SchEMS
School of Environmental
Science and Management
Affiliated to Pokhara University

Devkota sadak, Mid Baneshwor
PO BOX : 2453, Kathmandu, Nepal
Tel +977-1-4482475, 4465118
Fax : +977-1-4465119
Emails: mail@Schems.edu.np
http://www.schems.edu.np

मिति : २०७०/१२/१३

श्रीमान् डिन ज्यू,
विज्ञानतथाप्रविधि संकाय
पोखरा विश्वविद्यालय

मार्फत
श्रीमान् निर्देशक ज्यू,
पठ्यक्रमविकास केन्द्र
पोखरा विश्वविद्यालय

विषय : **वातावरणव्यवस्थापनविषय समिति बाट B.Sc.वातावरण व्यवस्थापन सम्बन्धी पाठ्यक्रम संशोधनगरिएको बारे ।**

महोदय,

उक्तविषयमा २०७० साल चैत्र ७गते बसेको वातावरणीय व्यवस्थापनविषय समितिको बैठकले B.Sc.वातावरण व्यवस्थापनको पाठ्यक्रममा"Climate Change and Society" सम्बन्धिविषय समावेश गरि संसोधनगरिएकोजानकारी गराउदछु । संसोधित पाठ्यक्रमतथाविषय समिति बैठकको माइन्यूट यसै पत्र साथ संलग्नगरिएको छ । सो पाठ्यक्रमआँउदो प्राज्ञिक परिषद्को बैठकमा अनुमोदनको लागि पेश गरिदिनु हुनहार्दिक अनुरोध गर्दछौं ।

भवदिय

.....

प्रा.डा. रामबहादुर खड्का
अध्यक्ष
वातावरणीयव्यवस्थापनविषय समिति
पोखरा विश्वविद्यालय

Bachelor of Science in Environmental Management
(B. Sc. Env. Mgmt.)

CURRICULUM

Faculty of Science and Technology

Pokhara University

2013

POKHARA UNIVERSITY
Bachelor of Science in Environmental Management Program

1. Program Objectives

The Bachelor of Science in Environmental management (B. Sc. Env. Mgmt.) of Pokhara University has been designed to offer an unique opportunity to acquire highly skillful knowledge and

practical tools on Multi-disciplinary subjects related to Environmental Management. The course provides the fundamental basis for the understanding and application of Social, Physical, Biological, legal and economical components of Environment and their integrating into a holistic approach to provide a comprehensive working knowledge on the environmental management. The program focuses on developing social, environmental and developmental outlook and adequate skill in analysis, environmental decision-making, implementation, leadership, and communication among the students.

The specific objectives of the program are as follows:

1. Offer the courses and research study covering fundamentals, environmental management tools and advanced courses.

2. Provide an opportunity of carrying out research using cross- cutting tools and state of the art information for thesis.

3. Provide an opportunity for the students to acquire the advance knowledge on the subject and enhance the individual skills and expertise and

4. Contribute to policy research and support the concerned institution in the country

2. Curricular Structure

The curriculum is designed to equip the students with the competencies, knowledge, skills, and attitudes required for a successful Environmental Scientist and Manager. The coursework gives students multi-disciplinary holistic view of the complexity of environmental issues. The curriculum comprises the following 4 distinct components:

- **Fundamental Knowledge Courses (FKC):** The foundation and analytical courses provide the necessary academic background and analytical tools for B.Sc. study and are pre-requisite for advanced courses.
- **Environmental Management Tools (EMT):** An advanced courses on the application of Environmental management tools and methods for analytical study for solving complexity of environmental problems
- **Advanced Courses (AC):** The courses provides students with an opportunity for in-depth study with particular focus on the global environment issues,
- **Thesis:** Students are required to undertake an undergraduate research project that involves fieldwork and empirical data analysis of the information collected. Students are also required to prepare a thesis on a prescribed format. This would provide students with an opportunity to gain real-life experiences by applying the environmental management tools for solving complex environmental issues.

3. Program Features

The program is spread over eight semesters. A student needs to successfully complete 120 credit hours of course work. The program will use a range of pedagogical inputs that includes on-campus learning through classroom discussions, presentations, group work, case analysis and guest lecture series, and off-campus learning through project work, on-line instructions.

4. The Semester System

The prominent feature of the semester system is the continuous evaluation of a student's performance, and flexibility given to the students to progress at pace suited to his/her individual ability as per the credit requirements.

The credit hour assigned to each course of this program varies depending on its lecture, tutorial and practical work hours in a week. One lecture/contact hour per week per semester is assigned one credit. That is, a three credit hours course has 48 class hours. A faculty member is assigned to teach each of the courses. If the course is taught by more than one faculty member, then one of the members is designated as the coordinator of that course.

5. Entry Requirements and Admission Procedures

Eligibility

The prospective individual with an intermediate (+2) degree in science, forestry, agriculture and engineering and other related technical subjects or equivalent from recognized institutions are eligible to enter into the B. Sc. degree course in environmental management. Besides fulfilling the basic academic requirements, the student must pass the entrance test conducted by the college.

Documents Required

The applicant is required to submit the following documents with the application form made available by the concerned college/school by paying a predetermined fee:

- Completed and signed B. Sc. application form
- Official transcripts from all the academic institutions attended
- Migration certificate

Certificates of all degrees should be photocopied and submitted with proper attestation. Enrolment is conditional upon completion of all admission formalities including payment of all fees as determined by the college. Incomplete applications shall not be processed.

Admission Procedures

A notice inviting applications for admission is publicly announced. Application forms and information brochures are provided, on request, after the payment of the prescribed fee. The concerned college scrutinizes the application. The eligible candidates are informed to take the entrance test. The date and time for the entrance test are informed to the applicants by the concerned colleges. The college may also interview the candidates for final selection for admission. A college may, however, modify the selection procedure to suit its needs with prior approval of the Dean.

The candidates, who are given provisional admission under special condition, are required to submit all necessary documents within a month of the beginning of regular classes. Otherwise, the admission will be canceled.

6. Academic Schedule and Course Registration

The academic session consists of two semesters. The Fall Semester starts in September and the Spring Semester starts in March. Students are normally admitted to the program in the Fall Semester.

Students are required to register courses at the beginning of each semester. Since registration is a very important procedural part of the credit system, all students must present themselves at the college. Registration in absence may be allowed only in rare cases at the discretion of principal. A student's nominee cannot register for courses but will only be allowed to complete other formalities.

7. Addition and Withdrawal from Courses

A student would have the option to add or drop from the course. This can, however, be done only during the first week of the semester. A student wishing to withdraw from a course, should apply on the prescribed from within two weeks from the starting date of the Semester.

8. Normal and Maximum Duration of Study

The duration for the completion of the program is as follows:

- Normal duration: 4 Years (8 Semesters)
- Maximum Duration: 8 Years

A full-time student has to take a minimum of 12 credits.

9. Attendance Requirements

The students must attain every lecture, tutorial and practical class. However, to accommodate for late registration, sickness and other such contingencies, the attendance requirements will be a minimum of 80% of the classes actually held.

10. Evaluation System

A student's academic performance in a course is evaluated in two phases as:

- Internally by the concerned faculty member and

- Externally by the Office of the Controller of Examinations through semester-end examinations.

A fifty percent weight is given to internal evaluation and fifty percent weight is given to external evaluation (Semester-end examination). The pass mark for both the internal evaluation and external evaluation (Semester-end examination) is forty-five percent. A student must qualify in both evaluations separately to get a pass grade in a particular course. The final grade awarded to a student in a course is based on his/her consolidated performance in both internal and external evaluations.

The internal evaluation may consist of various components like project works, quizzes, presentations, written examinations, reflection notes preparation, and the like. A student will get NOT QUALIFIED (NQ) status in the internal evaluation if his/her performance falls below the minimum requirement. Such students will not be allowed to appear in the semester-end examination of that particular course.

11. Grading System

Pokhara University follows a four-point letter grade system. The letter grades awarded to students will be as follows:

Grade	Grade Point	Description
A	4.0	Excellent
A-	3.7	
B+	3.3	
B	3.0	Good
B-	2.7	
C+	2.3	
C	2.0	Satisfactory
C-	1.7	
D+	1.3	
D	1.0	Minimum Requirement
F	0	Failing

If a student cannot finish all the assigned works for the course, he/she will be given an incomplete grade 'I'. If all the required assignments are not completed within the following trimester, the grade of 'I' will automatically be converted into 'F'.

The performance of a student is evaluated in terms of two indices: (a) Semester Grade Point Average (SGPA) which is the grade point average of the particular semester, and (b) Cumulative Grade Point Average (CGPA) which is the grade point average of all the semesters.

$$SGPA = \frac{\text{Total honor points earned in a semester}}{\text{Total number of credits registered in a semester}}$$

$$CGPA = \frac{\text{Total honor points earned}}{\text{Total number of credits completed}}$$

Where,

Honor Point = Grade point earned in a subject × Number of credits assigned to that subject

12. Degree Requirements

For graduation a student should have:

- A 'D' or better grade in each of the courses as specified in the grading system section.
- Completed the internship with 'Pass' grade.

- Completed all the courses, project work and internship as specified in the curricular structure section within the maximum time period specified in the normal and maximum duration of study section.
- A CGPA of 2 or better.

13. Distinction and Dean's List

A student who obtains a cumulative GPA of 3.60 or better will receive the B. Sc. degree with distinction. The Dean's list recognizes outstanding academic performance in the Faculty of Science and Technology. To qualify to this list, a student must have a CGPA of 3.70 or better.

14. Repeating a Course

A course may be taken only once for grade. Since passing of all courses individually is a degree requirement, the student must retake the failing course when offered and must successfully complete the course. A student will be allowed to retake maximum of two courses to achieve a minimum CGPA of 2.0. The grade earned on the retake examination will substitute the earlier grade earned by the student in that course. A student can retake a course only when it is offered by the college/university.

15. Credit Transfer and Withdrawal

A maximum of 25% of the total credit hours of course work completed by a student in an equivalent program of a recognized university/institution may be transferred/ waived for credit by the Dean on the recommendation of the principal of the college. However, for such transfer of credit, a student must have received a grade of 'B' or better in the respective course. Courses taken more than five years earlier than the date of application will not be accepted for transfer of credit.

Credit transfers will also be allowed from different programs of Pokhara University. In such cases, all credits earned by students in compatible courses with a minimum grade of B may be transferred to the new program.

The student may apply for withdrawal from the entire semester only on medical grounds. However, partial withdrawal from courses registered in a semester will not be considered.

16. Unfair Means

Students are strictly forbidden from adopting unfair means in class assignments, tests, report-writing and final examination. The following would be considered as adoption of unfair means during examination:

- Communicating with fellow students for obtaining help.
- Copying form another student's script/report/paper.
- Copying from disk, mobile, palm of hand or other incriminating documents and equipment.
- Possession of any incriminating documents, whether used or not.
- Any approach in direct or indirect form to influence teacher concerning grade.
- Unruly behavior which disrupts academic program.

If the instructor detects a student using unfair means, the student may be given an 'F' grade at the discretion of the Examination Board. Adoption of unfair means may result in the dismissal of the student from the program and expulsion of the student from the college and as such from Pokhara University.

17. Dismissal from the Program

A student is normally expected to obtain a GPA of 2.0 in the semester end examinations of the B. Sc. program. If a student's performance falls short of maintaining this CGPA continuously over the semester he/she may be advised to leave the program or dismissed from the program.

18. Detailed Curricular Structure

The B. Sc. students are required to complete 37 courses, Students are required to complete Fundamental Knowledge Course 11 (31 credits), Advance Management Courses 10 (30 credits) Tools and Techniques Course 11(32 credits) Specialized Courses 6 (credit 27), including thesis work.

The first semester is focused on developing the foundation required for learning the core/functional area and integrative courses. Students are required to attend classes in the college and take written examinations conducted by PU to be held at the end of the each semester.

CURRICULAM STRUCTURE

Fundamental Knowledge Course	**(31 Credit Hours)**
ENG 101 General English	2
MTH 102 Fundamentals of Mathematics	3
ENV 103 Introductory Biology	3
ENV 104 Introductory Chemistry	3
ENV 105 Introductory Physics	2
ENV 106 Environmental Geology and Soil	3
ENG 107 Communication and Technical English	3
MTH 108 Applied Mathematics	3
ENV 109 Environmental Microbiology	3
ENV 110 Environmental Chemistry	3
ENV 111 Ecology and Environment Science	3

Environmental Management Course	**(30 Credit Hours)**
SOC 201 Environmental Sociology	3
ECO 202 Fundamental Economics	3
STT 203 Applied Statistics	3
ENV 204 Biodiversity and Biotechnology	3
ENV 205 Hydrology and Meteorology	3
ENV 206 Environmental Resources and Sustainable Development	3
ECO 207 Environmental Economics and Trade	3
ENV 208 Environmental Engineering	3
MGT 209 Environmental Policy, Laws and Conventions	3
MGT 210 Project Management	3

Environmental Management tools and Techniques	**(32 Credit Hours)**
ENV 211 Sustainable Tourism Management	3
ENV 212 Environmental Management System	3
ENV 213 Environmental Assessment Techniques	3
ENV 214 Environmental Monitoring	3
ENV 215 Environmental Governance	3
ENV 216 Geo-information Management	3
MGT 217 Comprehensive Environmental Planning and Conflict Management	3
ENV 218 Disaster and Risk Assessment Techniques	3
ENV 219 Urban Development and Environmental Management	3
ENV 220 Integrated Watershed Management	3
ENV 221 Environmental Technology	2

Specialized Course	**(27 Credit Hours)**
ENV 301 Aquatic Environmental Management	3
ENV 302 Climate change and society	3
RCH 303 Research Methodologies	3
ENV 304 Environmental Health and Sanitation	3
ENV 305 Emerging Issues, Seminar and Proposal Writing	3
ENV 306 Thesis (Research Work)	12

Thesis

During the study in 8th Semester, students are required to undertake a research assignment as thesis work and prepare a research report in any areas of environmental management as approved by the Principal of Colleges. The principal of College should appoint a research supervisor for each student based on the topics of research. For undergraduate program (B. Sc.), the research supervisor should be holding a Ph. D. degree or more than 10 years experiences for those who are holding only M. Sc. degrees

on that particular area of research. Each student preparing for a thesis should submit a synopsis of research topics and curriculum vitae of research supervisor to the Principal of College and after approval; it should be forwarded to the Dean office of the University for Registration.

Students are required to attend the viva-voce examination and give a seminar presentation of their report as organized by the University. The weightage given for viva and the research report will be 25% and 75% respectively. For the evaluation of the research report, the University shall appoint external examiners. The external examiner shall be appointed from the list approved by the Office of the Dean and the search supervisor will act as internal examiner.

