Environmental and Resource Economics

(englischsprachiges Modul)

Modulnummer	Workload	Credits	Häufigkeit des Angebots	Dauer
32801	300 h	10	jedes Semester	1 Semester

1 Lehrveranstaltungen

Einheit	Titel	Workload
1	Environmental Economics	150 h
2	Resource Economics	150 h

2 Lernergebnisse (learning outcomes) / Kompetenzen

The participants in this course will gain a basic understanding of the problem of anthropogenic climate change, its causes and effects, as well as climate change mitigation strategies. Furthermore, they will become familiar with basic neoclassical welfare analysis and market equilibria under perfect competition. While some of this material may be familiar from other courses, our goal is to offer the same set of basic tools for calculating market outcomes to all participants in this course. Based on this, the participants will then learn how to analyze markets with imperfections such as externalities (e.g., pollution), and how such markets should be regulated to achieve Pareto efficiency. In doing so, they will acquire skills that are used in modern environmental economic analysis and research. The main goal of this course is to enable the students to perform problem-solving on their own. Therefore, a large part of this course consists of exercise material (problems + solutions). Beyond the basic environmental economic tools, the participants are also introduced to the technique of dynamic optimization, which is widely used to analyze dynamic problems within environmental and resource economics, and beyond.

3 Inhalte

The module consists of two parts.

Unit 1: Environmental Economics

The course starts with an introduction to the problem of anthropogenic (man-made) climate change. The goal is to give a broad overview and basic understanding of climate change: its causes, the physical mechanisms at work, and its consequences for life on our planet. We move on to an overview of the basic principles of the neoclassical theory: welfare analysis and market equilibrium under perfect competition. This is the benchmark against which markets with imperfections (e.g., externalities such as climate change) are compared. Whereas in the neoclassical world where Pareto-efficiency is reached, externalities, public goods, monopoly power etc. cause market failures and may call for government intervention, such as taxes on greenhouse gas emissions. Such market failures are, thus, introduced into the basic framework, and different kinds of regulatory instruments are discussed as well as formally compared, such as emission taxes vs. cap-and-trade (under certainty as well as under uncertainty). The course also introduces and formally describes concepts such as learning-by-doing (in the context of technological change) and strategic environmental policy (where governments behave strategically and non-cooperatively against each other). We finally give an introduction to the game-theoretic analysis of international environmental

	agreements, such as the Kyoto Protocol. Here, the central question is, if or under what conditions decentralized governments may be able to achieve an outcome that involves a significant degree of cooperation in reducing global greenhouse gas emissions. Unit 2: Resource Economics The second part of this course focuses on dynamic issues related with the extraction of non-renewable resources, but also with the accumulation of pollutants (such as greenhouse gases) in the atmosphere or in other waste sinks with a finite capacity. From a formal perspective, the main part of the second part of this course is to give an introduction to dynamic optimization. This is an optimization procedure that has similarities with the Lagrangian method in static optimization problems, but is slightly more complex because it applies to dynamic optimization problems. We will explain what “state and control variables” are in such problems, and how to apply the dynamic optimization technique to analyze basic problems. We will introduce this technique in a simple, heuristic way, without providing formal mathematical proofs for why this procedure works. Instead, the participants in this course will learn how to apply it in a simple fashion, and how the resulting optimality conditions may be interpreted economically in an intuitive way. We apply this procedure to analyze problems of non-renewable resource extraction (the so-called “cake-eating problem”), optimal growth with (or without) a non-renewable resource, and stock pollution problems, such as greenhouse gas emissions with a finite “emissions budget”. The course also gives a brief introduction to the famous DICE model by the Nobel price laureate William Nordhaus. In the final part of Unit 2, there is a collection of old exam questions that we recommend solving after studying the course material. These questions cover both units.
4	**Lehrformen** Fernstudium Die Einheiten enthalten eine große Zahl von Übungsaufgaben und Kontrollfragen sowie Lösungshinweise bzw. Musterlösungen zu diesen Aufgaben. Zusätzlich werden in Moodle Lehrvideos und weitere Übungsmaterialien zu Modulinhalten bereitgestellt.
5	**Teilnahmevoraussetzungen** Formal: Gemäß Prüfungsordnung des jeweiligen Studienganges Inhaltlich: Keine speziellen Voraussetzungen
6	**Prüfungsformen** Zweistündige Abschlussklausur
7	**Voraussetzungen für die Vergabe von Kreditpunkten** Die Leistungspunkte werden vergeben, wenn die Prüfungsklausur bestanden worden ist. Voraussetzung für die Teilnahme an der Prüfungsklausur ist das Bestehen mindestens einer von zwei Einsendearbeiten.
8	**Verwendung des Moduls** Masterstudiengang Wirtschaftswissenschaft Masterstudiengang Volkswirtschaft Masterstudiengang Wirtschaftsinformatik

	Masterstudiengang Wirtschaftswissenschaft für Ingenieur/-innen und Naturwissenschaftler/-innen Akademiestudium
9	**Stellenwert der Note für die Endnote** Gemäß Prüfungsordnung des jeweiligen Studienganges
10	**Modulbeauftragte/r und hauptamtlich Lehrende** Univ.-Prof. Dr. Robert Schmidt
11	**Sonstige Informationen** –