

TRIBHUVAN UNIVERSITY
INSTITUTE OF FORESTRY

**Course Catalogue of
Master Degree Program**



Institute of Forestry
Hariyokharka
Pokhara, Nepal
2010

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1. INTRODUCTION

1.1 Institutional Setting

The Institute of Forestry (IOF), of the Tribhuvan University, is the pioneer institution in Nepal providing professional level training and preparing manpower in the field of forestry and related natural resources management. Initially it was started as Nepal Forestry Institute in Kathmandu in 2004 B.S. (1947 A.D.). It was shifted to Suping (Bhimphedi), Makwanpur in 1957 and then to Hetauda in 1965 in better facilities developed under technical and financial assistance received from the Government of India through the Indian Cooperation Mission under the Department of Forests, His Majesties Government of Nepal. After its incorporation into the Tribhuvan University in July 1972, it became the Institute of Forestry. Until late 1970s IOF trained only sub-professional or technical grade forestry manpower (Rangers etc). In 1981, IOF expanded its academic program to a two-year certificate in forestry level and Bachelor of Science in Forestry degree. The Bachelors degree programme was shifted to its new campus premises in Pokhara developed with the financial assistance from the World Bank (WB) and International Development Agency (IDA), and technical assistance from the United States Agencies for International Development (USAID). IOF has received further development assistance from USAID, International Tropical Timber Organization (ITTO), the Government of India and others.

Currently, IOF operates at two campuses: one in Pokhara and another in Hetauda, having the same academic programs, i.e. Technical Certificate in Forestry and Bachelor's in Forestry. IOF added Master of Science in Forestry degree programme in 2001. IOF is collaborating currently with NORAGRIC of the Agricultural University of Norway (AUN) in implementing one semester of its Master of Science in Management of Natural Resources and Sustainable Agriculture (MNRSA) programme partially at Pokhara Campus. The campuses are administered by the Campus Chiefs under the leadership of the Dean of Institute of Forestry.

1.2 Mission and Objectives of the Institute of Forestry

The mission of IOF is to develop technically sound and competent, and socially compatible human resources in the field of forestry and natural resource management.

The objectives of IOF are :

- ◆ to design and implement educational programs that can address the needs and interest of the country in the area of forestry and allied fields.
- ◆ to prepare competent and practically oriented professional foresters and efficient managers in the area of natural resource management
- ◆ to develop academic environment and encourage faculty members and students in their professional and career development activities.

- ◆ to encourage research activities that can address the practical problems of farmers and communities at large.
- ◆ to develop IOF as the *Center of Excellence* in forestry education.

2. MASTER DEGREE PROGRAMMES

The Institute is implementing the Master Degree programmes in different areas with the following objectives:

2.1 Objectives

The Institute of Forestry, as a pioneer institute in the area of forestry and natural resource management education in Nepal, is implementing the Master degree programmes in different areas with the following objectives:

General objective: The objective of the program is to produce well-trained and practically equipped human resources in the area of forestry and allied fields which can cater to the various needs of the country as a whole.

Specific objectives:

- i. To produce high level technical manpower who are capable of providing services according to the needs of various clients (government, semi-government, and private companies/ industries).
- ii. To produce self-reliant and practically oriented resource managers who can initiate their own enterprises in the area of forestry and forest based industries and also provide consultancy services to other interested individuals and organizations.
- iii. To utilize under-used resources of IOF and explore other potential resources and make IOF as a *center of excellence* in the area of teaching, research and extension in forestry.
- iv. To develop professional relationships with various organizations (Government, bilateral and multilateral forestry projects in Nepal), donor agencies, and other in-country and out-country academic and research institutions IOF provide the necessary exposure in the outside world.

2.2 Name of the Degree

M. Sc. (Forestry)

M.Sc. (Watershed Management)

M.Sc. (Natural Resource Management and Rural Development)

2.3 Course Duration and Academic Session

M. Sc. degree will be of a two-year course program. Each year will be divided into two Semesters and there will be altogether four Semesters. First three semesters will have course works and the Fourth semester will be allocated for research, thesis writing and presentation. However, students will have to start planning their thesis work right from the second semester in consultation with the Advisory Committee.

2.4 Student Intake

I. M.Sc. (Forestry)

A total of 25 + 1 seats are available in M. Sc. Forestry programme of study at the IOF, Pokhara. These seats are allocated as following:

- a) Low tuition fee **15 seats**
- b) High tuition fee **10 seats** (8 seats for Nepalese citizens and 2 seats for foreign nationals)
- c) One seat for IOF staff.

II. M.Sc. (Watershed Management)

A total of 15+1 seats are available in M.Sc. Watershed Management programme as:

- a. Low Tuition fee - 10 seats
- b. High Tuition fee - 5 seats
- c. One seat for IOF staff

III. M.Sc. (Natural Resource Management and Rural Development)

A total of 15+1 seats are available in Natural Resource Management & Rural Development Programme as:

- a. Low Tuition fee – 10 seats
- b. High Tuition fee – 5 seats
- c. One seat for IOF staff

2.5 Admission Requirement

I. Master of Science in Forestry:

An applicant must have at least a 3 years B. Sc. Forestry degree from TU or recognized by the Tribhuvan University.

II. Master of Science in Watershed Management (WM):

An applicant must have at least a 3 years B.Sc. Forestry degree or B.Sc. Agriculture or B.Sc. Environmental Science or B.Sc Environmental Management or BE (Civil Engineering) or BE. (Agriculture Engineering) or BE. (Environmental Engineering) or B.Sc. degree with major in any of the following subjects: Soil or Geology or Hydrology or Metrology, from the Tribhuvan University (T.U.) or from a university recognized by the Tribhuvan University.

III. Master of Science in Natural Resource Management and Rural Development (NRMRD):

An applicant must have at least a 3 years B.Sc. Forestry degree or B.Sc. Natural Resource management or B.Sc. Environmental Science or B.Sc. Environmental Management or B.Sc. Agriculture or B.E. (Agriculture Engineering) from the Tribhuvan University (T.U.) or from an university recognized by the Tribhuvan University.

To be eligible in all these programmes, foreign applicants should have studied their undergraduate courses in English medium. Staff seat will be reserved only for IOF staff members who have B. Sc. Degree in one of the above subjects as mentioned. Senior faculty members will get priority. However, all applicants who

apply for admission in these programmes must pass the entrance examination administered by the Institute.

2.6 Admission Procedure

Interested and eligible candidates can apply for admission to the M.Sc. degree program of study by filling out the prescribed application forms along with the documents and credentials as mentioned below. Application forms and program brochures are available upon request for Rs. 200.00 (Two Hundred Rupees only) by the Nepalese citizens. Nepalese applicants are required to pay Rs. 1500.00 as an entrance examination fee with the application. Foreign nationals are required to pay US \$ 25.00 at the time of submission of application. The completed application along with the documents and credentials should reach the Admission Committee in advance.

2.6.1 Documents and Credentials to be submitted.

1. Academic transcript of B.Sc. degree with respective fields. In case an applicant is a graduate of an university other than the Tribhuvan University, he/she should submit a certificate of migration and of recognition and equivalence of his/her educational qualification from Curriculum Development Centre, TU.
2. Character Certificate.
3. Citizenship Certificate for Nepalese candidates.
4. Three recent passport sizes photographs
5. Candidates for the IOF staff seat must submit a no objection certificate from his/her Campus Chief and must be officially nominated by the IOF.
6. Candidates from other countries must have a proof of financial support.

2.6.2 Entrance Examination

Nepalese applicants are required to appear in a three-hour long entrance examination. Objective preferably multiple choice type questions will be given in the entrance examination. Syllabus for entrance examination covers all the courses related to forestry and natural resource management of B. Sc. Forestry programme. Full marks of the exam will be 300 and an applicant must secure a minimum of 40 % (120 marks) marks to pass the test. The final merit list of applicants will be prepared by adding 20 % marks of the B. Sc. Degree to 80% of percentage of the marks obtained by the respective candidate in the entrance examination. Names of candidates who pass the entrance test will appear in the result list on merit order. Foreign applicants will be selected on the basis of their grades secured in the B.Sc. Degree. In case seats reserved for foreign students remain vacant, these will be considered the high-tuition fee seats for Nepalese applicants. Candidates will be selected on the basis of their merit. In case, seat in high tuition fee remain vacant, successful Nepalese applicants applied for low tuition fee in the merit list will be given opportunity for admission by paying the high tuition fee.

2.7 Advisory System

An advisory committee of two to three members (one Major Advisor and One/two Co-Advisors) will be formed by the M.Sc. management committee to guide research and thesis work of individual student after the students are admitted in

the second semester. At least one faculty with a Ph.D.degree in related discipline or at least a Masters Degree in related discipline and with a teaching or research experience of at least 10 years will be assigned as major advisor of each student. One to two co-advisors with master degree in related discipline and work experience within or outside IOF/TU will be nominated to guide the research and thesis work. The committee, in consultation with the concerned department and the student, will decide the major advisor for each student's research and thesis work.

2.8 Evaluation and Examination System

In order to successfully complete the M.Sc. course of study and to pass it, students must secure a minimum of 40% marks in theory, practical and term papers separately. A term paper will be assigned in those subjects having no practical, which will carry 20% of the total weightage of the theory course. Thesis will be evaluated by internal examiner (Advisor) and external examiner. Thesis will be evaluated on the basis of following criteria:

Description	Percentile
Excellent	80% and above
Very good	65% to less than 80%
Good	50% to less than 65%
Fair	40% to less than 50%

Note: Reason should be given if marks are given below 50% and above 80%.

Students must take a written test in each subject at the end of the semester .After successful completion of the course, student's performance will be evaluated by using the following criteria:

Description	Percentile
Distinction	80% and above
First Division	65 % to less than 80 %
Second Division	50 % to less than 65 %
Pass	40 % to less than 50 %

2.9 Award of Degree

A student will become eligible for the award of the M.Sc. Degree only when she/he completes all the course requirements that are prescribed by the Institute. No partial degree shall be awarded, in case a student fails to fulfill the requirements. After successful completion of the prescribed programme of study, the Examination Board, Tribhuvan University shall issue an official academic transcript

2.10 Fee Structure

The following fee structure is applicable in the M.Sc programme of study at the IOF.

S.No.	Particulars	Amount (NRs.)	
		Year I	Year 2
1	Registration Fee	1500	----
2	Low tuition Fee @ NRs.20000 per semester	40,000	40,000
3	High Tuition Fee for Nepalese Students @ NRs.70000 per semester	1,40,000	1,40,000
4	High Tuition Fee for Foreign Students @ US \$ 1625 per semester	US \$3,250	US \$3,250
5	Exam Fee Per semester @ NRs.2500	5,000	5,000
6	Hostel Fee per semester @ NRs.3000 (If provided)	6,000	6,000
7	Library Fee per semester @ NRs.1000	2,000	2,000
8	Internet/ Computer Fee per semester @ NRs.2000	4,000	4,000
9	Student welfare Fee @ NRs.	500	----
10	Institutional Development Fee @ NRs.	2,000	----
11	Thesis defense Fee		5,000

Notes :-

- a) Additional Fee, on actual cost basis, will be charged for GIS course to all students other than the full-fee or high-fee paying ones.
b) Similarly, additional fee on actual cost basis will be charged for practical exercises of elective courses when offered, to all students other than the full-fee paying or high-fee paying ones.
2. Selected candidates have to arrange their own accommodation. Currently the hostel facility is not available at IOF.

3.0 Course Curricula and Organization

Courses offered in M.Sc. Programmes

S.No.	Subject	Code	Credit	Page
1	NTFP	FPE 701	2	17
2	Community Forestry and Governance	SFM 702	2	66
3	Natural Resource Economics	SFM 703	2	31
4	Global Environmental Change	WME 704	2	36
5	Advance Silviculture	SFB 705	2	52
6	Biodiversity Conservation and Protected area Management	PWM 706	2	38
7	Economics of Development and Finance	SFM 707	3	33
8	Society, Culture and Forestry	SFM 708	2	26
9	Watershed Management	WME 709	3	61
10	Soil Genesis and Geomorphology	WME 710	2	68
11	Agroforestry	SFB 751	2	50
12	Statistical method and Data Management	SFM 752	3	24
13	Ecotourism Planning and Management	PWM 753	2	41
14	Sustainable Forest Management	SFM 754	3	20
15	Biometrics	SFM 755	2	64
16	Wildlife Biology	PWM 756	2	93
17	Rural Development	SFM 757	3	74
18	Conservation and Rural Development	SFM 758	2	75
19	Soil Conservation Engineering and Watershed Rehabilitation	WME 759	2	58
20	Land Evaluation and Land Use Planning	WME 760	2	71
21	Research Methodology and Participatory Action Research	SFM 801	2	28
22	Geographical Information Science	WME 802	4	87
23	Advance Forest Ecology	SFB 803	2	81
24	Watershed Hydrological Issues	WME 804	2	55
25	Project Management	SFM 805	2	84
26	Forest Protection	SFB 806	2	78
27	Bio-energy	FPE 807	2	15
28	Programming C++	FPE 808	2	90
29	Conflict Management in NRM	SFM 809	2	46
30	Experiential Learning	SFM 810	2	94

M.Sc. in Forestry

S.N.	Course Code	Course Title	Credit Hours
First Semester			
1	FPE 701	Non timber Forest Products	2
2	SFM 702	Community Forestry & Governance	2
3	SFM 703	Natural Resource Economics	2
4	WME 704	Global Environmental Change	2
5	SFB 705	Advanced Silviculture	2
6	PWM 706	Biodiversity Conservation & Protected Area Management	2
			12
Second Semester			
7	SFB 751	Agroforestry	2
8	SFM 752	Statistical Methods & Data Management	3
9	PWM 753	Ecotourism Planning & Management	2
10	SFM 754	Sustainable Forest Management	3
11	SFM 755	Biometrics	2
12	PWM756	Wildlife Biology	2
			14
Third Semester			
13	SFM 801	Research Methodology	2
14	WME 802	Geographical Information Science	4
15	SFB 803	Advanced Forest Ecology	2
16	SFM 805	Project Management*	2
17	SFB806	Forest Protection	2
18	FPE807	Bio-energy*	2
19	FPE808	Programming in C++*	2
20	SFM810	Experiential Learning*	2
21	R&T851	Seminar I (Proposal Presentation)	1
			13
Fourth Semester			
22	R&T852	Thesis	10
23	R&T853	Seminar 2 (Thesis Defense)	1
			11
Total			50

* Elective Courses (Any one course is required for registration from the group of elective courses)

An elective course will be offered only when at least seven students registered for the course.

M.Sc. in NRMRD

S.N.	Course Code	Course Title	Credit Hours
First Semester			
1	FPE 701	Non timber Forest Products	2
2	SFM 702	Community Forestry & Governance	2
3	SFM 703	Natural Resource Economics	2
4	WME 704	Global Environmental Change	2
5	SFM 707	Economics of Development & Finance	2
6	SFM 708	Society Culture & Forestry	2
			12
Second Semester			
7	SFB 751	Agroforestry	2
8	SFM 752	Statistical Methods & Data Management	3
9	PWM 753	Ecotourism Planning & Management	2
10	SFM 754	Sustainable Forest Management	3
11	SFM 757	Rural Development	2
12	SFM 758	Conservation and Rural Development	2
			14
Third Semester			
13	SFM 801	Research Methodology	2
14	WME 802	Geographical Information Science	4
15	SFM 805	Project Management	2
16	FPE 807	Bio-energy*	2
17	FPE 808	Programming in C++*	2
18	SFM 809	Conflict Management in NRM*	2
19	SFM 810	Experiential Learning*	2
20	R7T 851	Seminar 1 (Proposal Presentation)	1
			13
Fourth Semester			
21	R&t852	Thesis	10
22	R&t853	Seminar 2 (Thesis Defense)	1
			11
		Total	50

* Elective Courses (Any two courses are required for registration from the group of elective courses)

An elective course will be offered only when at least seven students registered for the course.

M. Sc. In Watershed Management

S.N.	Course Code	Course Title	Credit Hours
First Semester			
1	FPE 701	Non timber Forest Products	2
2	SFM 702	Community Forestry	2
3	WME 703	Natural Resource Economics	2
4	WME 704	Global Environmental Change	2
5	WME 709	Watershed Management	3
6	WME 710	Soil Genesis & Geomorphology	2
			13
Second Semester			
7	SFB 751	Agroforestry	2
8	SFM 752	Statistical Methods & Data Management	3
9	SFM 757	Rural Development	2
10	SFM 758	Conservation and Rural Development	2
11	WME 759	Soil Conservation Engineering & Watershed Rehabilitation	2
12	WME 760	Land Evaluation & Land Use Planning	2
			13
Third Semester			
13	SFM 801	Research Methodology	2
14	WME 802	Geographical Information Science	4
15	SFM 804	Watershed Hydrological Issues	2
16	SFM 805	Project Management*	2
17	FPE807	Bio-energy*	2
18	FPE808	Programming in C++*	2
19	SFM810	Experiential Learning*	2
20	R&T851	Seminar 1 (Proposal Presentation)	1
			13
Fourth Semester			
21	R&T852	Thesis	10
22	R&T853	Seminar 2 (Thesis Defense)	1
			11
		Total	50

* Elective Courses(Any two courses are required for registration from the group of elective courses)

An elective course will be offered only when at least seven students registered for the course

Notes:

1. Any one of the above programmes may be suspended if less than 5 students are enrolled.
1. One **Credit Unit** earned in 20 lecture hours or its equivalent work, carries 25 full marks
2. One **Lecture Hour** is of one-hour duration
3. Seminar consists of oral and presentation.
Seminar - 1: Each student presents the rationale, objectives and methodology, and demonstrates the capability of conducting research on the selected topic.
Seminar - 2: Each student defends his/her research and thesis.
4. Each student will choose his/her research topic, prepare a research proposal on it and submit it at the seminar (851) in the third semester. He/she must submit the final proposal no later than the first day of the fourth semester and carry out the research work during this semester according to their accepted research proposal. Research and Thesis work (852) will be graded in the fourth semester. He/she must defend his/her thesis in a final seminar (853) as a part of the evaluation.
5. Finding the financial and material resources for the research work will be the responsibility of the students themselves.