Pokhara University

Bachelor of Science in Environmental Management Program

CURRICULAR STRUCTURE AND COURSE CYCLE

Semester I			Semester II		
Course Code	**Course Description**	**Credit Hours**	**Course Code**	**Course Description**	**Credit Hours**
ENG 101	General English	2	ENG 107	Communication and Technical English	3

MTH 102	Fundamental of Mathematics	3	MTH 108	Applied Mathematics	3
ENV 103	Introductory Biology	3	ENV 109	Environmental Microbiology	3
ENV 104	Introductory Chemistry	3	ENV 110	Environmental Chemistry	3
ENV 105	Introductory Physics	2	ENV 111	Ecology and Environment	3
ENV 106	Environmental Geology and Soil	3		Science	
		16			**15**

Semester III			**Semester IV**		
Course Code	**Course Description**	**Credit Hours**	**Course Code**	**Course Description**	**Credit Hours**
SOC 201	Environmental Sociology	3	ENV206	Environmental Resources and Sustainable Development	3
ECO 202	Fundamental Economics	3	ECO 207	Environmental Economics and Trade	3
STT 203	Applied Statistics	3	ENV 208	Environmental Engineering	3
ENV 204	Biodiversity and Biotechnology	3	MGT 209	Environmental Policy, laws and Conventions	3
ENV 205	Hydrology and Meteorology	3	MGT 210	Project Management	3
		15			**15**

Semester V			**Semester VI**		
Course Code	**Course Description**	**Credit Hours**	**Course Code**	**Course Description**	**Credit Hours**
ENV 211	Sustainable Tourism Management	3	MGT 217	Comprehensive Environmental Planning and Conflict Management	3
ENV 212	Environmental Management System	3	ENV 218	Disaster and Risk Assessment Techniques	3
ENV 213	Environmental Assessment Techniques	3	ENV 219	Urban Development and Environmental Management	3
ENV214	Environmental monitoring	3	ENV220	Integrated Watershed Management	3
ENV 215	Environmental Governance	3			
ENV 216	Geo-information Management	3	ENV 221	Environmental Technology	2
		18			**14**

Semester VII			**Semester VIII**		
Course Code	**Course Description**	**Credit Hours**	**Course Code**	**Course Description**	**Credit Hours**
ENV 301	Aquatic Environmental Management	3	ENV 306	Thesis Work	12
ENV 302	Climate Change and Society	3			
RCH 303	Research Methodology	3			
ENV 304	Environmental Health and Sanitation	3			
ENV 305	Emerging Issues Seminar and Proposal Writing	3			
		15			**12**

POKHARA UNIVERSITY TYPICAL CURRICULUM FOR BACHELOR IN ENVIRONMENTAL MANAGEMENT

Areas	Courses	Semester
Fundamental Knowledge Course Introductory Courses	ENG101General English	I
	MTH102Fundamentals of Mathematics	I
	ENV 103Introductory Biology	I
	ENV 104Introductory Chemistry	I

	ENV 105Introductory Physics	I
	ENV 106Environmental Geology and Soil	I
	ENV 107Communication and Technical English	II
	MTH108Applied Mathematics	II
	ENV 109Environmental Microbiology	II
	ENV 110Environmental Chemistry	II
	ENV 111Ecology and Environment Science	II
Environmental Management Course Advance Courses	SOC201Environmental Sociology	III
	ECO202Fundamental Economics	III
	STT203Applied Statistics	III
	ENV 204Biodiversity and Biotechnology	III
	ENV 205Hydrology and Meteorology	III
	ENV 206Environmental Resources and Sustainable Development	IV
	ECO207Environmental Economics and Trade	IV
	ENV 208Environmental Engineering	IV
	MGT209Environmental Policy, Laws and Conventions	IV
	MGT210Project Management	IV
Environmental Management Tools and Techniques Course Advance Courses	ENV 211Sustainable Tourism Management	V
	ENV 212Environmental Management System	V
	ENV 213Environmental Assessment Techniques	V
	ENV 214Environmental Monitoring	V
	ENV 215Environmental Governance	V
	ENV 216Geo-information Management	V
	MGT217Comprehensive Environmental Planning and Conflict Management	VI
	ENV 218Disaster and Risk Assessment Techniques	VI
	ENV 219UrbanDevelopmentandEnvironmental Management	VI
	ENV 220Integrated Watershed Management	VI
	ENV 221Environmental Technology	VI
Specialized courses Research and application in Environmental Management	ENV 301AquaticEnvironmental Management	VII
	ENV 302 Climate Change and Society	VII
	RCH303Research Methodology	VII
	ENV 304Environmental Health and Sanitation	VII
	ENV 305Emerging Issues, Seminar and Proposal Writing	VII
	ENV 306Thesis (Research Work)	VIII

ENG 101General English

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide the basic knowledge of English grammar and fundamentals.
- To enable the students to express or communicate their thoughts and ideas in English

Course Contents:

Unit I: Grammar **8 hrs**

Articles, prepositions, Active/Passive Voice, Tenses, Conditional Sentences, Inversions, Discourage Makers, Punctuation Marks, Subject Verb Agreement

Unit II: Writing Correct Sentences **6 hrs**

Spelling rules

Unit III: Comprehension Passage **6 hrs**

Articles published in the newspaper, journals, magazines and various other sources

Unit IV: Writing **6 hrs**

Style, beginning and ending a composition, paragraph writing

Unit V: Vocabulary Building **2 hrs**

30 days to a more powerful vocabulary

Unit VI: Spoken English **4 hrs**

Vowel sounds, long vowels, consonant sounds, and pronouncing infections

Text Books:

1. Orient Longman, (1990), Modern Essays, India
2. Pink M.A. and Thomas S.E. (1996), English Grammar (12th ed.) S Chand and Company Ltd. India

References:

1. Chopra Ravi. Words that Worry, Radhika Publications.
2. Bhatia S.C and Kaushik, R. K. (1995), Essays, Short Stories and One-Act Plays. Oxford University Press, Kolkatta
3. Michael Swan, Practical English Usage
4. Orient Longman, (1990), Modern Essays, India
5. Peter Roach, English Phonetics and Phonology
6. Pink M.A. and Thomas S.E. (1996), English Grammar (12th ed.) S Chand and Company Ltd. India
7. Thomas and martinet, Practical English Grammar
8. Wilfred Funk and Norman Lewis, 30 Days to a More Powerful Vocabulary

MTH 102 Fundamental of Mathematics

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide the students various mathematical tools.
- To enable the students to apply these tools in wide variety of problems in the environmental sector.

Course Contents:

Unit I: Basic Algebra **3 hrs**

Real numbers, exponents, radicals, polynomial and algebraic expressions, factoring, equations and its applications, inequalities.

Unit II: Sets and Relations **6 hrs.**

Definition, different types of sets, Venn diagram, operations on sets, ordered pairs, Cartesian products, relations, applications.

Unit III: Basic Trigonometry **8 hrs**

Introduction, Terminologies, Trigonometric Formula, Co-ordinate System- co-ordinates in three space and plane, angle between two lines, general equation of the first degree representing a plane, angle between two planes, plane through three points, plane through the intersection of two planes.

Unit IV: Functions and Graphs **4 hrs**

Definition, function, objective function, composite and inverse functions, graphs of functions, linear functions, periodic function and their graphs, exponential and logarithmic and trigonometric functions.

Unit V: Limits and Continuity **6 hrs**

Definition, properties and types of a limit, limit of a functions, continuity of a function, discontinuities, continuity and inverse images of open and closed sets, uniform continuity.

Unit VI: Derivatives **6 hrs**

Definition, Techniques of differentiation, derivative of algebraic, exponential, logarithmic and trigonometric functions.

Unit VII: Integration **6 hrs**

Integration concepts, Indefinite integrals, Techniques of integration and standard formulae, Definite integrals and fundamental theorem of integral calculus and properties of definite integrals.

Unit VIII: Two-dimensional Geometry **4 hrs**

Standard Equation of Circle, Parabola, Ellipse and Hyperbolic Sketch them. Some related (simple) problems.

Text Book:

1. Bernard J. Rice, Jerry D. Strange, Technical Mathematics and Calculus, Prindle, Weber and Schmidt.

References:

1. Bernard J. Rice, Jerry D. Strange, Technical Mathematics and Calculus, Prindle, Weber and Schmidt.
2. Larry J. Goldstein, David C. Lay, David I. Schneider, Calculus and its Applications, Prentice Hall Int.
3. Pandel, T.N. and Adhikari, H.P. 2004. Engineering Mathematics, Sukunda Pustak Bhawan, Bhotahity, Kathmandu
4. Ruric E. Wheeler, W. D. Peeples, Jr., Modern Mathematics with Applications to Business and Social Sciences, Brooks/Cole Publishing Company
5. Thomas, F., Calculus and Analytical Geometry, Narosa Publishing House.

ENV 103Introductory Biology

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide the fundamental concepts and understandings of biology.
- To provide an understanding of the linkages between biological science and other sciences.
- To provide an understanding of the linkages between different components of biology.

Course Objectives:

Unit I: Fundamentals of Biology **14 hrs**

Fundamental concept of a living system, evolution of living system, evolutionary theories, cell and cell structure, characteristics of prokaryotic and eukaryotic cells, characteristics and differences between plants and animals.1b.Morphology and anatomy- Morphological characters of plants and animals, tissue and organ systems in plants and animals, anatomy of some major organs of plants and animals.

Unit II: Physiology **8 hrs**

Concept of physiology, some basic physiological process in plants and animals (osmosis, transpiration, photosynthesis, respiration, excretion, growth, reproduction, movement, circulation, etc.)

Unit III: Systematic Studies: **12 hrs**

1. Introduction, Systems of classification including recent trends (Chemotaxonomy, molecular, cytogenetic, numerical taxonomy, etc.)
2. General classification of plants and animals, nomenclature. Taxonomic study of some important plants and animals, Important Plants and Animals: Some important plants and animals of economic importance including medicinal and recreational value.

Unit IV: Ecology **6 hrs**

Introduction of ecology, ecological factors, concept of ecosystems.

Practical **8 hrs**

1. Simple Biomass estimation
2. Vegetation Sampling
3. Microscopic cell analysis
4. Osmosis and transpiration
5. Microbiological examination of water
6. Visit nearby forest/ grassland ecosystem to enumerate floral and faunal diversity(preparation of herbarium and their study)

Text books:

1. Smith, R.L. 1992. Elements of Ecology, Harler –Collins Publishers
2. Verma, P.S. & Agrawal, V.K. 2000, Environmental Biology, S Chand and Company Ltd.

References:

1. Bilgrami, K., Shrestha, H. & Shrestha, L. Fundamentals of Botany, S. Chand and Co.
2. Noggle, G.R. and Fritz, G.J. 1992, Introductory Plant Physiology (Second Edition), Prentice Hall of India Pvt. Ltd.
3. Pandey, B. P. 1986, Modern Practical Botany Practical, Zoology Vol. II and I
4. Rastogi, S.C.1997, Essentials of Animal Physiology (Second Edition), New Age International Publishers
5. Shrestha, S. A Laboratory Manual of Botany
6. Smith, R.L. 1992. Elements of Ecology, Harler –Collins Publishers,

7. Verma P. S. and V. K. Agrawal, 1994, Cell Biology, Genetics, Evolution and Ecology, 12th Edition, S. Chand and Co.
8. Verma, P.S. & Agrawal, V.K. 2000, Environmental Biology, S Chand and Company Ltd.
9. Yadav, U.K. R. 2005. Ecology and Physiology, UK Publisher and Distributors, Kathmandu, Nepal.

ENV 104 Introductory Chemistry

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide the fundamental concepts of chemistry to the students
- To enable the students understanding the importance and use of chemistry in everyday life
- To make the students identify and evaluate the environmental and technological implications of chemistry.

Course Contents:

Unit I: Physical Chemistry **6 hrs**

Introduction, Physical properties of Matter and its changes, States of matter-gaseous state, liquid state and solid state, Physical Properties of Gases and Vapors, Diffusion, Kinetic Theory of Gases, Chemical equilibrium, Ionic equilibrium, thermodynamics and thermo-chemistry, chemical kinetics, catalysis and photochemistry, colloidal chemistry.

Unit II: Inorganic Chemistry **16hrs**

2a. Introduction, Atoms and Atomic Structure, Atomic properties, Symbol, Periodic table and classification of elements, Elements and Compounds, bonding in elements and compounds, Chemical bonds: Valency, Formula and Equation, Acids, Bases and Salts, Principles of qualitative and quantitative analysis-solubility product, common ion effect,

2b. Study of non-metals- Hydrogen, Oxygen, Nitrogen, Halogens, Sulphur and Phosphorus and their compounds.

2c. Study of Metals- Sodium, Potassium, Ammonium, Calcium, Magnesium, Zinc, Cadmium, Copper, Lead, Arsenic, Manganese, Cobalt and Iron and their compounds.

Unit III: Organic Chemistry **10 hrs**

Introduction to organic chemistry, classification and nomenclature of organic compounds, Some important organic compounds, polymers and polymerization, Carbohydrates, Lipids, Proteins and Vitamins

Unit IV: Concept of Analytical Chemistry **8 hrs**

Spectra - photometry, Chromatography and Titrometry. Principles of gravimetric and volumetric analysis,

Practical Courses: **8 hrs**

Concept of analytical methodology:

1. Volumetric Analysis
2. Colorimetric analysis
3. Spectrophotometric Analysis
4. Gravimetric Analysis

Text Book:

1. R.M. Harrison & S. J. de Mora, 1996, Introductory Chemistry for the Environmental Science, Second edition (Cambridge Low Price Editions), Cambridge University Press

References:

1. B.S. Bahl & Arun Bahl, 2001, Elementary Organic Chemistry, S. Chand & Company Ltd.
2. Ladle Mohan Mitra, 1999, A Text Book of Inorganic Chemistry, Ghosh & Co
3. R.M. Harrison & S. J. de Mora, 1996, Introductory Chemistry for the Environmental Science, Second edition (Cambridge Low Price Editions), Cambridge University Press

ENV 105 Introductory Physics

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide the students fundamental concepts of physics
- To make the students able to understand various principles concepts, formulas and mathematical relationships in physics
- To equip the students with an ability to apply the knowledge in various environmental related fields.

Course Contents:

Unit I: Units of Measurements and Scales **4 hrs**

Introduction, Significance of measurements, units of measurements, systems of units, dimension of physical quantity, dimensional formulae and equations.

Unit II: Principles of Mechanics **6 hrs**

States of matter, properties of matter, motion in a straight line- scalar and vector, kinematics-distance and displacement, velocity and speed, average, instantaneous, uniform and variable velocity, acceleration, equations of motion in a straight line, projectiles, Dynamics-force, momentum, Newton's Law of Motion, Work, Energy and Power-Work, Power, Energy, Principles of conservation of energy, Viscosity, Surface Tension and Hydrostatics.

Unit III: Thermal Effect **6 hrs**

Heat and Temperature, effects of heat, scales of temperature, expansion of matter (solid, liquid and gas), heat capacity and specific heat capacity, change in states (solid to liquid, liquid to gas and solid to vapor), triple point, gas laws and ideal gas equation, transmission of heat- conduction, convection and radiation.

Unit IV: Oscillation and Wave **4 hrs**

Wave motion and its propagation, intensity and loudness, Doppler effects, acoustic in room.

Unit V: Optical Phenomena **4 hrs**

Reflection, Refraction, Dispersion, Interference, and Diffraction.

Unit VI: Electric and Magnetic Effects **4 hrs**

Introduction, Polarization, charge conduction, and effects of current, magnetic effects.

Unit VII: Effects of Radiation **4 hrs**

Effects of Atomic and Nuclear Radiation-Introduction, effects of atomic radiation (X-rays, photoelectric effects, ionization), effects of nuclear radiation and radiation hazards.

Practical:

1. Vernier Scale Measurement
2. Viscosity
3. Expansion of Matter
4. Reflection/ Refraction
5. Charge/ conduction

Text book:

1. P. M. Whelean and M. J. Hodgson, Essential Principles of Physics

References:

1. R. Murugeshion, Modern Physics
2. I. Kaplan, Nuclear Physics

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To present the fundamental concept and principles of geology, geomorphology and the atmosphere, and their application to the understanding of the environment.
- To provide the students with the understanding of the different components of geology.
- To familiarize the students with different components of soil sciences including characteristics, land degradation- causes and effects.
- To enable and equip the students with applied and practical knowledge with the sufficient field and laboratory analysis with environmental perspective.

Course Contents:

GEOLOGY

Unit I: Introduction **3 hrs**

Global perspective-the universe, the solar system, the geologic timescale, the planet earth-spheres of the earth system, hemispheres, continents and ocean.

