Management (WFRM)*. The college hopes that the government will encourage the efforts made in this regard by providing the necessary financial and technical assistance.

2. Justification

Currently, global wild biological resources, together with their physical environment, are in a state of rapid change and are losing their inherent characteristic features that ensure sustainable utilization. Furthermore, rapid global population growth accompanied by high demand for natural resources has accelerated the rate of land-use change and loss of wild biodiversities inhabiting different ecosystems. This rate has, of course, a paramount effect at the global level.

The rate of loss of wild biodiversities along with their natural habitats is faster in developing countries than developed countries, mainly due to various socioeconomic constraints. The livelihood of most people living in developing nations comes mostly from direct exploitation of wild biodiversity resources.

Ethiopia is naturally endowed with one of the highest variety of wild biodiversity resources in the world. This is attributable to different factors, including the highly varied topography, diversified climate, and suitable landscapes. All these concurrently favored Ethiopia to be rich in wild fauna and flora resources, and with one of the highest levels of endemism in East Africa.

Despite these immense wild diversities and potentials, Ethiopia is losing (both in quality and quantity) these resources at an alarming rate. Habitat destruction, fragmentation, poaching, and lack of proper management are among the various factors that are decimating or threatening the quality and quantity of wild biodiversities in Ethiopia. As wild diversities are the products of millions years of evolution, the impact has global relevance.

Regarding utilization, even though Ethiopia is rich in wild biodiversity resources such as wildlife and fish, the existing potentials of these resources are not utilized properly and efficiently. To alleviate the effects of the aforementioned problems in the day-to-day life of the people, it is crucial to develop wise use and management of the wild diversities together with their natural habitats. The above mentioned losses of wild biodiversity resources, like wildlife and fish, along with unwise utilization and management, has occurred due to critical shortages of trained researchers and managers in the field of wildlife and fisheries resources management.

With these issues in mind, Wondo Genet College of Forestry has found it crucial to design and launch the *Department of Wildlife and Fisheries Resources Management* so as to produce competent trained staff equipped to handle the management of wild biodiversities. Moreover, there is high demand for technically trained personnel in formulation of wildlife and fisheries resource policy to implement at various levels to secure sustainable utilization. To fill those gaps, the new department will offer opportunities in training of appropriate persons through provision of widespread theoretical and practical knowledge and skill in wildlife and fisheries resources management.

3. Why *WFRM* in Wondo Genet?

Wondo Genet College of Forestry is an ideal place to train students in the field of Wildlife and Fisheries Resources Management. This is attributed to different factors. (1) Being the member of Debu University, the university has vested a power in the college to diversify its programs, as there is an agreement for sharing teaching staff share among different colleges and faculties of the university. (2) The college has long years of teaching and research experience in forestry and related fields, which will greatly contribute to WFRM in the college. (3) The college has already designed and begun training of students in the field of Natural Resources Management, which is of paramount importance toward implementing this newly proposed department. (4) The existing teaching staff members, infrastructure, and references materials are additional inputs for the success of WFRM in the college, although further improvements of infrastructure will be indispensable.

Geographically, the college is located in an ideal place to train students in the field of WFRM, as this is mainly an outdoor-training discipline. The closeness of the college to protected wildlife areas provides opportunities for enhancing and facilitating the learning-teaching process through wildlife safaris and educational field trips. The college will also benefit from experiences shared, as there will be a formation of domestic and international cooperation during the implementation of the program.

4. Mission of Department of *WFRM*

The mission of the department is to provide theoretical and practical knowledge and skills that technically fit in the sustainable conservation, utilization, and management of wildlife and fisheries resources. This is achieved through education, training, research, and extension activities that will facilitate sectoral and inter-sectoral development at various levels in Ethiopia.

5. Objectives of *WFRM*

The main objective of this department is to produce wildlife and fisheries resources managers and/or experts who are multidisciplinary in their approach and able to make decisions on the management of the prescribed resources.

The specific objectives of the department are to:

- Provide training in wildlife and fisheries resources management with theoretical concepts and practical knowledge and skill, which will ensure suitable utilization
- Conduct research activities on wildlife and fisheries resources and on protected-area management and its interaction with the socioeconomic aspects of the society and the physical environment as a whole
- Disseminate the skills and knowledge developed through research and training activities to key stakeholders in wildlife and fisheries resources and develop technical and extension methods that can ensure the resolution of interest-based conflicts
- Demonstrate, monitor, and evaluate the effectiveness of technologies developed in the department and introduce them to society in harmony with their felt needs
- Construct technical and methodical capacity in the coordination and management of scientific approaches that will help to change the rudimentary and wasteful traditional way of wildlife and fisheries resources utilization and management
- Identify the various complexities and interrelations created between wild biodiversity management and society to develop scientific methods that guarantee practical solutions
- Develop technologies that magnify the different values of wildlife and fisheries resources at community and national levels through enhancement of promising survival environments

6. Graduate Profile

On successful completion of the program, graduates are expected to

1. Implement conceptual and practical knowledge and skill to resolve challenging problems faced in the field of wildlife and fisheries resources management
2. Analyze how to manage wildlife and fisheries resources development projects and involve in multidisciplinary teamwork to solve practical problems in wild biodiversity management
3. Enhance integrated development planning, decision making, and action for the successful management and sustainable utilization of wildlife and fisheries resources in harmony with environmental conservation at various regimes

4. Assess wildlife and fisheries potential areas through the application of theoretical and practical knowledge and skill to develop integrated resource-use planning, monitoring, and impact studies
5. Select, formulate, and apply relevant/sound techniques and methods to solve problems faced in wildlife and fisheries resources management.
6. Use research and training skills to manage wildlife and fisheries potential areas
7. Work in higher learning, research, and non-governmental organizations and engage in wildlife and fisheries resources research and development activities
8. Communicate the knowledge and the skill gained to reconcile the felt needs of the society and managerial spectrum of wildlife and fisheries resources development
9. Explore and select basic field information so as to successfully manage special features or interests in wildlife and fisheries protected areas for optimized sustainable benefits.
10. Design, analyze, and evaluate critical issues in wildlife and fisheries resources management and other land-use types at various levels
11. Involve in wildlife and fisheries resources policy formulation and evaluation at various levels
12. Practice wildlife and fisheries resources farming activities and introduce the technologies to local communities to ensure sustainable utilization and improve the income at various levels

7. Admission Requirements

As a general rule, students of the department must fulfill the admission requirements of Debub University. The WFRM department uses a multidisciplinary approach toward accomplishing its goals. Moreover, it is better for admitted students to have good background knowledge of biological sciences.

8. Evaluation Methods

In the department of WFRM, students' evaluation is not a one-step process, but is a continuous process. In addition to the two major examinations (mid-semester and final), there is also a continuous monitoring of the level of understanding through assignments, safari field reports, and tests.

