

Appendix 8: Sample Course Outlines

The following course outlines are intended to demonstrate what is and what is not acceptable. The first two examples provide detailed information on each course such as specific content, the type of evaluation, prerequisites and related information. This level of detail allows the assessment panel to understand the degree to which courses meet the requirements of the standards. The first example is from a non-accredited Canadian university and the second example is from a German university and has been translated. The third example provides only a few sentences of description for each course which does not provide enough information for evaluation. This example comes from an American university.

Example 1: Canadian Non-Accredited University

This is a very good example of what is required for a course outline.

UNIVERSITY COLLEGE OF THE CARIBOO

Division of Sciences and Health Sciences

Department of Forestry and Natural Resource Science

INTRODUCTION TO FORESTRY - FRST 100

Winter 1999

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Course Description:

The course will provide an overview of Forestry in B.C. Forest conditions and forestry in BC will be compared to other parts of Canada and the world. Major forestry issues will be discussed from a variety of viewpoints. Students will be encouraged to share their views and to work together to explore various aspects of B.C. Forest Policy. At the end of the course students will have a better understanding of the problems of managing forests in the face of many competing and conflicting demands for the products and the many services provided by the forest in B.C., the evolving role of the "B.C. forest manager" in mediating those demands using a variety of tools (legislation, planning, research), and opportunities for personal involvement in forest management, whether as a future professional or an interested citizen.

Required text:

Hamish Kimmins "Balancing Act: environmental issues in forestry" Vancouver, UBC Press, 2nd ed. 1996. I chose this text because it presents information on forestry and forestry issues in a readable yet comprehensive manner. The presentation is balanced, and in my view realistic, but others disagree, principally those who view the use of forests from a spiritual viewpoint and regard the natural forest as the ideal.

Other books with much pertinent material include:

Chris Tollefson 1998. The Wealth of Forests: Markets, Regulation and Sustainable Forestry UBC Press. This book contains a series of essays on B.C Forest policy. I'll discuss the book when I get a copy!

Elizabeth May 1998 At the cutting edge: the crisis in Canada's forests. Key Porter Books. This book is a summary of environmentalists views about forest management in each of the Canadian Provinces. It is poorly written but will achieve fame for suggesting that Canadian Forests are going the way of the Atlantic cod fishery.

Ben Parfitt 1998 Forest Follies: Adventures and misadventures in the Great Canadian Forest. Harbour publishing. Parfitt's book has a more balanced view of forest management than May's while still retaining a strong green emphasis. It is also more

readable. His style is more personable and less rhetorical and he makes his points through telling a story. Much of his emphasis is on B.C.

Other B.C oriented books on Forest Policy include:

Ken Drushka, Bob Nixon, and Ray Travers editors 1993 Touch Wood: BC Forests at the Crossroads. Harbour Publishing. \$16.95. A book of essays on B.C Forestry; the essays are mostly opinion pieces and deal with political issues, rather than forest science, in contrast to Kimmins.

Michael M'Gonigle and Ben Parfitt 1994 Forestopia: a practical guide to the new forest economy. Harbour Publishing. \$16.95. This is easier to read than the above book, but doesn't contain as much detailed opinion.

Herb Hammond 1991 Seeing the forest among the trees: the case for wholistic forest use. Polestar Press. \$46.95. A more complex book than either of the two above, a more personal spiritual and ethical viewpoint for a much higher price, but nice pictures.

Province of B.C 1994. The 1994 Forest Range and Recreation Resource Analysis. Ministry of Forests Victoria. An survey of forestry and the forest resource in B.C. ... a photocopy of extracts on forest policy will be made available

Forest policy information with a Canadian focus can easily be obtained, free, by requesting copies of:

Government of Canada 1997. The state of Canada's forests: learning from History. Seventh report to Parliament. Canadian Forest Service Ottawa. A good source of information on Canada's forests and their use.

Government of Canada 1998 The State of Canada's forests: the peoples forests. 8th Report to Parliament, Canadian Forest Service, Ottawa.

If you are interested in the history of forest use, I recommend reading

John Perlin 1989 A forest journey: The role of wood in the development of civilization. Harvard University Press. An excellent historical tale of the role of forests and forestry in civilizations through the ages.

