MATH-USRM-A01: Harmonization Module Systems Science

Identifier	MATH-USW-W02			
Module title	Harmonization Module Systems Science			
German module title	Angleichungsmodul Systemwissenschaft			
Authorized module representative	Systems Science working group			
Learning objectives	To acquire the fundamentals of the undergraduate curriculum in Systems Science			
Exemplary contents	In this module, the principles of Systems Science will be taught in a condensed form to prepare students for the Master degree program.			
Module components with type of component and CP information	Lecture Problem class	1 component 1 component		
CP of the module	6 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Lecture	30	60	90 hours
	Problem class	30	60	90 hours
	Total	60	120	180 hours
Module duration	1 semester			
Module frequency	Usually in the winter semester			
Course credits				
Required pre-examination achievements	Achieve a certain number of points for problem sheet solutions			
Type of examination by continuous assessment	Written exam (90-120 minutes) or oral exam (usually 30 minutes)			
Examination requirements	Mastering of all contents of the module			
Calculation of module grade				
Regulations for passing the module				
Retaking to improve grades	When passed in the first attempt, an exam can be retaken within the standard period of study to improve the grade. The better grade of the two attempts will be applied.			
Decision-making body for the module	Fachbereichsrat Mathematik/Informatik			
Use of module				
Prerequisites for participation in this module				

MATH-USRM-P01: Environmental and Behavioral economics (M.Sc.)

Identifier	MATH-USM-P01			
Module title	Environmental and behavioral economics (M.Sc.)			
German module title	Umwelt- und Verhaltensökonomik (M.Sc.)			
Authorized module representative	Chair of Environmental Economics, FB 9			
Learning objectives	Students acquire basic competences in environmental economics as well as in behavioral economics (the latter with reference to environmentally relevant behaviour). They acquire expertise in environmental and behavioral economics and transfer competence by applying the acquired knowledge to concrete examples.			
Exemplary contents	• Causes of environmental problems from an environmental economic point of view • Economic valuation of environmental goods • Instruments of environmental policy, international environmental policy • Context of trade, growth and environmental behaviour • Economic determinants of environmentally relevant behaviour			
Module components with type of component and CP information	Lecture Practice	6 CP 3 CP		
CP of the module	9 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Lecture	4 SWS (60 Std.)	120 Std.	180 Std.
	Component 2	2 SWS (30 Std.)	60 Std.	90 Std.
	Total	6 SWS (90 Std.)	120 Std.	270 Std.
Module duration	1 Semester			
Module frequency	Every winter semester			
Course credits				
Required pre-examination achievements				
Type of examination by continuous assessment	Written examination (120 -150 min.) or oral examination (30 -60 min.)			
Examination requirements	Mastering of all contents of the module			
Calculation of module grade				
Regulations for passing the module				
Retaking to improve grades				
Decision-making body for the module	Council of department Mathematik/Informatik			
Use of module	M.Sc. Environmental Systems and Resource Management (P)			
Prerequisites for participation in this module	None			

MATH-USRM-P02: Coupled Human-Environment Systems

Identifier	MATH-USW-P02			
Module title	Coupled Human-Environment Systems			
German module title	Gekoppelte Mensch-Umwelt-Systeme			
Authorized module representative	Systems Science working group			
Learning objectives	• To apply equation-based modeling methods for the description of ecosystem dynamics and collective human behavior • To identify and examine feedback cycles between human and environmental systems • To evaluate management strategies and policy instruments in social-ecological systems • To recommend strategies for sustainable development based on quantitative methods			
Exemplary contents	• Modeling environmental systems, e.g. lake eutrophication, metapopulations in fragmented landscapes, irrigation systems, forestry, fishery, grazing systems, wildlife stocks • Modeling human behavior and decision making on a collective level, e.g. with the help of evolutionary game theory, optimization methods, as well as resource and socioeconomic approaches • Integrating environmental and socioeconomic systems • Stability, resilience, tipping points and limits of the management of social-ecological systems			
Module components with type of component and CP information	Lecture Problem class	1 component 1 component		
CP of the module	9 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Lecture	60	120	180 hours
	Problem class	30	60	90 hours
	Total	90	180	270 hours
Module duration	1 semester			
Module frequency	Every summer semester			
Course credits				
Required pre-examination achievements	Achieve a certain number of points for problem sheet solutions and/or tutorials			
Type of examination by continuous assessment	Written exam (90-120 minutes) or oral exam (usually 30 minutes)			
Examination requirements	Mastering of all contents of the module			
Calculation of module grade				
Regulations for passing the module				
Retaking to improve grades	When passed in the first attempt, an exam can be retaken within the standard period of study to improve the grade. The better grade of the two attempts will be applied.			
Decision-making body for the module	Fachbereichsrat Mathematik/Informatik			
Use of module				
Prerequisites for participation in this module				