9. Graduation Requirements

When all the required courses of the department are taken as indicated in this document, with no "F" grade in all the courses taken, and with a cumulative grade point average (CGPA) of not less than 2.00, a student is said to fulfill the requirements for graduation.

10. Degree Awarded Upon Graduation

After fulfilling the requirements for graduation, students will be awarded the degree of "Bachelor of Science in Wildlife and Fisheries Resources Management." Special mentions like "with distinction" or "great distinction" will be made based on the CGPA requirements set by the university.

11. Course Coding

A code of courses whose home base is the department begins with WFRM and followed by a three-digit number. The first digit indicates the year of the study; the second represents the category of the department and the third digit shows the semester and the category sequencing in which the course is offered. Non-departmental courses from other departments of the university are retained with original code assigned in the home departments.

12. Category of courses

Category 1. Fishery biology, fish stock assessment, fishery technology, limnology, aquaculture

Category 2. Wildlife ecology, wildlife resource management, wildlife utilization, range land ecology and management, conservation of wetland

Category 3. Introduction to: mammalogy, orientology, herpetology, animal zoology

Category 4. Wildlife: Physiology, anatomy, genetics, wildlife disease and parasite control

Category 5. Participatory wildlife management, wildlife policy and law, Wildlife based tourism and Ecotourism, wildlife and fisheries resources economics, senior seminar, senior research project

13. List of Courses

The courses proposed for the department of Wildlife and Fisheries Resources Management are shown in the table below.

Supportive Courses			
	Course code	Course title	Credit Hours
1	NaRM221	Natural Resources and Demography of Ethiopia	3
2	PISc242	Introductory Soils	3
3		Introduction to Crop Production	2
4		Introduction to Livestock Production	2
5	NREP131	Introduction to Forestry	3
6	NaRM213	General Ecology	2
7	PrFo253	Applied Statistics	3
8	Comp203	Introduction to Computer Use and Programming	3
9	NaRM232	Rural Sociology and Development	3
10	CEE111	Introduction to Civic and Ethical Education	3
11	FLEN201	Sophomore English	3
12	NaRM352	Remote Sensing and GIS	3
13	NaRM382	Research Methods	2
14	NaRM431	Extension WFRM	2
15	Mgmt414	Entrepreneurship Development	3
		Sub Total Cr. Hrs.	40
Major courses			
	Course code	Course title	Credit Hours
16		Botany	3
17	NaRM361	Integrated Watershed management and planning	3
18	WFRM213	Limnology	3
19	WFRM114	Fisheries Biology	3

20	WFRM218	Fish Stock Assessment and Management	3
21	WFRM216	Aquaculture	3
22	WFRM212	Fisheries Technology	2
23	WFRM322	Participatory Wildlife Resource Management	2
24	WFRM324	Wildlife Policy and Law	3
25	WFRM221	Rangeland Ecology and Management	3
26		Introduction to Zoology	2
27	WFRM235	Introduction to Mammalogy	2
28	WFRM237	Introduction to Ornithology	2
29	WFRM232	Introduction to Herpetology	2
30	WFRM244	Wildlife Disease and Parasite Control	3
31		Animal Physiology	2
32	WFRM146	Comparative Vertebrate Anatomy	2
33	WFRM148	Introduction to Wildlife Genetics	3
34	WFRM122	Wildlife Ecology	3
35	WFRM351	Wildlife – Based Tourism and Ecotourism	3
36	WFRM323	Wildlife Resources Utilization	3
37	WFRM325	Wildlife Management I	2
38	WFRM328	Wildlife Management II	3
39	WFRM357	Wildlife and Fisheries Resources Economics	3
40	WFRM326	Conservation of Wetlands	2
41	WFRM369	Senior Seminar in WFRM	1
42	WFRM368	Senior Research Project in WFRM	2
		Sub Total Ct. Hrs.	68

Total Cr. Hrs. = 108

COPE with 6 credit hours

Elective Courses			
	COURSE CODE	COURSE TITLE	Credit Hours
45	NaRM411	Environmental Impact Assessment	2
46	NaRM 461	Soil and Water conservation	2
48	NaRM311	Indigenous Knowledge and conflict Management	3
49	NaRM481	Project Planning	3
		Sub Total Ct. Hrs.	10

14. Sequences of Courses

Dept. WFRM, Year I; Semester I

Course Code	Course Title	Credit Hours
NaRM221	Natural Resources and Demography of Ethiopia	3
PISc242	Introductory Soils	3
	Introduction to Crop Production	2
	Introduction to Livestock Production	2
NREP131	Introduction to Forestry	3
NaRM213	General Ecology	2
FLEn201	Sophomore English	3
	Introduction to Zoology	2
Total		20

Dept. WFRM, Year I; Semester II

Course Code	Course Title	Credit Hours
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Comp203	Introduction to Computer Use and Programming	3
WFRM122	Wildlife Ecology	3
	Botany	3
WFRM114	Fisheries Biology	3
	Animal Physiology	2
WFRM146	Comparative Vertebrate Anatomy	2
WFRM148	Introduction to Wildlife Genetics	3
Total		19

Dept. WFRM, Year II; Semester I

Course Code	Course Title	Credit Hours
PrFo253	Applied Statistics	3
WFRM221	Rangeland Ecology and Management	3
WFRM213	Limnology	3
CEED201	Introduction to Civic and Ethical Education	3
WFRM235	Introduction to Mammalogy	2
WFRM237	Introduction to Ornithology	2
NaRM232	Rural Sociology and Development	3
Total		19

Dept. WFRM, Year II; Semester II

Course Code	Course Title	Credit Hours
WFRM232	Introduction to Herpetology	2
WFRM244	Wildlife Disease and Parasite Control	3
WFRM216	Aquaculture	3
WFRM218	Fish Stock Assessment and Management	3
NaRM352	Remote Sensing and GIS	3
NaRM382	Research Methods	2
NaRM361	Integrated Watershed management and planning	3
Total		19

COPE with 6 credit hours will be commenced at summer vacation time

Dept. WFRM, Year III; Semester I

Course Code	Course Title	Credit Hours
WFRM357	Wildlife and Fisheries Resources Economics	3
WFRM351	Wildlife – Based Tourism and Ecotourism	3
WFRM323	Wildlife Resources Utilization	3
WFRM325	Wildlife Management I	2
NaRM311	Indigenous Knowledge and conflict Management (E)	3
WFRM369	Senior Seminar in WFRM	1
NaRM481	Project planning (E)	3
NaRM359	Extension in NRM	2
Total		17/20

Dept. WFRM, Year III; Semester II

Course Code	Course Title	Credit Hours
Mgmt414	Entrepreneurship Development	3
WFRM322	Participatory Wildlife Resource Management	2
WFRM324	Wildlife Policy and Law	3
WFRM326	Conservation of Wetlands	2
WFRM328	Wildlife Management II	3
WFRM312	Fisheries Technology	2
NaRM 461	Soil and Water conservation (E)	2

NaRM411	Environmental Impact Assessment (E)	2
WFRM368	Senior Research Project in WFRM	2
Total		19/21

Note: Blank = represent university courses to completed

(E)= Represents that the course is elective and the students should take at least one of these courses in this semester.