Unit II: Crust **8 hrs**

The earth's internal layer, the earth's outer layer, the crustal layer, minerals and rocks, rock types-igneous, sedimentary, metamorphosis, the rock cycle, minerals and rock resources and environment, the lithosphere continental drift, continents and seafloors, distribution & movement of plates, earthquakes and volcanism distribution of earthquake and volcanic activity, earthquake terminology & hazards, Surface structures-fault structures, fold structure, regional deformation

Unit III: Geomorphology **8 hrs**

An introduction, the formation of landscapes and landforms- landscapes & landforms, gradation, erosion and tectonics, regional landscapes, weathering processes-mechanical, chemical, biological and geographical weathering, mass movement and its importance, water in the lithosphere-water at the surface, water flow in the rivers, water beneath the surface, Slopes and Streams-erosion & the hydrologic cycle, streams & basins, factors in stream erosion, the river as a system. Karst processes, glacial degradation and aggradations. Landforms and landscapes of continental glaciers, landforms and landscapes of mountain glaciers, peri-glacial environments and landscapes, wind as a geomorphic agent.

SOIL

Unit I: Introduction **3 hrs**

Concept of soil, composition of soil, relation with the environment

Unit II: Physical characteristics **4 hrs**

Classification of soil texture and structure, their roles in soil processes, in soil air-composition, variation in soil temperature, role in soil processes, concepts of soil water potential, types of soil water, role in soil processes.

Unit III: Soil Chemistry **4 hrs**

Primary and secondary minerals (clay minerals), macro- and micro-nutrients, soil organic matter, pH, buffering capacity, acidity, alkalinity, salinity, soil colloids, Cation and anion exchange capacity.

Unit IV: Soil Biology **4 hrs**

Soil organisms and their importance, major biological processes- aerobic and anaerobic decomposition processes, Nitrification and De-nitrification, mineralization and immobilization of nutrients.

Unit V: Soil Genesis **3 hrs**

Formation of soil horizons, factors affecting soil formation processes, soil classification.

Unit VI: Soil Quality **6 hrs**

Soil functions and land quality indicators, salinization, compaction, effects of polluted air and water, acidification, effects of mining and waste disposal, water logging, nutrient exhaustion, pesticide and heavy matter accumulation, and organic matter depletion.

Practical Courses **5 hrs**

1. Water Holding Capacity of Soil
2. Soil Texture and its classification
3. pH and Buffering Capacity of Soil .
4. Soil Porosity and Bulk density.
5. General Survey of Rocks and Minerals

Text Book:

1. Blume, H.P., Eager, H., Fleischhauer, E., Hebel, A., Reji, C.and. Steiner, K.G. (editors) Advances in Geo-ecology 31.Catena Verlag GMBH, Reiskirchern, Germany, 1998.Bloom, A.L.1992, Geomorphology, Prentice Hall of India.
2. Brady, N.C. The Nature and Properties of Soils (10th Edition), Eurasia

References:

1. Publishing House (P) Ltd., 1997 (Editors), Advances in Geoecology 31, Catena Verlag GMBH, Germany, 1998Cesare Emiliani, 1997, Planet Earth, Cambridge University Press.
2. Edward A. Keller, 1999, Introduction to Environmental Geology
3. Hills, E.S. 1972, Elements of Structural Geology, Chapman and Hall.
4. Miller, R.W. and Donahne, R.L. Soils in Our Environment (7thEdition), Prentice Hall of India. Pvt.Ltd. 1997.
5. Sharma, C.K.1994, Geology of Nepal. Wild. 1993. Soil and the Environment- An Introduction. Cambridge University Press.

ENG 107 Communication and Technical English

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To make the students able to deliver the technical knowledge orally in English
- To enable the students comprehending and taking notes after listening
- To develop the summarizing skills in writings
- To make the students capable of writing reports, letters, technical papers, seminar papers, applications and memoranda, etc.

Course Contents:

Unit I: Principles of Communication **4 hrs**

Barriers of Communication/Seven Cs of Communication

Unit II: Review of grammar and written English **4 hrs**

Unit III: Review of comprehension passages **8 hrs**

(more comprehension passages from Newspaper, Journals, Magazines, etc., which are relevant to environmental studies, social problems, etc.)

Unit IV: Oral Communication, Note taking and Summary writing **8 hrs**

Types or Variety levels of English, Technical talk on various environmental issues such as; environmental pollution, environmental resources, urbanization, social problems, etc.

Unit V: Technical Writing **16 hrs**

Different types of letters, memoranda, applications, technical descriptions, seminar papers, proposal writing, collecting /providing data and information following the given format, writing research papers and reports, etc.

Unit VI: Personal skill development **8 hrs**

Presentation skill, participation in group discussion, conduction of meeting, and preparation for facing an interview.

Text book:

1. Eisenberg, Anne 1992, Effective Technical Communication, McGraw Hill

References:

1. Houp and. Pearsall, T. E Reporting Technical Information, Allyn and Bacon, Boston.
2. Narayanswami, V. R. Strengthen Your Writing, Orient Longman, Madras.

MTH108 Applied Mathematics

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide students various applied mathematical tools.
- To enable them to apply these tools in wide variety of problems in the environmental sector.

Course Contents:

Unit I: Application of derivatives **6 hrs**

Differentials, slopes, stationary point, maximum and minimum (single variables), point of inflection, concavity, Conditions for concavity.

Unit II: Application of Integration **8 hrs**

The area under a curve, calculating area as a limit, Area between two curves, Area of closed curve, Average value, Application of integral calculus in the management, economics life sciences, environment and social science

Unit III: Ordinary Differential Equations **10 hrs**

Introduction, classification, separation of variables, exact equations an integrating factor, linear first order differential equations, homogenous equations and substitution techniques, Applications.

Unit IV: Matrix Algebra **8 hrs**

Matrices, Definition, some special types of matrices, matrix operations, transpose of a matrix, determinant, and properties of determinants.

Unit V: System Linear Equations **8 hrs**

Simultaneous linear equations, consistency and inconsistency, matrix representation of a linear system, solution of linear system, use of determinant to solve (up to three variable) simultaneous equations.

Unit VI: Linear Programming **8 hrs**

Linear inequalities, half planes, system of inequalities, convex polygon region (or polynomial convex set), objective function, constraints, theorem (without proof), graphical solution method, Simplex method, Simplex method (de-generation), Simplex method (difficulties in starting).

Text Book:

1. Bajracharya, D. R., Singh, M. B., Sthapit, Y. R, and Bajracharya, B. C. Basic Mathematics, Sukunda Pustak Bhawan

References:

1. Thomas, George B., Ross JR, and Finney, L. Calculus and Analytic Geometry, Narosa Publishing House, New Delhi
2. Shenik, A.C 1984, Calculus and Analytic Geometry, Scott, Foresman and Company.
3. Krayszig, Erwin 8th Edition, Advance Engineering Mathematics.

ENV 109 Environmental Microbiology

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide the students the concept of the microbial world.
- To provide the students general knowledge and practical skills on fundamental techniques of handling microbes.
- To enable the students in understanding characteristics, physiology and ecology of microbes.
- To familiarize the students with the application of microbiology in Environmental Management

Course Contents:

Unit I: Introduction to microbiology 4 hrs

Definition, classification based on phylum of microbes, based on ecological characteristics, based on carbon source, based on source of electron acceptor, based on temperature preference, and based on morphology, structure and functions of Eukaryotic (algae, fungi and protozoa) and Prokaryotic (bacteria and virus) organisms

Unit II: Life characteristics of microorganisms 8 hrs

Metabolism, enzymes, growth, reproduction, genetics of microorganisms; relation with carbon, nitrogen, mineral and vitamins, temperature, water activity, pH, gases, light.

Unit III: Microbial environment 6 hrs

Ecological concept, microbial interactions and symbiotic relationship, normal microbial flora of animals and plants, microbial flora of aquatic and terrestrial environment; acidophiles, alkaliphiles, halophiles, common human and plant pathogens

Unit IV: Microbial processes in terrestrial and aquatic environment 8 hrs

Introduction; role and threshold level of microbes in Carbon cycle Organic matter decomposition; Nitrogen cycle - onification, Nitrification, De-nitrification; Phosphorus cycle - solubilization, mineralization and immobilization; Sulphur cycle – mineralization, immobilization, oxidation and reduction of sulphur compounds in the environment; Degradation, mineralization and detoxification of xenobiotic and toxic, compounds

Unit V: Applications of Microbiology in Environmental Management 8 hrs

Wastewater treatment - Activated sludge, Trickling filter, anaerobic digestion and Oxidation Ponds Aquaculture; land treatment system, Solid waste treatment-composting, bio mechanism – Hazardous waste treatment, Bioremediation-polluted air, water and land Pollution control–Greenhouse gases

Unit VI: Biotechnological methods of pollution detection 6 hrs

Indicators, Bioassay, Biosensors Genetically engineered microbes in bio-treatment of wastes and environmental safety, Cleaner bioprocesses - Eco-friendly bio-products for environmental health, Microbial control of pests and disease causing organisms, Toxicity testing. Control of microorganisms: By physical, chemical, antibiotic and other chemotherapeutic agents.

Practical Work: 8 hrs

Lab/Field Visit:(water treatment Plant, Guheswori) Equipment's used in Microbiology Lab (Hot Water Bath, Autoclave, Incubator, Oven, pH meter, Balance, Spectrophotometer, Centrifuge, Microscope, and Desiccators).

1. Preparation of culture media
2. Study of indoor microbes
3. Bacteriological examination of water (qualitative tests)

4. Antimicrobial activity of medicinal plant extracts.
5. Gram staining of bacteria

Text Book:

1. Water and Wastewater Technology. Mark J. Hammer and Mark J. Hammer, Jr. Prentice-Hall of India Private Limited, New Delhi, 2000.

References:

1. Microbiology. Michael J. Pelcazar, Jr., E. C. S. Chan, and Noel R. Krieg. Tata McGraw-Hill Edition, New Delhi, 1993.
2. General Microbiology. Roger Y. Stainer, John L. Ingraham, Mark L. Wheelis and Page R. Painter. Prentice-Hall, New Jersey, 1986.
3. Soil Microbial Ecology – Applications in Agricultural and Environmental Management. F. Blaine Metting, Jr. (editor). Marcel Dekker Inc., New York, 1993.
4. Principles of Composting. Klaus Fricke, Thomas Turk and Hardy Vogtmann. EF-Verlag for Energy- and Environmental Technology GmBH, Berlin, 1990 (in German).
5. Microbiology – A Laboratory Manual. James G. Cappuccino and Natalie Sherman. Addison-Wesley Longman, Inc., Harlow, 1996.
6. Practical Microbiology. R. C. Dubey and D. K. Maheshwari. S. Chand & Company Ltd., New Delhi, 2002.
7. General Microbiology Vol.I and II, Power

ENV 110 Environmental Chemistry

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide fundamental background of environmental chemistry relevant to qualitative and quantitative analysis.
- To provide the understanding of the scope and depth of the environmental pollution.
- To provide the basic selection and use of appropriate analytical techniques.
- To familiarize the students with the knowledge of environmental monitoring techniques

Course Contents:

Unit I: Introduction **4 hrs**

Definition, Concept and scope of environmental Chemistry, Nomenclature, Environmental segments.

Unit II: Atmosphere **6 hrs**

Structure, composition, evolution, radiation balance, particles, ions and radicals, chemical and photochemical reactions, greenhouse effect, ozone hole and global climate.

Unit III: Hydrosphere **6 hrs**

Introduction, properties of water, hydrological cycle.

Unit IV: Lithosphere **6 hrs**

Composition, acid-base and ion exchange reactions, micro and macronutrients, nitrogen path, wastes and pollutants.

Unit V: Environmental toxicology **8 hrs**

Toxic chemicals, biochemical impacts of toxic elements, Fertilizers, Pesticides DDT, PCB, BHc, etc), Fuels

Unit VI: Pollution **10 hrs**

Air pollution-Introduction, air pollutants, air quality monitoring sampling and analysis of PM_{10}, NO_X, SOx, etc. Water pollution- Introduction, water pollutants, waste-water treatment technologies, water quality monitoring, sampling and analysis of various parameters Noise pollution- concept, causes, classification, measurements and effects

Practical Works: **8hrs**

Lab/Field Visit: (water treatment Plant, Guheswori)

1. Preparation, preservation and dilution of chemicals

2. Pollution: Water Pollution and Air Pollution (only orientation)- Learning to use the equipment's used for environmental studies (pH meter, Conductivity meter, BOD Incubator, UV spectrophotometer, Electronic Balance, High Volume Air Sampler)

3. Air quality monitoring techniques: Sample collection using HVS, methods of analyzing the parameters like; PM_{10}, NOx

4. Water quality monitoring techniques: Learning to use field kits for field observation, sample collection and preservation, methods of analyzing the parameters like; DO, BOD, Temperature, Conductivity, Turbidity, Chlorine, Hardness, Ammonia, pH, Iron, etc.

Text Book:

1. Dey, A. K., Environmental Chemistry, (3rd edition), New Age Int. (P), Ltd.

References:

1. Neill, P. O., Environmental Chemistry, (2nd edition), Chapman and Hall.
2. Banerji, S. K., Environmental Chemistry, Prentice Hall of India (P) Ltd.
3. Kothandaraman H.and Swaminatham.G. Principles of Environmental Chemistry, B.I Publications Pvt. Ltd, Chennai, India

ENV 111Ecology and Environment Science

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide the students a fundamental theoretical knowledge of the elements of ecology and environmental science.
- To make the students familiar with different ecological system
- To enable students understanding various environmental aspects and the relationship among themselves.
- To make the students familiar with fundamental issues on Environmental pollution and control
- To enable the students acquiring basic concept of resource conservation and management initiative

Course Contents:

Unit I: Introduction **4 hrs**

Fundamental concept of ecology and environmental science. Ecological and Environmental factors: Limiting factors, Liebig's Law of Minimum, Shelford Law of Tolerance.

Unit II: Biogeochemical and nutrient cycling **8 hrs**

Nitrogen, Carbon, Phosphorus, and Sulphur cycle and their impact on ecosystem.

Unit III: Ecosystem and Community Ecology **8 hrs**

Structure and function of major ecosystem Characteristics of Community, origin and development of community, classification of communities

Unit IV: Component of the Natural Environment **10 hrs**

Atmosphere: Physico-chemical structure of the atmosphere, Lithosphere: rocks and Soil, Weathering of rocks, mineralization, humification, Hydrosphere: Physical and chemical properties of water, fresh water habitats, lentic and lotic water. Biosphere: adaptation of plants and animals in biosphere, microorganisms, role of microbes. Socio-cultural Environment: Linkage between population and resources, cultural heritage and practices.

Unit V: Environmental pollution and hazards **6 hrs**

Fundamental concept of air pollution, water pollution, noise pollution and Solid waste management. Concept on Natural and human induced hazards

Unit VI: Environmental Initiatives and techniques for sustainable development **4 hrs**

Policy, Plan, and convention related to environment, Management of Environment-ecosystem approach (concept of Range, and Forest Management) Pollution control approach (Environmental friendly technology such as composting, biogas, and 3R principles).

Text Books:

1. Brijgopal and Bhardwaj, 1981, Elements of Ecology, Vikas Publication House.
2. Odum, E. P. 1971, Fundamentals of Ecology, W. B. Saunders.

References:

1. Joshi, A. R., Shrestha, S.L. and Joshi, Kunjani 2003. Environmental Management and Sustainable Development at the Cross Road, Ankus, Kathmandu, Nepal.
2. Pande, Badri B. et. al., 2000, Environmental Education Source Book, IUCN-The World Conservation
3. Union Trivedi, R.N. A Text Book of Environmental Sciences, Anmol Publications Pvt. Ltd.
4. Zobel, D. B., Jha P. K., Behar, M. J. and Yadav U. K., A Practical Manual for Ecology.
5. Y.N. Pande and G.P. Rao 1996 An Introduction to Applied Ecology, Students Friends, Allahabad, India

SOC 201 Environmental Sociology

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course objectives:

- To familiarize the students with some of the concepts, theories and methods in sociology and anthropology to understand the human-environment interactions and relations
- To enable the students in understanding and practicing the human ecological issues and develop a habit of realizing the integrating and interdisciplinary relationship of environmental and developmental issues.
- To develop the student's skills on identifying various human ecological issues and develop a thinking of integrating environmental issues in the human development aspect.