MATH-USRM-P03: Systems Science Colloquium

Identifier	MATH-USW-P03			
Module title	Systems Science Colloquium			
German module title	Systemwissenschaftliches Kolloquium			
Authorized module representative	Systems Science working group			
Learning objectives	• To gain insights into current systems science and interdisciplinary research • To become acquainted with various systems science approaches • To reflect processes and methods of gaining scientific knowledge • To get involved with scientific language and thinking from different disciplines The learning objectives can be achieved only be regular attendance.			
Exemplary contents	The talks delivered by external experts on different and recent topics of Systems Science will before the start of the semester.			
Module components with type of component and CP information	Seminar	1 component		
CP of the module	3 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Seminar	30	60	90 hours
Module duration	1 semester			
Module frequency	Every winter semester			
Course credits				
Required pre-examination achievements	Regular attendance (at least at 75% of the talks) and a written report on one of the topics presented			
Type of examination by continuous assessment				
Examination requirements				
Calculation of module grade				
Regulations for passing the module				
Retaking to improve grades				
Decision-making body for the module	Fachbereichsrat Mathematik/Informatik			
Use of module				
Prerequisites for participation in this module				

MATH-USRM-VA01: Geographic Information Systems (M.Sc.)

Identifier	MATH-USRM-VA01			
Module title	**Geographic Information Systems (M.Sc.)**			
German module title	**Geographische Informationssysteme (M.Sc.)**			
Authorized module representative	Dr. Jürgen Berlekamp (AG Systems Science)			
Learning objectives	• Knowledge of basic structures and methods of geographic information systems • Implementation of concepts and methods for system-scientific relevant questions on selected examples • Social skills: ability to cooperate, consulting skills • Self-competence: Time management, creativity, precision • Methodological skills: Learning strategies, research skills, project management			
Exemplary contents	• Coordinate systems and projections • Specific data structures of spatial data • Methods for acquisition, storage, processing, analysis and presentation of geodata • Basic functionalities for editing vector and raster data			
Module components with type of component and CP information	lecture and exercises (block course)	Component 1: lectures (3 CP) Component 2: exercises (3 CP)		
CP of the module	6 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Component 1	2 SWS (30 Std.)	60 Std.	90 Std.
	Component 2	2 SWS (30 Std.)	60 Std.	90 Std.
	Total	4 SWS (60 Std.)	120 Std.	180 Std.
Module duration	1 Semester			
Module frequency	Usually every summer semester			
Course credits				
Required pre-examination achievements	Participation in the exercises of the block course			
Type of examination by continuous assessment	Examination (90-120 min) or oral examination (usually 30 min) and written homework (protocols of the exercises incl. answering of exercise questions); if necessary further (project work)			
Examination requirements	Mastering of all contents of the module			
Calculation of module grade	Weighting: written or oral exam (60%) and term paper (40%)			
Regulations for passing the module	Both partial examinations must be passed			
Retaking to improve grades				
Decision-making body for the module	School Executive Board Mathematics/Informatics			
Use of module	M.Sc. Environmental Systems and Resources Management (WP)			
Prerequisites for participation in this module	none			