15. Course Descriptions

Natural Resources and Demography of Ethiopia NaRM 221

Credit hours: 3; Year I; Semester: I

Geological processes and resulting features; drainage patterns and water resources; climate; soil resources; natural vegetation; wildlife; population: size, distribution, composition, characteristics, and settlement patterns; economic activities: agriculture, industry, fishing, and tourism.

Practical Sessions:

Field tours that will enable students to have first hand information on all or at least most natural resources of Ethiopia are recommended. These tours can be integrated with other tours.

Introductory Soils PISc242

Credit hours: 3;Year: I; Semester I

Historical background on the development of soil science; soil forming factors, weathering processes, soil profile and its horizon development and formation; physical properties of mineral soils; chemical properties of mineral soils; management and reclamation of acid and salt-affected soils; soil colloids, soil water forms, organic matter of mineral soils; essential plant nutrients; soil survey and modern systems of soil classification (USDA and FAO-UNESCO systems) and their applications in the classification of Ethiopian soils.

Practical Sessions:

Identification of minerals and field observation of weathering rocks and minerals; identification and description of soil profiles and horizons in the field; feel / field method of soil texture, structure, and consistence determination; determination of organic matter, soil pH, and water movement in different textural classes of soils; Identification of different soil types in and around Wondo Genet.

Introduction to Crop Production

Credit hours: 2; Year: I; Semester: I

Introduction: general principles and practices of, agronomy, and horticulture in Ethiopia; Agro-ecological zonation of Ethiopia: impact on major crops production and associated land use systems. Potentials and constraints in mixed farming systems in Ethiopia; crop pest controlling and management techniques.

Practical Sessions:

On campus of the college students will be acquainted how to evaluate the condition and productivity of maize and coffee farming practices. Field tour: to be integrated with other tour.

Introduction to Livestock Production

Credit hours: 2, Year: I, Semester: I

Introduction: general principles and practices of animal science in Ethiopia; impact on

major livestock production and associated land use systems. Livestock production system in nomadic pastoralists; livestock forage preparation; Potentials and constraints of mixed farming system, Beekeeping as part of animal husbandry.

Practical Sessions:

On campus evaluation of dairy farming and beekeeping; Field tour: to be integrated with other tour

Introduction to Forestry NREP131

Credit Hours: 3, Year: I, Semester: I

The concepts of forests, forest resources and forestry; regeneration; forest seed collection and handling; nursery establishment and management, seedling production; plantation, site selection and treatment; basics of forest ecology; Silviculture and management of forest resources.

Practical Sessions:

Selection of mother trees and practicing of forest seeds collection, exercising how to raise seedlings in the nursery, practice the different plantation establishment and management techniques.

General Ecology NaRM213

Credit hours: 2, Year: I, Semester: I

Concept of ecology and the history of man-environment interaction; scope and relationship of ecology with other disciplines; ecology and the concept of ecosystem, ecosystem functioning (energy flow and nutrient cycling); adaptation and evolution; the ecological stress concept; biological productivity; ecosystem changes.

Practical Sessions:

Assessment of ecosystem productivity, both structural and functional evaluation.

Sophomore English FLEN201

Credit hours: 3, Year: I, Semester: I

Reading Skills: purpose of reading, selecting material to read, reading strategies and their functions, reading and summarizing; writing skills: academic style, structure and cohesion, stages of writing, types of writing; letter and CV writing: informal letters, formal letters, application, guidelines for writing CVs; Group discussions: preparation, participating, and chairing; Surveys, project/research and report writing: selecting a topic, researching sources of information and note-taking, and writing the research report; oral presentations and public speeches: preparing a presentation/speech, giving the presentation/speech, evaluation and feedback.

Introduction to Zoology

Credit hours: 2, Year: I, Semester: I

Understand the creation of life and explain the hierarchical properties of living system, the continuity of life and the role of reproductive glands and hormones; Acquiring a clear understanding of the body development features (radical versus spiral cleavage, coelome formation and the formation of germ layers); Taxonomy of vertebrates and common invertebrates; major classes of animal kingdom, principles of animal ecology and their distribution.

Practical session

Collect different small animals, identify their classes, recognize and categorize as

vertebrates and invertebrates, field observation of animals in their habitat.

Introduction to Computer Use and programming Comp203

Credit hours: 3 Year: I, Semester: II

Introduction to computers; evolution of a computer; generation of computers; application of computers; the system concept of a computer; computer hardware; computer software; data communication and networks; application of computers; introduction to MS-DOS, Microsoft Windows basics, Microsoft word and spreadsheet processing.

Practical Sessions:

Exercise on introduction to MS-DOS; Exercise on Microsoft Word: introduction, editing and formatting a document, using tables, using newspaper-style columns, using objects, mail merge, using templates and using styles and printing; Exercise on Microsoft Excel; Excel basics, entering and editing worksheet data, essential spreadsheet operations, creating and using formulas, worksheet formatting, chart features, working with graphics and lists and printing; Exercise on Local Area Network (LAN) and Internet; using of LAN for resource sharing resources and use of server for backup, Internet browsing.

Wildlife Ecology WFRM122

Credit hours: 3, Year: II, Semester: I

Basic concepts of wildlife ecology; historical development of wildlife ecology; wildlife ecosystems and their attributes; and principles of wildlife ecology (wildlife habitats, nutrition, movement, reproduction and mortality); common behavior in wildlife; social interaction in organisms (cohabitation, territoriality, competition, mutualism, amensalism, commensalism, antagonism, parasitism and predation); costs and benefits of social behavioral adaptation, feeding, mating and breeding behavior in higher organisms; Effects of fire on wildlife population; Influence of biotic succession on wildlife population; Wildlife population evolution (variation, natural selection, speciation and ecological niches); Assessment and identification of potential and hot spot wildlife population areas and characteristics; biogeography and wildlife ecology; The wildlife population ecosystems of Ethiopia(potential, diversity, abundance and prospects).

Practical Sessions:

Field trip to wildlife potential areas of Ethiopia; Film show recorded on the global diversity, abundance and behavior of wildlife population.

Botany

Credit hours: 3, Year: I, Semester: II

Historical development and scope of botany; plant cells and tissues (anatomy of plants); taxonomy of kingdom plantae (systematic classification, identification and nomenclature); structure and development of primitive plants; structure of higher plants (roots, stems and leaves); plant physiology and development (photosynthesis, metabolism, transport process- soils and mineral nutrition, development, reproduction, and morphogenesis); plant genetics and evolution; phytogeography; plants of Ethiopia.

Practical Sessions:

Classification, identification and naming of common plants in the campus; collection of plant specimen and preparation of small herbarium; field observation to see how plant species composition, distribution and abundance is influenced by environmental factors.