3.4 The Credit System

Each subject will be assigned certain credits. One credit unit, earned in 20 lecture hours or its equivalent work, carries 25 full marks. One lecture hour may normally require an hour lecture, three to five hours of laboratory work or its equivalent of field practical work. A graduate student will earn a total of 50 credits (minimum 38 credits of course work 12 credits for Research and Thesis) for successful completion of the Master of Science Degree requirements.

3.5 Description of Courses

COURSE CODE: FPE 701
COURSE TITLE: **NON-TIMBER FOREST PRODUCTS**
CREDIT HOUR: 2

General Objectives: After completion of this course one will be able to plan, analyze, implement and manage NTFPs in general and specific.

Specific objectives: The students will be able to

- i. Understand the classification, uses and nursery practices of NTFPs
- ii. Analyze harvesting, resource assessment and value addition of NTFPs
- iii. Examine management, policy, practices and trade and marketing of NTFPs
- iv. Understand enterprises and certification of NTFPs

UNIT 1. INTRODUCTION, CLASSIFICATION AND USES OF NTFPs (4)

- 1.1 Introduction - definition, terms used, MFPs, NWFPs, and NTFPs
- 1.2 Importance
- 1.3 Classification based on parts and uses
- 1.4 Commercial value Important NTFPs and their uses
- 1.5 Ethno-botanical knowledge and their importance

UNIT 2. NTFPs Based LIVELIHOOD (5)

- 2.1 NTFPs based Livelihood strategy
- 2.2 Livelihood Assets and framework
- 2.3 NTFPs and rural Livelihood

UNIT 3. NURSERY PRACTICES (4)

- 3.1 Nursery practices of important NTFP species
- 3.2 Propagation techniques of important NTFP species

UNIT 4. CULTIVATION AND DOMESTICATION (4)

- 4.1 Importance of domestication and cultivation of NTFPs
- 4.2 Domestication process of Important of NTFPs
- 4.3 Cultivation Practices

UNIT 5. HARVESTING OF NTFPs (4)

- 5.1. Importance
- 5.2 Tools and techniques
- 5.3 Sustainable harvesting
- 5.4 Season of harvesting

UNIT 6. RESOURCE ASSESSMENT OF NTFPS (4)

- 6.1 Importance
- 6.2 Resource assessment techniques
6.2.1: General and Specific

UNIT 7. PROCESSING AND VALUE ADDITION OF NTFPs (5)

- 7.1 Importance
- 7.2 Challenges and opportunities

- 7.3 Processing techniques of major NTFPs
- 7.4 Role of entrepreneurs/enterprises/communities in processing and value addition
- UNIT 8. NTFPS MANAGEMENT (4)
 - 8.1 Importance
 - 8.2 NTFPs in community based forest management
 - 8.3 NTFPs-oriented forest management
 - 8.4 Formulation of NTFPs management plan
- UNIT 9. IMPORTANT NTFPS INDUSTRIES (5)
 - 9.1 NTFPs based industries in Nepal
 - 9.2 Prospects and Problems of Industrial Development
 - 9.3 Scope of Community Based NTFPs Industries
- UNIT 10 POLICY AND PRACTICES FOR CONSERVATION OF NTFP SPECIES (5)
 - 10.1 Policy & regulation for NTFP conservation (National)
 - 10.2 Red data book (CITES categories)- International
 - 10.3 Conservation assessment and management planning (CAMP) categories
 - 10.4 Stakeholders and Institutions involved in conservation practices
 - 10.5 Impact of climate change on conservation of NTFP
- UNIT 11. TRADE AND MARKETING OF NTFPs (4)
 - 11.1 Importance of trade and marketing of NTFPs
 - 11.2 Policy and regulations of NTFPs marketing (National/International)
 - 11.3 Benefit sharing and community support
 - 11.4 Fundamentals of marketing (themes and principles)
- UNIT 12. ENTERPRISE OF NTFPs (5)
 - 12.1 Prospects and potential
 - 12.2 Community based enterprises
 - 12.3 Promotion of enterprises for local development
 - 12.4 Enterprise development approaches
 - 12.4.1 Value chain analysis
 - 12.4.2 Sub sector analysis
 - 12.5 Preparation of enterprise development plan
- UNIT 13. CERTIFICATION OF NTFPS (4)
 - 13.1 Importance and types of certification
 - 13.2 General procedure of certification
 - 13.3 Policy and regulations related to certification(GATT, WTO, CITES,SAPTA etc)

Note: Local field visit of a NTFP based Processing Unit.

References:

1. Non Timber Forest Products of Nepal: published by I.C. Dutta, WWF, ANSAB, LFP/DFID etc.

2. Forest Certification Seed Tree Nepal, UNDP, GEF-SGP Nepal, 2004; SGP Publication 01/2004
3. Cultivation of selected medicinal plants: National medicinal plants board, Dept. of Ayush, New Delhi, 2004
4. NTFP inventory guidelines of FAO, SDC etc..
5. Policy Act, Regulation of GoN in NTFP Sector
6. International Agreements on NTFP
7. Published literatures on different issues of NTFPs
8. Series of published papers on NTFPs.
9. Minor Forest Products; M. P. Shiva and R. B. Mathur, Centre of MFP Publication, Dehradun
10. Indian Forest Utilization; FRI, Dehradun Publication
11. Minor Forest Products by Krishnamurty, India
12. Linking Plant-Based Enterprises and Communities to Bio-diversity Conservation by Bhisma Subedi, ANSAB, Nepal
13. Enterprize Development for Natural Products Manual, ANSAB, Nepal
14. Manual of Forest Utilization by S. Chowdhary, IOF, Hetauda, 2003

Course Code: SFM 702

Course Title: Community Forestry and Governance

Credit Hour: 2

The general objective of the course is to enhance students' understanding of a new concept and theory of community based forest management. Moreover, the course is designed to enhance students' understanding of principles and issues related to community based forest management planning and implementation, and skills in the promotion and facilitation of community forestry processes as well.

The specific objectives of the course are:

- To understand the theory of common property resources
- To learn the emergence of community forestry in the context of Nepal
- To recognize the challenges in community forestry
- To give the students a thorough understanding of community based forest management and good governance

Unit 1. Prevalent concepts and issues (10)

1.1 Common Property Resources – Tragedy of commons

1.2 Population pressure on resources

1.3 Community based forest management (Six different management models in Nepal)

1.4 Sustainable development perspective

1.4.1 Human development perspective

1.4.2 Balancing ecological and social economic dimension

1.4.3 Sustainable livelihood framework (vulnerability context, capital formation and their flow, institutions and processes, livelihood strategies and outcomes)

Unit 2. Community forestry in regional and global context (5)

2.1 Community forestry policy and practices from Asia/Africa/South America

2.2 Global climate change, local community and community forestry

2.3 Contribution of community forestry to global environment

Unit 3. Community forestry in Nepal (25)

3.1 Evolution of community forestry in Nepal

3.1.1 Privatization, nationalization and participatory approaches in forestry

3.1.2 Basic premises of community forestry (use right and equity)

3.1.3 Challenges in community forestry (case studies from mid-hills and tarai focusing on conflicts at national and local level)

3.2 Stakeholders (government, non-government, civil society and private sector) in community forestry

3.3 Stakeholder analysis (role, responsibilities, authorities, accountability and effectiveness)

3.4 Contribution of community forestry to people's livelihood

3.4.1 Livelihoods, poverty and conservation

3.4.2 Poverty concept defined by World Bank, DFID and NLSS

3.4.3 Does community forestry contribute to poverty reduction?

3.4.4 Contribution of community forestry to people's livelihood (five capitals)

Unit 4. Governance in community forestry (10)

4.1 Decentralization and devolution

4.2 Central Government roles for effective decentralization

4.3 Principle of good governance (major elements such as accountability, transparency and rule of laws)

4.4 concept and practices of REDD

4.5 The importance of good governance for REDD

Course Code : SFM 703
Course : **Natural Resource Economics**
Credit hr. – 2
Lecture hours : 50

General Objectives: .

The course will provide the students with knowledge of resource economics to enable them to utilize the theory and tools of economics for the management of natural resources.

- Unit 1: Introduction to Natural Resources 4
1. Meaning and types of natural resources.
 2. Issues in defining property right.
 3. Climate change and its adaptation
 4. Role and threshold of resource extraction: Concept of max. Sustained yield.
- Unit 2: Economics of Natural Resources 12
1. Production Function: Cobb-Douglas/CES production function.
 2. Environment as input in production function analysis.
 3. Externality in production and consumption: Positive & negative
 4. Externalities in natural resource management : Forest management, watershed management, Bio-diversity and protected area management
 5. Environmental policy measures for managing externalities
 - a. Control and command Vs. market instrument
 - b. Fiscal policy instruments (Taxes & Subsidies)
- Unit 3: Institutional Economics and Natural Resource Management 6
1. Concept of institution and institutional framework.
 2. Characteristics of effective institutions
 3. Concept and analysis of transaction cost.
 4. Conflict and cooperation in Natural Resource Management
- Unit 4: Environment and Development 10
1. Concept and indicators of sustainable development: Weak and strong sustainability.
 2. Sustainability Rules: Hartwick approach, London School approach, safe minimum standard approach, Harman Daly's operational principles.
 3. Sustainable accounting (Green Accounting): Integrated Environmental and Economic Accounting (IEEA)
 4. Poverty-Environment and Development Linkages.
- Unit 5: Economic Valuation of Environmental Resources 18
1. Need for valuation of environmental services of nature
 2. Concepts of values: Use versus exchange value; Use versus non-use value; consumptive versus non-consumptive value; option value; existence value; Bequest value.
 3. Valuation methods: Direct and indirect methods.
 - a. Production function approaches
 - b. Travel cost methods
 - c. Hedonic price approaches
 - d. Cost-Benefit analysis

- e. Contingent valuation: Willingness to pay (WTP) and willingness to accept (WTA)
- f. Application of valuation methods in forest management, Bio-diversity conservation, Soil and Water conservation

References:

1. Bhatteai, Lekhnath, "Poverty Environment Linkages: An Appraisal of available literature". The Economic Journal of Nepal.
2. Das Gupta, Partha, The place of Nature in Economic Development. SANDEE working paper. No.38-09, 2009
3. Gunatilake, Herath M. Environmental valuation: Theory and Application South Asia Network for Devt. And Env. Economics.
4. Hanley, Nick, Jabon F. Shogren and Ben white, Environmental Economic in theory and Practice (Chap. 13), Machillan India Limited, (Latest edition)
5. Kadekodi, Gopal K. Environment and Development In Rabindra, N. Bhattacharya edited Environmental Economics: An Indian perspective, Delhi: Oxford University Press, India, 2006.
6. Ostrom, Elinor: Governing the Commons, Cambridge Publication
7. The Journal of Environment and Development Vol.14(1) Sage Publication.
8. Titenberge, Tom, Environmental and Natural resource Economics. (Latest edition). Pearson Education India.
9. Vincent Jeffery R. The Environ as a production Input: A Tutorial, SANDEE working paper 32-08, May 2008

COURSE CODE: WME 704
COURSE TITLE: **GLOBAL ENVIRONMENTAL CHANGE**
CREDIT HOUR: 2

General Objectives : The course and design to provide student with Global Environmental knowledge, climate change, impact and adaptation as well as international/national policy and protocol.

Specific Objectives : After completing the course student will learn

- Climate change and Global Environmental Issues
- Major impact on climate change
- Policy and program of adaptation/mitigation measures in national and international level

UNIT 1 GLOBAL ENVIRONMENTAL ISSUES	5
1.1 Physical (Global warming, Pollution, Ozone Depletion, Acid rain)	
1.2 Biological (Loss of biodiversity, Deforestation)	
1.3 Socio-economic (Industrialization, Urbanization, Migration)	
UNIT 2 CLIMATE SCIENCE	5
2.1 History of Climate	
2.2 Climate Change	
2.3 GHGs Emission	
2.4 Climate Models (GCM, RCM)	
UNIT 3 IMPACTS OF CLIMATE CHANGE	10
3.1 Agriculture-Food Security	
3.2 Water Resources-Snow and Glaciers, River Discharge	
3.3 Human health, animal, plant	
3.4 Biodiversity-forest, Rangeland	
3.5 Wetlands ecosystem	
3.6 Settlement and Infrastructure	
3.7 Gender and Livelihood	
3.8 Indigenous Communities	
UNIT 4 CARBON POOLS AND FLUXES (DYNAMICS)	6
4.1 Methods of Carbon Sequestration	
4.2 Terrestrial, Aquatic and Atmospheric Carbon Pools	
4.3 Carbon Emission	
4.4 Aquatic ecosystem, Soil, Forest	
4.5 Land use Change and its effect on Carbon Pool	
UNIT 5 ADAPTATION AND MITIGATION	8
5.1 Planned and self-adaptive measures	
5.2 Local/regional/national/international adaptation strategies	
5.3 Indigenous knowledge and practices	
5.4 Alternative energy and clean energy technology	

- 5.5 Crop diversification
- 5.6 Afforestation and Reforestation, Management of degraded lands

UNIT 6 CONVENTION, INTERNATIONAL POLICIES AND PROTOCOLS 5

- 6.1 Desertification
- 6.2 Biodiversity
- 6.3 Wetlands & Range lands
- 6.4 Traditional knowledge to cope with climate change
- 6.5 UNFCCC
- 6.6 IPCC
- 6.7 Kyoto protocol
- 6.8 Bali Action Plan
- 6.9 COP Accord

UNIT 7 ENVIRONMENTAL POLICIES AND LEGISLATION OF NEPAL 6

- 7.1 REDD (Reducing Emission from Deforestation & Forest Degradation)
- 7.2 NAPA (National Adaptation Plan of Action on Climate Change)
- 7.3 Environment Act 2053 B.S.
- 7.4 Environmental Regulation 2054 B.S.
- 7.5 Environmental Strategy of Nepal 1987 A.D.
- 7.6 Payment for Environmental Services (PES)

EXERCISE: 10

- 1 Case Study
- 1 Term Paper
- 1 Seminar
- 1 Field Work

References:

1. Global Environmental Chang
2. Environmental Assessment of Nepal, ICIMOD 2006
3. ISET-Nepal Report
4. IPCC Report
5. Kraft, M.E. 2007. Environmental Policy and Politics, Fourth Edition. New York: Pearson Longman.
6. UN Report/IPCC Report=2008
7. Government documents/NAPA documents

Course Code : SFB 705
Course Title : **Advance Silviculture**
Credit hours : 2

General objective :

On completion of this course the student are expected to gain the necessary advance knowledge & skills of silviculture for the management of different forest types and for different purposes.

Specific objective :

The student will acquire the analytical knowledge and skills in :

- i) Forest genetics and Tree improvement
- ii) Plantation forestry and Natural regeneration techniques
- iii) Application of Silvicultural Systems
- iv) Growth function, dynamics of forest stand and urban forestry

Unit 1: Plantation Forestry (8)

- 1.1 Introduction and scope
- 1.2 Plantation in Nepal
- 1.3 Plantation in the tropics
- 1.4 Afforestation of difficult sites

Unit 2 : Forest Genetics (8)

- 2.1 Genetic material
- 2.2 Gene expression and interaction
- 2.3 Hybridization
- 2.4 Mutation and polyploidy
- 2.5 Speciation
- 2.6 Population genetics

Unit 3 : Tree Improvement (6)

- 3.1 Selection
- 3.2 Provenance test : Clonal and progeny
- 3.3 Seed orchards
 - 3.3.1 Importance and scope
 - 3.3.2 Establishment
 - 3.3.3 Management

Unit 4 : Natural Regeneration techniques (8)

- 4.1 Introduction to silvicultural systems
- 4.2 Natural Regeneration
- 4.3 Regeneration Techniques
 - 4.3.1 Canopy manipulation for light, seed supply and soil condition.
 - 4.3.2 Burning for regeneration
 - 4.3.3 Slash management

Unit 5 : Silvicultural management of forest (Application of silvicultural systems) (8)

- 5.1 User group forest (Hill and Terai)
- 5.2 Government forest (Hill & Terai)
- 5.3 Forest on private land

- 5.4 Multiple use forest management – For timber production, fuelwood production, NTFPs production, wildlife & recreation
- 5.5 Effects of application of silvicultural systems on
 - 5.5.1 Soil and water conservation, soil nutrients
 - 5.5.2 Wildlife and wildlife habitat
 - 5.5.3 Recreation

Unit 6 : Quantitative silviculture (8)

- 6.1 Growth function – Emperical, Exponential, Allometry and Backmen’s growth function
- 6.2 Growth cycle and phases, co-relation between size and plant population
- 6.3 Probability of individual tree mortality
- 6.4 Models of tree mortality and yield for unthinned forest stands
- 6.5 Dynamics of unevenaged forest
- 6.6 Competition for space, light and nutrients in forest stands and their effect on population
- 6.7 Plant geometry and self thinning, stand structure and allometry of trees during self thinning of pure stand.