MATH-USRM-VA03: GIS-Model Integration

Identifier	MATH-USRM-VA03			
Module title	**GIS-Model Integration**			
German module title	**GIS-Modell-Integration**			
Authorized module representative	Dr. Jürgen Berlekamp (AG Systems Science)			
Learning objectives	• Implementing geoinformatic approaches to solve problems in spatio-temporal systems • Execution of GIS operations and programmatic implementation of modeling approaches • Application of vector- and raster-based methods for coupling Geographical Information Systems (GIS) and models • Evaluation of own model simulations			
Exemplary contents	• Empirical, conceptual and process-based models with a focus on hydrologically relevant issues (soil erosion, runoff, material inputs and transport) • Programming of models in GIS using Python • Cellular automata in GIS for dispersion modeling			
Module components with type of component and CP information	lecture and exercises (block course)	lectures (3 CP) exercises (3 CP)		
CP of the module	6 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Block course	4 SWS (30 Std.)	120 Std.	180 Std.
Module duration	1 Semester			
Module frequency	Usually every winter semester			
Course credits				
Required pre-examination achievements	Participation in the exercises of the block course			
Type of examination by continuous assessment	Examination (90-120 min) or oral examination (usually 30 min) and written homework (protocols of the exercises incl. answering of exercise questions); if necessary further (project work)			
Examination requirements	Mastering of all contents of the module			
Calculation of module grade	Weighting: written or oral exam (60%) and term paper (40%)			
Regulations for passing the module	Both partial examinations must be passed			
Retaking to improve grades				
Decision-making body for the module	School Executive Board Mathematics/Informatics			
Use of module	M.Sc. Environmental Systems and Resources Management (WP)			
Prerequisites for participation in this module	none			

MATH-USRM-VA04: Population and individual based modelling (M.Sc.)

Identifier	MATH-USRM-VA04			
Module title	**Population and individual based modelling (M.Sc.)**			
German module title	**Populations- und individuenbasierte Modellierung (M.Sc.)**			
Authorized module representative	Systems Science Group (Prof. Andreas Huth)			
Learning objectives	• knowledge and understanding of ecological models, overview • development of dynamic ecological models on its own (programming, parametrization, analysis, equilibrium) • interpretation and evaluation of model simulations • detailed analysis of ecological models (e.g. sensitivity analysis, role of model components)			
Exemplary contents	• dynamic population models, individual based models, meta populations • food webs, competition between species, stability of food webs • modelling of vegetation and forest ecosystems • stochastic models, extinction of populations • modelling biodiversity, island theory, neutral models (Hubbell) • remote sensing and ecological modelling			
Module components with type of component and CP information	VL + Ü	6 CP		
CP of the module	6 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	VL	2 SWS (30 Std.)	60 Std.	90 Std.
	Ü	2 SWS (30 Std.)	60 Std.	90 Std.
	Total	4 SWS (60 Std.)	120 Std.	180 Std.
Module duration	1 Semester			
Module frequency	each			
Course credits				
Required pre-examination achievements	successful working on a project			
Type of examination by continuous assessment	presentation and paper (on project) **or** oral examination (norm. 30 min)			
Examination requirements	mastering of all contents of the module			
Calculation of module grade				
Regulations for passing the module	successful participation at the module and passed examination			
Retaking to improve grades	**will be decided by the examination committee**			
Decision-making body for the module	Fachbereichsrat Mathematik/Informatik			
Use of module	see overview on module description for degree course			
Prerequisites for participation in this module	see examination regulations			