Fisheries Biology WFRM114

Credit hours: 3, Year: I, Semester: II

This is an applied fisheries course designed based on the principles of population

biology of fish stocks. It starts with fish biology and systematic, ecology, fish community interactions, and fish assemblages. It deals with factors and phenomena that affect the dynamics of fish populations in different systems, such as feeding and quantitative analysis of fish diets, breeding and reproductive performances, methods of age determination and various ways of modeling growth and mortality rates in fish populations. It deals with methods of estimating population abundance, stock biomass. Production as well as yield of fish obtained from different types of aquatic systems. Topics are also included about the potentials and status of practices.

Practical Sessions:

Practical are designed as well as recommendations on management practices. Practices are designed to incorporate field visits, laboratory sessions on techniques as well as exercise on different types of modes and mathematical equations used in population dynamics.

Animal Physiology

Credit hours: 2, Year: II, Semester: I

Understanding cellular structures and membrane compositions, animal body organization, the contractile mechanism of muscle cells, process of digestion in different organs, pumping of blood thorough veins and arteries, Respiratory organs and mechanical properties in breathing, action of the nervous system, endocrine glands and their role, interaction of animals with their environment (response of animal body to temperature, shortage of nutrient and water, disease causing organisms etc)

Practical Sessions:

Students will expect to conduct laboratory practical. In the sessions they will try to identify the microstructures of the animals, recognize and be familiar with the different organs of animals and their functions.

Comparative Vertebrate Anatomy WFRM146

Credit hours: 2, Year: II, Semester: I

Basic concepts of vertebrate anatomy; animal evolution and vertebrate anatomy; the need to study vertebrate anatomy; evidences to study comparative vertebrate anatomy; classification of animals by vertebrate anatomy; major anatomical systems in vertebrates (digestive, reproductive (male and female), breathing, respiratory, skeletal, cardiovascular, urinary, endocrine, nervous and muscular systems); anatomy and ecological adaptation of vertebrate animals; anatomy of some common vertebrate animals; comparative vertebrate anatomy and wildlife population dynamics and management.

Practical session:

Laboratory work.

Introduction to Wildlife Genetics WFRM148

Credit Hours: 3, Year: II, Semester: I

Introduction to: historical background of the science of genetics, structure and function of the genetic materials, cellular mechanisms underlying inheritance of a character; Population genetics: genetic structure (amount and distribution of genetic variability) of a population, factors/evolutionary forces determining the genetic variation within and between populations, source and significances of variation, Genetic markers: methods of detecting genetic variation - different genetic markers and their application; Ecological

and behavioural genetics: the role of ecology and behaviour on the survival and reproduction of species; Breeding and animal improvement: population genetics application for breeding, selection of traits and crossing(mating schemes) for improvement, statistical procedures for estimating breeding values, habitability, genetic engineering and biotechnology, basic techniques in cloning, Conservation of wildlife genetic resources: the need for conservation, strategies of conservation, conventions on the conservation of biological diversity.

Practical Sessions:

Laboratory exercise: - Biochemical and molecular genetic markers (example: Enzyme extraction, DNA isolation/fragmentation techniques, and Gel electrophoresis techniques. Techniques of cloning: -field exercise: selection and breeding techniques

Applied Statistics PrFo253

Credit hours: 3, Year: II, Semester: I

Descriptive statistics; probability; discrete random variables and probability distributions; continuous random variables and probability distributions; sampling distributions; point and interval estimation; hypothesis testing on single and two samples; experimental designs and compute ANOVA with fixed factors; linear and non-linear regression models; chi-square tests.

Rangeland Ecology and Management WFRM221

Credit hours: 3, Year: II, Semester: I

Basic concepts of rangeland ecology and management; The need for rangeland conservation and management; Principles of rangeland ecology (rangeland productivity, wildlife habitats, nutrition, carrying capacity, wild animals food preferences, selectivity and foraging, distribution and abundance of plants by wild animals and vice versa); the art of rangeland management (assessment of rangeland potential, physical effects of grazing and browsing wild animals, prescribed fire as a management tool, biological control, management of mixed game species, reclamation of damaged rangeland, Formulation of rangeland management plan and evaluating of its effectiveness, community integrated wildlife rangeland management); rangeland management in Ethiopia(potentials, attempts, limitations and prospects)

Practical Sessions:

Field tour to wildlife protected areas and managed rangelands; Film show recorded on rangeland management aspects.

Limnology WFRM213

Credit hours: 3, Year: II, Semester: I

This course is about freshwater ecology and it comparable topics about physical, chemical and biological components of freshwaters that regulate the production of organisms in water. Different types of lakes and running waters are students are studied in broad context as well as in reference to water bodies in the country. Biotic and biotic components of freshwaters lake pollution and different types of wastes and their effects in aquatic systems as well as treatment methods are discussed.

Practical Sessions:

Visit to different types of lakes and running waters, assess impact of wastes.

Introduction to Civic and Ethical Education CEE201

Credit hours: 3, Year: I, Semester: II

The course Civic and Ethical Education deals with the meaning and purpose of civics

and ethics; survey of history of citizenship in general and citizenship in Ethiopian context in particular; origin and evolution of constitutional practices; the state, citizenship and government; the history and practice of democratic governance in the world with specific attention to Africa; meaning and nature of fundamental human rights; harmful traditional practices and the state of human rights in the Federal Democratic Republic of Ethiopia (FDRE) The question of political pluralism; important societal values; skill-building mechanisms for democratization and management; contemporary global issues. Ethics and morals, axiology (ethics and values), ethics and moral responsibility, personality inequality and power; sex and gender; professional ethics.

Introduction to Mammalogy WFRM235

Credit hours: 2, Year: I, Semester: II

Basic concepts of mammalogy; origin and evolution of mammals; taxonomy of mammals (classification identification and nomenclature in mammals); ecology of mammals (habitats, nutrition, movement, reproduction and mortality); assessment of distribution and abundance mammals by agro-ecology; center of mammals species diversity and biogeography; population dynamics in mammals; conservation and management of mammals and their habitats; humans and mammals; the mammals of Ethiopia.

Practical session:

Field trip to potential wild mammal diversity and abundance areas of Ethiopia; Film show recorded on different agro-ecology end ecosystems of the world.

Introduction to Ornithology WFRM 237

Credit hours: 2, Year: I, Semester: II

Basic concepts of ornithology; biology of birds (anatomy, genetics, physiology and morphology); taxonomy of birds (key classification, identification and nomenclature techniques in Ornithology); ecology of birds (geographical ranges, habitats, nutrition, movement, breeding, mortality and behavior); assessment of potential (important hot spot) global bird areas; diversity and abundance of bird species across the different biological regions; birds of Ethiopia (potentials, opportunities and limitations of birds management in Ethiopia).