For all kinds of information on forests and forest policy see WEB Pages:

www.canadian-forests.com; www.for.gov.bc.ca; www.cif-ifc.org; www.bcen.bc.ca;
www.rpf-bc.org
www.pfc.cfs.nrcan.gc.ca

Course Evaluation:

- 1). Final exam.....50%
- 2). 3 short Essays..... 15%
- 3). Forest management computer game..... 5%
- 4). Project (including essay and presentation)..... 30%

Course Content:

Jan. 7th	Issues in the management of B.C.'s forests
Jan. 14th	B.C.'s Forests and the world
Jan. 21st	How <i>do</i> we manage our forests in B.C.?
Jan. 28th	The management structure: laws, policies, tenures, and practices
Feb. 4th	Forest Practices Code: what is in it? Is it working? Is Certification an alternative?
Feb. 11th	The clearcutting debate with an emphasis on alternatives
Feb. 18th	SPRING BREAK
Feb. 25th	Timber supply: what is it? how is it calculated? what affects it?
Mar. 4th	Local communities; effects of timber supply reductions
Mar. 11th	Forest Renewal BC; what is it; what will it do; Planning for future forest use
Mar. 18th	Treaty negotiations with First nations and their effect on forestry
Mar. 25th	Sustainable forestry in B.C.: is it possible?
April 1st	Group presentations
April 8th	Group presentations; plus course REVIEW
April 15th	Exam (tentative)

Example 2: German University with English Translation

This is the bare minimum of what is required for a course outline.

Modul (Wahlpflicht)	ECOPEDOLOGY OF THE TROPICS AND SUBTROPICS
Art/Umfang/Doz.	V / 6 Credits, K=56, S=124 / Veldkamp
Vorbedingungen	none
Inhaltl. Beschr.	<p>Part I: General introduction in soils of the tropics and subtropics, their functions, genesis, geography and properties. Objective: general understanding of the most important aspects of tropical soils, their occurrence, genesis, properties and use. The following topics will be discussed: Introduction; Climate, water and vegetation; Weathering and weathering products, clay minerals; Soil organic matter, C and N dynamic; Soil chemical reactions, variable charge; Soil forming processes and development of soils; Water and nutrient cycling of land use systems; Tropical shield areas (example: Amazon basin); Arid shields and platforms (example: West Africa); Tropical mountain areas (example: Andes); Fluvial and coastal areas in the tropics (example: coastal areas in Asia).</p> <p>Part II: Introduction in the description and classification of soils, using in international system (FAO). Objective: understanding the principles of the FAO soil profile description and classification. The course consists of introductory lectures in which the principles of the FAO soil description and classification will be explained. This knowledge will be practiced using examples of soil profiles from different tropical countries. The second part consists of a practical week during which soil profile descriptions and evaluations will be exercised in the field. We will visit three contrasting sites around Göttingen where a site and soil description will be made. The work will be done in small groups. Students discuss their results in a report.</p>
Prüfung	Term paper and written exam (2 hours)
Lernziele, Qualifikationen	General understanding of the most important aspects of tropical and subtropical soils, their occurrence, genesis, geography, properties and use. Understanding the principles of the international FAO soil profile description and classification.
Verwendbarkeit	

Modul (Wahlpflicht)	PROJECT PLANNING, MANAGEMENT AND EVALUATION
Art/Umfang/Doz.	V/Ü / 6 Credits, K=56, S=124 / Möhring (Koord.), Olschewski, v. Stieglitz
Vorbedingungen	none
Inhaltl. Beschr.	<p>This module provides managerial and planning methods for forestry projects and gives insight into practical examples of development co-operation. The economic evaluation of forestry projects includes private goods like timber as well as public goods like recreation and protection services to allow for decision making on a broad information basis. The students learn how to use the methods and instruments and recognise advantages and limitations of the different evaluation techniques. A deeper understanding of the subject-matter is achieved by exercises. In the last years the subjects of this module formed the basis for a cost-benefit analysis, conducted by the students during the following project semester.</p>
Prüfung	Written exam (2 hours)
Lernziele, Qualifikationen	<p>This module provides managerial and planning methods for forestry projects and gives insight into practical examples of development co-operation. The economic evaluation of forestry projects includes private goods such as timber as well as public goods such as recreation and protection services to allow for decision making on a broad information basis. The students learn how to use the methods and instruments and recognise advantages and limitations of the different evaluation techniques.</p>
Verwendbarkeit	