Course Contents:

Unit I: Fundamental concepts in sociology and anthropology 4 hrs

Fundamental concepts in Sociology and Anthropology: Society, community, culture; social structure: caste, class, ethnicity and gender; Major theoretical approaches: Functionalism, Conflict and Interpretative

Unit II: Population and Resources 6 hrs

Concept, meaning, nature and scope of Population studies and theoretical concepts of population growth, Natural resources; cultural concept of resources, Interrelationship between resources and Population (T. Mathus, E. Boresup, G. Hardin and R. Rappaport).

Unit III: Community development and people's participation 6 hrs

Community Development and people's Participation: Basic concept of people, community and Environment: development, concept of people's participation, and community development, and Realities of People's Participation in Conservation and Developmental Nepal

Unit IV: Human Ecology and Environment 8 hrs

Human Ecology: Overview of Human ecology, Theoretical approaches; Environmental determinism, cultural possibillism, cultural ecology, system ecology, actor-based model, ethno-ecology, cognitive ecology, political ecology

Unit V: Approaches of Gender 6 hrs

Approaches of Gender: WID, WAD, GAD and WED. Gender roles and interface with environment-gender based division of labor in and over resource management, access, control and decision making of men and women in over resource management (land, water and forest), environment degradations and impacts on women's life

Unit VI: Current Social Anthropological Issues of Environmental Management 8 hrs

Current social and cultural issues of Environment management: Patterns of environmental changes in Nepal, Indigenous knowledge on resource management in Nepal (discussion with some examples based on empirical studies), Roles of ritual and norms and values on resource management, weather fluctuation and climate change

Unit VII: Research methodology 8 hrs

Research Methodology: concept and meanings of social research, types of research, research design, tools and techniques of data collection (observation, interview, group discussion, survey)

Practical Works:
Field studies/Case studies:

1. PRA
2. RRA
3. Focused Group Discussion(FGD)
4. Questionnaire Design
5. Delphi Techniques

Text Book:

1. Hardesty, Donald A. 1977. "Introduction", in *Ecological Anthropology*, New York, NY: John Wile

References:

1. Kottach, Corrad Phillip 1991. *Cultural Anthropology*. New York
2. MacIver R. M. and C. H. Page 2001. *Society: An Introductory Analysis*. MacMillan India Limited.
3. Abraham, M. F. 1999. *Modern Sociological Theory: An Introduction*. Oxford University Press. India. (**Chapter 1, 4 and 5**)
4. Bhende Asha. A. and Tara Kanitkar 2004. *Principles of Population Studies*. Himalayan Publishing House, New Delhi. (**Chapter 1 and 5**)
5. Andelson, R. V. 1997. "Commons without Tragedy: The Congruence of Garrett Hardin and Henry George" in R, V. Anderson (ed.) Commons without Tragedy: Protecting the Environment for Overpopulation: A New Approach. London Shepheard- Walwaynpp. Pp 27-43
6. Hardin, G. 1998. "The Tragedy of the Commons" in Science pp. 1243-1248
7. Bhattachan K. B. 1997. "People/Community Development Strategy in Nepal", in K. B. Bhattachan and C. Mishra (eds) Developmental Practices in Nepal. Central Department of Sociology and Anthropology, TU., Kirtipur Pp. 100-148
8. Sachs, W. 1992. 'Development", in W. Sachs (eds.) *The Development Dictionary: A guide to Knowledge as Power*. Orient Longman. Pp 155-75.
9. Chhetri, R. B., 1999. "The Rhetoric and Realities of People's Participation in Conservation and Development in Nepal: An Anthropological Perspective", in R.B. Chhetri and O. P. Gurung (ed) *Anthropology and Sociology of Nepal: Cultures, Societies, Ecology and Development*. SASON, Kathmandu Nepal. Pp. 192-211.
10. Moran, E. F.,1979. *Human Adaptability: An Introduction to Ecological Anthropology*. West view Press, Boulder Colorado. (**Chapter 2 and 3 Only Pp 23-63**)
11. Rapp port, R. 1979. *Ecology, Meaning and Religion*. Berkeley, CA: North Atlantic Books. (**On Cognized Models Pp. 97-144)**
12. Bhasin, K. 2000. Understanding Gender. Kali for Women, New Delhi.
13. Augusta M. 1987. "Forest Conservation in Nepal: Encouraging Women's Participation Story " in *Seed* No 10.
14. Chhetri, R. B., 1999. "The Rhetoric and Realities of People's Participation in Conservation and Development in Nepal: An Anthropological Perspective", in R.B. Chhetri and O. P. Gurung (ed) *Anthropology and Sociology of Nepal: Cultures, Societies, Ecology and Development*. SASON, Kathmandu Nepal. Pp. 192-211.
15. Chhetri, R. B. 2008. "Culturally Embedded Knowledge in Irrigation: People's Ways of Thriving in a Himalayan Village", in H. R. Ojha, N. Timsina, R. B. Chhetri, and K. P. Paudel (ed.) *Knowledge Systems and natural Resources: Management, Policy and Institutions in Nepal*. New Delhi: Cambridge University Press. Pp 135-154.
16. Poudel J. M. 2012. "Testing Farmers' Perception of Climate Variability: A Case study from Kathmandu Valley. In *Journal of Water, Energy and Environment.* Hydro Nepal Kathmandu
17. Kumar Ranjit 2005. *Research Methodology: A step-by-Step Guide for Beginners*. Sage Publication, London

ECO202Fundamental Economics

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide fundamental knowledge of Economics to the students.
- To familiarize the students with basic theories and laws of economics.
- To provide the conceptual clarity of Economics and development to the students so that it would be helpful for them in understanding Environmental Economics and Engineering Economics.

Course Contents:

Unit I: Introduction **2 hrs**

Definition, Scope, Subject Matter, and Concept of Production Possibility Curve, Macro and Micro Economics.

Unit II: Economic Theory **6 hrs**

Theory of Demand, Law of Demand, Elasticity of Demand, Theory of Supply, Law of Supply, Supply Elasticity; Law of Diminishing Marginal Utility, Law of Equi-Marginal Utility, Derivation of Demand Curve, Indifference Curve Approach, Price Effect, Income Effect; Substitution Effect, Derivation of Demand Curve; Consumers' Surplus, Demand Forecasting.

Unit III: Theory of Production **8 hrs**

Concept of Factor of Production, Production Function, Law of Variable Production, Producers' Equilibrium, Law of Returns to Scale, Least Cost Combination, Iso-quants.

Unit IV: Theory of Cost and Product Pricing **8 hrs**

Cost and Cost Curves (Long Run and Short Run Cost Curve), Revenue and Revenue Curves, Various kinds of Markets and their features, Price – output determination under Perfect Competition, Monopoly and Monolistic Competition.

Unit V: Factor Pricing **6 hrs**

Marginal Productivity Theory of Distribution, Rent, Wages, Interest, Profit.

Unit VI: Taxes **6 hrs**

Kinds of Taxes.

Unit VII: Development Economics **6 hrs**

Basic Characteristics of Economic Development, Developing and Developed countries economic Development and Development Plans in Nepal, Economic Growth and Environment.

Unit VIII: Engineering Economics **6 hrs**

Time Value of Money, Present Value and Future Value, Discounting and Opportunity Cost, Payback Period, Cost Benefit Analysis, Some Examples Related With Environment.

Practical work:

Methods for valuation of Environmental resources in some examples

Text Book:

1. Turner, R.K. Environmental Economics

References:

1. Dewett, K.K. Modern Economic Theory, Shyam Lal Charitable Trust, New Delhi.
2. Joshi, S. Micro and Macro Economic Analysis.
3. Koutsoyinnis, A. (1989). Modern Microeconomics. Macmillan Education Ltd.
4. Lipsey, R.G., and Chrystal, K.A. (1996). An Introduction to Positive Economics. Oxford University Press.
5. Meler,G. M.. Leading Issues in Economic Development. Oxford University Press

STT 203 Applied Statistics

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide the students a basic knowledge of statistic
- To enable the students in manual calculation of simple statistical tools
- To enable the students in choosing & interpreting appropriate statistical tools
- To make the students able to apply statistical tools for environmental research.

Course Contents:

Unit I: Fundamentals **6 hrs**

Introduction, nature, classification and presentation of statistical data, frequency distribution, measures of central tendency, Skewness and Kurtosis, mean, median, quartiles and percentiles, measures of dispersion-Range, quartile deviation, mean and standard deviation, coefficient of variation.

Unit II: Probability **8 hrs**

General concepts of probability, Laws of probability, additive and multiplicative, conditional probability, Random variables and probability distributions-Binomial, Poisson, Normal distribution, bivariate distribution.

Unit III: Statistical Methods **10 hrs**

General concept, Sampling-Population, sample, simple random sampling, stratified sampling, multistage sampling and cluster sampling, estimation of sample size (relevant for Environmental Assessment such as nutritional baseline survey, solid waste management, water quality management, etc.).

Unit IV: Testing of Hypothesis **10 hrs**

Concept and types of hypothesis-Null hypothesis and Alternative hypothesis, Hypothesis testing: t-test, Z-test, parametric tests and non-parametric tests (chi-square test), Thurston scale and Likert Technique for general environmental assessment, Odd ratio and Risk ratio, Development Index.

Unit V: Bivariate Relation Measurement **6 hrs**

Correlation and Regression, Application, Interpretation of correlation and regression.

Unit VI: Application of Statistics **8hrs**

Demographic study-sources of demographic data, Age-Sex composition, Measurement of Mortality and life tables, Measurement of Fertility, Economic Study- Index number, time series analysis, statistical quality control, Nepalese official statistics and national income (only concept and illustration of few examples)

Text Book:

1. Bailey, N. T .J. (1995). Statistical Methods in Biology (3rd.Ed) Cambridge: Cambridge

References:

1. Freund, J.E. Mathematical Statistics, Prentice Hall of India Pvt. Ltd., New Delhi.
2. Freund, J. Modern Elementary Statistics, Prentice Hall Inc., New Jersey.
3. Levin, R.I. Statistics for Management: Fundamental of College Algebra.
4. Mode, E.B. Elements of Statistics, Prentice Hall of India, Pvt. Ltd., New Delhi.
5. Spiegel, M.R. and Schiller, J. Probability and Statistics, McGraw Hill, New York

ENV 204 Biodiversity and Biotechnology

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide fundamental concepts, levels or types and values of biodiversity to the students
- To equip the students in understanding the causes of biodiversity degradation and its impacts in natural system
- To acquaint the students in understanding different practices of biodiversity management
- To introduce the scopes, importance and techniques of biotechnologies applied in the world and in Nepal.
- To provide the students a state of art information on biodiversity and biotechnology both practically and theoretically

Course Contents:

Biodiversity

Unit I: Fundamental of Biodiversity **2hrs**
Introduction, Definition, Scopes and Importance of Biodiversity.

Unit II: Levels of Biodiversity and Status **6hrs**
Ecosystem Diversity (Terrestrial and Aquatic ecosystem); Species Diversity- Endemism and hotspots, Status of Biodiversity, rare, threatened, endangered species, red data book, Genetic Diversity-Center of crop diversity, wild relatives of crop plants (cereals).

Unit III: Value of Biodiversity **4hrs**
Mega-diversity center of the world, and ecological, economic and aesthetic importance of the species, uses of some species to fulfill traditional knowledge and community development, a case study of the uses of plants by the ethnic group or local village communities of Nepal.

Unit IV: Degradation of Biodiversity and impacts **4hrs**
Causes of destruction of habitats, reduction and depletion of species, consequences and impacts.

Unit V: Management of Biodiversity **6hrs**
Concept of conservation of biodiversity, in-situ conservation: protected areas; conservation Beyond parks and reserves (Habitat conservation); ex-situ conservation: botanical garden, zoos, seed bank, gene bank and germ plasma collection; Management initiatives: Policy, plan, strategies, legislation and international conventions related to biodiversity conservation and sustainable utilization.

Biotechnology

Unit VI: Fundamental of Biotechnology **2hrs**
Introduction, Scope and importance of Biotechnology.

Unit VII: In vitro culture techniques and applications **10hrs**
totipotency, basic procedures of culture techniques, protoplast, culture, cell culture, embryo culture, tissue culture; Application for (a) production of improved varieties (high yielding and disease resistant (b) micropropogation (c) in vitro establishing of Mycorrhiza (d) Biosynthesis of secondary products; Plant-Microbes interaction-symbiotic and a symbiotic organisms for soil fertility and crop improvement (a) Rhizobia (b) Blue-green algae (c) Cryobiology: fundamental concept and importance.

Unit VIII: Biotechnology and Environment **6 hrs**

Biosafety. Examples from Nepal

Practical Course: **8 hrs**

1. Overview of Biodiversity of Nepal (Scientific Name, Description, Distribution, Uses).
2. Field Study: Biodiversity and Ethno biological uses in the village or by Ethnic group.
3. Field observation: Tissue culture Laboratory.

Text Book:

1. HMGN/MFSC, 2003. Biodiversity Conservation Strategy, Ministry of Forests and Soil Conservation

References:

1. Bhatt, D. D. 1970. Natural History and Economic Botany of Nepal, Department of Information, HMG/ Nepal
2. Chaudhary, R. P. 1998. Biodiversity in Nepal (Status and Conservation), S. Devi, Saharanpur, India and Tec press Books, Bangkok
3. Duby, R. C. 2003. A Text Book of Biotechnology, S. Chand & Company Ltd., India.
4. Gupta, V.N.P., Singh, M. Joshi, Kunjani and Rao, G. P. 2003. Text Book of Botany Part 3: Biochemistry and Biotechnology), Student's Friends, India
5. Joshi, A. R., Shrstha, S. L. and Joshi, Kunjani 2003, Environmental Management and Sustainable Development at the Crossroad, Ankus, Kathmandu, Nepal
6. Joshi A. R. and Joshi, Kunjani 2005. Ethnobotany and Conservation of Plant Diversity in Nepal, Rub Rick, Kathmandu, Nepal
7. Martin, G.J.1995. Ethno Botany A, Methods Manual Chapma & Hall, London.
8. NARMSAP 2002. Forest and Vegetation Types of Nepal, Ministry of Forests and Soil Conservation, NARMSAP, Tree Improvement and Silviculture Component, Nepal.
9. Wilson, E. O. (ed.), 1988. Biodiversity, National Academy Press, Washington DC

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objective:

- To aquatint the students with the development of a nation with water resources, as it is equally important for industrial production, generation of hydropower, irrigation and drinking purposes for human being and animal kingdom.
- To enable the students to estimate the water yield and sediment yield from a basin and understand the flood that may occur at given site.
- To familiarize the students with the importance of the aspect of ground water which has been provided in a lucid and comprehensive manner

Course Contents:

Unit I: Fundamental of Hydrology and meteorology 6 hrs

Interrelation of Hydrology and Meteorology, hydrologic cycle, global water budget, continuity equation, water budget equation, difficulties in planning and developing water resources projects in Nepal. Importance of water resources, Water resources and implication for conservation and development Nepal's richness in water resources, status of development of Nepalese water resources, Requirements of water for various uses-municipal and industrial water supplies, irrigation, hydropower generation, navigation and recreation.

Unit II: Drainage Basin 8 hrs

Topo map and Scales, recording and non-recording rain gauges, rain fall mass curve and hyetograph. Different methods in calculating average rainfall. Measurement of evaporation, Pan Coefficient factor affecting evaporation. Stream pattern and river basins, river systems of Nepal, Precipitation measurement of rainfall, intensity and duration of rainfall, Calculation of Annual rainfall, Evaporation and Evapo-transpiration, Estimating Evapo-transpiration, control of evapo-transpiration

Unit III: Subsurface and Surface Water 6 hrs

Classification of sub surface water, infiltration, percolation factors affecting infiltration, measurement of infiltration, and components of runoff. Introduction, infiltration, and movement of groundwater, water logging and its control, runoff process and component of runoff, factors affecting runoff, hydrograph and its separation, unit hydrograph.