Practical Sessions:

Field trip, to some important bird areas of Ethiopia; film show recorded on the global diversity; abundance and ecology of birds; laboratory and taxidermy work.

Rural Sociology and Development NaRM 232

Credit hours: 3, Year: I, Semester: II

Basic concepts and perspectives of sociology and society in general; the origin of rural sociology; the widening scope of rural sociology; defining the rural; determinants of rural social formation; the institution of family and primary group interaction; social stratification in rural communities; rural and urban communities a continuum or a dichotomy. Social changes in rural societies; forms of social change; globalization and rural societies; rural development (general and as applied to Ethiopia); what is development? The elements of rural development.

Introduction to Herpetology WFRM232

Credit hours: 2, Year: II, Semester: II

Basic concepts of herpetology; biology of amphibians and reptiles (snakes, lizards,

chelonians and crocodiles); anatomy, genetics, physiology and morphology; taxonomy of amphibians and reptiles; ecology of amphibians and reptiles (geographical ranges, habitats, nutrition, movement, breeding, mortality and behavior); assessment of potential amphibians and reptile areas; diversity and abundance of amphibian and reptile species across the different biological regions; amphibians and reptiles of Ethiopia (potentials, and management perspectives).

Practical Sessions:

Field trip to some amphibians and reptiles potential areas of Ethiopia; Film show recorded on the global diversity, abundance, ecology and various values of amphibians and reptiles; laboratory and taxidermy work.

Wildlife Diseases and Parasites Control WFRM244

Credit hours: 3, Year: II, Semester: II

Basic concepts of wildlife diseases (pathogens and wildlife populations, types of wildlife diseases, the effects of disease on individual wildlife, the effects of pathogens on the size and the genetic structure of wildlife populations and vice versa); the development of disease in wildlife populations; the genetic basis of disease resistance in wildlife; environmental modification of host-pathogen interactions; common types of wildlife pathogens in the tropics and their prevention and controlling methods. The scope of parasitology and the nature of parasitism; the metabolism and physiology of parasitic stages; host-parasites interaction (host suitability, effects of parasites on the host wildlife, zoonotic interaction) Immunity of specific parasites, evolution of some common Endo and ecto- wildlife parasites in the tropics; Common invasive epidemiological wildlife parasites in the tropics and their prevention and controlling methods.

Practical Sessions:

Laboratory exercises on the techniques of mounting and identifying common wildlife pathogens and parasites, Culture media preparation and development, Field trip to potential wildlife disease and parasitic areas of Ethiopia.

Aquaculture WFRM216

Credit hours: 3, Year: II, Semester: II

Different aquaculture practices are discussed ranging from small-scale rural fish farming activities to large-scales commercial aquaculture technologies. Specific topics include species and site selection for small and large-scale culture, water quality assessment, pond construction and management, feed formulation. Diseases and their preventive methods, economic assessment under different culture systems. Emphasis is given to the feasibility and prospects of fish farming in Ethiopia.

Practical Sessions:

Site selection, assessing water quality and visit to site practicing aquaculture.

Fish stock Assessment and management WFRM218

Credit hours: 3, Year: II, Semester: II

The purpose of assessment and resource management is to provide advice on the optimum level of exploitation of aquatic living resources such as fish. Accordingly the first part of the course, assessment of fish stocks, deals with methods of searching the exploitation level that gives biologically and economically optimum yield from a given Fisheries. Specific topics of interest under this include methods of procuring and

processing of Fisheries data to estimate employed for predication of sustainable yield and optimum fishing effort such as empirical, holistic and analytical models. Particular emphasis will be given to molds used for tropical fish stock assessment purposes. The second part, Fisheries resource management, is focused on different management practices that lead to optimal exploitation of Fisheries resources. Practical sessions involve exercises on data analysis regarding the application of various stock assessment models using both programmable calculators and computer software's as required.

Remote Sensing and GIS NaRM352

Credit hours: 3, Year: II, Semester: II

Introduction to concepts and systems, electromagnetic energy and spectrum; image characteristics, remote sensing systems, and sources of remote sensing information; interpretation of images: interaction between light and matter, photo mosaic, stereo-pairs of images, black-and white images, IR-color images; digital image processing: structure of digital images, image processing overview, image enhancement, and information extraction; introduction: definition, capabilities of GIS, components of GIS, questions a GIS can answer, sample GIS applications in NRM; basic map concepts: types of map information, map features, fundamental map representation techniques, and topology; procedures for simple GIS-Projects: geographic database, organizing map information, and designing database; input of data in to GIS: data sources, and data entry techniques; spatial data quality control: errors and their sources, correcting spatial data; attribute data: sources of attribute data, input, linking attributes to geographic features; managing the database: projection/ transformation/ geo-referencing, coordinate systems; geographic analysis: analytical characteristics of GIS, steps for performing geographic analysis; presentation of the results of geographic analysis; GIS and wildlife protected areas management.

Research Methods NaRM382

Credit hours: 2, Year: II, Semester: II

Philosophy of science; scientific method; process of empirical research; purpose and methodology of scientific research; problem identification and prioritization; developing research proposal; planning and performing of experiments, data collection, compilation and analysis; analysis of interrelates among problems and causes, preparation of research report.

Practical Sessions:

Periodical reports on causes of wildlife and fisheries degradation and its causes, possible solutions and recommendations; proposal writing and budget estimation practices and survey of the specified resources.

Integrated Watershed Management and planning NaRM361

Credit hours: 3, Year: II, Semester: II

Introduction: definition, the need for watershed management; watershed approach and basic concepts: involving different stakeholders in watershed management, planning approaches, planning level, components of watershed management planning; major steps and procedures of watershed management planning: determining main objective and priorities, conceptual framework, data collection and verification information for activities, data analysis, and document preparation; preparation of integrated watershed management plan: formulation of management alternatives, strategies, recommendation on implementations, production of integrated watershed management plan for decision-

making, monitoring and evaluation.

Practical Sessions:

Site selection for the project; setting objectives; resources, stakeholders and problem identification; designing a conceptual framework for the analysis of the watershed management planning; designing a project plan that involves different stakeholders; watershed survey, data collection and generation of relevant information; production and presentation of integrated watershed management plan; the students are expected to carryout Integrated watershed management plan in a unit area, and present the final working document, using all or some of the above practical exercises.

Wildlife and Fisheries Resources Economics WFRM357

Credit hours: 3, Year: III, Semester: I

Introduction: the evolution; scope and nature of economics in wildlife and fisheries resources management; wildlife and Fisheries resources as economic resources; mathematical concepts: equilibrium and dynamic analysis, growth models, optimization; sustainable development; the economic system and wildlife and fisheries resources: welfare economics and wildlife and fisheries resources; optimal utilization of wildlife and fisheries resources, efficiency, equity, market and the role of government in resource allocation; valuation: the need to value the wildlife and fisheries resources, types of economic values, valuation techniques, valuing benefits; identification and valuation of marketed and non-marketed inputs and outputs in wildlife and fisheries resources management; macro and micro-economic aspects of wildlife and fisheries resource management: demand, supply, optimal rate of production, concepts of cost in wildlife and fisheries resources; wildlife and fisheries resources and the national account; wildlife and fisheries resources- based investment and other economic development; case study.