Modul	FOREST UTILIZATION AND WOOD PROCESSING
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(Wahlpflicht)	
Art/Umfang/Doz.	V / 6 Credits, K=56, S=124 / Kürsten (Koord.), Höfle
Vorbedingungen	none
Inhaltl. Beschr.	<p>The modul consists of two parts: Work Systems and Methods in Forest Utilization. It puts forest operations into the broader context of society and forest ecosystems and stresses the human factor involved. Emphasis is directed to systems analysis and long-term perspectives. Contents: Overview of the role of forestry, forest products, forest areas, removals and general tendencies as basic information. The importance of the human factor: indigenous knowledge, training, ergonomics, occupational safety and health, work studies. Basic elements of road planning, construction and maintenance. Fuelwood, simple methods for charcoal production. Harvesting technologies: overview, reduced impact logging, case studies. Technologies outside harvesting. Appropriate technologies. Cost control in forest operations. Recent developments (information technology, GIS, logistics).</p>
Prüfung	2 written exams (à 1 hour)
Lernziele, Qualifikationen	<p>Knowledge of technological relevant wood properties of important commercial timbers. Technology of major forest products in tropics (lumber, veneer, plywood, wood-based panels, pulp and paper) and their significance for forest utilisation. Enables students to analyse situations where forest operations take place and to select and quantify the optimal course of action. It puts forest operations into the broader context of society and forest ecosystems and stresses the human factor involved. Emphasis is directed to systems analysis and long-term perspectives</p>
Verwendbarkeit	

Modul (Wahlpflicht)	INTERNATIONAL FOREST ECONOMICS
Art/Umfang/Doz.	V/Ü / 6 Credits, K=56, S=124 / Olschewski (Koord.), N.N.
Vorbedingungen	keine
Inhaltl. Beschr.	<p>The module "International Forest Economics" is divided in two parts: "International Markets, International Resources and Forest Protection" (Olschewski) and "Forest Development Economics" (N.N.). "International Markets, International Resources and Forest Protection": The lecture is split in two main areas: 'International Wood Markets' and 'International Environmental and Forest Conservation'. The first part deals with the international trade with wood and wood products. International markets and the consequences of protectionism are analysed. Furthermore, aspects of international wood marketing are shown. In the second part, international environmental problems are described and possibilities as well as constraints for international co-operation are discussed. Finally, relations between environmental conservation and economic development are analysed. "Forest Development Economics": Indicators for the measurement of economic development are presented and obstacles for the development process are discussed. Approaches for forest development policy are shown and their impact on foreign trade is analysed. Furthermore, the promotion of sustainable forest-land use in the informal sector and aspects of forest development planning are discussed.</p>
Prüfung	Written exam (2 hours)
Lernziele, Qualifikationen	<p>The students are enabled to analyse different problems in the field of international forest economics and to show solutions for such problems based on economic theory. Knowledge of market as well as foreign-trade theory is acquired and environmental and development economic instruments are applied.</p>
Verwendbarkeit	

Example 3: American University

This does not meet what is required for a course outline.

220—School of Forestry—Forestry

Graduate Programs

The School of Forestry offers these graduate degrees: Master of Science in Resource Conservation, Master of Science in Forestry, Master of Forestry, Master of Science in Wildlife Biology, Master of Science in Recreation Management, and Doctor of Philosophy.

For further information on these programs contact the Graduate School.

Courses

U = for undergraduate credit only, UG = for undergraduate or graduate credit, G = for graduate credit. R after the credit indicates the course may be repeated for credit to the maximum indicated after the R.