Unit IV: Sedimentation 6 hrs

Causes of Heavy sediment level in Nepal, Negative impacts of sedimentation, measurement of Sediment in river. Introduction and sources of sediment, factors affecting sediment yield, control measures, sedimentation problems in Nepal.

Unit V: Floods and its measurement 8 hrs

Mitigation techniques for floods, lateral and medial moraines, Causes of GLOF. Introduction and classification of flood, measurements and estimation of flood, control techniques and forecasting of flood. Snow and Glaciers, snow and its classification, glaciers and types of glaciers, glacier movement, Glacier Lake and glacier lake outburst flood.

Unit VI: Weather and Climate 14 hrs

Local winds in mountainous regions and the advantages and disadvantages of these local winds in Nepal, vertical zonation of natural vegetation with respect to different climate in Nepal. Climatology and meteorology, scope of climatology, Atmosphere- Introduction, composition of the atmosphere, layered structure of the atmosphere, Energy and Temperature-Introduction, the radiation and the heat balance, Horizontal and vertical distributions of temperature, Atmospheric moisture-Water vapor, physical changes of state of water, clouds-formation and classification, precipitation-process, forms and

types, Air pressure and wind: Atmospheric pressure, air movement in the atmosphere, local wind systems. Climate classification and regionalization: Climatic classification, climatic regions of the world, climatic types- arid, moist, dry, low latitude and high latitude weather systems. Climatic change - Climatic trends and cycles, theories of climatic change, Applied Climatology -Climate and water resources, climate and the biosphere, climate and agriculture, climate and industry, climate and housing.

Practical Work:
Field visit to the department of Hydrology and Meteorology

Text book:

1. Suresh, R.1997, Watershed Hydrology, Standards Publishers and Distributors, Delhi.

References:

1. Critch field, H.J. General Climatology
2. Grag, S.K. 2000, Hydrology and Water Resources Engineering, Khanna Publishers, Delhi.
3. Hewlett, J.D. 1982, Prince of Forest Hydrology, University of Georgia Press, Athens, Georgia.
4. James, W. Climate Change
5. Kohler, L. and Paulhus, 1992, Applied Hydrology, Tata McGraw-Hill Publishing Company Ltd., New Delhi, India
6. Lockwood, J.G. World Climatology
7. Reddy, P.J. 2000, A Text Book of Hydrology, Laxmi Publication, New Delhi.
8. Climatology by D.S. Lal chaitanya Pub.
9. Climatology by Oliver Pearson

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide basic concept of environmental resources and sustainable development
- To enable the students understanding the renewable, non-renewable and recyclable resources and their uses as environmental resources
- To make the students able to identify and analyze the environmental issues and their management
- To familiarize the students with the knowledge about the Techniques of Environmental Resource Management

Course Contents:

Unit I: Introduction **3 hrs**

Definition and types of environmental resources, and their interrelationship, Concept of sustainable development, implications of Sustainable Development in Management of resources

Unit II: Environmental resources **16 hrs**

Physical resources: Land resources: Landforms, land uses, environmental problems related to land resources (land degradation, desertification); Atmospheric Resources: components of atmosphere and their importance, environmental issues related to atmosphere. Water Resources: an overview, sources and uses of water, wetland, and environmental problems related to water resources.

Unit III: Forest and wildlife Resources **10 hrs**

Forest Resources: Introduction, Environmental importance of forests, historical review and present status of forest resources of Nepal, types of forest and vegetation, uses of forest resources, issues related to forest degradation and destruction, (deforestation) and its impact on environment, Wildlife resources: distribution and status, Forest and wildlife management.

Unit IV: Energy Resources **8 hrs**

An overview, types of energy resources, conventional source of energy resources, alternative sources of energy, energy resources in Nepal, environmental issues, development of non-conventional energy in Nepal.

Unit V:Socio-cultural environment **7 hrs**

Linkage between population and resources, cultural heritage and practices

Unit VI: Techniques in Environmental Resource Management **8 hrs**

Concept in environmental resource management, application of various tools in resource management (land use planning, community forestry, integrated watershed management etc.), participatory approach in resource management (RRA/PRA techniques etc).

Practical works:

1. Vegetation succession/ Forest inventory/ Transect survey (Shivapuri National park and buffering zone)
2. Piloting and implementation of payment for ecosystem services for biodiversity conservation or water resource management(Shivapuri national Park and Buffer one)
3. Use of PRA tool into practice in the case of Bagmati river management (Bagmati river)
4. Working modalities of community forestry(Lalitpur District)
5. Assessment of human environmental system(identification of linkages between population, resources, cultural heritage and practices) (Boudhanath temple area)
6. Use of DPSIR model to assess the environmental security of Kathmandu (Kathmandu)

7. Development of indicators for ecosystem comparison between arable land and forest land and identification of required management targets for each land (Shivapuri area)
8. Water harvesting methods used by communities

Text Books

1. Economic Geography of Nepal: Prof S.H. Shrestha. Educational Integration
2. Owen, O. S., Natural Resource Conservation an Ecological Approach, McMillan Publishing Company, Inc. New York.

References:

1. Campbell, Gabiel Inspirations in Community Forestry.
2. Joshi, A.R., Shrestha, S.L. and Joshi, Kunjani 2003. Environmental Management and Sustainable Development at the Cross Road, Ankus, Kathmandu, Nepal
3. Joshi, A.R and Joshi, Kunjani 2005. Ethnobotany and Conservation of Plant diversity in Nepal, Rubrick, kathamndu, Nepal.
4. Miller, G. T. Jr., Living in the Environment, Wadsworth Publishing Company, Belmont, California, USA, 1995.
5. Shrestha, T.K. Encounter with the Himalayan Wildlife.
6. Upadhyaya, Madhukar Guidelines for Forest Conservation and Wild life Branch, Forest Resources Division, FAO.
7. Environmental and Natural Resources; Concepts, methods, planning and project; Prof P. K. Pradhan & Bandana Pradhan, Quest Publication.

ECO 207 Environmental Economics and Trade

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course objectives:

- To provide the basic fundamental knowledge and theory of environmental economics and its relationship between environment and economics
- To make the students able to identify and analyze the environmental issues and their management through economic measure instruments
- To familiarize the students with international Trade and agreements affecting, Promoting and conserving environment protection including climate change,
- To enable the students understanding the importance of environmental economics for the sustainable development

Course Contents:

Unit I: Introduction **8 hrs**

Environmental economics: relationship between environment and economics, basic concept of environmental economics and natural recourse economics, environmental costs and benefits. Sustainable development: concept and principle of sustainable development, economic growth, population growth and environment; Externalities: positive and negative externality, internalization of externality; Market failure and Government failure: how markets works, why they fail, public goods, private goods, club goods, why government intervenes and why they fail.

Unit II: Environment Pollution **6 hrs**

Major environmental pollutions (Air, Water, Ground/ Soil and Noise Pollution), Special environmental problems (Global climate change, Acid Rain, Ozone layer depletion), and Optimum level of pollution.

Unit III: Environmental Management Measures **12 hrs**

Regularity measures/ instruments: Command and control, Types of standards; Economics measures/ instruments: Different types of economics instruments, Pollution charges and abatement subsides, Deposit refund system, Tradable emission permits, Liability law and property right- Polluter pay principle, Coasian solution- Enshrining Property Rights, User' charge, product charge; Pollution tax: Power of pollution tax, Comparing pollution tax with emission standard and associated fines, Relation of standard and taxes, Tax vs. uniform standard setting; Moral Suasion

Unit IV: Environmental Accounting **8 hrs**

Green accounting, Natural resource accounting, and green taxes.

Unit V: Environmental Valuation **8 hrs**

Concept and principle of environmental valuations, Different types of valuation methods: Direct methods and indirect methods, Market based method and continent valuation method.

Unit VI: International Trade and Agreements **6 hrs**

The United Nation Framework Convention on Climate Change (UNFCC), Carbon trading, WTO, Intellectual property right.

Practical Work:

1. Methods for valuation of environmental resources in some examples.

Text Book:

1. Field, Barry c. 1998. Environmental Economics: An Introduction

References:

1. Hackett, C.S. 1998. Environmental and Natural Resources Economics
2. Titenburg, Tom, 2000. Environmental and Natural Resources Economics.
3. P. Kerry Turner: Environmental Economics
4. Toerenberg: Environmental and Natural Resources Economics.
5. D.V. Pearce and R.K. Turner: Economics of Natural Resources and the Environment
6. John Goody and Sabine D' Hara: Economics for Environmentalists
7. Bibek Debroy: Economics and Social Development
8. Mahesh C. Regmi: The State and Economics Surplus: Trade and Resource Mobilization in Early 19th Century, Nepal

ENV 208 Environmental Engineering

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course objectives:

- To provide the basic fundamental knowledge of engineering to the students
- To introduce the art and practice in the field of Water supply, Wastewater, Air and Noise pollution and Solid Waste Management.
- To emphasize the students to have more knowledge in the quality standards, treatment, technologies and monitoring mechanism related to above branches of engineering.
- To familiarize the students with the Global and National Policy and their implications

Course Contents:

Unit I: Introduction **4hrs**

- Definitions
- Introduction of Env. Engg.
- Scope & Limitations
- Units of pollution measurement & unit conversions

Unit II: Water Supply **9hrs**

- Sources of water supply
- Water demand
- Impurities in water
- Water quality analysis
- Water treatment technique
- Monitoring of water quality

Unit III: Wastewater Engineering **9hrs**

- Sources of wastewater
- Characteristics of wastewater sewerage system
- Environmental pollution caused by untreated wastewater
- Wastewater treatment technologies

Unit IV: Air and Noise Pollution **10hrs**

- Sources and types of air pollutants
- Effects of air pollutants
- Air quality standards and emission standards
- Transport and diffusion of air pollutants
- Introduction to air pollution control
- Sound & noise
- Effects of noise
- Noise control options

Unit V: Solid Waste Management **10 hrs**

- Sources and types of solid wastes
- Sampling and analysis
- Characteristics of solid waste
- Concept of integrated solid waste management
- Collection, transfer, disposal of solid waste
- Introduction to resource recovery
- Overview of solid waste management in Nepal

Unit VI: Policy & Initiatives **2 hrs**

- Global and national policy
- Strategy and action plans
- Legislation
- Initiatives & actions

Lab work/Field study **4 hrs**

Practical works:

1. Water quality analysis
2. Waste water treatment analysis
3. Air pollution analysis

Text Book:

1. Davis & Cornwell, *Introduction to Environmental Engineering*, Mc Graw Hill International (3rd Edition)

References:

1. Kamala, D. L. Kanth Rao, *Environmental Engineering: Water Supply, Sanitary Engineering and Pollution*
2. Gilbert M. Masters, *Introduction to Environmental Engineering and Science*, Eastern Economy Edition
3. Howard S. Peavy, Donald R. Rowe, G. Tchobanoglous, *Environmental Engineering*, Mc Graw Hill International Edition

.

MGT209 Environmental Policies Laws and Conventions

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To make the students able to analyze the successful environmental policies, legal framework of different environmental sector
- To provide the students the fundamental concept of public policy for air, water, toxic substances and other chapters
- To enable the students in understanding National and International treaties, conventions and negotiations and National efforts, and
- To enhance the knowledge of the students in building plans and strategies and the action plans, general idea about national, regional and global environmental institutions.

Course Contents:

Unit I: Background **4 hrs**

Major Environmental Episodes, Evolution of Environmental Policy and Planning, Concept of Sustainability

Unit II: Initiatives for Environmental management **12hrs**

Stockholm conference, Agenda 21, Millennium development Goals; National environmental policy, Sect oral environmental policies related to environmental management and sustainable development.

Unit III: Environmental Planning **8 hrs**

Periodic plans; Strategies: National Conservation Strategy (NCS), sustainable development Agenda. Nepal Environmental and Policy Action Plan (NEPAP)

Unit IV: Environmental Law **10hrs**

Concept of general law, Principles of International Environmental law, enforcement and compliance of Environmental Law, National Environmental laws, the role of Judiciary in the protection of environment, evolution of people's participation in Environmental-related laws.

Unit V: Nepalese Laws on Environment **8hrs**

Classification of Nepalese acts/rules relating to environmental conservation, Environmental Protection Act (1997), Environmental Protection Regulation (1997), Suggestive Measures for Environmental Laws - Need for comprehensive Environmental act, enforcement and compliance, Economic incentives, Technology forcing, Penalty.

Unit VI: International Conventions **6hrs**

Convention related to Biodiversity, Ozone Depletion, Climate change, and Hazardous waste, Trade and Environment, POPs.

Practical Works:

1. Formulation Policy
2. Policy implementation
3. Policy analysis
4. Environmental implications of Policy implementation

Text Book:

1. EPC 1993. Nepal Environmental Policy and Action Plan, EPC, Kathmandu, Nepal

References:

1. Malcoln N. Shaw, International Law.
2. MFSC 2002. Nepal Biodiversity Strategy, Ministry of Forests and Soil Conservation, Nepal
3. Michael Bothe, Trends in Environmental Policy and Law.
4. MOPE Environment Protection Acts and Environment Protection Regulations, MOPE, Kathmandu.
5. NPC/IUCN 1988. Building in Success, National Conservation Strategy, NPC, Nepal
6. Priya Ranjan Trivedi, International Environmental Law.
7. Thomas Sterner, Policy Instruments for Environment and Natural.
8. WECS 2002. Water Resources Strategy Nepal, Water and Energy Commission Secretariat, Kathmandu, Nepal

MGT 210Project Management

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide knowledge to the students on basic concepts, theories and analytical techniques of project management.
- To acquaint the students to be familiar with the techniques and methods in the preparation, implementation and evaluation of projects.
- To make the students able to understand and implement the practical aspects within the project in Nepalese context.

Course Contents:

Unit I: Introduction: 8 hrs

Concept and characteristics of Project and Project management, project management and traditional management, benefits of project management, project classification and project life cycle, project manager's roles and responsibilities, skill requirements for a project manager.

Unit II: Project Planning and Formulation 12hrs

Concept of project planning, project identification and formulation, feasibility analysis, project appraisal, tools of project analysis and evaluation, capital budgeting, cost benefit analysis

Unit III: Project Organization and Implementation 10 hrs

System view of an organization, project organization, authority delegation, leadership in project environment, procedure for project implementation, time management, team building, management of conflict in project management.

Unit IV: Project Monitoring, Evaluation and Control 12 hrs

Project Monitoring and evaluation, communication in a project, Project coordination project control and its techniques, work break down structure, network analysis: PERT,CPM

Unit V: Project Management in Nepal 6 hrs

Project management, its benefits and limitations in Nepal. Practical difficulties in project implementation in Nepal,

Case Studies

Text Book:

1. Meredith, J.R. and Mantel, S.J. 2000. Project Management: A Managerial Approach, John Wiley, New York

References:

1. Chaudhary, S. 2005 Project Management, Wiley and Sons, New Delhi
2. Agrawal, Dr, G.R; Project Management in Nepal: M.K. Publications and Distributors, Kathmandu,2012

ENV 305.3Sustainable Tourism Management

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To familiarize the students with the basic concept of sustainable tourism
- To make the student understand how ecotourism can contribute in nature conservation and sustainable development in Nepal
- To make the students aware of the principles and processes of good practice in ecotourism development/management for nature conservation and sustainable development in Nepal

Course Contents:

Unit I: Introduction **4 hrs**

Definition and types of tourism, trend of tourism development.