Wildlife-Based Tourism and Ecotourism WFRM351

Credit hours: 3, Year: III, Semester: I

Background and historical development of tourism; Basic concepts in ecotourism and its forms; nature and characteristics of ecotourism and wildlife-based tourism; Reasons for developing ecotourism and wildlife-based tourism; wildlife-based tourism and wildlife ecology; wildlife-based tourism and wildlife area management; impacts of wildlife-based tourism and ecotourism; wildlife-based tourism and photography; wildlife-based tourism policy formulation and development; the art of wildlife-based tourism management (tourist attraction potential assessment, planning, infrastructure and tourist facilities development, monitoring and evaluation); community oriented wildlife-based tourism management; wildlife-based tourism in Ethiopia (potentials, achievements, limitations, future prospects)

Practical Sessions:

Field trip to wildlife potential areas where wildlife-based tourism and ecotourism is practiced, film show recorded on wildlife-based tourism and ecotourism.

Wildlife Resources Utilization WFRM323

Credit hours: 3, Year: III, Semester: I

Introduction to wildlife resources utilization; historical background and development of wildlife resources utilization technology; types of wildlife resources utilization (consumptive and non-consumptive utilization); wildlife resources utilization and population dynamics; wildlife utilization and criminology; databases of wildlife resources utilization technology; wildlife farm establishment and management (infrastructure

planning and development, potential assessment, selection of species, capturing, breeding and utilization/ cropping technology); wildlife utilization planning and policy issues; wildlife utilization and game management in wildlife protected areas; community-based wildlife utilization and management; Manage the techniques how to handle firearms in wildlife utilization areas, processes and systems of wildlife resources utilization; sport hunting techniques in wildlife controlled hunting areas; financial and infrastructure development in wildlife utilization areas; wildlife utilization technology models; small-scale wildlife utilization technology; wildlife resources utilization techniques in developed and developing countries; wildlife resources utilization of Ethiopia (opportunities, attempts, limitations and future prospects.

Practical session:

Field trip to wildlife farm and utilization areas of Ethiopia,
Film show recorded on wildlife farming and utilization technology.

Wildlife Management I WFRM325

Credit hours: 2, Year: III, Semester: I

Definition and types of wildlife conservation and management; reasons for conserving wildlife resources; process of wildlife management; managing wildlife protected areas; selection of sites for wildlife protected areas establishment; databases of wildlife management (habitat and wildlife inventory and monitoring techniques, management data from dead wild animals, management from sex and age data); firearms management in wildlife protected areas.

Practical Sessions:

Study field tour to some wildlife potential areas (protected areas) of Ethiopia; Wild animals censing, habitat inventory and evaluation of population size with other habitat parameters; Wildlife film show concerning wildlife populations and habitat management techniques.

Indigenous Knowledge and Conflict Management NaRM311

Credit Hours: 3, Year: III, Semester: II

Theoretical background to the concept of conflict: the dialectical, functional, exchange and structural models of conflict; the causes, the function and consequence of conflict; ways of converting conflict to cooperation: formal and informal mechanisms of conflict resolution, proactive and reactive approaches to conflict in wildlife and Fisheries resource management; common property management mechanisms; the concept of indigenous knowledge, survey of traditional systems of wildlife and Fisheries resource management; some common features of traditional wildlife and Fisheries resource management as opposed to scientific method; indigenous systems of resource management by resource types; indigenous and scientific knowledge systems: complementary or contradictory; limitation of indigenous knowledge: power disparities between social groups. Fire as a tool in traditional resource management.

Practical Sessions:

Video show from best experiences; Field visit: observation, discussion and interview; Field visit to some selected sites of known indigenous practices of resource management

Senior Seminar in WFRM WFRM369

Credit hours: 1, Year: III, Semester: I

Identification of relevant research problems related to their fields of study and proposal

writing by the students in consultation with advisors nominated by the department; oral presentation of the proposal for evaluation, comments and approval.

Project planning NaRM481

Credit hours: 3, Year: III, Semester: II

Concept of development and planning; systems and levels of planning; functional relationships between plans, programs, and projects; concept of development projects; phases of a project: project identification, formulation, appraisal, implementation, and monitoring (implementation, effectiveness, and validating monitoring) and evaluation (ongoing, interim, terminal, and ex-post evaluation); framework of a project document; Logical Framework Approach (LFA); feasibility studies from financial, economic, technical, environmental and social perspectives; investment criteria in project planning and other cognate sectors; valuation techniques for project inputs, outputs, outcomes, and impacts; cost-benefit analysis of development projects; cost effectiveness analysis.

Extension in Natural Resource Management NaRM 359

Credit hours: 2, Year: III, Semester: I

Philosophy, principles and purposes of extension; principles of adult learning; communication: its role, process, diffusion and adoption models, innovation, skills and barriers to effective communications; extension methods: individual, group, mass methods; how to work with people: working with formal and informal leaders; extension campaign in wildlife and Fisheries resource management; extension program: planning, organization, implementing, monitoring and evaluation; The role of government and NGO's in extension.

Entrepreneurship Development BaSc414

Credit Hours: 3, Year: III, Semester: I

Entrepreneurship and entrepreneurs; historical perspectives of entrepreneurship; motivation and entrepreneurship; the role of entrepreneurship in socioeconomic development; entrepreneurial competencies; marketing and planning; legal aspects of entrepreneurship.

Participatory Wildlife Resource Management WFRM322

Credit hours: 2, Year: III, Semester: II

The concept of participation in natural resource management; strategies for participation; Methods of promoting participation; participatory methods; stakeholder analysis; local-level information gathering and planning (PRA/RRA, participatory action research); project/program planning tools; multi-stakeholder collaboration; large group interventions; joint/collaborative natural resource management; monitoring and evaluation of participation; institutional support for participation.

Practical Sessions:

A participatory project preparation on a selected topic.

Wildlife Policy and Law WFRM324

Credit hours: 3, Year: III, Semester: II

Wildlife as natural and public resource; traditional and legal status of wildlife reserve among natural resources property. The rights of the public to wildlife resource; wildlife-human interaction, land use competition and the need for policy(ies); objectives of wildlife policy(ies) and law(s); state-centered and society-centered policy making models; procedure for formulating and implementing wildlife policy and laws; wildlife

policy and laws as conflict management tools. The historical account of game laws in Ethiopia and current situation; Federal and Regional governments' role in wildlife management; issues and constraints. International conventions and Ethiopia's wildlife policy direction.

Practical Sessions:

Indoor policy making and evaluation exercises will be given.