- U 130N Introduction to Ecology and Environmental Management 3 cr.** Consideration of ecological principles underlying the use and conservation of natural resources, and the societal constraints on their management. Group-project oriented and on-site observation.
- U 140 Introduction to Urban Forestry 2 cr.** An introduction to urban forestry principles and practices. Benefits of the urban forest. Topics covered include plant species selection, site design, site assessment, planting, watering, fertilization, insects and diseases, pruning and tree care, inventory of property values, and community forestry development.
- U 180 Careers in Natural Resources 2 cr.** Same as WBio 180 and Recm 180. Subject matter and fields of study within natural resources management. Topics include forestry, wildlife biology, range, water, recreation management, forest products production, and other opportunities for careers in natural resources.
- U 195 Special Topics Variable cr. (R-6)** Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.
- U 196 Independent Study Variable cr. (R-3)** Prereq., consent of instr. Problems course designed to allow individual research at the undergraduate level.
- U 200 Introductory Forest Biometrics 2 cr.** Prereq., Math 121 or 150. Introduction to statistical procedures applied to biological populations. Includes use of number scale, descriptive statistics and introduction to hypothesis testing ("Z", "t" and "F" tests). Lectures are reinforced with lab exercises including an introduction to the use of computers to solve statistical problems.
- U 201 Advanced Forest Biometrics 3 cr.** Prereq., For 200. Applying statistics, hypothesis-testing and computer programming to biological problems.
- U 210N Introductory Soils 3 cr.** Prereq., Chem 151N. An introduction to the chemical, physical, biological and morphological properties of soils.
- U 220 Technical Writing 3 cr.** Stresses principles of effective technical writing, primarily clarity and conciseness. Short writing assignments are criticized for grammar, sentence structure, organization and work economy. Emphasizes self-editing as a means of improving writing and discusses problems of literature citation.
- U 230 Forest Fire Management 2 cr.** Presuppression and suppression of fire and the uses of fire in management practices. Fire weather, the measurement of fire weather, the factors that influence fire behavior, and fire management decisions. Class meets for half semester.
- U 232 Forest Insects and Diseases 2 cr.** Identification, significance of and remedies for insect infestations and infectious and non-infectious diseases of forests and forest products. Class meets for half semester.
- U 240N Tree Biology 3 cr.** Suggested coreq., For 241N. The physical and biological requirements for the growth and development of trees. Discussions of: identification, classification, range, and economic importance of the major tree species of North America.
- U 241N Tree Identification Laboratory 2 cr.** Prereq., Biol 120N; suggested coreq., For 240N. Methods and techniques for identifying the major families of North American trees, based on gross morphological and anatomical features. Building and use of identification keys.
- U 245 Introduction to Timber Management 3 cr.** A survey of the concepts basic to timber management. Areas covered are silvics, mensuration, silviculture and yield regulation.
- U 250 Plane Surveying in Resource Data Systems 3 cr.** Prereq., Math 121. Principles, field techniques and applications of plane surveying.
- U 270N Conservation of Wilderness, Wild Rivers and National Parks 3 cr.** Same as Evst 270N and Recm 270N. Examination of the historical, philosophical and legislative background for development and management of our national system of wilderness areas, wild and scenic rivers, trails, and national parks; their place in our social structure.
- U 271 Wilderness Ecology 3 cr.** Prereq., For 130N or Evst 101N. A study of forestry and wildlife issues which affect the maintenance of wilderness integrity. Topics include: global climate changes; management of wildfires, cattle grazing and noxious weeds; game management; threatened and endangered species, including grizzly bears, wolves, bird and fish species.
- U 272 Wilderness and Civilization 3 cr. (R-6)** Core course in the Wilderness and Civilization Program. Includes field instruction in wilderness resources and orienteering, participation in wilderness issues, and study and discussion of wilderness in Montana and in society as a whole.
- U 280S Perspectives in Environmental Management 3 cr.** Offered alternate years. Study of how western people and people of other cultures have managed forest lands and other wildlands, both past and present. Includes discussion of philosophies of natural resource use, and legal, social, economic, political and ecological constraints on resource policy.