Unit 7: Urban forestry (4)

- 7.1 Establishment and maintenance of tree in urban environment
- 7.2 Benefits of urban forest
- 7.3 Stress management in urban trees
- 7.4 Field practice in evaluating urban green space & tree resources

Exercise :

Course Code: PWM 706

Course Title: **Biodiversity Conservation and Protected Areas Management**

Credit Hours:- 2(60% lecture + 40% practical is proposed)

General objectives:

This course will offer a broad landscape level perspective to biodiversity conservation, protected area management and wildlife management.

Specific objective:

- Understand current policies and approaches to biodiversity conservation, protected area and wildlife conservation
- Analyze, evaluate and prepare holistic management plan of PAs
- Develop capability to collaborate research activities linking with management
- Understand the human dimensions in biodiversity conservation measures

Unit .1. Introduction

- 1.1 Concept and significance of biological diversity (forest, wetland, rangeland, agriculture, corridor and connectivity)
- 1.2 Protected area management concept
- 1.3 Conservation biology
- 1.4 Introduction to urban ecology

Unit. 2. Biodiversity status at global, regional, national level with special focus to Himalayas (HKH)

- 2.1 Status of biodiversity at global, HKH region and Nepal

Unit. 3. Policy, legislation and multilateral environmental agreements at global and national level

- 3.1 Global and regional policies and legislations (conventions and trade and treaties, CITES, CITESMIKE, CBD, IUCN, RAMSAR, GTF, GTI, UNESCO World Heritage Convention, conservation strategy, MEA)
- 3.2 National level strategies - NBS, All species action plans, MPFS,
- 3.3 Critical analysis of Acts and regulations related to environment, biodiversity, PA, forest

Unit 4. Wildlife management in the tropics

- 4.1 Population management –local (meta population, island biogeography, species recovery plans, Ex-situ and in-situ conservation for eg. Translocation/reintroduction, Wildlife farming, measures to curb poaching – (role of the army, community based Anti poaching operations, Anti poaching units park based, wildlife crime investigation)
- 4.2 Habitat management -Landscape ecology (eco-region, biomes, biodiversity hotspots, corridor and connectivity, habitat restoration plans, grazing and fire management, rangeland management, wetland, invasive species)

- 4.3 Management and maintenance of ecological processes- climate change (O₂ and CO₂, nutrient cycling, hydrological cycle, dendrochronology)

Unit 5. Monitoring Biodiversity

- 5.1 Population Monitoring
 - 5.1.1 Direct method – direct counts, vantage point sampling, sweeping techniques, flushing, etc.
 - 5.1.2 Indirect method – Camera trapping surveys, DNA based surveys, Sign based surveys, Telemetry studies, etc.
 - 5.1.3 Data analysis – Capture/recapture techniques, Presence/absence analysis, ecological niche factor analysis, etc. , Use of softwares – PRESENCE, CAPTURE, DENSITY, EcoSim, etc.
- 5.2 Habitat Monitoring - habitat selection/resource selection, habitat suitability assessment, techniques, carrying capacity assessment, Animal food habit studies, habitat occupancy modeling
- 5.3 Management effectiveness of protected areas

Unit 6. Human Dimensions in Biodiversity conservation

- 6.1 Human-wildlife conflict
- 6.2 Human-wildlife conflict mitigation measures (BZ, conservation areas, community forests)
- 6.3 Wildlife rescue and orphanage management
- 6.4 Biodiversity, ecosystem services and poverty alleviation

Unit 7. Sustainability of Protected Areas Management

- 7.1 Payment for environmental services (PES)
- 7.2 Financing protected areas

Unit 8. Protected Areas planning and management

- 8.1 Planning model: conventional planning and modern planning
- 8.2 Components of plans
- 8.3 Exercise in planning

Field exercise:

References:

1. National Biodiversity Strategy 2002
2. IUCN WCPA 1993
3. Convention on Biological Diversity (CBD)
4. Biodiversity Action Plan
5. Convention on Biological Diversity's Programme of Work on Protected Areas and Programme of Work on Mountain Biodiversity
6. Buffer Zone Regulations 1996, Forest Act 1973 and amended one, Revised Forest Policy 2000, I
7. National Conservation Strategy Nepal
8. National Planning Commission (NPC) forestry focused

9. Nepal Poverty reduction strategy paper
10. Millennium Ecosystem Assessment (MEA) 2005
11. Payment for Environment Services by the World Bank
12. Mountain Forum Bulletin on PES 2010 published by the Mountain Forum
13. WWF Nepal RAPPAM 2006
14. WWF RAPPAM Guidelines 2003
15. Rinjan Shrestha-rinjan.shrestha@wwfnepal.org
16. Annual reports (DOF, DNPWC, MFSC)
17. Protected area management in tropics
18. Protected area management plans
19. Ramsar site management plans
20. Species action plans (Rhino, Tiger, Elephant, Snow leopard, Red Panda, etc.)
21. All project reports (DNPWC/PCP, WWG, WCN, CSUWN, WTLCP, WWF, NTNC, IUCN, ICIMOD, BCN)
22. Urban ecology course work- UMB course work (Ram Chandra Nepal jee to NTNC rcnepal@ntnc.org.np)
23. NAST to be cooperated- Dendrochronology

Course Code: SFM 707

Course Title: Economics of Development and Finance

Credit Hours: 2

General objective

On the completion of this course, students will gain knowledge on the concepts, theories, processes, and institutional as well as policy issues underlying economic development, microfinance and enterprise creation on relevant areas.

Specific objectives

On the completion of the course, the students will be able to:

- Understand the concept, paradigm and indicators of development
- Gain understanding about factors and contemporary issues in development
- Be familiar with stage growth theories and modern approaches to development
- Learn about concept, process and crisis of development planning
- Be acquaint with development policy issues
- Understand the concept and development of microfinance, and enterprise development
- Build a solid understanding of the microfinance sector and their legal formalities in Nepal
- Be able to examine the relationship between microfinance program, microenterprise development and their role in poverty reduction, sustainable livelihood, rural development and natural resource management
- Enable students to have necessary knowledge on micro-enterprises creation, support service and to prepare a business plan
- Impart understanding on marketing strategies, financial resources and their mobilization
- Be able to analyze issues and problem of development and finance from Nepalese prospective.

Part A: Development Economics

Unit 1: Concepts of Development

10

- 1.1 Various Development Concepts and Paradigm: Economic Growth Vs Economic Development, Growth plus Change, Participatory Development Approaches, Human Development, Sustainable Development
- 1.2 Indicators of Development: Single and Composite Indices (PQLI, HDI)

1.3	Factors of Development: Natural Resource, Human Resource, Capital, Technology, Value and Institution	
Unit 2: Issues of Development		8
2.1	Poverty and Inequality	
2.2	Agriculture, Industrialization and Development	
2.3	Policy issue: Liberalization, Globalization, Public –Private Partnership (PPP)	
2.4	Development Planning Issues: Concept and Process of Planning; Crisis in Planning	
Unit 3: Theories of Development		7
3.1	Stage Growth Theories: Marx and Rostow	
3.2	Modern Theories: Participatory Development Approaches, and Livelihood Approach of Local Development	
Part B: Microfinance and Enterprise Development		
Unit 4: Introduction and Role of Microfinance		5
4.1	Concept and Need of Microfinance	
4.2	Product and Services of Microfinance: Savings, Credit, Insurance, Transfer and Empowerment	
4.3	Microfinance Approaches: Individual Lending, Grameen Bank Solidarity Lending, Solidarity Group System, Village Banking, and Self-reliant Village Bank	
Unit 5: Role, Issues and Policies of Microfinance		6
5.1	Microfinance Rules and Regulation in Nepal	
5.2	Microfinance Institutions in Nepal: Informal and Formal	
5.3	Microfinance Programs in Poverty Reduction and Natural Resource Management	
Unit 6: Micro-Enterprise Development		4
6.1	Concept of Enterprise, Entrepreneur and Entrepreneurships	
6.2	Input, Training and Consultancy	
6.3	Process of Business Enterprise Development	
6.4	Micro-Enterprise and Rural Development	
Unit 7: Business Support Service and Marketing		5

- 7.1 Concept of Business Support Services
- 7.2 Concept of Marketing
- 7.3 Marketing Strategies
- 7.4 Financial Resources for Micro-Enterprises

Unit 8: Business Plan Formulation (Project Work)

5

- 8.1 Develop a Business Plan for Small Forestry or Agro-forestry or Related Micro-Enterprises

References:

1. Todaro, M. P. and Smith, *Economic Development*, Pearson Education, India.
2. Mishra and Puri, *Economic Development and Planning*, Himalayan Publishing House, Delhi.
3. Jhingan, M. L., *Economics of Development and Planning*, Vrinda Publications Pvt. Ltd., Delhi.
4. UNDP, *Human Development Reports* (Various Issues), Washington, D. C.
5. World Bank, *World Development Reports* (Various Issues), Washington, D. C.
6. National Planning Commission, *Plan Documents* (Different Plans), Kathmandu.
7. Central Bureau of Statistics, *Nepal Living Standard Survey, 2003/04, and 995/96*, Kathmandu.
8. Sen, Amartya, *Development as Freedom*, Oxford University Press, New Delhi.
9. Ledgerwood, Joanna, *Microfinance Handbook*, World Bank, Washington, D. C.
10. Panda, D. K., *Understanding Microfinance*, Wiley India Pvt. Ltd., New Delhi.
11. Bashyal, Rama, *Microfinance: Access to Finance for Nepal's Rural Poor*, Institute for Integrated Development Studies (IIDS), Kathmandu.
12. Rakhal, Dhaneshwar, *Microfinance Regulation in Nepal*, Organization for Integrated Research and Development, Pokhara.
13. Mathema, V. R., *Microfinance in Nepal*, Padma Mathema, Kathmandu.
14. Shrestha, Prakash (Ed.), *Impact of Microfinance Services on Poverty Reduction in Nepal*, SAP/INAFI-Nepal, Kathmandu.
15. Khanka, S. S. *Entrepreneurial Development*, S. Chand and Company Ltd., New Delhi.
16. Agrawal, G. R., *Entrepreneurship Development in Nepal*, M. K. Publishers and Distributors, Kathmandu.
17. Industrial Enterprise Development Institute, *Prepare Your Own Business Plan* (Text in Nepali), Kathmandu.
18. Kotler, P. and Armstrong, G. *Principles of Marketing*, Pearson Education, Delhi.
19. Thakur, Baleshwar (Ed.), *Perspectives in Resource Management in Developing Countries Vol. 1*, Concept Publishing Company, New Delhi.

COURSE CODE: SFM 708
COURSE TITLE: **SOCIETY, CULTURE & FORESTRY**
CREDIT HOUR: 2

General objective of the course is to build the capacity of students to plan and work effectively in multicultural society

The specific objective of the course are to make students able to :

- Understand the importance of culture in natural resource management.
- Describe the institution and governance related to natural resources.
- Explain the socio-cultural issues related to natural resource management.

UNIT1. INTRODUCTION: BASIC CONCEPTS (11)

- 1.1 The concept of culture and its relevance for NRM
- 1.2 The concept of natural resource: social and cultural perspectives
- 1.3 The concept of community: in the context of NRM
- 1.4 Pressure of population on resources: Different viewpoints
- 1.5 Human/Cultural Ecology: Understanding Empirical Diversities in NRM
- 1.6 Conservation and Ethics of Development
- 1.7 Knowledge Systems: Indigenous/Local, Traditional and Scientific

UNIT 2. RESOURCE MANAGEMENT INSTITUTION AND GOVERNANCE (14)

- 2.1 Forestry Sector
 - 2.1.1 Government/State Management: a) Policy, legislation and institutional framework, b) protected areas and conservation areas.
 - 2.1.2 Participatory/communal management: a) Local/Traditional systems: b) formal users Group approaches
- 2.2 Farming sector
 - 2.2.1 Government/state management: a) Policy, Legislation and Institutional Framework; b) Land tenure and taxation; c) Pasture and Livestock Development and Management
 - 2.2.2 Agriculture: Subsistence vs Market Orientation
 - 2.2.3 Livestock, Farm, Forestry Linkages
- 2.3 Water Resource
 - 2.3.1 Government/state management: a) Policy, Legislation and institutional framework
 - 2.3.2 Irrigation Schemes and Farmer Managed Irrigation Schemes.
 - 2.3.3 Management for: Hydropower, Household and other Uses by State and Communities

UNIT 3. SOCIAL AND INSTITUTIONAL ISSUES (25)

- 3.1 Disparities, Inequality and Stratification
 - 3.1.1 Social and Cultural-Caste, Ethnicity, Gender
 - 3.1.2 Economic and Regional - Class, Rural vs Urban
 - 3.1.3 Gender and Regional--Class, Rural vs Urban
 - 3.1.4 Women and NRM Women FUGs and Mothers Groups in Nepal).

- 3.2 Poverty Alleviation and Livelihoods
 - 3.2.1 Role of Forestry: Policies and Practice
 - 3.2.2 IGA: Farm, Off-Farm, Forest Product Based, Off-Forest, etc.
- 3.3 Local/Indigenous Knowledge and Practices
 - 3.3.1 Local/indigenous knowledge and intellectual property rights
 - 3.3.2 Local /indigenous people and conservation-Knowledge and practices
- 3.4 Land and Tree Tenure
 - 3.4.1 Tree Tenure: Concept and Practice
 - 3.4.2 Issues of Land and Resource Tenureship in Community Base Management
- 3.5 Decentralization and Devolution
 - 3.5.1 Analysis of Legal and Policy Frameworks including Local Self Governance Act.
 - 3.5.2 Decentralization/Devolution: Illustrations from Forestry Sector in Nepal'
 - 3.5.3 Participatory Management of Resources in Nepal: The Rhetoric and Reality
- 3.6 Conflict Management (5)
 - 3.6.1 Nature and Sources of Conflicts in NRM (e.g. Resource control as an issue)
 - 3.6.2 Formal and Informal Arrangements for Conflict Management

COURSE CODE:WME709

COURSE TITLE: **WATERSHED MANAGEMENT**

CREDIT HOUR: 3

GENERAL OBJECTIVE:

- The course is designed to provide students with a holistic and integrated outlook in the management of watersheds. Students will gain a mountain ecosystems perspective on the numerous aspects of watershed management for sustainable and environmentally compatible development, including watershed degradation , soil erosion processes/modeling, watershed analysis, project planning and research.

SPECIFIC OBJECTIVES:

More specifically, upon completion of the course students will:

- Be able to apply knowledge base of management principles in watershed resources
- Gain insight into land use effects on various types of watershed degradation and apply the knowledge for watershed management.
- Be able to conduct monitoring of watershed parameters and initiate research to study key processes and issues
- Be capable to analyze watershed conditions, status and processes and apply appropriate management practices.

UNIT 1: CONCEPT OF WATERSHED MANAGEMENT (2)

- 1.1.Management principles
- 1.2.Approaches to watershed management
- 1.3.Watershed resources base

UNIT 2 ANALYSIS OF WATERSHED RESOURCES (4)

- 2.1 Frame work for analysis (PSIR, SWOT)
- 2.2 Land use and land cover
- 2.3 Water availability & quality
- 2.4 Aesthetic & recreational uses of watershed

UNIT 3. THEORIES ON WATERSHED DEGRADATION (10)

- 3.1 Theory of Himalayan Environment Degradation (HED)
- 3.2 Poverty and social exclusion
- 3.3 Sustainable development theory

UNIT 4: LAND USE IMPACTS ON WATERSHED DEGRADATION (12)

- 4.1. Land use types and features
- 4.2. Agricultural impacts (farming practices, systems and cropping patterns)
- 4.3. Grazing impacts (vegetation, erosion, hydrological)
- 4.4. Forest degradation
- 4.5. Soil degradation
- 4.6. Land use changes (cause/effect relationships, drivers, direction & magnitude)
(Field trip to examine land use types and their impacts on watershed degradation)

UNIT 5: LAND AND SOIL DEGRADATION (4)

- 5.1 Land degradation process: deforestation, land slides & mass-wasting, soil erosion processes & mechanisms; soil fertility decline.
- 5.2. Road/trail construction and slope instability,
- 5.4 Nutrient deficiency symptoms, Hidden hunger,
- 5.5 Biological tests, Plant analysis,
- 5.6 Soil testing and soil testing facilities in Nepal, Interpretation of soil test results

UNIT 6: WATERSHED MONITORING AND RESEARCH (13)

- 6.1. Spatial and temporal scale of watershed monitoring and research (plot, sub-watershed, catchment; event: daily, monthly, annual, etc.)
- 6.2. Soil fertility and nutrient status and management
- 6.3. Research approach, needs & priorities assessment
- 6.4. Field experimental design and implementation (plot, paired catchments, etc.)
(Field visit to project and experimental sites)
- 6.5 Sedimentation Survey

UNIT 7: WATERSHED MODELLING (13)

- 7.1. Spatial and temporal considerations in modeling
- 7.2. Model types (empirical/process-based; continuous/event-based; lumped/distributed)
- 7.3. Scale issues in modelling processes
- 7.4. Examples of major model types (RUSLE, WEPP, EPIC, SWAT)
- 7.5. Advantages/disadvantages of model types
- 7.6. Comparative modelling and field experimentation
(Exercise on model development and application)

UNIT 8: WATERSHED PROJECT PLANNING (12)

- 8.1. Socio-economic aspects of bio-physical, social & institutional watershed projects (analysis tools & methods; case studies)
- 8.2. The project cycle
- 8.3. Project design
- 8.4. Plan preparation
- 8.5. Appraisal of alternatives
- 8.6. Plan implementation
- 8.7. Monitoring & evaluation

UNIT 9: WATERSHED MANAGEMENT PRACTICES (5)

- 9.1 Gender issues in watershed management
- 9.1 Participatory process
- 9.1 Ecosystem services and compensation
- 9.1 Best Management Practices (BMP)

EXERCISE :

Field oriented exercise and group works will be conducted. Each student will prepare paper dealing with watershed analyses and conditions assessment; sub-watershed planning; watershed project development; etc.