Conservation of Wetlands WFRM326

Credit hours: 2, Year: III, Semester: II

Characteristics of wetland ecosystems: peculiarities of wetland ecosystem requirements and values; wetland ecosystem functions, productivity and growth limiting factors; restoration of wetland ecosystems, methods and practices of wetland ecosystem management; the socioeconomic environment of wetlands; wetland ecosystems management conventions; assessment of needs, constraints and options of wetland management in Ethiopia.

Practical Sessions:

Field evaluation and characterization of wetland ecosystems and their functions.

Wildlife Management II WFRM328

Credit hours: 3, Year: III, Semester: II

Man and wildlife management; wildlife conservation education; management of game and non-game species in wildlife protected areas; management actions for over abundant population; wildlife immobilization techniques; control of problem wild animals; wildlife translocation techniques; management of rare and endangered species; management of exotic species in wildlife protected areas; guide lines to formulate wildlife management plan; infrastructure planning and development in wildlife protected areas; evaluating the effectiveness of wildlife management plan; community-integrated wildlife conservation and management; wildlife conservation and management in Ethiopia: attempts, achievements, limitations and opportunities.

Practical Sessions:

Study field tour to some wildlife potential areas (protected areas) of Ethiopia, Identification of some wild mammal and bird species and formulating management plan, Wildlife film show concerning wildlife populations and habitat management techniques.
NB. The field tour for the courses Wildlife Management I and II can be combined together.

Fisheries Technology WFRM312

Credit hours: 2, Year: III, Semester: I

Topics about the processes involved and facilities used for harvesting and post harvest handling of fish are the main theme of this course. These include fish capture methods; production, maintenance and handling of fishing gears (nets, hooks boats etc) as well as post harvest handling technology of fish such as work under our conditions deserve special emphasis.

Practical Sessions:

The practical include fish capture methods, maintenance and handling of fishing gears, handling of harvest technologies

Soil and Water Conservation NaRM461

Credit hours: 2, Year: III, Semester: II

Effects of population growth on agriculture and other major socio-economic

development; water behaviour in relation to soil texture; soil erosion and erosion process; physical and human factors influencing soil erosion; models of soil erosion; measurement and assessment methods of soil erosion; strategies and types of soil conservation practices including indigenous soil and water conservation practices and their suitability to various land use types and agro-ecological zones; indigenous soil and water conservation and management practices.

Practical Sessions:

Field observation of the different types of soil erosion; practical application of Universal Soil Loss Equation; assessment of soil erosion in the field; propose suitable conservation measures based on USLE; the use of line level to laying out soil conservation structures; construct soil bund, *fanyajuu* terraces and cutoff drains; study tour to Hosanna and Wolayta

Environmental Impact Assessment NaRM411

Credit hours: 2, Year: III, Semester: II

Consequences of environmental degradation; sustainable development; concepts and importance of environmental regulations used in general practice; environmental quality (EQ), EQ attributes; resource and accounts; format for envisagement; principles and elements of environmental assessment: types of environmental assessments, when to use them, data/information required, how data/information should be collected and analyzed and communicated; impact analysis checklist and network analysis; impact index; actual case study of EIA of development projects taking different exemplary cases; environmental monitoring, mitigation measures; social impact assessment, scope and state of development of social impact assessment; format of social impact assessment; forecasting methods; EIA legislation, procedures and practice.

Practical Sessions:

An educational tour to a selected development project to carry out EIA practices and reporting

Senior Research Project in WFRM WFRM352

Credit hours: 2, Year: III, Semester: II

Data collection based on proposal prepared as a requirement for the course, Senior Seminar, data organization, analysis and interpretation of their own research work and final report writing in consultation with the advisor assigned by the department; submission of finally commented research report of the findings as a partial fulfillment of the degree in the department.

Community Oriented Practical Education (COPE) in WFRM

Credit hours: 6, Year: III, Semester: II

This is a practical attachment whereby the students go to different wildlife and fisheries resources management and development organizations to get practical skill by applying the knowledge and experiences gained during their study time in the department; a close supervision is made by the department as a part of the practice; the students will be familiar with the working system of their future career and this will enable them to look into what and how they learn from their department.

Debut University
Wondo Genet College of Forestry

Workshop on curriculum development for Undergraduate natural Resource Management programs (November 6-7, 2004).

Time	Program	Presenter	Chairperson/Secretary
Opening Session			
8.30	Registration	Receptionist	
9.00	Welcome Address	De. Abdu Abdelkadir	Abdu/Zebene
9.15	Opening Address	Dr. Tesfaye Teshome	
9.30	Background	Dr. Badege Bishaw and Dr. Zebene Asfaw	
10.00	COFFEE BREAK		
Group work on individual program			
10.30	Soil resources and Watershed management	Mersha G/Hiwot	To be selected
	Natural Resource Economic and policy	Girma kelboro	To be Selected
	Nature conservation and eco truism	Tefera Mengistu	To be Selected
	Wildlife and Fisheries	Solomon Ayele	To be Selected
10,45	Discussion on individual program	Participants	To be Selected
13.00	LUNCH IN ASSEMBLY HALL		Committee
<i>Afternoon Session</i>			
14.14	Group discussion Continue	Participants	To be Selected
9,45	Coffee Break		Committee
16.00	Group discussion Continue	Participants	To be Selected
17.00	The last part of the day		

November 7 in the morning

Time	Program	Presenter	Chair Person/Secretary
8.30	Group report and discussion	Participants	Dr. Melaku Bekele
10.30	COFFEE BREAK		Committee
	General Discussion		Dr. Abdu Abdulkadir
	Closing remark		De. Abdu Abdulkadir
12.00	Lunch		Committee