- U 295 Special Topics** Variable cr. (R-6) Experimental offerings of visiting professors; new courses or one-time offerings of current topics.
- U 296 Independent Study** Variable cr. (R-3) Prereq., consent of instr. Individual research at the undergraduate level.
- UG 300 Forest Mensuration** 4 cr. Prereq., For 201. The theory and practice of timber inventory and growth projection, including sampling procedures, statistical methods, field procedures, and use of microcomputers to compile inventories and simulate stand growth under specified management prescriptions.
- UG 304 Conservation of Natural and Human Resources in Montana** 3 cr. Prereq., consent of instr. Same as EVST 304. Conservation in Montana; environmental problems such as air pollution, water pollution, mining impacts and resource management of wildlands, timberlands, and wildlife.
- UG 307 Computer Modeling in the Natural Sciences** 3 cr. (R-6) The construction and analysis of computer models or simulations of processes, systems and populations in the natural sciences. A project-oriented course.
- U 310 Soil Physics** 3 cr. Prereq., For 210. The physical and mechanical properties of soils with special emphasis on the role of water in influencing those properties. A lab will accompany the course.
- UG 320 Forest Economics** 3 cr. Prereq., Math 150; Econ 111S. Economic analysis involved in the use and distribution of forest resources.
- UG 330 Forest Ecology** 3 cr. Prereq., Biol 120N or Biol 103N, 104N; prereq., or coreq., For 210N. Examination of the processes and variation of forests with field labs at Lubrecht in the months of April and May; interpretive ecology and development of skills in observation, taxonomy, measurement, data interpretation and problem solving.
- UG 331 Wildland Fuel Management** 3 cr. Prereq., For 230 or equiv. Fire ecology, western vegetation types; planning for prescribed use of fire; fuel management objectives and techniques: mechanical, chemical, prescribed fire; smoke management considerations.
- UG 332 Forest Entomology** 3 cr. Prereq., For 232. Classification, identification, life cycles, and control of insects which injure forests and forest products.
- UG 340 Timber Harvesting and Forest Products Manufacturing** 5 cr. Prereq., junior standing or consent of instr. Survey of ground, cable and aerial timber harvesting techniques and the subsequent manufacture of wood-based products from this harvest. Laboratory field trips to timber harvesting operations and several local manufacturing facilities.
- UG 341 Timber Management** 3 cr. Prereq., For 320, 346. Management of timber stands, including assessment of site quality, stocking, stand condition, and other factors influencing growth; use of growth and yield projections; development of stand management prescriptions; economic evaluation of alternative management strategies; stumpage appraisal and harvest scheduling.
- UG 342 Wood Anatomy, Properties and Identification** 3 cr. Prereq., Biol 120N or For 240N, 241N. Lecture and laboratory investigation of the structure, identification and physical and mechanical properties of the commercial tree species of North America.
- UG 346 Principles of Multiple Resource Silviculture** 1 cr. Prereq., a course in ecology. Principles of silviculture to meet multiple resource objectives. Field trips will be arranged.
- UG 347 Practice of Multiple Resource Silviculture** 2 cr. Prereq., For 300, 330; coreq., For 346. The practice and application of silvicultural techniques to forest ecosystems to meet multiple resource objectives. Field trips will be arranged.
- UG 351 Photogrammetry and Remote Sensing** 3 cr. Prereq., Math 121, For 250. The theory and application of photo- and electro-optical remote sensing for mapping resources and developing information systems.
- UG 352 Advanced Surveying** 3 cr. Prereq., For 250. Introduction to precision-ordered instruments, electronic distance measurements, control surveys, satellite-based positioning, and data processing.
- UG 360 Range Management** 3 cr. Prereq., junior standing or consent of instr. An introduction to rangelands and their management, grazing influences, class of animal, grazing capacity, control of livestock distribution, improvements, competition and interrelationships with wildlife. Laboratory exercises to gain on-the-site experience on topics and concepts presented in lectures.
- U 361 Range Forage Plants** 3 cr. Prereq., For 360 and Biol 165N. Description, identification, forage value and ecology of forage plants of the western United States; important weed species; management of grazing lands, and the relationship of ecophysiology and morphology to grazing response.
- U 362 Range Livestock Production** 3 cr. Prereq., For 360 or consent of instr. Offered alternate years. An introduction to livestock production in natural systems and the role of livestock production in the world food situation; emphasizes selection, production and management principles of beef cattle systems.
- UG 372 Wildlife Administration, Enforcement and Biopolitics** 3 cr. Overview of the laws affecting wildlife and how those laws are initiated, implemented, and enforced; impact of politics, interest groups, and agency jurisdictions.
- UG 380S Environmental Conservation** 3 cr. Prereq., junior standing. The interrelationships of resource conservation problems and programs; management and conservation in the context of an expanding economy.