References:

1. FAO Bulletins_ Integrated watershed management
2. Participatory Integrated watershed management
3. Soil and water conservation practices
4. ICIMOD Publication

COURSE CODE: WME 710
COURSE TITLE: SOIL GENESIS AND GEOMORPHOLOGY
CREDIT HOUR: 2

General Objectives: This course gives the knowledge on general process of soil formation and how the soils are classified. It will help to examine the soil in the field. It will also help to know about the knowledge about landscape.

Specific objectives:

1. Be able to apply knowledge on soil survey, soil interpretation and classification.
2. Gain the knowledge in land form and Geomorphology.

UNIT 1. INTRODUCTION TO SOIL GENESIS (6)

- 1.1 Historical development
- 1.2 Perspective on the origin of the science of soil genesis
- 1.3 Some fundamental concepts of soil genesis
- 1.4 A soil as an anatomical specimen
- 1.5 A soil as an open system
- 1.6 Methods of soil genesis studies
- 1.7 Morphology of soils
- 1.8 Soil micro-morphology
- 1.9 Soil composition and characterization

UNIT 2. WEATHERING, SOIL FORMING AND DEVELOPING PROCESS (6)

- 2.1. Soil environment
- 2.2. Parent materials
- 2.3. Relief and landscape
- 2.4. Climate
- 2.5. Organisms
- 2.6. Time
- 2.7. Land form & its development

UNIT 3. PRINCIPLE AND HISTORICAL DEVELOPMENT OF SOIL CLASSIFICATION (12)

- 3.1 Nepalese traditional soil classification and nomenclature
- 3.2 Modern system of soil classification
- 3.3 FAO/UNESCO soil classification system
- 3.4 USDA seventh approximation system of soil classification
- 3.5 Soil orders available in Nepal and their distribution

UNIT 4. EXAMINATION OF SOIL IN THE FIELD (9)

- 4.1 Parent materials of soil
- 4.2 Landform relief and drainage
- 4.3 Identification and nomenclature of soil horizon
- 4.4 Soil colour

- 4.5 Soil texture, soil structure, and consistency
- 4.6 Soil reaction and its classes
- 4.7 Special feature of soil formation
- 4.8 Organic matter and roots
- 4.9 Accelerated soil erosion
- 4.10 Vegetation
- 4.11 Land use

UNIT 5 - PROCESS GEOMORPHOLOGY -AN INTRODUCTION (4)

- 5.1 Introduction/scope/Concept
- 5.2 Basics of process geomorphology
 - 5.2.1 The Delicate balance
 - 5.2.2 Force/Process/Resistance
- 5.3 Basin denudation

UNIT 6 - CLIMATE AND INTERNAL FORCES (3)

- 6.1 Introduction
- 6.2 The Endogenic effect
- 6.3 Climate Geomorphology

UNIT 7 - GLACIERS AND GLACIAL MECHANISM (3)

- 7.1 Introduction
- 7.2 Glacial origins and types
- 7.3 Mass balance
- 7.4 The movement of glaciers
- 7.5 Ice structures

UNIT 8- FLUVIAL PROCESSES AND LAND FORMS (6)

- Introduction
- The river channel
- Sediment in channel
- Channel pattern
- Flood plains
- Fluvial terraces
- Fans
- Delta
- Soil and landscape processes

Exercise: The students will carry out a survey of a given area and prepare a soil survey report

References:

1. Process geomorphology: Dele F. Ritter, WM.C Brown Publishers college division, 1986, ISBN no. 0-697-05047-5
2. Geomorphology " A systematic analysis of late Cenozoic landforms" : Arthur L. Bloom , Prentice hall of India Private limited New Delhi 1979

3. The Text book of Geology : G.B. Mahapatra, CBS Publishers & Distributors.
4596/1-A, Daryaganj New Delhi first edition 1987
4. Geology for Technical Student: Ranjan Kumar Dahal, Bhrikuti Academic
Publications, Blood Bank Complex, Exhibition road Kathmandu, Nepal.
5. Soil Genesis
6. Soil Taxonomy, USDA.

Course Code:SFB 751

Course Title : **Agro-forestry**

Credit hours : 2

General Objective:

Students will acquire advances of agroforestry & be able to utilize the knowledge and skills in agroforestry research & development.

Specific objectives:-

- Be familiar with agroforestry practices and their role in farming and forest system.
- Understand & describe A.F. system to contribute in rural livelihood and environment.

Unit 1: Introduction and description of A.F. system. (Review) (10)

- 1.1 Definition, system approach and classification of agroforestry system.
- 1.2 Agro-forestry in Nepal and South Asia
- 1.3 Farming system in Nepal and their linkage with agroforestry system
- 1.4 Farm land & forest based A.F. practices
- 1.5 Plant management in Agroforestry.
- 1.6 Contribution of Agro-forestry in rural economy.

Unit 2: Rural population and Agro-forestry management (5)

- 2.1 Characteristics of rural communities
- 2.2 Distribution of population & land resources
- 2.3 Factors influencing the promotion of A.F. system
- 2.4 Constrains in resource management in Agroforestry systems
- 2.5 Effects of resource depletion on environment & rural economy

Unit 3: Agroforestry & livelihood (7)

- 3.1 Models of AF system (agro-ecological zone) for improving livelihood.
- 3.2 Sustainable livelihood & food security for small holder in rural areas.
- 3.3 Problems and prospects of waste land development through agroforestry system.
- 3.4 Product diversification in community based forest management through agroforestry systems
- 3.5 Use of common land for income generation/livelihood improvement for poor and landless households
- 3.6 AF for sustainable soil management and nutrient cycling

Unit 4: Environment & climate change (5)

- 4.1 The role of A.F. system in conserving biodiversity
- 4.2 A.F. system & carbon sequestration potential & perspectives
- 4.3 Climate change adaptation in farming system through A.F.

Unit 5: The economics of agro-forestry project (8)

- 5.1 Introduction

- 5.2 Efficiency in A.F. system & project design
- 5.3 Distributive consideration in A.F. project design
- 5.4 Distortion of A.F. incentive
- 5.5 Evaluation of Agro-forestry (Financial & Economic)

Unit 6: Agro-forestry Research and development (8)

- 6.1 Agro-forestry Diagnosis and design (Complete research work)
- 6.2 Current trends in AF development
- 6.3 Participatory Research Design
- 6.4 Policies in AF development.
- 6.5 Role of NGOs & INGOs in prompting agroforestry

Unit 7: Issues and challenges in AF (7)

- 7.1 Exploitation of Forest Resources
- 7.2 AF in community based forestry
- 7.3 Institutional aspects of AF in Nepal
- 7.4 Population pressure and impact in AF.
- 7.5 Land tenure, ownership and agro-forestry

Exercise:

Field visit to local area

COURSE CODE: SFM 752
COURSE TITLE: **Statistical Methods and Data Management**
CREDIT HOUR:3 (2+1) (Th 50+Pr 25)

General objective:

On completion of the course students will be able to understand general concepts, meaning & use of statistics & develop basic skills for computing & interpreting the data, data mining & modeling of Social & Bio-physical sciences.

Specific objectives: Students completing the course should be able to:

1. Understand the meaning & types of different statistical constants.
2. Understand the importance of descriptive & inferential statistics.
3. Use major formal & non-formal experimental designs used in bio-physical & Social Sciences.
4. Understand and use different type of modeling.
5. Use different statistical software to explore & analyze data.

UNIT 1: INTRODUCTORY STATISTICS 5

1. Review of descriptive statistics
 - a. Data collection, primary and secondary data
 - b. Data tabulation, frequency distribution & cross tabulation, data presentation, stem & leaf plot, Box & whisker plot, Diagrams & Graphs.
2. Measures of central tendency, dispersion, skewness, kurtosis, correlation, Correlation matrix, Scatter plot.

UNIT 2: RANDOM VARIABLE & PROBABILITY 10

1. Random variable, probability computation, relative frequency, relative frequency plot, cumulative relative frequency plot, types of random variable, probability distribution, distribution function, central limit theorem.
2. Probability distributions: Binomial, Poisson & Normal distribution, Normal approximation of Binomial and Poisson probability, their applications
3. Variable transformation

UNIT 3: INFERENCE STATISTICS 15

1. Estimation: Parameters & statistics, Estimators & their properties, sampling & sampling distribution, sampling & non-sampling error, Point estimation, Interval estimation; confidence interval.
2. Hypothesis testing: Hypothesis; Null & alternative, one-tailed & two-tailed hypothesis, Errors in Hypothesis testing, type I & type II errors, level of significance, rejection region, critical values, p-value, power of the test.
 - a. t-test, Assumptions, property of t-variate, test for means, standard deviation, Simple correlation, regression coefficients.
 - b. χ^2 -tests, assumptions, properties of χ^2 -variate, condition & validity of χ^2 -test and its applications.
 - c. F-test: Variance ratio test, ANOVA : One way & two way ANOVA
 - d. Non-parametric tests: Median test, Mann whitney u-test, Kruskal, Wallis test, Friedman ANOVA, Wilcoxon sign rank test

UNIT 4: DESIGN OF EXPERIMENTS

10

Formal experimental designs CRD, RBD, LSD, Factorial experiments, Split plot design.

UNIT 5: DATA MODELLING

15

1. Two variable model, linear & Non-linear models, regression models, Assumptions estimation & testing
2. Multiple regression model, assumption, estimation & testing, coefficient of determination (R^2)
3. Regression with dummy variables:
Qualitative variable, categorical variable, regression with dummy explanatory variables, regression with dummy dependent variables, odd ratio, logit model.
4. Residual analysis, Residual plot, Multicollinearity: Definition, consequence, test, remedial
5. Time series analysis : Definition, components, seasonal index, trend analysis, data smoothing, Forecasting.

UNIT 6: USE OF STATISTICAL SOFTWARE AND PRACTICAL

Exercises on MS-Excel, SPSS, R, SAS²

References:

1. Basic Econometric – D.N. Gujrati
2. Bio Statistics - W.W. Denial
3. Business Research methods and statistics using SPSS – Burns and Burns 2009.
4. Elements of Statistics – David V Hunsborger and Patric Billingslev
5. Statistical manual for forestry research – FORSPA publication – K. Jayaramar
6. Zac, 1996 – Biostatistical Analysis
7. Non-parametric statistics – Sidney Siegel

Course code:- PWM 753

Course title:- **Eco-tourism planning and management**

Credit hour:- 2

General objective:

The overall objective of this course will be to build up the capacity of the students to plan and manage the tourism without damaging the natural and cultural environment for the benefits of communities.

Specific objectives:

The specific objectives will be to make students able to:

- Understand the philosophy, concept and evolution of eco-tourism
- Assess and manage social, economic and environmental impacts of eco-tourism
- Describe the management of ecotourism products and regions.

1.	INTRODUCTION TO ECOTOURISM	8
	1.1 Definitions of Ecotourism	
	1.2 Explain the history and evolution of ecotourism and sustainable development.	
	1.3 Identify mass and alternative tourism: advantages and disadvantages of ecotourism.	
	1.4 Explain the roots of conservation -ecosystem management and protected areas.	
	1.5 Describe the role of ethics in ecotourism.	
	1.6 Principles of eco-tourism	
2.	ECOTOURISM POLICY, ORGANISATIONS AND THE ECOTOURIST.	5
	2.1 Status of tourism and eco-tourism in the world and Nepal	
	2.2 Discuss organisation policy versus tourism policy global and national	
	2.3 Describe ecotourism typologies	
	2.4 Explain social advantages and disadvantages of ecotourism	
	2.5 Describe ecotourism and biodiversity	
3.	ECOTOURISM DEVELOPMENT: INTERNATIONAL, NATIONAL AND REGIONAL PERSPECTIVE	10
	3.1 Discuss the globalisation of ecotourism	
	3.2 Identify the development of the Asian and Himalayan range ecotourism product	

- 3.3 Discuss Asian and Himalayan ecotourism initiatives and joint projects
- 3.4 Identify community development and the destination
- 3.5 Discuss regional ecotourism projects
- 4. ECONOMICS OF ECOTOURISM 10
 - 4.1 Explain the economics of ecotourism
 - 4.2 Describe the Economic contribution of ecotourism locally, nationally and internationally
 - 4.3 Describe TQM (Total Quality Management) of Ecotourism Resorts
 - 4.5 Identify direct, indirect and induced economic effects
 - 4.6 Discuss the multiplier concept, types and limitations within the ecotourism destination.
- 5. MANAGEMENT AND MARKETING OF ECOTOURISM 10
 - 5.1 Identify Ecotourism products
 - 5.2 Explain the Marketing of ecotourism: development of appropriate strategies
 - 5.3 Discuss Management issues in ecotourism
 - 5.4 Describe the terms Eco-branding and Eco-labeling within the overall ecotourism product
- 6. ECOTOURISM AND THE ENVIRONMENT 7
 - 6.1 Discuss linking conservation and community
 - 6.2 Describe Sustainable tourism development
 - 6.3 Discuss alternative versus mass tourism
 - 6.4 Identify Ecotourism as a model for sustainable tourism
 - 6.5 The future of ecotourism: Key trends and future developments.
- 7. EXERCISE AND PRACTICES OF PLANNING TOOLS
 - Participatory approach- Sustainable tourism planning model (WTO model), ZOPP, APPA)
 - Development eco-tourism plan of an area
 - Case studies in ecotourism: international, national and regional.

Recommended Reading

Core Text			
Title	Authors	Publisher	Year
Ecotourism and Sustainable Development: Who Owns Paradise?	Honey, M.	Island Press	1998 and 2008
Ecotourism & certification : setting standards in practice.	Honey, M.	Island Press	2002
Last resorts: the cost of tourism in the caribbean	Pattullo, P.	Monthly review	2005
World travel	Baker, C.P	Warner books	1996
Ecotourism. An Introduction	Fennell A David	Routledge, London and New York	2003
Green travel guide	Neale, G.	Earth scan	1999
Ecotourism Impacts, potentials and possibilities	Wearing and Neil	Butterworth & Heinemann	2000

Eco-tourism		IUCN	
Readings in rural tourism	Upadhyay, R.P		2008
Tourist and tourism: Science and industry interface	Kunwar, R.R		2006

Supplementary Reading			
Title	Authors	Publisher	Year
Environmental Management and pathways to Sustainable Tourism	Swarbrooke J, Evans N, Long P, Sharpley R	The centre for travel and tourism in association with Business Education Publishers Ltd	2000
Tourism and Sustainability. Development and New Tourism in the Third world 2 nd Edition	Mowforth M, Munt I.	Routledge, London and New York	2003

Middleton, V. 1998. *Sustainable tourism : a marketing perspective*. Woburn, MA : Butterworth-Heinemann.

Stevens, S., ed. 1997. *Conservation through Cultural Survival: indigenous peoples and protected areas*. Washington, D.C.: Island Press.

Wearing S. and J. Neil. 1999. *Ecotourism : impacts, potentials, and possibilities*. Boston: Butterworth-Heinemann.

Weaver, D. 1998. *Ecotourism in the less developed world*. New York : CAB International.

COURSE CODE: SFM 754

COURSE TITLE: **SUSTAINABLE FOREST MANAGEMENT**

CREDIT HOUR: 3

General objectives:

The students will acquire knowledge and skills in applying in managing forests sustainability.

THE SPECIFIC OBJECTIVES : The student will acquire knowledge and skills in applying various tools and techniques in managing forests sustainably.

- Explain the concept of sustainable forest management.
- Analyze Forest management practices in Nepal and other countries.
- Apply tools of regulating forests and employ methods of optimal rotation determination
- Demonstrate ability to write forest management plans at micro and macro level.
- Explain the concept of forest certification, REDD and Natural Resource Policy.