Unit II: Tourism and Environment **6 hrs**

Interrelationship, impacts of tourism on social, cultural, and economic areas, ecology and environment, tourism infrastructures and support facilities

Unit III: Sustainable Tourism **6 hrs**

Concepts and definitions, principles for implementation of sustainable tourism, resource assets, and Sustainable tourism in different geographical areas: mountain, coastal area and sea

Unit IV: Ecotourism **12 hrs**

Ecotourism for Sustainable Development, ecotourism and other forms of tourism, positive and negative impacts of ecotourism, ecotourism and nature conservation, ecotourism guidelines and code of conducts, protected areas and their management systems in Nepal.

Unit V: Sustainable Tourism Management **12 hrs**

Carrying capacity, land use planning and zoning, Hypothetical cycle of tourist area evolution, Limits of Acceptable Change (LAC), Eco-labeling.

Unit VI: Global and National Initiatives **8 hrs**

Global efforts: Agenda 21, Millennium Development Goals, Implementation Plan for Sustainable Development, National efforts: NEPAP, sustainable development agenda for Nepal.

Field/ Case studies

Case study in some tourist areas of Nepal
Linkage between tourism to livlihood

Text Book:

1. Swarbrooke,J. 1999.Sustainable Tourism management, CABI Publishing, UK

References:

1. Devi Gurung, Eco-Tourism Development in the Kanchanjunga Region
2. Prayag R. Sharma, Culture and Tourism Defining Goals, ICIMOD
3. T. B. Shrestha, Mountain Tourism and Environment in Nepal
4. P. Rogers, Tourism Development and Change in the Sagarmatha National Park and its Environment.
5. Karna Shakya, Dolpo the World behind the Himalayas.
6. Cater, Erlet and Gwen Lowman (eds.), Ecotourism, A Sustainable Option? John Willey & Sons, 1994.
7. Pandey, R. N., et.al. Effects of Tourism on Culture & Environment, UNESCO,1993.

ENV 212 Environmental Management Systems

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide the students the fundamental concept of cleaner production and environmental management system
- To make the students able to understand the Quality Management System

Course Contents:

Unit I: CP (Cleaner Production) and EMS (Environmental Management System) 4 hrs
Introduction to CP, Historical background, Environmental trends, Different terminology, Definition of CP, Importance of CP

Unit II: Approach to CP Assessment 8 hrs
Management commitment, Pre-assessment training, Assessment training, and Post assessment training. Planning and Organization of CP: Systematic methodology, Methodology description step by step, Case study (to prepare outline of planning).

Unit III: Concept of flow chart 4 hrs
Purpose, Types of PFD, Exercises (Case Study), and Criteria for audit focus.

Unit IV: CP Assessment 4 hrs
Mass balance, Identification of inputs and outputs, Case study on mass balance.

Unit V: Cause Evaluation 4 hrs
CP Techniques, Types of wastage, (Why generation), option generation methods.

Unit VI: Case study (Based on literature) 6 hrs
Group formation, CP Assessment, Audit focus, Cause evaluation, Option generation and prioritization, Presentation, Monitoring and evaluation of CP options.

Unit VII: Environmental Management System (EMS) 6hrs
Introduction, EMS audit, Case Study. QMS (Quality Management System): Introduction, ISO, ISO Series (ISO 9000 and ISO 14000), Clauses, Benefits, QMS/ISO 9000 audit criteria and types.

Unit VIII: LCA (Life Cycle Assessment) 6hrs
Concept, Method, LCA Impact Assessment, and Application for Pollution Prevention.

Field Visits To Pollution Prone Industries 5 hrs

Practical works:

1. Industrial Visit
2. CP study of an industry. EMS, ISO Certification
3. Process Flow of an indudtry.

Text Book:

1. S. Musharaf Ali, Legal Aspects of Environmental Pollution and its Management.

Reference:

1. Suresh Dalela, Saurabh, ISO 9000A Manual for Total Quality Management.

ENV 213 Environmental Assessment Techniques

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To prepare concepts and methods of EIA
- To enable the students to acquire skills in using EIA tools
- To develop students' skill in carrying out or critically reviewing the IEE, EIA and SEA Reports

Corse Contents:

Unit I: Introduction **2 hrs**
Background, basic concepts of EIA and sustainability, Evolution of EIA, introduction of EIA into Nepalese system

Unit II: EIA Processes **10 hrs**
EIA principles, EIA and Project cycle, Steps of EIA

Unit III: Screening/Initial Environmental Examination (IEE) **6 hrs**
Objective and approach, Screening system in Nepal, IEE: Introduction, Objective and approach (Method).

Unit IV: Scoping/Terms of Reference (TOR) **6 hrs**
Objective and approach, scooping requirements of Nepal, Procedural and technical considerations, preparation of TOR.

Unit V: Baseline Information for EIA Study **6 hrs**
Introduction and objective, methods of data collection for baseline information on environmental setting, role of baseline information in monitoring process, role of baseline information in decision making.

Unit VI: Impact Identification and Mitigation Measures **8 hrs**
Introduction, Methods of impact identification, impact assessment and evaluation, comparison of alternatives; Mitigation Measures: Introduction and objective, methods (alternatives, corrective, compensatory, preventive), implementation of mitigation measures.

Unit VII: Environmental Management Plan (EMP) **6 hrs**
Introduction and objective, environmental monitoring: introduction, methodologies, indicators, result and suggestion, environmental audit.

SEA: Introduction, prospectus of Strategic Environmental Assessment (SEA) **4 hrs**

Case Studies / Exercises
Practical works:

1. Complete field based exercise on:
    1. Point project
    2. Band project
    3. Report writing
    4. Presentation

Text Book:

1. Ram B. Khadka, et al (2012)Environmental Impact Assessment (EIA); Process, Procedures and Practice of South Asia(Nepal, India, Bangladesh and Bhutan); SchEMS

References:

1. ADB, Environmental Impact Assessment for Developing Countries, Volume I
2. HMG/USAID/IRG, Manual for Public Involvement in the EIA Process of Hydropower Projects
3. Larry Canter, Environmental Impact Assessment, McGraw Hill Publications
4. IUCN, National EIA Guidelines 1993
5. Modak, P.and Biswas, A.K. 1999. Conducting Environmental Impact Assessment in Developing Countries, United Nations University Press, New York

ENV 214 Environmental Monitoring

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- Provide concepts of Environmental Monitoring and evaluation
- Make the students familiar with methods of Monitoring and evaluation and techniques for risk assessment
- To enable the students to acquire skills in integrated assessment and management of resources

Course Contents:

Unit I: Fundamentals of Environmental Monitoring and Evaluation 4 hrs
Introduction, general concepts and principles, importance of the areas.

Unit II: Types and criteria of Environmental Monitoring and Evaluation 4 hrs
Evaluation systems, parameters, selection of sites, time, evaluation and controlling techniques, participatory monitoring and evaluation.

Unit III: Areas of Environmental Monitoring 4 hrs
Air pollution-sources and effects, primary and secondary pollutants, properties of air pollutants, Effects of SO_2, NOx and CO, hydrocarbon and particulates, urban air pollution in Asia, the Asian Brown Cloud, air sampling and measurement techniques.

Unit IV: Pollution 4 hrs
a) Noise pollution: Introduction, psychological and other effects, measurement of noise level, noise control approaches. b) Soil pollution: Soil forming factors, importance of soils, sources, effects and controls of soil pollution.

Unit V; Global Warming 4 hrs
The effects of global warming, monitoring concentration of heat trapping gases in different continents, approach to deal with global warming, Ozone hole in the stratosphere and its effects, causes of acid rain, its effects and controlling approaches.

Unit VI: Industrial Hazards 4 hrs
Introduction, types, causes, and effects, potential hazards, approaches to minimize hazards, industrial wastes, effects and control of industrial wastes, Environmental standard.

Unit VII: Marine Pollution 4 hrs
Introduction, bio-magnification, sources of marine pollution, effects and control of marine pollution, urban sources of water pollution, diseases burden due to marine pollution.

Unit VIII: Surface Water And Groundwater Pollution 4 hrs
Major sources of water pollution, global surface and ground water status, water pollution and problems, impacts of human activities on ecosystems, sustainable use of water resources, wetlands status and importance, controlling approaches for water pollution

Unit IX: Water Sanitation and Scarcity 4 hrs
Global overview, water scarcity, major stocks of water, costs of water related diseases, international river basins and management, and global targets for water supply, water treatments, characteristics of drinking water

Unit XI: Solid Waste Management **4 hrs**

Introduction, objectives, treatment and disposal methods, sanitary landfill sites, problems and solutions, monitoring of physical, chemical, and biological impacts on environment and the society.

Unit XII: Methods for Monitoring and Evaluation **4 hrs**

Methods for collection of data, evaluation and approaches to control pollution level and other measures to improve the environmental management of any landscape, region, and global as a whole.

Unit XIII: Field Visits **4 hrs**

All areas of environmental monitoring such as air, noise, soil, industrial, marine, surface and ground water pollution, climate change impact and solid waste disposal sites. Students have to prepare at least two reports mentioning the problems and solutions.

Practical works:

1. Field Survey to bagmati corridor
2. Identify varration of pollution along BR
3. Visit to Waste water treatment plant
4. Understand the regulating factors
5. Evaluate the level of water pollution

Text Book:

1. Environmental Monitoring: G. Bruce Wiersma

References:

1. Miller J Environmental Monitiring
2. Wiersma GB,Environmental Monitoring

ENV 305.2Environmental Governance

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objective:

- After the completion of this course the students will be able to apply the concept of Governance and under their application in environmental management**.**

Course Contents:

Unit I: Fundamentals of Environmental Governance **2 hrs**

Unit II: Environmental Governance Today **3 hrs**

Unit III: Public Participation and Access **4 hrs**

Unit IV: Civil Society **3 hrs**

Unit V: Decentralization **4 hrs**

Unit VI: Businesses and Accountability **4 hrs**

Unit VII: International Environmental Governance **3hrs**

Unit VIII: World of Decision: Case Studies **4 hrs**

Unit IX: Towards the better balance **4hrs**

Unit X: Environmental Governance in Nepal **1hr**

Practical Works:

1. Exercise on consensus building
2. Exercise on conflict management

Text Book:

1. Ram B. Khadka, and Shrestha Uttam, (2010):Environmental Governance and diplomacy; An introduction- lambert Academic publications

Reference:

1. World Resources Institute: Decision for the Earth: balance, voice and power (2002 – 2004)
2. Lamont C. Hempel: The environmental Governance; the global challenge

ENV 216 Geo-information Management

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- Objective of this course is to impart Knowledge on Geographic information System, make the students able to acquire and manage spatial data and geo-database and analyze for the purpose of planning and decision making in the environmental sector imparting clear concept on national geographic information infrastructure and GIS project modeling and implementation.

Course Contents:

Unit I: Introduction **2hrs**

GIS definition; Functions of GIS; Philosophy of GIS, Historical development of GIS; Physical and functional Components of GIS; Application area of GIS; Contributing disciplines in GIS, GIS and 4 Ms

Unit II: Data and information **3 hrs**

Geographic phenomena, Field and objects, Data type based on theme, format, geometry, structure, measurement, Vector and raster data and their characteristics, Metadata, spatial relationship and topology, Interpolation and auto-correlation, Vector and raster integration

Unit III: Spatial referencing **3 hrs**

Spatial reference systems, the shape of the earth, Spheroid, Datum, Projections, Coordinate Systems, geo-referencing, Geometric rectification of image.

Unit IV: Spatial database management **4 hrs**

Introduction, data modeling, database design and maintenance, storage and archive, data security, species information

Unit V: Spatial data entry **5 hrs**

Data sources, data preparation and input techniques, data digitization, concept of remote sensing as a source of data acquisition, GPS and data processing data editing, verification

Unit VI: Spatial data analysis **4 hrs**

Measurement, retrieval and classification functions, overlay, neighborhood, and connectivity functions.

Unit VII: Spatial data visualization **3 hrs**

Thematic data visualization, Map layout cosmetics and dissemination. Topographic Analysis:

Unit VIII: Digital terrain model (DTM) **3 hrs**

Slope, aspect, Hillshade, viewshed analysis

Unit IX: Modeling and simulation **5 hrs**

Concepts and types, System, model, process models, index and binary models, Simulation in GIS, watershed modeling, hydrology modeling, flood Modeling, application of GIS in environmental modeling

Unit X: GIS System Development Process **5 hrs**

GIS Project planning; Project requirement analysis and needs assessment, GIS Project development for environmental sector, Data sharing and partnership, spatial data infrastructure, clearinghouse, components of NSDI, SDI status in Nepal, GIS development in Nepal.

Lab exercise part **10 hrs**

1. **Introduction to GIS software and concept on data preparation**
- Software Anatomy, Interface and available platform,
- Concept on project , data frame and data file and layers
- Concept of Metadata
- How to use Arc GIS for creating spatial project and visualize the given set of data

2. **Spatial data Generation**
- Spatial Data modeling,
- Data acquisition from the field based on ground surveying (a sample of already collected data shall be used)
- Data acquisition using GPS
- Data acquisition based on Remote Sensing imagery (Sample image shall be used for visual interpretation)
- How to use aerial photograph
- Adding attributes to the data acquired
- Applying the appropriate coordinate system to the data acquired

3. **Digitization of map features**
- Database modeling in GIS
- Digitizing map features (Using scanned image)
- Adding attributes to polygon features, line themes and polygons
- Topology and its characteristic in Geospatial database
- Topological Editing spatial data in Arc GIS
- Adding the GPS acquired data over the existing map and visualize them

4. **Attribute manipulation and basic queries**
- Introduction and modify tabular data
- Link tables and performs basic queries
- Summarizing tables
- Table display
- joining and Linking the spatial database with the other attribute set
- Hotlinks

5. **Map projection and coordinate transformation**
- Map coordinate system: Geographic and Projected coordinates
- Transformation of coordinate system (Why necessary?)
- Types of projection system and changing from system to the other
- Map Projection Selection
- Define Projection (Assigning the Projection Properties in the existing spatial data)
- Set a data frame's map projection
- GPS relevant table creation
- Plotting of GPS data into maps
- Datum transformation
- Projecting the GPS data into the suitable projection system
- Coordinate conversion from metric to Decimal degree and vice versa
- Changing the data from one projection to the other one.
- Geo-referencing an image in ARCGIS (Image to Image registration and
- Draping of Geo-referenced image over the existing vector data set

6. **Spatial Query and Measurement Operation (Vector-based)**
- Point measurement (Automatically calculating X and Y coordinates)
- Line measurement (Automatically calculating lengths)
- Polygon measurement (Automatically calculating Area and perimeters)
- Geometric selection
- Attribute selection

- Statistics of selection
- Save selected feature
- Spatial query based on the selected features
- Clip, intersect, union, buffer operations
- Suitability analysis using vectors model

7. Map printing

- Map Layout design
- Editing layout component
- Printing the layout component

8. Applying GIS with case studies

- Interpolation of contour data for DEM generation
- Slope and aspect calculation
- View shed calculation
- Water inundation area calculation
- Interpolation of Temperature and Rainfall data
- Mapping Meteorological information in GIS environment
- Hydrology modeling,
- Flood Modeling
- Mapping the effect of climate change using GIS
- Estimation of water volume caused by dam construction water volume storage
- Suitability analysis using Raster Data model
- Analyzing habitat patches using GIS
- Erosion Modelling

9. Google earth

- Loading your map over Google earth
- Getting the data traced in Google earth to your GIS

Reading Materials:

Text Book: Introduction to Geographic Information Systems, Kang-tsung Chang, TATA McGraw-Hill edition.