- UG 385 Introduction to Watershed Management 3 cr.** An introduction to physical and biological controls over water movement and storage in the environment, and how those controls are affected by land management practices. Laboratory exercises introduce basic watershed measurement and analysis techniques.
- UG 389 Integrated Resource Management of Riparian/Wetland Areas 3 cr.** Prereq., one introductory ecology course. Importance of riparian/wetland areas and the complexities associated with their management for short and long term benefits.
- U 395 Special Topics Variable cr.** (R-12) Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.
- U 398 Cooperative Education Internship Variable cr.** (R-12) Prereq., consent of department. Extended classroom experience that provides practical application of classroom learning during placements off campus. Prior approval must be obtained from the faculty supervisor and the Cooperative Education Office.
- UG 400 Sampling Methods 3 cr.** Prereq., For 201 or equiv. Offered alternate years. Definitions, sampling with and without replacement, equal and unequal probability sampling, sample size and allocation, estimates and their variances, simple random sampling, stratification, doubling sampling, two-stage sampling, PPS and 3P sampling uses and precision.
- UG 410 Soil Morphology, Genesis and Classification 3 cr.** Prereq., For 210N. The morphological characteristics of soils, how the horizons formed and an introduction to the *Soil Taxonomy* classification system used in this country. Field trips will be included.
- UG 412 Ecosystem Ecology 3 cr.** Prereq., For 210N, 310, 315. Discussions of the functioning of ecosystems with emphasis on processes, leading to understanding of landscape ecology. Emphasis on the ways humans can alter ecosystem processes and how systems that have been disturbed recover.
- UG 420 Forest Resources Finance and Valuation 3 cr.** Prereq., For 320. Theory and practice of evaluating financial and other economic impacts of forest resources management opportunities.
- UG 422 Natural Resources Policy and Administration 3 cr.** Policy formation in the United States and a survey of the major resource policies interpreted in their historical and political contexts.
- UG 423 Natural Resources Law 3 cr.** Prereq., senior standing. Offered alternate years. Survey of the structure of the American legal system with emphasis on the principles of law relevant to natural resource management.
- UG 430 Forest Regions of North America 3 cr.** Prereq., a class in ecology. Ecological development of forest regions of North America, successional patterns, limiting factors; development and application to forestry problems of selected classification systems.
- UG 431 Forest Habitat Typing and Management Implications 3 cr.** Prereq., For 330 or Biol 355. Habitat typing and ecological classification used as a forest management tool in the northern Rocky Mountains.
- UG 432 Advanced Fire Weather 4 cr.** Prereq., For 230. The study of mesoscale and synoptic meteorological influences on fire behavior, danger and climate in the northern Rocky Mountains.
- UG 433 Fire Management Planning 3 cr.** Prereq., For 331 or consent of instr. Offered alternate years. Planning analysis using case studies; consideration of fire history, weather, and fuels in wilderness fire management; smoke management and multiple resource coordination.
- UG 440 Advanced Timber Harvesting 3 cr.** Prereq., For 340. Timber harvest unit and transportation system layout, logging planning, and system organization for the application of ground-based, cable, and aerial timber harvesting systems; economic feasibility of alternative practices; achieving compatibility with environmental constraints.
- UG 442 Technical Processing of Wood Products 5 cr.** Prereq., For 340 and 342. Lecture, discussion, laboratory manufacture, and evaluation of solid and composite wood products. Exercises include lumber manufacture and drying at School's sawmill; plywood, laminated beam manufacture and strength testing; particle board and flakeboard manufacture and testing.
- UG 446 Nursery Practices and Tree Improvement 3 cr.** Prereq., For 346. The study of nursery practices and forest tree breeding methods for genetically improved forest tree seedlings and seed.
- UG 450 Advanced Aerial Photogrammetry 3 cr.** Prereq., For 351. Aerial photogrammetric methods in map construction and compilation, resource inventories and forest engineering.
- UG 451 Remote Sensing in Resource Management 3 cr.** Prereq., For 351. Imaging systems, multi-band and multi-spectral imaging, image analysis for resource information and evaluation.
- UG 452 Advanced Image Analysis 3 cr.** Prereq., For 451. Offered alternate years. Analysis of problems in the use of remote sensing media and their evaluation as sources of resource information.
- UG 460 Range Inventory and Analysis 3 cr.** Prereq., For 360 and one course in statistics. Methods of measuring range and shrub-land vegetation at individual and community level for determining plant composition, changes following treatments, and carrying capacity of range livestock and native ungulates.
- UG 461 Animal Nutrition 3 cr.** Prereq., For 360 or consent of instr. Elements of animal nutrition, physiology of ruminant nutrition, nutritional characteristics of forage plants related