UNIT 1.	INTRODUCTION	3
1.1	Sustainable forest management	
	1.1.1 Concept and approach	
	1.1.2 Practices	
	1.1.3 Criteria and indicator for SFM	
UNIT 2	History of forest management in Nepal.	5
2.1	Comparing forest management of developed countries / India to Nepal; what should be the approach to promote forest management in Nepal	
2.2	Community Forestry Concept and practices	
2.3	Private Forestry Concept and Practices	
2.4	Leasehold forestry Concept and Practices	
2.5	National Forest Concept and Practices	
2.6	Collaborative forest management	
UNIT 3.	NORMAL FOREST	4
3.1	Concept.	
3.2	Implication of the concept to forest management	
3.3	Applied aspects of Normal Forest Concept to Forest Management in Nepal.	
UNIT 4.	GROWING STOCK	4
	4.1 Introduction and definition of growing stock	
	4.2 Determination of growing stock by various methods	
UNIT 5:	ROTATION	3
5.1	Concept and types of rotation	
	5.1.1 Concept	
	5.1.2 Types of rotations	

5.1.3	Choice and length of rotation	
5.2	Rotation determination methods	
5.2.1	Biological criteria	
5.2.2	Financial / economic criteria	
5.2.3	Social / environmental criteria	
UNIT 6.	SUSTAINED YIELD AND SITE QUALITY	5
6.1.	Concepts and principles of sustained yield	
6.1.1	Concepts and definitions	
6.1.2	Prerequisites for sustained yield	
6.1.3	Limitations in Nepal's conditions	
6.1.4	Steps for achieving sustained yield	
	1. Yield types	
	2. Management steps for sustained yield	
6.2	Importance and determination of site quality	
6.2.1	Site assessment for potential production of a site	
6.2.2	Reasons for assessment (Land allocation and development planning, Choice of species, Growth of Species, Forecasting of growth and yield)	
6.2.3	Methods of Site Assessment	
6.2.4	Dominant height on age relationship	
6.2.5	Method of defining dominant height on age relationship	
6.2.6	Maximum means annual increment class	
UNIT 7:	YIELD REGULATION	7+1=8
7.1	Introduction to yield regulation	
7.2	Concept of yield regulation (by volume and area)	
7.3	Regulating plantation forest	
	7.3.1 Concepts	
	7.3.2 Applications	
7.4	Regulating natural forests	
	7.4.1 Concepts	
	7.4.2 Applications	
7.5	Allowable cut methods	
	7.5.1 Area control	
	7.5.2 Volume control	
	7.5.3 Combined area and volume control	
UNIT 8.	FOREST CERTIFICATION AND REDUCING EMISSION FORM DEFORESTATION AND FOREST DEGRADATION (REDD)	5
8.1	Origin and Importance of Forest Certification	
8.2	Methods of Certification	
8.3	Policy and Regulations of Certification	
8.4	Status of Forest certification in Nepal	
UNIT 9:	MATHEMATICAL PROGRAMMING (REVIEW ONLY)	4
	9.1 Linear Programming	
	9.2 Non-linear Programming	
	9.3 Dynamic Programming	
	9.4 Network analysis	

9.5 Simulation models

UNIT 10: FOREST RESOURCE PLANNING FOR MANAGEMENT	6
10.1 Working/management plan	
10.1.1 Definition, objectives and limitations	
10.1.2 Small scale forest management plan	
10.1.3 Organization of working plans	
10.2 Preparation of working plans	
10.2.1 Data collection	
-bio-physical	
-Socio-economical	
10.2.2 Maps and sketches	
10.2.3 General format	
10.2.4 Contents	
10.2.5 Write up of management plan	
10.2.6 Methods of updating	
UNIT 11: FOREST PLANNING / OPERATIONAL PLAN	4
11.1 Definition, objectives, need and scope of Community Forestry operational plan	
11.2 Steps in preparation of Operational Plan.	
11.3 Write up of operational plans for macro and micro level	
UNIT 12. POLICY DEVELOPMENT	6
12.1 History of Natural Resources Policy	
12.2 History of Nepalese Natural resources Policy formulation.	
12.3 Current issues in Natural resources Policy in Nepal.	
12.4 Approach to policy making	
12.1.1 Role of science in policy making	
12.1.2 Participatory policy making	
12.5 Evolution of Nepalese forest policy	
12.6 Analysis of selected countries NR Policy (More focus on developing countries).	
12.7 Natural Resources Policy Development process in Developed and developing countries.	
UNIT 13. EVALUATION OF POLICY	
13.1. Policy Evaluation Skills and Tools	
13.2. Application of Economics, social and Biological criteria for Policy Evaluation	
13.3. Case studies of Natural Resources Related Policies in Nepal, Forest Policy, Biodiversity conservation Policies, Environmental Policies, development Policies and Decentralization Policy and their Interrelationship with other Policies inflowing Natural resources use and management.	
UNIT 14. FUTURE DIRECTION OF NR POLICIES	4
14.1. Natural Resources Policy for supporting livelihoods of Rural People.	

- 14.2 NR policy for Human Capital and social capital formation.
14.3 NR policy Compatible to the Concept of Development in 21 centuries.

EXERCISE:

2. Practice in forest inventory and assessment
3. Normal forest analysis
4. Preparation of operational plan (including steps and method)

References :

1. Introduction to Forest Resource Management. William A. Leuschner. John Wiley & Sons. 1984
2. Forest Management. Ram Prakash. International Book Distributors. Dehradun. 1986
3. Measuring Trees and Tree Crops. M.S. Philips University of Dar es Salam. 1983.
4. Forest management. Lawrence. S. Davis and K. Norman Johnson McGraw Hill Book Company. 1987
5. Timber Management. A quantitative approach Clutter J.C. et al. John Wiley & Sons. 1983
6. Forest Measurements. T.E. Avery and H.E. Burkhardt. McGraw Hill Book Company. 1983.
7. IIFM. 2002. India : National Forest Policy Review Paper submitted at the 19th Session of Asia Pacific Forestry Commission. Mongolia. 22-30 Aug. 2002.
8. Saigal, S., Arora, H. and Rizvi, S. 2002. The New Foresters : The role of private enterprise in the Indian Forestry Sector International Institute of Environment and Development, London, UK
9. Davis, L.S., Johnson, K.N., Bettinger, P.S. and T.F. Howard. 2001. Forest Management. 4th Ed. McGraw Hill, New York.
10. FAO 2005. State of World's forests. FAO, Rome.
11. GON 2002. Leasehold Forest Policy. Ministry of Forest and Soil Conservation, Kathmandu.
12. DoF 1991. The Community and Private Forestry in Nepal Dept. of Forest, Kathmandu.
13. GOI 1998. National Forest Policy. Ministry of Environment and Forests, Govt. of India, New Delhi.
14. Nepal Forestry Hand book. 2004. FAO, Rome www.fs.fed.us/forestmanagement, www.recoftc.org/site

Course Code : SFM 755
Course Title : **Biometrics**
Credit hour : 2

General Objective: The student will be able to acquire in depth knowledge in Forest Mensuration and develop skills in volume calculation and forest sampling.

Specific Objectives:

The students will be able to :

1. Implement inventory programme for management.
2. Analyze growth and yield of various forest stands.
3. Understand various forest growth models.

UNIT 1. VOLUME AND BIOMASS OF TREES AND PRODUCTS	6
1.1 Measuring Single Tree and Stand	
1.2 Preparation of local and general volume tables (Regression technique)	
1.3 Preparation of merchantable volume table	
1.4 Biomass table and equations	
UNIT 2. GROWTH PREDICTION	8
2.1 Diameter, Basal area and volume growth	
2.2 Stand growth	
2.3 CAI, MAI	
2.4 Stand structure, site quality, and yield	
2.5 Stem and stump analysis	
UNIT 3. GROWTH AND YIELD	8
3.1 Growth and yield of even-aged forest	
3.2 Growth and yield of uneven-aged forest	
3.3 Different growth and yield modelling approaches (Distance independent Growth Models, Single tree distance Dependent Growth Models)	
3.3.1 Stand table projection	
3.3.2 Whole stand modelling	
3.3.3 Individual tree modelling	
3.4 Application of growth and yield models	
3.5 Yield table	
UNIT 4. FOREST SAMPLING	10
4.1 Principles and theory of sampling	
4.1.1 Sampling techniques	
4.1.2 Selection of sampling units	
4.1.3 The theory and application of sampling	
4.2 Types of Sampling	
4.2.1 Simple random sampling	
4.2.2 Stratified Random Sampling	
4.2.3 Cluster sampling	
4.2.4 Double or low phase sampling	
4.2.5 Systematic Sampling	

- 5.1.1 Inventory and scope
- 5.1.2 Strip system of cruising
- 5.1.3 Line plot system of cruising
- 5.1.4 Point sampling and relascope survey
- 5.2 Use of aerial photographs and satellite data in forest inventory
 - 5.2.1 Introduction and scope
 - 5.2.2 Interpretation of aerial photographs & satellite imageries
 - 5.2.3 Forest type classification
 - 5.2.4 Area and volume estimation
- 5.3 Forest inventory [Planning and execution, objectives of inventory, source of information, field measurement, statistical consideration, calculation, analysis and data capture, the execution of field work and control for accuracy, Security of inventory, records and events, results, recurrent forest inventory field work for recurrent inventory, types of plots (permanent plots, temporary plots, both permanent and temporary plots, in plantation and natural forest)]

Exercise:

- Regression models development (Volume Table)
- Inventory with Point Sampling
- Various Plot Sampling techniques (Circular, Square, Rectangular)

References :

1. Forest Measurements - T.E. Avery and H.E. Burkhart. McGraw Hill Book Company. 1983.
2. Forest Mensuration - H.B. Bertram; C.I. Miller and T.W. Beers
3. Forest Mensuration - A.N. Chaturbedi and L.S. Khanna
4. Measuring Tree and Tree Crops - M.S. Philips, University of Dar es Salam. 1983
5. Forest Management - Lawrence S. Davis and K. Norman Johnson. McGraw Hill Book Company, 1987.

Course Code: PWM 756
Course Title: **Wild Life Biology**
Credit Hours: 2

General Objectives:

- To familiarize with the biology of various threatened High altitude Nepalese species and understand their better management
- To study the adaptation of different species to understand their niche they occupy in the ecosystem

Specific Objectives :

- Acquire knowledge on Habitat ,diet and nutritional requirements of various Wildlife species
- To familiarize students about the Wildlife health management for conservation
- Link wildlife research and monitoring with management

Course contents:

Unit 1:Basic principles of Ecology: The concept of ecology, structure and functioning of an ecosystem. Significance of energy flow in various ecosystem types, the concept of limiting factors and community ecology

Unit 2 :Animal ecology: Feeding ecology of herbivores, carnivores, insectivores and omnivores ,temporal and spatial variation in food resources, estimation of carrying capacity and natural resources, reproductive ecology.

Unit 3: Habitat and Fragmentation:

- Introduction,
- Habitat specialists/generalists,
- Habitat types/availability/use/selection/Quality/Preference;
- Habitat loss
- Edge effect
- Metapopulation
- Technique for Wildlife Habitat Management

Unit 4: High Altitude Wildlife (A special World)

1. High Altitude Environment

- | | |
|--------------------------------------|-----------------------|
| a) Low air pressure | b) Cold temperature |
| c) Atmospheric aridity | d) High Wind velocity |
| e) Light | f) Snow cover |
| g) Local condition and micro climate | h) Biotic Factors |
| i) Valleys -- | |

2 High altitudes Wildlife

- | | |
|-----------------------------|--|
| a) Biogeographic affinities | b) Wildlife depletion in the Himalayas |
| c) Over exploitation by man | d) Need for conservation |

3 High altitude adaptations

- a) Structural (Morphological) adaptations
- b) Functional (Physiological) Adaptations
- c) Behavioral (Ethological) adaptation

4 High Altitude Mammals:

- | | |
|-----------------------------------|------------------------|
| a) Snow Leopard | b) Himalayan lynx |
| c) Himalayan Wolf | d) Wilddog (Dhole) |
| e) Himalayan Tahr | f) Blue sheep (Bharal) |
| g) Tibetan Sheep (Nayan / Argali) | h) Himalayan Musk Deer |

Unit 5 Wildlife Disease

1: History of Wildlife disease in Nepal, Wildlife health monitoring and evaluation (Problems and solutions) Ecology of diseases and maintenance of infection

2: Infectious and non infectious diseases of wild animals.

Unit 6: Research: Wildlife research priorities in Nepal, their scales of application, research issues. Wildlife monitoring- what, where, when and how?

Field exercises :

Course Code : SFM 757
Course Title : **Rural Development**
Credit Hour : 2

General objective : To expose students to the relationship with natural resources and livelihood of rural people.

Specific objectives :

- To familiarize with fundamental concepts and paradigms in relation to rural development
- To understand potentials and constraints of development for different people
- To understand the differences and implications of different actors, contexts, approaches and strategies to rural development
- To understand the natural and non-natural resource-based livelihood strategies
- To understand and critically assess the policies and legislations in relation to NRMSA & RD.

Unit 1. Introduction to Rural Development

1.2 Theories
Paradigm of development and shifts in development thinking
Conservation and development

1.3 Development Approaches
Classical
Populist
Neo-liberal
Livelihood

UNIT 2. ACTORS, CONTEXT AND SUSTAINABLE LIVELIHOODS [4]

- 2.1 Rural Development Actors
- 2.1.1 Social Relations (gender, class, age, ethnicity)
 - 2.1.2 Institutions (rules and customs, land tenure, market in practice)
 - 2.1.3 Organisations, their policies and practices (governmental, non-governmental, private voluntary, community-based, civil society)
- 2.2 Context
- 2.2.1 Socio-economic and political trends (political situation, macro-policies, economic trend)
 - 2.2.2 Natural and social shocks/vulnerability (natural hazards & calamities, political conflicts, diseases/epidemics)
- 2.3 Assets/Resources/Capitals: (Building and mobilisation of various capitals)
- 2.3.1 Human
 - 2.3.2 Social/political
 - 2.3.3 Natural
 - 2.3.4 Physical
 - 2.3.5 Financial

UNIT 3. SUSTAINABLE LIVELIHOOD STRATEGIES AND OUTCOMES

- 3.1 Sustainable livelihoods strategies
- 3.1.1 Natural resource-based strategies in relation to different types of capitals - social, financial, physical, human - to improve people's

- livihoods (Watershed, Water resource, Forest (community forest, leasehold forestry etc.), Biodiversity conservation (Buffer zone, conservation area, agro-biodiversity), Agricultural
- 3.2 Non-natural resource-based Strategies
 - 3.2.1 Enterprise Development (including entrepreneurship and off-farm activities)
 - 3.2.2 Micro-financing (saving & credit)
 - 3.2.3 Remittances
 - 3.2.4 Services
- 3.3 Livelihood Outcomes
 - 3.3.1 Livelihood security (food security, income stability, social inclusion-empowerment)
 - 3.3.2 Environmental sustainability (Sustainable natural resources management - agriculture, forestry, water, energy)

UNIT 4. INSTITUTIONAL CHALLENGES FOR RURAL DEVELOPMENT

- 4.1 National policy making and legislation
- 4.2 Good governance at macro, meso and micro-level institutions
 - 4.2.1 Compliance to rule of law
 - 4.2.2 Roles and responsibility & accountability
 - 4.2.3 Transparency
 - 4.2.4 Decentralization/devolution
- 4.3 Power balance (representation and participation in decision/policy making)

Unit 5. POLICIES FOR RURAL DEVELOPMENT

- 5.1 Global issues, local action - the impact of IFIs, conventions, conferences on rural poverty
- 5.2 Decentralization and the role of state/local government
- 5.3 National policymaking, legislation, by laws, plans, programs and the influence of macro-economic policies, plans and programs.
- 5.4 Good (democratic) governance (responsibility, accountability, transparency)

Exercise :- Discussion on a development project, visit to project

References:

DFTD 1994, Sustainable livelihoods
 ELITS FRANK 2000. Rural Livelihoods & Diversity in developing countries

Course Code : SFM 758
Course Title : **Conservation and Rural Development**
Credit Hour : 2

General objective: Students will be able to understand concept theory and relationship between conservation and development.

Specific objectives:

- To familiarize concept and theories of rural development.
- To understand and analysis of different approach of rural development programme in Nepal.
- To familiarized the relationship between rural development and natural resource conservation.