References:

- Principles of Geographic Information System, Rolf A. Deby, the Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente, the Netherlands
- Principles of Remote Sensing, the Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente, the Netherlands

Description of the module

- **Total allocated Lectures hrs: 48 hour**
- **Credit hrs: 3**
- **Total Marks for evaluation: 100**
- **Field visit: 2 days**

Further breakdown of the allocated time and method of evaluation is given in the following table:

Activities		**Time Allocated (hours)**	**Description**	**Marks allocated for evaluation**
Theory	Class Room Lectures	28	Lectures 1:30 hours each per day	Subjective: 40 Objective: 10 Practical exam: 30
	Self Study during non school hours	16 (Not to be added in the credit hours count)		
Practical/ Lab	Supervised	10	Supervised by instructors in lab	

	Unsupervised during non school hours	16(Not to be added in the credit hours count)	Self, no supervisors available	
Exam	Final written exam Internal written exam	2 2	Comprises with subjective and objective questions	
Assignments	Class room/ lab	4	As per requirement	10
	Home assignments during non school hours	5(Not to be added in the credit hours count)	To be done at home	5
	Presentation skills on home assignment in group	2	To be presented in class	
Attendance, class room and lab participation and discipline				5
Total		**84**		**100**

Reading Materials
Text Book: Introduction to Geographic Information System, Kang- Tsung Chang, TATA McGraw-Hill edition

References:
1. Principles of Geographic Information System, Rolf A. Deb, The Faculty of Geo-information Science and Earth Observation (ITC), University of Twente, The Netherlands
2. Principles of Remote Sensing, The Faculty of Geo-information Science and Earth Observation (ITC), University of Twente, The Netherlands

Lectures and hands out produced by the Lecturers on the related topics.

MGT217 Comprehensive Environmental Planning and Conflict Management

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To familiarize the students with the basic fundamental concept of Comprehensive Planning.
- To make the student understand about the critical environmental problems, designing goals, objectives and strategies, designing actions, relationship to other kind of planning.
- To make the students aware of the principles and processes of good planning practice in environment management for nature conservation and sustainable development in Nepal

Course Contents:

Unit I: Fundamentals of Comprehensive Planning **4 hrs**
Introduction, planning process/ Types, participation for planning, use of plan

Unit II: Environmental Planning **12 hrs**
Concept, process, issues of environmental concern, and nature of planning, sustainability: overarching agenda in planning, information and decision in environmental planning, decision making in environmental planning, implementation of environmental planning

Unit III: Comprehensive Plan **10 hrs**
Elements of comprehensive plan updating the plan, data gathering and analysis, identifying critical environmental problems, designing goals objectives and strategies, designing actions, relationship to other kind of planning.

Unit IV: Development of Comprehensive Environmental Plan in Nepal **8 hrs**
Historical background, planning and managing the natural resource base, local level environmental planning.

Unit V: Concept of Conflict **6 hrs**
Definition of conflict, Reactions to intense conflict situations, functional and dysfunctional aspects of conflict, types and factors influencing conflict tolerance level. Sources of Conflict: Need-based, work environment, organization factors, goals, individual factors.

Unit VI: Conflict Resolution **8 hrs**
Traditional method of conflict resolution, conditions influencing conflict resolution, facilitation techniques and personal skills for conflict management, resolution strategies.

Case Studies/ Situation analysis
Practical Works

1. Conflict Resolution in any case from a community

Text Book:

1. Harigopal, K. 1995. Conflict Management, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India.

References:

1. Chhetri, R. B. and Kattel, S.P., 2004, Dispute Resolution in Nepal: A Socio-Cultural Perspective, CVICT, Kathmandu.
2. ICA 1980. Participatory Strategic Planning Manual, Belgium
3. IUCN 1999. Environmental Planning and management of the Kathmandu valley

ENV 218 Disasters and Risk Assessment Technique

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To make the students able to know the basic concept of natural and manmade disaster
- To provide the students with the knowledge of the fundamental tools and techniques of Hazardous Assessments
- To enable the students in understanding the disaster management and their control measure and
- To enhance the knowledge of the students in global and national initiatives for the environmental sustainable developments

Course Contents:

Unit I: Introduction **2 hrs**

Fundamental aspects on disasters and hazards

Unit II: Types of disasters **6 hrs**

Climate Change Hazards, Natural and man-made disasters (landslides, floods, earthquakes, glacial lake outburst floods etc.) factors responsible for disasters, cause and effects of disasters.

Unit III: Tools and techniques for Hazards Assessment **8 hrs**

Assessment of hazards, inventory and mapping of disasters, stability analysis, and identification of disasters prone areas.

Unit IV: Risk assessment **10 hrs**

Living in a hazardous environment, risk, hazard and vulnerability, potential risk with development, assessment techniques.

Unit V: Disaster Management and control **12 hrs**

Construction Site disaster and risk management including hydropower, Urban Risk Assessment, mining and multi-storied building disaster forecasting, preparedness planning and programming, Strengthening of capability of institutions, measures ad control of hazards, physical and bio engineering measures, people participation in hazard mitigation.

Unit VI: Global, regional and national initiatives **8 hrs**

Disaster management for sustainable development of resources.

Field/ Case study **2 hrs**

As we all know theoretical knowledge is essential but not perfect. So, I do emphasize on more practical / field works.

Topics	**Duration**
1. Field works on landslide/ Flood study	1 Day
2. Field works on bio- engineering techniques	1 Day
3. Field works on construction site risk management	1 Day

Text Book:

Nicholas K. Coch; Geo-hazards: Natural and Human

References:

1. Chalise, S.R. and Karki, S. (eds). 1995.Landsilide Hazard Management and control in the Hindu Kush Himalayas, ICIMOD, Kathmandu, Nepal
2. Deoja, B.Dhital, M.Thapa, K.B.Wagner A. (eds) 1991.Mountain Risk Engineering and Awareness Hand Book, Vol I &II, ICIMOD
3. Fort, M.1987.Geomorphic and Hazards mapping in the dry, continental Himalaya: 1:50,000 Maps of the Mustang District, Nepal, Mountain Res Dev, 7:222-238.
4. Ives.J.D.1986.Glacial lake outburst floods and risk engineering in the Himalays, occasional paper No.5, Kathmandu, ICIMOD.
5. Ives, J.D.abd Nesserku, B, 1989.The Himalayan Dilemma, reconciling development and conservation. The united National University, Routledge, London.
6. Johnson, K.Olson, E.A.and Manandhar, S.1982.Environmental Knowledge and response to natural hazards in mountainous Nepal. Mountain Res.Dev.2: 175-188.
7. Mool,P.K.Bajracharya,S.R. and Joshi,S.P.2001.Inventory of Glaciers ,Glacial Lakes and Glacial lake outburst floods, monitoring and early warning systems in the Hindu -Kush Himalayan region, Nepal, ICIMOD, Nepal
8. Participatory Tools and Techniques for Assessing Climate Change Impacts and Exploring Adaptation Options. A Community Based Tool Kit for Practitioners by UKAID and Livelihoods & Forestry Program.
9. Hydropower, mining & building journals
10. Urban Risk Management in South Asia, Launch of Global Campaign on Making Cities Resilient, 8-9 June, 2010, New Delhi
11. Urban Risk Reduction and Adaptation; C. Wamsler,PhD

ENV 219 Urban Development Environmental Management

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To give a fundamental concept of environmentally sound urban infrastructure development
- To provide the students a basic concept of urbanization and its implications on environment.
- To make the students able to identify and analyze the emerging issues of urbanization and environment management.

Course Contents:

Unit I: Introduction **4 hrs**

Urban Environment – a conceptual understanding, comparative study of rural and urban environment

Unit II: Structure and Dynamism of Urban areas **10 hrs**

Historical background and origin of development urban areas, urban growth and features, Urbanization process and trends.

Unit III: Urbanization Infrastructures and Services **12 hrs**

Urban settlement, urban centers, Services and their status: shelter and land development, water, drainage and sanitation, solid waste, transportation and communication, open space, energy, Social infrastructures: Development of public places for children, aged people, community activities, public green parks for recreation

Unit IV: Urban Environmental Concerns **12 hrs**

Land Use and Environment, impacts on environment and resources, origin and development of sustainability issues in towns and cities of Nepal

Unit V: Global initiatives **6 hrs**

Concept of healthy cities, Agenda 21, Habitat, concept of sustainable cities, integrated urban management.

Unit VI: National initiatives and trend **4 hrs**

Policy and legislation related to urban development and environmental management, urban concept of town planning and land pooling. Healthy cities, Habitat, Sustainable development agenda

Field works:

1. Study on the urban settlement of some area
2. Standards for building
3. Process of land pooling/Zoning

Text Books:

1. Gurung, S. B., 1998, Rural Development Approaches in Nepal: Some Experiences, DEVA Pvt. Ltd., Kathmandu
2. Mathema, M.B., Joshi, A.R., Shrestha, S.L. and Shrestha, C.L. 1992. Environmental problems of urbanization and industrialization: the existing situation and future direction. UNDP/EMA Group, Nepal.

References:

1. Buller, H., Wright, S. and et. al., 1990, Rural Development: Problems and Practices, Gower Publishing Company, USA
2. Peavy, HS, Rowe, DR, Tchobanoglous, G. 1985, Environmental Engineering,McGraw Hill International Editions.
3. Tchobanoglous, G., Theisen, H., and Vigil S., 1993, Integrated Solid Waste Management: Engineering Principles and Management Issues, McGraw-Hill, Inc.
4. Metcalf and Eddy, Inc. (Revised by G. Tchobanoglous), Wastewater Engineering: Treatment, Disposal and Reuse, Tata McGraw Hill.
5. Viessman, W., Hammer, Mark J. Sr., Water Supply and Pollution Control, Adison-Wesley Pub.
6. Thapa, GB and Devkota, SR, Managing Solid Wastes in Metro Kathmandu, ACRD Program, SERD, AIT Bankok.
7. ADB/ICIMOD 2006. Environment Assessment of Nepal – Emerging Issues and Challenges, ICIMOD, Kathmandu, Nepal.

ENV 220 Integrated Watershed Management

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To familiarize the students with the basic concept of watershed management and its components
- To make the students aware of the processes of hydrological cycle /management for nature conservation and sustainable development in Nepal
- To familiarize the student about Land use and Watershed Degradation and to know the Importance of watershed management
- To familiarize the students with the global/international Watershed condition and management policy with their implications.

Course Contents:

Unit I: Introduction to the Concept of watershed 4 hrs

Watershed Divide, Ridge, Contours, Relief, Outlet, Scales of Map, bar scale, Natural boundary, catchments area, contribution to natural resource endowment, and microclimate within a watershed.

Unit II: Components of Watershed 8 hrs

Biophysical components (land, soil, vegetation, slope, elevation), Human component (in Nepalese context), wildlife (in forests and water bodies), bio-diversity, game/recreation, tourism

Unit III: Hydrologic cycle 8 hrs

Hydrological Cycle having no beginning and end. Flotation of Water taste and its impacts shape of basins affecting runoff. Land Use map delineation. Benefits from well managed watershed. Precipitation, infiltration, water movement and storage, rivers, springs, lakes, sea, functions of these in watershed; Basins: Major basins of Nepal, Importance of these basins for power and irrigation, Watershed management for water yield, groundwater recharge, runoff generated by watershed.

Unit IV: Land use and Watershed Degradation 12 hrs

Causes of Watershed Degradation in Nepal. Land use and its importance in watershed management, land use change, population growth and their impacts in watershed condition, concept of degradation and nature of degradation, Soil erosion, landslide, gully, stream and riverbank cutting/erosion, vegetation degradation, water degradation, agencies responsible for degradation

Unit V: Integrated Watershed Management for Environment Protection and Sustainable Development 10 hrs

Practical Example for Soil, water, and vegetation by bioengineering techniques. Conservation of resources, sustainable management of resources, and concept of participatory watershed management. Rehabilitation of degraded resources, restoration of resources, types of measures (bioengineering, landslides, stream bank, erosion control structures, torrent control etc.)

Unit VI: Watershed Management in Nepal 6 hrs

Example of watershed management in Nepal. Watershed conditions in Nepal, National plans, policy, program related to watershed management, traditional techniques of watershed management, integrated watershed management techniques and their implication for sustainable conservation of resources.

Case Studies/ Field works

Field Works:

1. Case study on Jhhiku Khola Watershed Management system
2.

Text Book:

1. PM Sharma, Watershed Management in Asia

References:

1. Donald R. Satterland and Paul W. Adams, Wild Land Watershed Management
2. Chandra K. Sen, Farmer Led Integrated Watershed Management
3. AIT Bankok, Managing Mountain Watersheds in Nepal, Pokhara
4. Dr. Archana Mishra, Watershed Management (Danida)
5. Karen Secher, Watershed Development (Danida)
6. HMG/MOFSC, Bagmati Watershed Project
7. Suresh R. 1997 Watershed Hydrologystd.Pub.
8. Hewlett 1982 Practice of Forest Hydrology Univ.of Georgiaprem
9. Shanasyam, Soil Conservation,

ENV 221 Environmental Technologies

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Curse Objectives:

- The major objective of this course is to make students know about the tools and techniques used.
- To evaluate and formulate data from the tools used and
- To evaluate the extreme effect due to the tools and their use in environmental management

Course Contents:

Rainwater Harvesting System

Unit I: Introduction **4 hrs**

Basic Hydrology, water cycle, hydrodynamic cycle, rainfall, measurement of rainfall, consistency of rainfall data, estimating of missing rainfall data, mean annual rainfall, design storm.

Unit II: Loss from rainfall **10 hrs**

Introduction, evaporation and its estimation, empirical equations, water balance method to reduce evaporation. Rain water harvesting system: design component of RHS, per capita demand, area of collection, layout and basis of the design of RHS, use of RHS, and conjunctive use of RHS, types of RHS, RHS technology option and choices.

Unit III: Purification of RHS water **8 hrs**

Water quality, impurities, biological and mineral impurities, impurities affecting health, purification of water, sedimentation, filtration, slow sand filter, chlorination.

Unit IV: International and national initiatives **2 hrs**

Integrated solid waste management technology:

Unit V: Introduction: **6 hrs**

Waste and solid waste pollution, sources and types of solid waste composition of solid waste, trend in solid waste generation.

Unit VI: Solid waste management system **10 hrs**

Integrated solid waste management, hierarchy of solid waste management, integrated SWM system, urban solid waste management, and operational management system.