- to nutrition requirements of livestock and wildlife, and nutritional strategies of free-roaming animals.
- UG 462 Range Ecology 3 cr.** Prereq., For 360 and one course in plant ecology. Applied ecology of rangeland uses by various biota, synecological response to grazing, fire, herbicides, fertilizers and mechanical treatments, structural and functional responses of grassland systems to disturbance.
- UG 463 Range Improvement 3 cr.** Prereq., For 360. Methods of improving rangelands, including grazing systems, control of weeds, controlled burning, seeding, fertilization and mechanical soil treatments.
- UG 467 Rangeland Planning 3 cr.** Prereq., For 460, 462, 463. Development of a detailed management plan for a specified land unit. Field problem in planning, inventory, analysis, allocation and management.
- UG 480 Forest and Rangeland Area Planning and Design 2 cr.** Prereq., senior standing. A multidisciplinary planning team approach to developing detailed, site-specific resource management planning for units of forest and rangeland at the area or watershed level. Includes use of geographic information systems, computer modelling, and linear programming.
- UG 481 Forest Planning 3 cr.** Prereq., For 341 or consent of instr. A multidisciplinary planning approach to integrated multiple use planning at both the management unit and forest-wide levels: defining multi-resource management goals, generating management alternatives, projecting outcomes, assessing environmental impacts, and implementing preferred options. Includes introduction to linear programming and other modeling techniques of forest planning.
- UG 483 Foundations of National Forests 3 cr.** Offered alternate years. Historical and topical seminar on the development of forest planning under the National Forest Management Act; current issues in forest planning including the appeals process.
- UG 485 Advanced Watershed Management 3 cr.** Prereq., For 385 or consent of instr. Effects of land management practices on water and sediment yields from wildland watersheds. Introduction to statistical methods in hydrology. Introduction to water yield and sediment modeling techniques.
- UG 487 Northwest Forest Resources Field Trip 3 cr.** Prereq., senior standing. One-week trip will focus on field and mill applications of silviculture, harvesting, regeneration, manufacturing, management, and watershed, wildlife and recreation practices in the Pacific Northwest.
- UG 489E Ethics and the Management of Public Lands 3 cr.** Prereq., lower-division course in Perspective 5 or consent of instr. Theoretical and practical ethical issues affecting the management of natural resources in national forests and on other public lands.
- UG 495 Special Topics Variable cr.** (R-12) Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.
- U 496 Independent Study 1-3 cr.** (R-10) Prereq., consent of instr. Individual study or research problems.
- U 497 Senior Thesis 3 cr.** Prereq., senior standing and consent of instr. Preparation of a major paper based on study or research in a field selected according to the needs and objectives of the student.
- UG 498 Cooperative Education Internship Variable cr.** (R-15) Prereq., consent of instr. Extended classroom experience which provides practical application of classroom learning during placements off-campus. Prior approval must be obtained from faculty advisor and Cooperative Education Office.
- G 500 Forest Growth and Yield 3 cr.** Prereq., For 300 or consent of instr. Offered alternate years. Theory and methods for projecting quantitative measures of tree and stand growth over time; includes analysis of computer growth and yield models used in the region.
- G 501 Research Methods 3 cr.** Prereq., a course in statistics or consent of instr. The nature of scientific research, planning research projects, organization and presentation of research results. Emphasis on the development of study plans for specific research projects.
- G 502 Advanced Research Methods 3 cr.** Prereq., For 501 or equiv. The use and analysis of advanced statistical procedures related to natural resources research.
- G 503 GIS: Methods and Applications I 3 cr.** Prereq., consent of instr. General principles of geographic information systems. Instruction and lab use of specific software packages used for management decision-making in natural resources management. Students have hands-on experience in digitizing, mapping, spatial analysis and data-base creation.
- G 504 GIS: Methods and Applications II 3 cr.** Prereq., For 503. Continuation of 503.
- G 511 Soil Chemistry 3 cr.** Prereq., For 210N, 330. A series of lectures on soil chemistry in the beginning of the semester, emphasizing water and nutrient movement, followed by a series of laboratory and lecture classes on soil chemistry, emphasizing data interpretation and problem solving.
- G 520 Advanced Forest Economics 3 cr.** Prereq., For 320. Economic basis for multi-product management of forest land resources and industries.
- G 523 Forest Land Resource Economics 3 cr.** Prereq., For 320. Economic analysis of forest land in terms of institutional arrangements, allocation, and production relationships.
- G 530 Forest Meteorology 3 cr.** Prereq., graduate standing or consent of instr. A brief introduction to synoptic and mesoscale meteorology, followed by more intense study of physics