Unit 1. RURAL DEVELOPMENT - CONCEPT AND THEORIES

- 1.1 Concept
 - 1.1.1 Households, family, villages, community, society
 - 1.1.2 Gender
 - 1.1.3 Empowerment, emancipation
 - 1.1.4 Participation/Exclusion
 - 1.1.5 Sustainability, Rural-Urban
 - 1.1.6 Development
 - 1.1.7 Poverty (Who are poor?; poverty dimensions-global, international, national, local; poverty line and indicators; distribution)
 - 1.1.8 Livelihoods
- 1.2 Theories
 - 1.2.1 Feminist theory
 - 1.2.2 Development strategies and poverty alleviation
 - 1.2.3 Conservation and Development
 - 1.2.4 Paradigm of development & shifts in development thinking

UNIT 2. DIVERSITY RURAL COMMUNITIES IN THE CONTEXT OF RD [6]

- 2.1 Understanding rural communities
- 2.2 Dimensions of diversity in rural communities
- 2.3 Social exclusion and discrimination in rural communities
- 2.4 Social structure of rural communities (stratification with respect to leadership, class, ethnicity, caste, gender etc.)
- 2.5 Social processes in rural communities (social cohesion, integration, conflict)
- 2.6 Community organizations (formal, informal, networks)

Unit 3. COMPLEXITY OF RURAL COMMUNITIES

- 3.1 Socio-political context of community development
 - 3.1.1 Dimensions of diversity
 - 3.1.2 Social exclusion, discrimination
- 3.2 Community organizations (formal, informal, network)
 - 3.2.1 Social cohesion/integration/conflict (class, ethnic, caste, gender, etc)
 - 3.2.2 Stakeholder analysis

UNIT 4. STRATEGIES AND APPROACHES TO RURAL COMMUNITY DEVELOPMENT (16)

- 4.1 Strategies
 - 4.1.1 State (government) led
 - 4.1.2 Non-government led
 - 4.1.3 Market led
 - 4.1.4 Mainstreaming gender
 - 4.1.5 Community led (Social mobilization, e.g. Community forestry)
- 4.2 Approaches (6)
 - 4.2.1 Rights based approach
 - 4.2.2 Participatory (bottom-up)
 - 4.2.3 Blue print (top-down and conventional development planning)
 - 4.2.4 Dissemination of information technology (extension)
 - 4.2.5 Integrated, holistic, systemic, synergy
 - 4.2.6 Sectoral
 - 4.2.7 Indigenous local knowledge and initiatives
- 4.3 Sustainable livelihood approaches
 - 4.3.1 Mobilization and building human, natural, social, physical, financial capital
 - 4.3.2 Local resource mobilization (micro-finance, IGA, Saving/Credit, Off-farm employment, enterprise development)
 - 4.3.3 Local institution building (Human resource capacity building self help groups)
 - 4.3.4 Integrated Conservation and Development Project (ICDP) approach

UNIT 5. NATURAL RESOURCE MANAGEMENT & SUSTAINABLE AGRICULTURE AND RURAL DEVELOPMENT

- 5.1 Management of Natural Resources and Agriculture for Rural Community Development
 - 5.1.1 NRM and RD (e.g. Community Forestry)
 - 5.1.2 Conservation and development (biodiversity, bufferzone, conservation area)
 - 5.1.3 Role of agriculture in RD
 - 5.1.4 Agroforestry
 - 5.1.5 Livestock/fishery/farm-fodder linkages
 - 5.1.6 Ecotourism and RD
- 5.2 NRM Linkage
 - 5.2.1 Sustainable agriculture identification/rural productivity and natural resource use
 - 5.2.2 Agriculture-environment-poverty-nexus
 - 5.2.3 Population and resources
 - 5.2.4 Rural - urban linkages
 - 5.2.5 Case study/Field visits

Field exercise and visit to Rural Development and Conservation Area Projects.

References:

Report Preparation

Choose 3 cases with certain approaches (selection criteria)

- Community (women) led - community forestry
- NGO led - biodiversity conservation
- Government led - watershed management

One field trip to Eco-tourism village in Sirubari, Syangja

Examples of Projects:

1. Biodiversity based livelihood programme - managed by a NGO-Rural Reconstruction Nepal, Pokhara.
2. In situ conservation of agro-biodiversity - managed by Libird NGO, NARC govt and IPGRI.
3. Watershed Management Project - managed by TOLO Team organizing for local initiative (NGO) - funded by JICA funded in the field of conservation, reforestation, S/C.

COURSE CODE WME 759

COURSE TITLE: **SOIL CONSERVATION ENGINEERING AND WATERSHED REHABILITATION**

CREDIT HOUR: 2

General objectives:

The course is designed to impart overall knowledge on soil fertility management, reclamation and rehabilitation of degraded lands through biological, mechanical and bioengineering techniques and make students able to design mechanical, bio-engineering structures, manage soil fertility and rehabilitate degraded watershed.

Specific objectives:

- Students will:
- Gain the knowledge about soil, its mechanical property and soil fertility.
- Be able to know about soil and loads on it
- Be able to design different structures
- Be able to design sustainable structures on the basis of stability of soil.
- Be able to rehabilitate watershed by using different techniques and measures

UNIT 1 INTRODUCTION (2)

- 1.1. Characteristics of soil (structure, texture, density, shear strength, bearing capacity)
- 1.2. Compaction
 - a. Standard proctor's test
 - b. Modified proctor's test

UNIT 2 SLOPE STABILITY ANALYSIS (9)

2.1 EARTH PRESSURE

- 4.3.1. Active and Passive state
- 2.1.3** Active and Passive earth pressure: Rankine's Theory
- 2.1.3** Coulomb's Wedge Theory
- 2.1.4** Design of gravity retaining wall

2.2 STABILITY ANALYSIS OF SLOPES

- 2.2.1 Stability analysis of Finite slopes Swedish Circle Method
- 2.2.2 Method of locating centre of critical slip circle
- 2.2.3 Frictional Circle method
- 2.2.4 Taylor's Stability Number and Stability Curves

2.3 BEARING CAPACITY

- 2.3.1 Definition
- 2.3.2 Rankine's analysis
- 2.3.3 Terzaghi's analysis
- 2.3.4 Plate Load test
- 2.3.5 Penetration Test

UNIT 3: SITE INVESTIGATIONS & SUB-SOIL EXPLORATION (4)

- 3.1. Introduction
- 3.2. Site reconnaissance
- 3.3. Site exploration

- 3.4. Method of site exploration
- 3.5. Shallow foundation design

UNIT 4. REHABILITATION AND RECLAMATION METHODS (4)

- 4.1 Rehabilitation and reclamation principles and approaches
 - 4.1.1 Reclamation of degraded soils.
 - 4.1.2 Chemical (fertility, salinity/sodicity; acidity/alkalinity; organic matter)
 - 4.1.3 Control grazing
 - 4.1.4 Control tillage
 - 4.1.5 Cropping system and soil management
- 4.2 Major land rehabilitation techniques (mechanical, vegetative, bio-engineering)
- 4.3 Ecosystems approach to rehabilitation (Churia example; DSCWM strategy)

UNIT 5 MAINTAINING SOIL FERTILITY (6)

- 5.1 Elements required in plant nutrition
Primary, Secondary, and Micronutrients
- 5.2 Basic soil-plant relationships,
- 5.3 Soil fertility evaluation
- 5.4 Use of fertilizers,
- 5.5 Organic manure- FYM application,
In-situ manure,
Green manures
Forest litter and its consequences
Bio-fertilizers,
- 5.6 Composting and organic farming
- 5.7 Useful properties of algae for agriculture, Fertilizers,
- 5.8 organic and inorganic Fertilizers: Nitrogenous,
Phosphatic and Potassium fertilizers, Single and multi-nutrient fertilizers,
- 5.9 Fertilizers mixing, handling, storage, and fertilizer application (methods),
- 5.10 Fertilizer economy (loss and uptake, residual effect of applied fertilizers),

UNIT 6 STABILIZATION OF SOIL (3)

- 6.1. Mechanical, cement, lime, chemical
- 6.2. Stabilization by heating
- 6.3. Electrical stabilization

UNIT 7: Bio-engineering Techniques (7)

- 7.1 Vegetative measures
 - 7.1.1 Fascine
 - 7.1.2 Palisades
 - 7.1.3 Wattling
 - 7.1.4 Brush Layering
 - 7.1.5 Hedgerow / SALT

- 7.1.6 Nursery
- 7.1.7 Plantation (Planting Techniques)
- 7.1.8 Bamboo planting
- 7.1.9 Live Fence
- 7.1.10 Grass Planting
- 7.1.11 Jute Netting
- 7.1.12 Mulching
- 7.1.13 Agroforestry
- 7.1.14 Fruit Tree Planting
- 7.1.15 Shelter Belt
- 7.2 Functions of bioengineering system
- 7.3 Interaction between vegetative & engineering system
- 7.4 Ideal plant communities for bio-engineering
(Field trip to see different rehabilitation techniques)

UNIT 8. Design and Analysis of Engineering Structure (15)

- 1.1 Check dam
- 1.2 Retaining wall/ Toe wall
- 1.3 Spur
- 1.4 Revetment
- 1.5 Embankment
- 1.6 Dyke
- 1.7 Rip-rap
- 1.8 Terracing
- 1.9 Drop structure, Flume / Chutes
- 1.10 Practical Exercise : Case Studies (Designing conservation measures for given degraded sites)

COURSE CODE: WME 760
COURSE TITLE: **LAND EVALUATION AND LAND USE PLANNING**
CREDIT HOUR: 2

General Objectives: On completion of this course the student will understand the different types of land under use in Nepal. They also can identify and evaluate different land uses and assess suitability of land for different uses. Student will understand certain type of soil and how soil survey is carried out and the way a soil survey report is prepared.

Specific Objectives:- Students will understand and able aerial photo interpretation.

UNIT 1. USE OF LAND RESOURCE SURVEYS (5)

- Survey for special purposes
- Priorities
- Detail Objectives
- Relationships between surveyors, planners and other users
- Use of existing data
- Computer or manual systems

UNIT 2. LAND CLASSIFICATION (3)

- General concepts
- Land capability classification
- Land suitability classification
- Agro-ecological zone
- Factors of land classification: Economic factors, Physical factors, Project development consideration
- Types of land classification: Standard types, Reconnaissance, Semi detailed, Detailed, Minimum requirement

UNIT 3. LAND/SOIL SURVEY AND EVALUATION (8)

- 4.1 Characteristic of soil maps and reports
- 4.2 Soil mapping
- 4.3 Preparation of field works
- 4.4 Plotting and assembly of field data
- 4.5 Coordination
- 4.6 Classification and terminology
- 4.7 Concepts of land evaluation
- 4.8 Land evaluation techniques
- 4.9 Land resources evaluation
- 4.10 Land resources attribute
- 4.11 Selection of parameters
- 4.12 Environmental impact evaluation

UNIT 4. UNITS OF SOIL CLASSIFICATION & MAPPING (4)

- Aerial photo interpretation

Soil mapping and formulation of soil legends
Plotting boundaries in the field
Soil correlation and inspection
Soil grouping on the map

UNIT 5. LAND CLASSES SPECIFICATION (6)

5.1 Specification for Land Classes and subclasses
Specification for Informative appraisals
Review of specifications
Symbols and conventional signs
Field correlation

UNIT 6. LAND USE PLANNING (3)

6.1 Definition and concept of land use planning
6.2 Definition and concept of sustainable land use planning

UNIT 7. SUSTAINABLE LAND USE PLAN (6)

7.1 General land use plan for protected and productive area
Preparation of existing and proposed general land use map
Suitability criteria for various land uses
 Agricultural area
 Forest land
 Grazing land
 Urban, commercial, industrial areas

UNIT 8. BASIC FRAMEWORK AND PRINCIPLES (3)

8.1 General premises and thrust: Holistic approach, sustainability, land security, empowered communities
8.2 Basic approach in land use planning:
8.3 Biophysical assessment of the area, crop yield and carrying capacity

UNIT 9. PREPARATION OF SOIL SURVEY REPORTS (9)

S

Practical: The students will carry out a survey of a given area, evaluate the land and soil and prepare a sustainable land use plan report.

References:

1. FAO Soil Survey and classification
2. Nature and properties of Soil NC Brady.

Course Code: SFM 801

Course Title: **Research Methodology and Participatory Action Research**

Credit Hour : 2

Objectives:

General:

After completion of this course, the students will have understood general concepts, meaning and procedure of research methods and developed basic skills in planning, designing, conducting and reporting research in the management of natural resources.

Specific: Students completing the course will be able to :

1. Understand the meaning and types of research and their characteristics
2. Write an effective research proposal
3. Identify major themes and problems in forestry research
4. Develop a research design to solve a research problem
5. Execute the research work in field setting.
6. Select, execute and interpret appropriate measurement tools and statistical procedures
7. Understand, interpret and present research findings

Unit 1: Introduction (5)

- 1.1 Meaning and types of research
- 1.2 Research methodology and research methods
- 1.3 Sources of knowledge
- 1.4 Characteristics of good research
- 1.5 Scientific research process
- 1.6 Research problem and research questions.

Unit 2: Variables and Measurement (5)

- 2.1 Concept, construct, hypothesis and theory
- 2.2 Induction and deduction method
- 2.3 Variables and its types
- 2.4 Scale of measurement - mapping rules, (characterization, order, distance and Origin)

Unit 3: Literature Review (5)

- 3.1 Need and benefit of literature review
- 3.2 Process and tools of reviewing
- 3.3 Writing literature review: referencing quotation, paraphrasing and organizing review.

Unit 4: Research Design (10)

- 4.1 Meaning and purpose of research design

- 4.2 Types of research designs :
- Exploratory and descriptive
 - Experimental and quasi-experimental
 - Casual comparative
 - Action research design
 - Qualitative research design
 - Evaluation research design
- 4.3 Sampling design
- Census and sampling
 - Probability and non probability sampling techniques
 - Sampling procedure
 - Sample size determination
- Unit 5: Formulation of Research Proposal (5)
- 5.1 Topic selection, criteria of a good topic
- 5.2 Purpose of research proposal
- 5.3 Types of research proposal
- 5.4 Components of research proposal
- Unit 6: Instrument Development (5)
- 6.1 Drafting measurement questions/checklists/schedules
- 6.2 Assembling, pre-testing and revising instruments.
- 6.3 Test of validity and reliability of instruments
- 6.4 Finalizing and formatting the instruments
- 6.5 Preparation for field work
- Unit 7: Methods of Data collection (5)
- 7.1 Communication methods : questionnaire, interview
- 7.2 Observation: self observation and participatory observation
- 7.3 Discussion : focus group, key informant
- 7.4 Experimentation
- 7.5 Case study
- 7.6 Participatory methods : action research methods, RRA and PRA (tools and techniques)
- Unit 8: Data Processing and Analysis (5)
- 8.1 Editing and coding data
- 8.2 Data entry and processing
- 8.3 Descriptive and inferential analysis
- 8.4 Qualitative analysis
- 8.5 Participatory methods of analysis
- 8.6 Interpretation and discussion of findings
- Unit 9: Report writing (5)
- 9.1 Scientific /technical writing:
- 9.2 Efficiency in technical writing
- 9.3 The attributes of good technical writing and report
- 9.4 Types of reports
- 9.5 Components of research report

9.6 Documentation and formatting research report.

References;

1. P.R. Panta, Social Research Method and Report writing (Latest ed).
2. C.R. Kothari, Research Methodology
3. F.N. Kerlinger, Foundation of Behavioral Research
4. T.L. Baker, Doing Social Research
5. Houpp, Kenneth, Reporting Technical Information
6. Copper and Shindler, Business Research Methods, McGraw Hill.
7. Burns and Burns, 2009. Business Research Methods and Statistics Using SPSS, Sage Pub.

COURSE CODE: WME 802
COURSE TITLE: **GEOGRAPHICAL INFORMATION SCIENCE**
CREDIT: 4 (Th 50 + Pr 50)

General Objectives:

Geographical Information Science and technology can be used for scientific investigations, resource management and development planning. The purpose of the course is to educate students on the practical application of Remote Sensing (RS), Geospatial Information Science (GIS) and Global Positioning System (GPS) for resource management and analysis.

Specific Objectives:

- Introduce and implement key concepts of geospatial information science, GPS, and RS.
- Understand why GI Science, GPS, and RS are important and useful for inventory and analysis of spatial information.
- Increase understanding and building confidence to use geospatial data.
- Increase awareness of geospatial analysis and supporting decision-makers by using cross-cutting Decision Support System (DSS)

Part1 :GIS

1. Fundamentals of GIS	2
1.1 Definition, Components', Scope, and Development in global context and in Nepal	
2. Geographic data (spatial data)	5
1. Geo-referenced data – data structure- (raster, vector), layers, theme, topology	
2. Sources of georeferenced data	
3. Attribute referenced data – socio-economic data, feature attribute data	
4. Time referenced data	
5. Concept of database management, - RDBMS, Geodatabase, Object Oriented database, metadata	
3. Projection and Transformation	5
3.1 Definition and types of projection – coordinate system, datum	
3.2 Concept of map extension and shape, size, scale, and direction	
4. Concept of Data Handling in GIS Software	4
4.1 Vector data handling	
4.2 Raster data handling	
5. Accuracy and Errors in spatial data handling	4
5.1 Sources of errors	
5.2 Concept of RMS errors	
5.3 Editing and rectification of errors	
5.4 Propagation of errors	

Part 2 : Remote Sensing

1. Fundamentals of Remote Sensing 8
1. Definition,
 2. stages of remote sensing,
 3. history and development of data acquisition,
 4. Energy sources and radiation principles – principles of RMR, EMR spectrums, Spectral characteristics or bands
 5. Energy interactions – scattering in the atmosphere, absorptions in the atmosphere, incident energy, reflectance energy, absorbed energy and transmitted energy,
 6. concept of reflectance of EMR and difference of reflectance in vegetation, soil, and water
2. Sensor platforms, types and characteristics 8
- 2.1 Different sensors developed in the global arena – optical, geostationary, sun synchronies, active, passive, hyperspectral, stereo pairs, thermal, etc,
- 2.2, Resolution – spectral, radiometric, temporal, spatial
3. Characteristics of RS data - 6
- 3.1 Concept of digital image, digital numbers (DN), image enhancement, pixel, reflectance curve,
- 3.2 Aerial photographs, orthophoto and LIDAR technology

8

Part3 : GPS

3.1 Concept of GPS and GIS application to capture real world data
Concept of community forest data, infrastructure, hazard location etc,
GPS data overlaid on the GIS map and prepare the watershed analysis map
UNIT Specific Application of RS, GIS & GPS: Forest cover mapping, Forest inventory, Forest change detection, Bio-mass estimation, watershed management

Practical

GIS – 25
Data Entry – Creating shape files/coverage of vector data structure, screen digitize
geo-reference of shape files,
transformation and projection

Data management and manipulation
spatial data management
attribute data management

Operating spatial tools – extraction, overlay, proximity, geostatistics, generalization, network analysis, 3-D modeling, surface generation and interpolation from different data layers

Cartographic design and map production (Project work)

Basic of Interpretation of RS data

Visual interpretation of panchromatic aerial photographs and separation of forest, water, human used land and other features

Visual characterization water, soil, and vegetation from the hardcopy of multiband, images

Download raw data from the internet data, data conversion, projection, rectification,

Digital Image Processing (DIP) in ERDAS/ELWIS/ENVI/ or any opens source software based radiometric, spectral, spatial enhancement.