Unit VII: Solid waste management technologies **8 hrs**

Composting technology, principles of composting, types of composting, composting techniques, recycling technology, metal recycling, paper recycling, plastics recycling, glass recycling, land fill technology

Case Study/Exercise
Practical works

S.no	Venue	Activity	Follow up/assignment	No. of classes
1.	**Rainwater Harvesting System (RWHS)**			**3.5 classes**
1.1	**Field visits**			**1+1 (field+ presentation)**
a.	ENPHO	Training on water quality assessment	Learning note and application in college	1 (after class)
b.	Dallu	RWH, Biosand Filter, Grey Water	Prepare a case study and a presentation identifying the differences and similarity in household and community RWHS and possible uses(10-15 mins)	1 (after class)
c.	Aalkohiti and wells in Patan	Ground water recharge via RWH and restoration of dug wells		1 (during class and after class)
1.2	**Case Study**	Group work: students to be divided into different groups and prepare report on following topic and present in front of other college students		**1/2+1(discussion on topics +presentation)**
a.	RWH system knowledge in college/ community	Prepare the survey report of knowledge about RWH and its uses in college/Community	Report+ presentation	**1 class for presentation**
b.	Water quality analysis (i)Tap (ii)Rainwater	Water collection and analysis		
C	Case Study (RWH)	Case study of existing RWH system in different institutions		
d.	Groundwater Recharge/ existing scenario	Possible methods of ground water recharge in particular community or existing practise of ground water uses and management in a community		
1.3	**Individual**	Students will have to conduct at individual level		No extra period needed to assign the task
a.	RWHS design at individual house	Estimate water demand, and design RWH system at individual house. (Report to include-water demand, need assessment, water collection feasibility, quantity of water, possible storage area, cost estimation and outlet for excess water along with proper mapping of pipes and storage area eg.: Prabhat school)		
2.	**Solid waste management (SWM)**			
2.1	**Field Visit**			**2.5 classes**
a.	Kirtipur and Bagbani	Solid waste management by community and observation of vermin composting in larger scale for farming at Bagbani	Individual Report on each field visit	1 (post class)
b.	SWMRC-Teku	Waste segregation and transfer mechanism		1 (during class)

2.2	**Case Study**	Group work: students to be divided into different groups and prepare report on following topic and present in front of other college students		**½+1 (assigning topics +presentation)**
a.	Waste management by private sector	A group should visit some of the private sectors (at least 1 renowned and 1 new/emerging to collect information on how they are managing waste and what are the challenges and status of waste pickers)	Prepare a case study and a presentation (10-15 mins)	1 class for presentation by 4 groups
b.	How much income generated from waste by waste scrappers/ *Kawadis*?	Visit at least three waste collection centre (*Kawadis)* and make inventory of the business and income of those places and people		
c.	Government Sector: -Practice -Policy	Identify the waste management mechanism and policy regarding SWM and check if the waste is being managed accordingly and find out people's perception in waste management (may be community or so)		
d.	People's perception on solid waste collection site near their home	Find out people's perception in locating waste collection centre near their home and find out their ideas for its management		
2.3	**Individual**	Students will have to conduct at individual level		No extra period needed to assign the task
a.	Waste inventory at Home.	Make the complete inventory of waste quality and quantity along the valuation of non-biodegradable waste and find out per capita waste generation along the existing and possible management practise	Prepare a short report on the inventory	

Text Books:

1. Environment, Technology and Sustainability: Hocine Bougdah, Stephen Sharples
2. Nanotechnology for Water and Wastewater Treatment - P. Lens, J.Virkutyte, V. Jegatheesan, Seung-Hyun Kim and S, Al-Abed

References:

1. Nanotechnology for Water and Wastewater Treatment - P. Lens, J.Virkutyte, V. Jegatheesan, Seung-Hyun Kim and S, Al-Abed
2. Basic Principles of Wastewater Treatment - Marcos Von Sperling

ENV 301Aquatic Environmental Management

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To acquaint the students with the theoretical and practical aspects of the aquatic environment and biodiversity
- Help to understand scientific principles that underpin the sustainable management of aquatic environment.
- Provide knowledge in relevant practical fields and generic skills

Course Contents:

Unit I: Fundamentals of Aquatic Environment **4 hrs**

Introduction, types, functions and importance of aquatic and ecosystems, physical, chemical and biological factors of aquatic environment.

Unit II: Aquatic Habitats and Biodiversity **12 hrs**

Types of habitats (lakes, rivers, pond, reservoirs etc.), characteristics of habitats, distribution and morphological diversity of flora and fauna, community change, succession, uses of habitats and biodiversity by local people and for environmental management and economic benefit.

Unit III: Assessment of Aquatic Habitats and Components **12 hrs**

Water budget, habitat diversity, productivity of aquatic ecosystems, water quality, their assessment of habitats and biodiversity, indicator for monitoring, linkage between aquatic biodiversity and people.

Unit IV: Conservation and Management of Aquatic Habitats and Resources **8 hrs**

Environmental issues related to aquatic environment, in situ and ex situ conservation, concept of physical, chemical and biological system based wastewater treatment plants.

Unit V: Global and National Initiatives for Sustainable Management **6 hrs**

Policy, plans, legislations and conventions related to Aquatic environmental management, community participation in sustainable aquatic environmental management

Practical: **6 hrs**

Study of community structure of a lake or pond ecosystem

1. Assessment and monitoring of water quality of any wetland ecosystem
2. Study of composition of benthic animals of pond or river or lake

Text Book:

1. Moss, Brian 1998. Ecology of Fresh Water; Man and Medium, Past to Future, 3rd.Edition

References:

1. Blackwell- Science. Sutherland, William J. 1996. Ecological Census Techniques, a Handbook, Cambridge University Press.
2. Wetzel, R.G. 1987. Limnology, Saunders, Philadelphia.

ENV 302 Climate Change and Society

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide basic concept of Climate change theories, theories of climate change, greenhouse gases and global warming
- To make the students able to develop Climate change indicator, analyze and evaluate, and identification, prioritization of climate change impacts and required adaptation and mitigation measures.
- To enable the students understanding the role of climate change approach in natural resource management and effects of climate change on the environment & human beings
- To make the students aware on key national and international institutional Framework/ Policy/Program related to climate change
- To enable the students to assess climate change impacts in a participatory way and help to explore the adaptation strategies.

Course Contents:

Unit I: Understanding Climate Science (6hrs)

1.1 Weather and climate
1.2 The climate system
1.3 Energy balance in the climate system
1.4 Factors leading to warming of the climate system
1.5 A changing atmosphere (climatic variability)
1.6 Green House Gases (GHGs)
1.7 Relationship of biogeochemical cycles with climate change
1.8 Effects of natural Green House Gases
1.9 Global warming

Unit II: Introducing Climate Change (8 hrs)

2.1 History of climate change
2.2 Evidences and indicators of Climate change (Global to national)
2.3 Causes of climate change (Emissions by Sources, by gas, by country)
2.4 Warming signs, impacts (agriculture, biodiversity, water, glaciers) and consequences

Unit III: Responses (6 hrs)

3.1 Global (IPCC, UNFCCC, Kyoto Protocol, REDD+)
3.2 National (Communication report, NAPA/LAPA to climate change policy and initiatives)

Unit IV: Responses (6 hrs)

4.1 Mitigation
4.2 Adaptation
4.3 Resilience

Unit V: Climate change and Society, Ethical Issues (6 hrs)

5.1 Climate change, personal and collective responsibilities
5.2 Ethics, climate change and scientific uncertainty
5.3 Justice and international climate change negotiation

Unit: VI: Introduction to participatory tools and techniques for assessing climate change Impacts and exploring adaptation options (8 hrs)

6.1 Climate hazard mapping
6.2 Climatic hazard trend analysis
6.3 Climatic hazard ranking
6.4 Climate hazard impact assessment
6.5 Assessing climatic hazard impacts on livelihood
6.6 Vulnerability assessment
6.7 Vulnerability matrix
6.8 Coping and adaptation strategies assessment

Unit VIII: Practical / Field activities (8hrs)

7.1 Visit of laboratories that are undertaking works/researches on environmental and climate change situations
7.2 Visit of the climate change hotspots and places, and climate change study areas being carried out by various organizations
7.3 Case studies review, the paper review of the case studies done by various researchers or climate change

Teaching Methodology

- Audio/ visual
- Documentaries/ presentation/ videos related to climate change
- Guest lecture to give recent updates in the field of climate change and sharing on development of new mechanisms, policies, researches etc. that update the knowledge of student.
- Review of scientific papers on different aspects of climate change

Examination/ Evaluation:

- Presentation/ viva on lab visits, hotspot visit and climate change study area
- Evaluation of reviews paper
- Midterm assessments
- Semester and board examination

Text Book:

1. Dessler Andrew, 2011 An Introduction to Modern Climate Change; Texas. A and M. University
2. Houghton John, 2009 Global Warming - International Panel on Climate change
3. Fletcher Charts, 2013 Climate Change- Wiley

RCH303 Research Methodology

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To provide the students fundamental concept of research methods
- To make the students able to understand the research methods and problems and to apply in the practical field
- To make the students able to develop research proposal, and be prepared to make critical analysis and develop a concrete report of the findings.

Course Contents:

Unit I: Introduction **4 hrs**

Definition of Research, meaning, types and significance of research, defining and identifying research problems, selection of the problem, techniques involved in defining a problem.

Unit II: Research Design and Proposal **6 hrs**

Meaning of research design, need for research design, features of a good research design, important concepts relating to research design, types of research designs, preparation and main features of a research proposal.

Unit III: Nature and types of evidences **4 hrs**

Importance of evidence in research, differences between the original and the secondary source materials, contemporary records and their significances in research, importance of newspapers and periodicals.

Unit IV: Methods of Data Collection **8 hrs**

Review of literature-consultation of published and unpublished documents and records, exploration of sites, questionnaire and interview, observation, photography and filming of subjects.

Unit V: **Sample selection** **10 hrs**

Principles of sampling and its significance, steps in sampling design, criteria for selecting a sampling procedure, characteristics and types of sample designs.

Unit VI: Data processing, analyzing and presentation **6 hrs**

Editing, tabulation of data, problems in processing, and types of analysis.

Unit VII: Statistical Methods **10 hrs**

An overview of statistical methods, hypothesis testing, drawing conclusions and recommendations, report witting, thesis format (format of writing research report).

Research Works:

Conducting Short term research work under research process of any area:

Text Books:

1. Dr. M. L. Singh-5, Understand Research Methodology
2.

References:

1. Berthouex, PM, Brown, LC, Statistics for Environmental Engineers, Lewis Publishers
2. R. P. Mishra, Research Methodology: A Hand Book
3. Young, Pauline V., Scientific Social Surveys and Research

4. Arkin H and Carlton R, Statistical Methods, New York Barnes and Noble. Wolf, Howard K. and Pant, Prem, A handbook for Social Science

Research and Thesis Writing

1. Bryan, F.J. Manley, Statistics for Environmental Science and Management, CRC press.
2. Gilbert, R. O. Statistical Methods for Environmental Pollution Monitoring, John Wiley and Sons
3. Kerlinger, Fred N., Foundations of Behavioral Research
4. Kothari, C. R., Research Methodology, Methods and Techniques, Wiley Eastern and New age.

ENV 304 Environmental Health and Sanitation

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

- To give fundamental concepts of environmental health and sanitation to the students.
- To enable the students in understanding and assessing environmental health hazards and risks.
- To make the students able to understand and identify causes and effects of environmental sanitation.

Course Contents:

Unit I: An Overview **4 hrs**

Health, sanitation and Environment; Historical perspective; Basic requirements for a healthy environment; Measuring environmental quality, human exposures and health impacts, Patterns of illness throughout the world.

Unit II: Nature of Environmental Health Hazards **6 hrs**

Hazards and risks, Biological hazards, Chemical hazards, Physical hazards, Mechanical hazards, Psychological hazards, occupational health hazards

Unit III: Risk Assessment and Management **12 hrs**

Risk assessment and Risk management framework, Epidemiological methods, Hazard identification in the field, Relationship between dose and health outcome, Human exposure assessment, Health risk characterization, approach to managing risk, factors affecting the perception and acceptance of risk, prevention and control of exposures, risk monitoring and use of indicators, special problems in managing environmental health risks, cost-effectiveness and cost-benefit analysis of interventions, obstacles and opportunities for resolving environmental health problems

Unit IV: Action to protect Health and the Environment **10 hrs**

From knowledge to action, Ethnical principles that guide action on environmental health, role of environmental health professionals. Problems of decision-making

Unit V:Global and National Initiatives Related to Environmental Health **8 hrs**

Policies, plan, strategies, legislations including conventions and treaties

Unit VI: Problems Relating to Environmental Sanitation **8 hrs**

General problems in developing Countries, Problems in SAARC region, Problems in Nepal

1. National Sanitation Policy in Nepal; National Development Plan in "Water Supply and Sanitation Sector".
2. Waste Water Treatment and Disposal: Low-cost seepage treatment
3. Domestic Sanitation: Outline of the problems in Nepal; Taking actions, sanitary disposal of wastewaters, On-site sanitation, Toilet connections

Case Studies/Field works/ lab works

1. Conducting Health survey in any community
2. Determining health hazards
3. Identify alternate way and mitigation measures for health problems

Text Book:

1. Annalee Yassie, Basic Environmental Health

References:

1. AnnaleYassi, Tord Kjellstrom, Theo Dekok and Tee Guideotti, EnvironmentalHealth, WHO/ENG/98.19
2. UNEP/USEPA/WHO 95.26 Ed. D. Briggs, C. Cosvalan, M. Nurmines, Linkage methods for Environment and Health analysis: General Guidelines.
3. Dr. A. K. Sinha, Human Health
4. Dr. P. K. Roy, Pollution and Health
5. PRIA, Occupational and Environmental Health
6. Re-evaluation of Inhalation Health Risks, Office of Research and Development, US
7. Leela Dahal, Study on Pesticide Pollution in Nepal.

ENV 305 Emerging Issues, Seminar and Proposal Writing

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:
The major objective of the course is to make understand about the real world mostly the environment related issues. How to organize the in a plat form of seminar and discuss them and finally conduct research in to the issues.

Course Contents:

1. Overview of the emerging issues of Environment **6 hrs**
2. Global and national initiatives for sustainable management of environmental issues **6 hrs**
3. Identification of priority areas for preparation of proposals **12 hrs**
4. Proposal writing methodology and proposal preparation **12 hrs**
5. Seminar **12 hrs**

Practical Works:
Conducting Seminars under recent related issues and practice on Proposal writing

ENV 306 Thesis (Credit hours 12)

Course Objective:

- For the final Semester the students will carry on research work by the guidance of their Supervisor so that they will have better knowledge to conduct research works in the real field.

1. Proposal Defense
    - **a.** Title selection **2credit hrs**
    - b. Proposal Writing
    - c. Proposal correction by Supervisors
    - d. **Proposal Defense**
2. Midterm presentation
    - a. Field investigation **4credit hrs**
    - b. Field Data Summarization/ analysis
    - e. Presentation
3. Pre-final thesis draft presentation **5credit hrs**
    - a. Thesis writing and Submission
    - b. Draft Submission
    - c. Draft Re correction by Supervisors
    - d. Presentation
4. Final Thesis Defense **1credit hrs**
    - a. Final Draft Submission
    - b. Final Thesis Presentation

MES 302 Mountain Environment and Sustainable Development

Evaluation:

	Theory	Practical	Total
Internal	60	-	60
Final	40	-	40
Total	100	-	100

Course Objectives:

After studying the subject the students will be able to understand the concept of Mountains, their importance and their management.

Course Contents:

1. **Introduction:** Location and extent, Mountain characteristics. **(2 hrs.)**

2. **Mountain Resources**: Physical Resources: Landscape, climate, geology and soil, minerals and water resources, Land use: land system, land capability, fragility and sensitivity Bio-resources: Biodiversity, ecosystems, biogeography, forest and vegetation, rangelands, species and genetic diversity, endemism, uses of biodiversity. Socio-cultural and economic aspects: population and ethnic groups, cultural resources and diversity, Economic condition (poverty, income, employment, industry, trade and commerce), traditional knowledge and practices, community development. **(12 hrs.)**

3. **Mountain specificities and limitations:** Specific characters and limitations of the mountain ecosystem **(8 hrs.)**

4. **Environmental issues in Mountains:** general issues, causes and consequences, basic issues affecting the long-term sustainability of mountain resources. **(6 hrs.)**

5. **Management of mountain environment:** Sustainable development concept, factors affecting sustainability, indigenous practices, traditional knowledge, Sustainable Development of fragile mountain areas, community involvement in management of resources, perception of local people. Concept of Stake holder **(12 hrs.)**

6. **Initiatives for sustainable management of mountain environment**: International initiatives, regional and national initiatives, institutions involving in management of mountain resources and their roles, integrated environmental management approaches. **(8 hrs.)**

Practical Works:

1. Study on land use system/capability
2. Study on mountain resources and their management
3. Practices on mountain development

Text Books:

1. J.D.A. Stainton, J.D.A., Forest of Nepal
2. FRISP (1999) Forest Resources of Nepal, (1987-98) Forest Research and Survey Department

References:

1. Klienn, C.(1994) Forest Resources Inventories in Nepal: Status, Quo, Needs, Recommendation, Forest Resources Information Project (FRISP)
2. Philip, M. Measuring Trees
3. Shrestha, T.K. (1997) Mammals of Nepal
4. Fleming, R.L. (1979) Birds of Nepal
5. Joshi AR, Shrestha SL & Joshi K (2003) Environmental Management and Sustainable Development at the Crossroad, Ankus, Kathmandu, Nepal.