List of Participants, Natural Resource Curriculum Review Workshop

No.	Name	Institution
1	Dr Teshome Yizengaw	Ministry of Education
2	Ms. Marion McNamara	Oregon State University - USA
3	Dr. Badage Bishaw	Oregon State University - USA
4	Dr Huluf G/Kidan	Alemaya University, Department of Plant Science
5	Dr.Wegayehu Bekele	Alemaya University, Department of Economics
6	DR Lisanework Nigatu	Alemaya University, Department of Plant Science
7	Ato Yonas Sefere	Ministry of Agriculture and Rural Development, Soil Management
8	Ato Fikadu Tilahun	Ministry of Agriculture and Rural Development, Water Management
9	Ato Mahdere Mulugeta	EARO-Forestry Research Centre
10	Ato Mulatu Fikadu	Addis Ababa University (AAU), Department of Economics
11	Ato Tesfaye Zegeye	EARO-Economic Sector
12	Professor Zerihun Wolde	Addis Ababa University, Department of Biology
13	Dr. Solomon Amossa	EARO Wondo Genet
14	Dr Taye Bekele	EARO-National Soil Research Centre
15	Ato Getachew Tesfaye	Ministry of Agriculture and Rural Development, Wildlife Sector
16	Ato Kassa Tadele	Arbaminchi University, Department of Hydrology
17	Dr. Tesfaye Bekele	EARO-Forestry Research Centre
18	Dr Hailu Sharew	USA
19	Ato Ermais Aynekulu	Mekele University, Department of Land Resources Management
20	Ato Girma Amente	GTZ-Adaba Dodola Participatory Forest Management
21	Dr. Assefa Mebrate	Addis Ababa University, Department of Biology
22	Dr.Zelalem Tefera	NGO-Wolf project
23	Ato Alemayehu Girma	Ethiopian Natural History and Wildlife Society
24	Dr. Minasie Gashaw	Ministry of Agriculture and Rural Development, Wildlife Sector
25	Ato Mateos Ersado	Institute of Biodiversity Conservation
26	Ato Kesela Mengistu	Ministry of Water Resources Development, Hydrology Sector
27	Ato Girma G/Kidan	Ministry of Agriculture and Rural Development, Training Sector
28	Ato Mengistu Kindu	EARO-Forestry Research Centre
29	Dr. Eyilachew Zewdie	Jimma University, Ambo Agricultural College
30	Ato Mikael Assefa	FARM-AFRICA Southern Region project
31	Dr Tesfaye Teshome	Academic Affairs and Research Vice President Debub University (DU)
32	Ato Denbela Gelo	DU-Awassa College Agriculture, Department of Economics
33	Ato Kebebe Ergano	DU-Awassa College Agriculture, Department of Economics
34	Ato Tamirat Andargie	DU-Dept. Biology
35	Ato Mengistu Dinato	DU- Social Sciences
36	Dr. Sheleme Beyene	DU-Awassa College Agriculture, Department of Dryland Agriculture
37	Dr. Ealias Dedebo	DU DU-Awassa College Agriculture, Department of Animal Science
38	Dr. Yosef G/Giorigis	DU DU-Awassa College Agriculture, Department of Animal Science
39	W/ro Aster Abebe	DU DU-Awassa College Agriculture, Department of Animal Science
40	Ato Kidane Fanta	CTEHS College of Teachers Education
41	Ato Yoseph	Addis Ababa University, Department of Biology
42	Tefera Belay	DU-Wondo Genet College of Forestry-WGU
43	Ato Agena Angelo	DU-Wondo Genet College of Forestry (DUWGCF)
44	Ato Amare Tesfaye	DU-Wondo Genet College of Forestry (DUWGCF)
45	Ato Bereket Roba	DU-Wondo Genet College of Forestry (DUWGCF)
46	Ato Birhanu Biazin	DU-Wondo Genet College of Forestry (DUWGCF)
47	Ato Dejene Alemu	DU-Wondo Genet College of Forestry (DUWGCF)

48	Ato Dimamu Mesfin	DU-Wondo Genet College of Forestry (DUWGCF)
49	Ato Fantahun Yimer	DU-Wondo Genet College of Forestry (DUWGCF)
50	Ato Geberyesus Tenagashaw	DU-Wondo Genet College of Forestry (DUWGCF)
51	Ato Girma Kelboro	DU-Wondo Genet College of Forestry (DUWGCF)
52	Ato Kahsu Gebru	DU-Wondo Genet College of Forestry (DUWGCF)
53	Ato Mahammed Ali	DU-Wondo Genet College of Forestry (DUWGCF)
54	Ato Mamo Kebede	DU-Wondo Genet College of Forestry (DUWGCF)
55	Ato Megeressa Debelie	DU-Wondo Genet College of Forestry (DUWGCF)
56	Ato Mesele Negash	DU-Wondo Genet College of Forestry (DUWGCF)
57	Ato Motuma Tolera	DU-Wondo Genet College of Forestry (DUWGCF)
58	Ato Neguisse Bekele	DU-Wondo Genet College of Forestry (DUWGCF)
59	Ato Solomon Ayele	DU-Wondo Genet College of Forestry (DUWGCF)
60	Ato Tadele Zewdie	DU-Wondo Genet College of Forestry (DUWGCF)
61	Ato Teferra Mengistu	DU-Wondo Genet College of Forestry (DUWGCF)
62	Ato Tesfaye Ashine	DU-Wondo Genet College of Forestry (DUWGCF)
63	Ato Tesfaye Teklay	DU-Wondo Genet College of Forestry (DUWGCF)
64	Ato Teshale W/Amanual	DU-Wondo Genet College of Forestry (DUWGCF)
65	Ato Yared Girma	DU-Wondo Genet College of Forestry (DUWGCF)
66	Ato Yemiru Tesfaye	DU-Wondo Genet College of Forestry (DUWGCF)
67	Ato Yibeltal Tebekew	DU-Wondo Genet College of Forestry (DUWGCF)
68	Ato Yidnekachew Habte	DU-Wondo Genet College of Forestry (DUWGCF)
69	Ato Yohanis Zergaw	DU-Wondo Genet College of Forestry (DUWGCF)
70	Ato Yosef Melka	DU-Wondo Genet College of Forestry (DUWGCF)
71	Ato Zerihun Asrat	DU-Wondo Genet College of Forestry (DUWGCF)
72	Ato Zerihun Demirew	DU-Wondo Genet College of Forestry (DUWGCF)
73	Dawit Tegybelu	DU-Wondo Genet College of Forestry (DUWGCF)
74	Dr. Abdu Abdulkadir	DU-Wondo Genet College of Forestry (DUWGCF)
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80	Dr. Zebene Asfaw	DU-Wondo Genet College of Forestry (DUWGCF)
81	Dr. Zewdu Eshete	DU-Wondo Genet College of Forestry (DUWGCF)
82	Dr Takele Deresse	DU-Wondo Genet College of Forestry (DUWGCF)
83	W/ro Belaynesh Zewdie	DU-Wondo Genet College of Forestry (DUWGCF)
84	W/ro Hadia Sied	DU-Wondo Genet College of Forestry (DUWGCF)
85	W/ro Mersha G/Hiwot	DU-Wondo Genet College of Forestry (DUWGCF)
86	W/rt Addisalem Ayele	DU-Wondo Genet College of Forestry (DUWGCF)
87	W/rt Bezashwork Melaku	DU-Wondo Genet College of Forestry (DUWGCF)
88	W/rt Hiwot Workagegnehu	DU-Wondo Genet College of Forestry (DUWGCF)
89	W/rt Tigist Yihmenahe	DU-Wondo Genet College of Forestry (DUWGCF)
90	W/rt Yehwalashet Tesfaye	DU-Wondo Genet College of Forestry (DUWGCF)
91	Ato Amlaku Bikis	AAU-WGCF
92	Ato Solomon Zewedie	AAU- DUWGCF
93	Ato Tola Gemechu	AAU- DUWGCF
94	Ato Fikadu Gemechu	AAU- DUWGCF
95	Ato Hussien Seid	AAU- DUWGCF



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