DIP of land use cover classification -

unsupervised, supervised, knowledge engineer, objected based classification

Stereo pair (ANALGRIPH) operation

image ratio, PCA Project based on RS data analysis and report writing, image fusion, fourier analysis, HIS transformation, Accuracy Assessment(Confusion matrix).

References;

1. Remote Sensing & Image Interpretation – Lilisand & Keiffer
2. Aerial photo interpretation& image analysis- Thomas Avery & Berlin
3. ESRI publications
4. Beyond the Map; J.O.Loony
5. Remote sensing of Environments- J. R. Jenson
6. Remote Sensing- Jorge Joshep
7. GIS- A. P. Burrows

Course Code : SFB 803
Course Title : **Advance Forest Ecology**
Credit : 2

General objectives: The students will acquire advances knowledge and skills of forest ecology, forest and environmental interaction, forest influences and forest ecosystem modeling.

Specific Objectives :

- Be familiar with forest ecology, forest ecosystem, structural and functional aspects of forest ecosystem.
- Specifically the students will acquire the analytical knowledge and skills necessary in forest ecology to plan and implement the forest ecosystem development for managing the forest ecology of the country.

Unit 1 : Forest Ecology (5)

- 1.1 Fundamental concept of forest ecology
- 1.2 Forest ecosystem - The function, structure and major components of forest ecosystem.
- 1.3 Forest ecosystem biomass

Unit 2 : Forest and environmental interactions (5)

- 2.1 Positive interaction - Concept, mutualism, commensalisms, proto co-operation
- 2.2 Negative interaction - Competition, Antagonism, Ammensalism, Parasitism and predation

Unit 3 : Forest influences (10)

- 3.1 Effects of forest on soil, vegetation, physiography, local and micro-climate
- 3.2 Litter production, accumulation, decomposition and nutrient cycling.
- 3.3 Carbon sequestration and green house effect
- 3.4 Measuring influences
 - 3.4.1 Environmental and physical parameter to measure forest influences.
- 3.5 Vegetation mapping

Unit 4 : The Ecosystem perspective (10)

- 4.1 The ecosystems approach to problem solving
- 4.2 Concepts of systems analysis and simulation
- 4.3 Methods of system analysis
 - 4.3.1 Concept of model formulation
 - 4.3.2 Quantitative specification of model
 - 4.3.3 Model evaluation and use

Unit 5 : Disturbance and Stand Development

- 5.1 Conceptual stages of Stand Development
 - 5.1.1 Stand initiation stage
 - 5.1.2 Stem exclusio
 - 5.1.3 Under story initiation stage
 - 5.1.4 Old growth stage
- 5.2 Disturbance and effects on forest development
- 5.3 Kinds of major disturbances

- 5.3.1 Abiotic
- 5.3.2 Biotic
- 5.4 Tree response to disturbance
- 5.5 Application to management

Unit 6 : Application of simulation models in Forest Ecology (10)

- 6.1 Population Dynamics; Effects of Density independent and density - Dependent Factors
- 6.2 Effects of age-specific Natality and mortality
- 6.3 Effects of Fluctuating Environmental conditions
- 6.4 Effects of competition and frequency of Ecological disturbance
- 6.5 Effects of Foraging and Thermoregulation

Unit 7 : Application of simulation models in Natural Resource (Forest) management (10)

- 7.1 Wildlife management : Effects of Habitat Fragmentation on the management of Endangered Animal species
- 7.2 Rangeland management : Effects of stocking Density and Frequency of Brush Control on Rangeland productivity
- 7.3 Forest management : Effect of Timber Harvest on the Relative Abundance of Wildlife species.

Exercise :

Field visit / Field exercise

References;

1. Grant, W.E., E.K. Pedersen, and S.L. Marin 1997. Ecology and Natural Resource Management : Systems Analysis and Simulation. Wiley, New York 373pp.
2. Ford, A. 1999. Modeling the Environment : An Introduction to system dynamics modeling of Environmental systems, Island Press, Washington, D.C. 401 pp.
3. Gold, H.J. 1977. Mathematical modeling of Biological systems : An Introductory guide book, John Wiley & Sons, New York 357pp.
4. Haefner, J.W. 1996. Modeling Biological Systems : Principles and Applications. Chapman and Hall, New York 473pp.
5. Hall, C.A.S. and J.W. Day, Jr 1977. Ecosystem modeling in theory and practice. John Wiley & Sons, New York 684pp.
6. Hannon, B. and M. Ruth 1994. Dynamic modeling. Springer - Verlag, new York 248pp.
7. Jeffers, J.N.R. 1978. An Introduction to System Analysis with ecological applications. University park press, Baltimore, MD 198pp.
8. Kitching, R.L. 1983. Systems ecology : An Introduction to ecological modeling. University of Queensland Press, St. Lucia, Queensland 280pp.

9. Neill, W.H. and 14 Co-authors. 2004. Ecophys. Fish : A Simulation model of Fish growth in Time varying environmental regions. /Rev. Fish. Sc. 12 : 233-288.
10. Odum, H.T. and E.C. Odum 2000. Modeling for all Scales : An Introduction to system Simulation. Academic press, New York 458pp.
11. Swartzman, G.L. and S.P. Kaluzny. 1987. Ecological simulation primer. Macmillan, New York. 370pp.
12. Hofbauer, J. and K. Sigmund 1988. The theory of evolution and dynamical systems. Cambridge University press.
13. Gurney, WSC and Nisbet, R.M. 1998. Ecological dynamics. Oxford University press.
14. Kot, M. 2001. Elements of mathematical ecology. Cambridge University press.
15. Mangel, M. 2006. The Theoretical Biologist's tool box. Cambridge University press.
16. Murray, J.D. 1989. Mathematical Biology. Springer, Berlin.

COURSECODE:WME 804

COURSE TITLE: **WATERSHED HYDROLOGICAL ISSUES**

CREDIT HOUR: 2

General Objectives:

The course is designed to impart holistic and integrated knowledge in the management and conservation of water resources and make students able to apply quantitative hydrological methods to use measuring instruments, to assess water availability and demand and overall manage and conserve the water resources.

Specific Objectives :

Students will :

- Gain knowledge about the hydrological characteristic and its applications to watershed management
- Be able to assess and effectively manage water quality in the mountain watershed context
- Be able to use hydrological instruments and measure hydrological parameters for water resource management.
- Gain knowledge on water resources, laws and regulations and management issues in Nepal.
- Be able to assess the irrigation water demand and management for its efficient application.

UNIT 1: HYDROLOGICAL CHARACTERISTICS OF WATERSHED (3)

- 1.1 Slope hydrology and runoff generation
- 1.2 Initiation of channels and drainage networks
- 1.3 Basin hydrology

UNIT 2: APPLICATION OF HYDROLOGY IN WATERSHED MANAGEMENT (4)

- 2.1. Water and energy budgets and cycles
- 2.2. Ecosystems perspective of the hydrologic cycle
- 2.3. Quantitative hydrologic methods (return period; frequency analysis; probability; time series analyses)

Unit 3. Hydrological instrumentation and measurement (6)

- 3.1 Precipitation
- 3.2 Surface runoff
- 3.3 Subsurface flow
- 3.4 Infiltration
- 3.5 Evapo-transpiration

UNIT 4 : WATER RESOURCE IN NEPAL (5)

- 4.1 Different sources of water in Nepal (quality and quantity considerations)
- 4.2 Prospectus and problems of Water resources
- 4.3 Negotiations on water resource projects
- 4.4 Issues of downstream benefits

- 4.5 National water resource policy
- 4.6 Laws and regulations related to water resources (Riparian rights, statutory water law, environmental protection law, Aquatic and wildlife, land acquisition laws)

UNIT 5. WATER AVAILABILITY AND DEMAND (7)

- 5.1 Basic concepts
- 5.2 Sources, methods and systems of irrigation
- 5.3 Water use efficiencies
- 5.4 Control and application of irrigation water
- 5.5 Water harvesting methods
- 5.6 Water storage
- 5.7 Surface drainage and drainage techniques
- 5.8 Indigenous technology

UNIT 6: WATER QUALITY AND MANAGEMENT (5 + 8= 13)

- 6.1 Water quality standards and criteria (for different uses)
- 6.2. Total maximum daily loads standards (TMDLS)
- 6.3. Water quality monitoring and assessment (principles & processes)
- 6.4. Water quality problems (point & non-point source pollution)
- 6.5. Water quality management (source and headwater protection; harvesting & ground water recharge)
(Field trip to see water sources, protection measures and pollution examples)

Unit 7. Water resource management and conservation (5)

- 7.1 Public sector institutions
- 7.2 Water user groups
- 7.3 Gender and water,
 - 7.3.1 Gender and water technology
- 7.4 Policies and water rights
- 7.5 Water related conflicts
 - 7.5.1 Water users groups and conflicts
 - 7.5.2 Conflicts on sharing of water sources, payments and maintenance of water source, diversion, distribution

References:

1. WECS, ?? National Water Plan. HMG/N, Water and Energy Commission, Kathmandu.
2. Umesh Parajuli, M. Miah, Khalilur Rahman, George Verghese, Somnath Mukherjee, and Shahid Hamid. 2004. Water Conflicts in South Asia, Global Environment and Energy in the 21st Century, Honolulu, Hawaii, USA,

3. Folliot, P.F. 1990. Manual of Watershed instrumentation and measurement, US Watershed Management Project, College Laguna, The Phillipines.
4. UNEP, 1978. Quality criteria for water, US UNEP, Washington, USA.
5. Trilocahn Upreti. 2006. International watercourse law and its Application in South Asia, Pairavi Prakashan, Kathmandu,
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7. Andy D. Ward, Stanley Trimble Environmental Hydrology, ?? 2nd Edition, Lewis Publishers.
8. ICAR, ??? Handbook of Agriculture, Indian Council of Agricultural Research, New Delhi.
9. Gleick, David Katz, Emily Lee, heather Cooley, 2006. The World’s Water 2006-2007: The Biennial Report on Freshwater Resources, Island Press.
10. M. Diordano and K.G. Villholth (editors), 2007. The Agricultural Groundwater Revolution: Opportunities and Threats to Development, CABI in association with IWMI.
11. Linden Vincent. 1995. Hill irrigation: Water and development in mountain agriculture, Intermediate Technology Publication, London
12. Norman Uphoff, 1986. Getting the process right: Improving irrigation management with farmer organization and participation, Cornell University, Ithaca
13. C.W. Fetter, 2000, Applied Hydrology Prentice Hall
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14. Technical Committee Reports of Global Water Partnerships (GWP) (www.gwpforum.org)
15. Olli Varis, Cecilia Tortajada and Asit Biswas (editors), 2005. Integrated Water Resources Management in South and South-east Asia , Oxford University Press.
16. Karin Kemper, William Blomquist, Ariel Dinar, 2007. Integrated River Basin Management through Decentralization . Springer-Verlag NewYork, LLC.
17. Ven Te Chow (ed.), ??? Handbook of Applied Hydrology, McGraw Hill Book Co., New York.

Course Code : SFM 805
Course Title : **Project Management**
Credit hour : 2 (Th.25+Pr.25)

General objectives:-

The general objective of the course is to provide knowledge on project organization, planning, monitoring & evaluation.

Specific objectives: The student will have :

- Knowledge of development projects, Project management, project monitoring and project organizations.
- Exposure to Project Planning and implementation.
- Ability to project finance and financial management

Unit 1. Development & Development project

1. Introduction of development theories –

- Infrastructure dev.
- Social dev.
- Capability dev.
- Sectoral dev.
- Development Project
 - Definition
 - Difference between development project & production project
 - Project cycle
 - Main causes of development project failure in under developed countries
- GON development strategies/planning
 - Five year plan of GON development by NPC
 - Current donor agencies interest/strategies /involvement in rural development of Nepal.

Unit 2. Development Project Framework& Project Environment

- Introduction to project framework
 - LFA/RBM
- Project environment
 - Social
 - Political
 - Financial
 - Other

Unit 3. Project Management & Project Manager

- Introduction of project management
- Role of Project manager
- Management skills
- Major project management challenge in under developed countries

Unit 4. Project Organizations & Human Resource Development

- Introduction about variations organization setup
- Brief introduction about various Project Organization setup
- People management & team building in project organization

- Project organization and staffs/stakeholders capability building
- Unit 5. Planning and implementation of development project
- Logical Break-down of activities
 - The techniques of network analysis (CPM/PERT)
 - Scheduling of activities
 - Budgeting based up on varies activities
 -
- Unit 6. Procurements, contracts & use of professional services
- GON & Donor Agencies rule and regulations for Procurements, contracts & use of professional services
- Unit 7. Project finance and financial management
- Introduction
 - Budgeting
 - Financial management and accounting
 - Investment appraisal
 - Financial Analysis
 - Summary
- Unit 8. Managing Stakeholders
- Introduction to participatory approach
 - Stakeholder mapping or Venn diagram
 - Beneficiaries/target groups(communities, gender & social equity, social inclusion of DAG others)
 - Partners (Donors, NGOs, CBOs)
 - Transparencies/accountability
- Unit 9. Monitoring & evaluation of development project.
- Periodic review of the project
 - Initial, Annual, midterm review
 - Project activities modification based up on review result
 - Resource Audit
 - Public Audit
 - Evaluation of the project
- Unit 10. Documentation and dissemination of project out comes and lesson learned
- Unit 11. Project proposal development and report writing
- Unit 12. Beyond Project
- Current issues of development project and project management.
 - Strategic of safe landing for sustainable future management.
 - Suitability of the project activities after termination of the project.

Practical

- Observe/visit various development projects of different natures/objectives
 - Economic/in come focus

- Social transformation
- Capacity building
- Education & Health etc.
- Review their project documents and implementation processes.
- Develop project proposals
- Submit detailed proposal for marking

Text Book:

Managing Projects in Developing Countries edited by J.W. Cusworth and T.R. Franks,
Published by : Pearson Prentice Hall, e-mail <http://www.pearson-books.com>

References:

1. Rural Livelihoods and Diversity in Developing Countries, Frank Ellis, Oxford University Press.
2. Whose Relativity Counts? Putting the First Last Robert Chambers, Yidg Publishing, 103-105 Southampton Row, London WC1B 4HL, UK, www.itdgpublishing.org.uk

Course Code : SFB 806
Course Title : **FOREST PROTECTION**
Credit hours : 2

General Objective:

To provide a basic understanding of the ecology and management of insect pests in forest ecosystems, specialized forestry settings, and urban environments.

Specific Objectives:

1. Knowledge of the major forest insect pests, their ecology, and their impact on forest management values
2. basic understanding of principles of forest insect and pest management,

Unit 1 : Entomological Aspect of Forestry

- 1.1 Introduction to Entomology
- 1.2 Insect structure & function
- 1.3 Insect Classification
 - 1.3.1 Phloem Boring insects, Wood boring insects, Shoot boring insects, Root, Tip, Terminal, defoliating, Seed and cone insects

Unit 2 : Insects and Plants - Trees :

- 2.1 Diet, defense and Co-evolution, insect population dynamics
- 2.2 Biological and chemical control of insects of forest nursery plants and forest trees
- 2.3 Methods for developing insect resistance plants and trees

Unit 3 : Pathological aspect of Forestry

- 3.1 Forest diseases classification (Root diseases, stem disease, leaf disease, and bark diseases)
- 3.2 Symptoms, pathogenic organisms, mode of infection.
- 3.3 Forest disease, fungus nutrition, pathological problems in natural, plantation forest - urban, agrofarm forests and in seed pathology.
- 3.4 Control measures (Biological & chemical) of pests and diseases for nursery plants and trees as Sal, Sissoo, Khair, Teak, Populus, Eucalyptus, Siris, Chirpine, Blue pine, Fir, Deodar, Spruce and agro/farm forestry horticulture plant species.

Unit 4 : Management for insect, pest & diseases

- 4.1 Management of important insects, pests and diseases of nursery, natural forests, plantation forests including farm forestry, agroforestry, avenue trees.
- 4.2 Management of insect pests and mycoflora of seeds of forest trees.
- 4.3 Integrated pest management (IPM) in forestry
 - 4.3.1 Use of (IPM) in different types of forests in Nepal
- 4.4 Tools used for developing disease resistance trees.
- 4.5 Assessment of losses of forest due to insects diseases and pests Ecological, and economical aspects.

Unit 5 : Management for forest improvement

- 5.1 Wildlife damages in nursery and plantation and their management
- 5.2 Weed problems in nursery and plantation and their management

- 5.3 Invasive plants in forests and wetland and their management
- 5.4 Assessment the natural resource losses by wildlife, Bio-diversity and economical aspects.

Unit 6 : Biological and chemical control

- 6.1 Natural components, Introduced species, enhancement of natural enemies and biotic insecticides
- 6.2 Chemical control - Insecticides, Pheromons, growth regulators and antifeedants
- 6.3 Microbial insecticides, genetic manipulations and physical & biological methods of control.

Unit 7 : Decay in Timber

- 7.1 Types of decays
- 7.2 Chemistry of decays
- 7.3 Decays and its control
- 7.4 Methods of treatment
- 7.5 Moulds resistant to treated wood

Exercise :

- Visit local nurseries and nearby natural and plantation forests to study the insects, pests and diseases symptoms and their control
- Term paper

References;

- Coulson, R.N. and J.A. Witter. 1984. *Forest Entomology: ecology & management*, John Wiley and Sons, NY.
- Borrer, D.J. and White, R.E. (1998). *A Field Guide to Insects : Am Erica North of Mexico, 2nd Edition*, Houghton Mifflin Co. Boston.
- Supplemental Books and Guides on reserve at the Life Sciences Library:
- Berryman, A. (1986) *Forest Insects: Principles and Practice of Population Management*. Plenum Press, New York.
- Cullen, P.J. and Cranston, P.S. (1994)./ *The Insects: An Outline of Entomology*, Chapman and Hall, London.
- Leather, S. (2005) *Guide to Insect Borers of North American Broadleaf Trees and Shrubs*. Agric, Handbk, 706. Washington, DC: U.S. Department of Agriculture, Forest Service.
- Wainshouse (2005) *Ecological Methods in Forest Pest Management*, Oxford University Press Inc., New York.
-
- Online support: This course is supported by an on-line resource (WebCT) that provides a secure and convenient environment for disseminating course material. Students are able to view grades and download class material (e.g., supplemental readings, lab handouts, lecture outlines, links to websites). This site also provides chat rooms and discussions forums where students can post comments or opinions and interact with classmates.
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COURSE CODE: FPE 807
COURSE TITLE: **BIO ENERGY**
CREDIT HOURS: 2

GENERAL OBJECTIVES:

After completion of the course the students will be able to work for the development and management of biomass resources and utilization of bio-energy

OBJECTIVES:

Implementation of this course will enhance the following skills:

- Plan for biomass energy resource development
- Work on proper management of biomass resources
- Work for conservation and improved utilization of bio-energy
- Assess the demand and supply of important bio-energy resources.
- Identify appropriate bio-energy technologies.

UNIT 1 INTRODUCTION (6)

- 1.1 Energy types (Renewable and Nonrenewable energy sources)
- 1.2 National & International scenario of energy generation and consumption pattern (Role and contribution of biomass resources in national & international energy, e.g. economy and environment)
- 1.3 Concept of renewable and non-renewable energy and the importance of bio-energy in renewable energy (RE)
- 1.4 Traditional bio-energy sources
- 1.5 Potential modern bio-energy and alternative energy (AE) sources

UNIT 2 CONCEPT OF ALTERNATIVE ENERGY (4)

- 2.1 Importance, scope and limitation of non biomass based alternative energy (solar, hydro, wind, geo-thermal, hydrogen, tidal, nuclear etc.)
- 2.2 Role of bio-energy in AE (bio-briquettes, charcoal, wood-fuel, liquid bio-fuel, bio-ethanol, bio-hydro carbon oil, bio-diesel, bio-gas, wood-gas, dendro-thermal power and bio-mass power plant)

UNIT 3 BIO-ENERGY RESOURCES (10)

- 3.1 Prospects and potential of forestry and non-forestry based bio-energy as well as other AE development
- 3.2 Identification of potential bio-energy resources for development
- 3.3 Sustainable management of bio-energy resources (management and development: existing resource assessment, new resource development, management practices etc.)

UNIT 4. CLASSIFICATION OF BIOMASS ENERGY ACCORDING TO PRODUCTION SYSTEMS (10)

- 4.1 Solid biomass fuels (woody and non-woody: production sources i.e. forestry, agriculture, livestock, industry, household, urban habitat development and other sectors)

- 4.2 Components of solid biomass (fuel wood, charcoal, briquettes, dried residues of crops and animals and production methods)
 - 4.3 Other biomass energy sources
 - 4.3.1 Liquid bio-fuels derived from woody and non-woody biomass - modern bio-energy components
 - 4.3.2 Gaseous bio-fuels derived from woody and non-woody biomass - modern bio-energy components
- UNIT 5 BIO ENERGY TECHNOLOGY (10)**
- Direct combustion system (cook-stoves, boilers, kilns, furnaces etc.)
 - Thermo-chemical conversion system (charcoal kilns, retorts, gasifiers etc.)
 - 5.3 Bio-chemical conversion system (bio-methanation process, fermentation process,
 - 5.4 Distillation system (bio hydrocarbon oil)
 - 5.5 Dendro-thermal plants and cogeneration plants
 - 5.6 Biomass power plants
 - 5.7 Hybrid technology system
- UNIT 6 ENVIRONMENTAL CONCERNS OF BIO-ENERGY(6)**
- 6.1 Green house gases (GHGs) emission and carbon sequestration
 - 6.2 Clean development mechanism (CDM), Reduction of emission from degradation and deforestation (REDD, REDD+, REDD++) in developing countries, forest certification etc.
 - 6.3 Green energy as a sustainable energy option (substitution of fossil fuels)
- UNIT 7 NATIONAL POLICY, STRATEGY, ACT AND PROGRAMME (4)**
- 7.1 Current sector specific policies, strategies, acts and programmes
 - 7.2 Bio-energy and AE related institution and coordination
 - 7.3 Sector specific constraints and issues
 - 7.4 Possible measures for improvement

Field Exercise:

References:

Published text-books
 FAO publications
 International energy agency
 World energy council
 Bio-energy related international networks
 To be identified

Course Code : FPE 808
Course Title : **Programming in C++**
Credit Hour : 2(1+1)(Th.25+Pr.25)

The general objective of this course is to provide knowledge and skills in C++ program language which in turn help students to program for computer modeling in the field of Forestry and NRM.

Specific Objectives:

- Explain how object-oriented software engineering enhances the software development process
- Identify the major elements in programming language
- Implement the concepts of data abstraction and encapsulation in the creation of abstract data types.
- Implement operator overloading
- Use inheritance in C++
- Select the proper class protection
- Demonstrate the use of virtual functions to implement polymorphism
- Compare the object vs the procedural approach to writing software
- Define and use classes in a C++ program
- Derive classes using inheritance in C++
- Implement polymorphism by using virtual functions in a program

1. Introduction (3 hrs.)
 - a. History
 - b. Advantage
 - c. Need for C++
 - d. Introduction to OOPS
 - e. First C++ Program
 - f. Input and output statements
 - g. Defining classes
2. Fundamentals of programming language (5 hrs)
 - a. Software development cycle (concept)
 - b. Introduction to compiler language
 - c. Spoken language vs. programming language
 - d. Flow charts
 - e. Data types
3. Fundamental of C++ (8 hrs.)
 - a. C++ data types, comments and name spaces
 - b. Variables
 - c. Arithmetic operator
 - d. Control - flow loop (while, for)
 - e. Simple conditions (exit, break, continue)
 - f. Truth conditions (and, or, not)
4. Essential of C++ (6 hrs)
 - a. Functions
 - b. Arguments and parameters

- c. Return statements
 - d. Arrays (Single & multi dimensional)
-
- 5. Fundamentals of classes (8 hrs.)
 - a. Data types
 - b. User defined data types
 - c. Dynamic memory allocation
 - d. Object oriented arrays
 - e. Memory management
 - f. Using and defining a class
 - g. Public and private classes
 - h. Simple pointers & instances
 - i. Constructors and destructors

PRACTICAL (Total 20 hrs)

- 1. Designing flowcharts (1 hrs)
- 2. Hellow world in C++, Name spaces and comments (2 hrs)
- 3. C++ data types (3 hrs)
- 4. Conditions and control flow statements (6 hrs)
- 5. Functions and arrays (6 hrs)
- 6. Input/Output & Graphics (2 hrs)

Course Code: SFM 809

Course: **Conflict Management in NRM**

Credit: 2

The general objective of the course is to build the capacity of students to plan and manage natural resources in an area where conflicts exist. The specific objectives of the course are to make students able to :

- Understand the concept, theory and dimensions of conflicts.
- Learn knowledge and skills for managing natural resources effectively
- Develop well-articulated views on policy towards conflict management.

Unit 1. Introduction

- 1.1. Concept and theory of conflict
- 1.2. Type of conflict
- 1.3. Value of conflict
- 1.4. Characteristics and dynamics of conflict

Unit 2 Understanding conflict in NRM

- 2.1. Social Dimensions of conflict in NRM
- 2.2. Scarcity of natural resources
- 2.3. Legal dimensions – review of acts and regulations related to NRM
- 2.4. Party politics related conflicts

Unit 3 Conflict Analysis

- 3.1. Examining the history and impacts of a conflict
- 3.2. Identifying the causes of conflicts
- 3.3. Level of conflict
- 3.4. Identifying who the stakeholders are and their interests.
- 3.5. Exploring stakeholder power and relations

Unit 4 Conflict Management

- 4.1. Basic principle of managing conflict
- 4.2. Conflict resolution
- 4.3. Option of conflict management strategies
 - 4.3.1. Compromise
 - 4.3.2. Force
 - 4.3.3. Collaboration
 - 4.3.4. Withdrawal
 - 4.3.5. Consensus
 - 4.3.6. Accommodation
- 4.4. Case studies related to conflicts in natural resources such as water, land and forests.

References:

Robbins, P-

http://www.berghof-handbook.net/articles/clements_handbook.pdf

OECD: Executive Summary, pages 17-23

DAC Guidelines on Conflict, Peace and Development Cooperation, Policy Statement, May 1997.

Collier, Paul: Greed or Grievance

http://www.worldbank.org/research/conflict/papers/greedgrievance_23oct.pdf

Collier, Paul: Economic Causes of Civil Conflict and their implications for Policy

<http://www.worldbank.org/research/conflict/papers/civilconflict.pdf>

Macartan Humphreys (2002) Economics and Violent Conflict

<http://www.preventconflict.org/portal/economics/Essay.pdf>

Bates, R. H. 2001, *Prosperity and Violence. The Political Economy of Development*, New York, Norton.

Dr Stephan Klingebiel: The OECD, World Bank and IMF: Development activities in the Crisis Prevention and Conflict Management Sphere.

www.bellanet.org/pcia/documents/docs/engl-oecd-imf-wb2.doc

Conflict Sensitive Approaches to Development, Humanitarian Assistance and Peace Building, International Alert (2002)

<http://www.international-alert.org/pdf/pubdev/develop.pdf>

Baker, Scott (2002) Triad in Crisis: The Important Relationship of Humanitarian, Intervention and Reconstruction Organizations, the International Business Community and Societies in Conflict. (INCORE Occasional Paper)

<http://www.ciaonet.org/wps/bas03/bas03.pdf>

World Bank (2002) The Conflict Analysis Framework (CAF): Identifying Conflict-Related Obstacles to Development:

www.worldbank.org/socialanalysis/sourcebook

Klingebiel, Stephan (2001) The OECD, World Bank and International Monetary Fund: Development Activities in the Crisis Prevention and Conflict Management Sphere

<http://www.bellanet.org/pcia/documents/docs/engl-oecd-imf-wb2.doc>

Bush, Kenneth: (1998) A measure of Peace: Peace and Conflict Impact Assessment of Development Projects in Conflict Zones (IDRC Working Paper)

Code of conduct. Conflict Transformation Work

http://www.international-alert.org/pdf/pubIA/coc_full.pdf

Building Conflict Prevention Capacity

<http://web.idrc.ca/uploads/user-S/10226960610cp-capacity.pdf>

A CRITICAL VIEW:

Bendana, A. What Kind of Peace is Being Built? Critical Assessment from the South.

Books:

Brown, J., Issacs, D. & Wheatly, M. (2005). *The World Café: Shaping our Future through*

Conversations that Matter. Berrett-Koehler Publishers.

Crum, T. (1998). *The Magic of Conflict: Turning a Life of Work into a Work of Art*. Touchstone

Isenhardt, M. & Spangle, M. (2002). *Collaborative Approaches to Resolving Conflict*. Sage

Publications.

Kahane, A. (2004). Solving Tough Problems. An Open Way of Talking, Listening, and Creating New Realities. Berrett-Koehler Publishers.

Kraybill, E., Evans, A. & Evans, R. (2001). Peace Skills: Manual for Community Mediators
John Wiley & Sons.

Mayer, B. (2000). The Dynamics of Conflict Resolution. Jossey-Bass

Shrock-Shenk, C (ed, 2000). Mediation and Facilitation Training Manual: Foundations and

skills for constructive conflict transformation. Mennonite Conciliation Service.

http://www.mcc.org/us/peaceandjustice/mcs/printed_mat.html

Global Witness (2004), Breaking the Links between the Natural Resource Conflict and Corruption. London: Global Witness.

Homer-Dixon, T.F. 1991. On the threshold: environmental changes as causes of acute conflict. *International Security*, 16 (2): 76-116.

Homer-Dixon, T.F., J.H. Boutwell and G.W. Rathjens. 1993. Environmental change and violent conflict. *Scientific American* 268: 38-45.

Homer-Dixon, T.F. 1994. Environmental scarcities and violent conflicts: evidence from cases, *International security*. 19 (19:5-40)

Homer-Dixon, T.F. 1999. Environmental scarcities and violence. Princeton University Press.

Where appropriate additional supplemental readings will be assigned for various weeks. The readings will either be accessible on the Internet or via the library's reserves.

COURSE CODE: SFM 810

COURSE TITLE: **EXPERIENTIAL LEARNING**

CREDIT HOURS: 2

General Objective: The overall objective of this course is to take students to the field and let them work in groups with the complexity of local people's use of forests, other natural resources, agricultural and other income sources to maintain their livelihoods in a typical Nepalese hill district village.

Specific objectives:

- Ability to describe interdisciplinary problems and issues of rural livelihoods in Nepal.
- Ability to justify a professional approach to interdisciplinary data collection and analysis on livelihoods in rural Nepal given the time, resources and human capital available.
- Ability to develop a clear and concise problem formulation including operational research questions.
- Ability to select appropriate data collection methods, collect and analyse data from the field drawing to relevant theories.
- Ability to analyse field data and draw logical conclusions that relate to the problem formulation and research questions.
- Ability to reflect critically on their own conclusions and their relevance to society.
- Ability to present and discuss scientific and social significance of the results.

UNIT 1. INTRODUCTION (5)

- 1.1 Typologies of learning styles
- 1.2 Problem based and applied learning approaches
- 1.3 Strength of experiential leaning
- 1.4 Application of experience leaning in natural resource management (and livelihood studies)
- 1.5 Interdisciplinary and problem-oriented group work

UNIT 2. FORMULATION OF PROBLEM ORIENTED PROJECT WORK (5)

- 2.1 Key ideas and elements of the course
- 2.2 Formulation of problem based project (problem formulation)
- 2.3 Introduction to the field
- 2.4 Student group formulation
- 2.5 Identification of the data need (requirement)
- 2.6 Identification of appropriate method for data collection for the project
- 2.7 Activity plans and schedule

UNIT 3. FIELD WORK IN THE VILLAGES (accompanied by faculty) (20)

- 3.1 Socio-economic survey
- 3.2 Biophysical survey

- 3.3 Institutional survey
- 3.3 Debriefings (inter/inner group debriefing and data sharing)

UNIT 4. ANALYSIS OF FIELD DATA AND REPORTING (20)

- 4.1 Application of appropriate analytical tools
- 4.2 Interdisciplinary group reports
- 4.3 Presentation and feedback of group reports in the community
- 4.4 Presentation and submission of final reports in groups
- 4.5 Evaluation of the course

References;

1. Ellis, Frank 2000. Rural livelihoods and diversity in developing countries. Oxford university press, Oxford.\
2. Chambers, R., and Conway, G., 1992. Sustainable rural livelihoods: practical concepts for the 21st century. In: *IDS Discussion Paper 296*, IDS, University of Sussex, Brighton, UK.
3. Campbell, B.M., Luckert, M.K. (Ed.) 2002. Uncovering the hidden harvest: valuation methods for woodland and forest resources WWF/UNESCO/Royal Botanical Gardens, Kew, Earthscan Publications Ltd, London.
4. DFID 1994. Sustainable livelihood guidance sheets. DFID.
5. Learning paradigm
6. Typology of learning styles