MATH-USRM-VA05: Mathematical Epidemiology

Identifier	MATH-USW-VA05			
Module title	Mathematical Epidemiology			
German module title	Mathematische Epidemologie			
Authorized module representative	Systems Science working group			
Learning objectives	• To formulate mathematical models and simulation models for the spread of infectious diseases • To analyze and evaluate control strategies of epidemics • To account for the interactions of disease characteristics, the ecology of host populations, and the environment			
Exemplary contents	• Modeling the spread of epidemics, endemics, and pandemics • Basic reproduction number and herd immunity • Control and containment measures: vaccination, quarantine, social distancing, contact tracing, risk groups • Sexually transmitted diseases • Environmentally transmitted diseases, vector-borne disease, co-infections, wildlife and plant epidemics • Evolution and adaptive dynamics			
Module components with type of component and CP information	Lecture Problem class	1 component 1 component		
CP of the module	6 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Lecture	30	60	90 hours
	Problem class	30	60	90 hours
	Total	60	120	180 hours
Module duration	1 semester			
Module frequency	Usually every other winter semester			
Course credits				
Required pre-examination achievements	Achieve a certain number of points for problem sheet solutions			
Type of examination by continuous assessment	Written exam (90-120 minutes) or oral exam (usually 30 minutes)			
Examination requirements	Mastering of all contents of the module			
Calculation of module grade				
Regulations for passing the module				
Retaking to improve grades	When passed in the first attempt, an exam can be retaken within the standard period of study to improve the grade. The better grade of the two attempts will be applied.			
Decision-making body for the module	Fachbereichsrat Mathematik/Informatik			
Use of module				
Prerequisites for participation in this module				

MATH-USRM-VA06: Applied Dynamical Systems

Identifier	MATH-USW-VA06			
Module title	Applied Dynamical Systems			
German module title	Angewandte Dynamische Systeme			
Authorized module representative	Systems Science working group			
Learning objectives	• To explain the basics of the mathematical theory of dynamical systems • To apply methods and concepts from dynamical systems to examples from ecology, the environment, epidemiology, resource economics, physiology, and neuroscience • To use expert software for the analysis of short- and long-term dynamics, in dependence of parameter values and initial conditions			
Exemplary contents	• Basic concepts and notions of dynamical systems • Elementary bifurcations and their normal forms • Hysteresis effects, time scales, catastrophe theory • Excitability and bursting • Numerics: forward and backward sweeping • Attractor crises, ghost attractors, transient chaos, basins of attraction (homogeneous, fractal, and riddled), synchronization			
Module components with type of component and CP information	Lecture Problem class	1 component 1 component		
CP of the module	6 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Lecture	30	60	90 hours
	Problem class	30	60	90 hours
	Total	60	120	180 hours
Module duration	1 semester			
Module frequency	Usually every other summer semester in alternation with MATH-USRM-VA07			
Course credits				
Required pre-examination achievements	Achieve a certain number of points for problem sheet solutions			
Type of examination by continuous assessment	Written exam (90-120 minutes) or oral exam (usually 30 minutes)			
Examination requirements	Mastering of all contents of the module			
Calculation of module grade				
Regulations for passing the module				
Retaking to improve grades	When passed in the first attempt, an exam can be retaken within the standard period of study to improve the grade. The better grade of the two attempts will be applied.			
Decision-making body for the module	Fachbereichsrat Mathematik/Informatik			
Use of module				
Prerequisites for participation in this module				

MATH-USRM-VA07: Complex Ecosystem Dynamics

Identifier	MATH-USW-VA07			
Module title	Complex Ecosystem Dynamics			
German module title	Dynamik komplexer Ökosysteme			
Authorized module representative	Systems Science working group			
Learning objectives	• To describe and quantify empirical biodiversity patterns • To explain the principle dynamic effects in the ecology of populations (including empirical examples) • Identifying and comparing the structure, functions, and stability of complex ecosystems			
Exemplary contents	• Biodiversity patterns • Species abundance models • Biodiversity indices • Resource competition and the structure of food webs • Three-species competition models • Food webs and community modules			
Module components with type of component and CP information	Lecture Problem class	1 component 1 component		
CP of the module	6 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Lecture	30	60	90 hours
	Problem class	30	60	90 hours
	Total	60	120	180 hours
Module duration	1 semester			
Module frequency	Usually every other summer semester in alternation with MATH-USRM-VA06			
Course credits				
Required pre-examination achievements	Achieve a certain number of points for problem sheet solutions			
Type of examination by continuous assessment	Written exam (90-120 minutes) or oral exam (usually 30 minutes)			
Examination requirements	Mastering of all contents of the module			
Calculation of module grade				
Regulations for passing the module				
Retaking to improve grades	When passed in the first attempt, an exam can be retaken within the standard period of study to improve the grade. The better grade of the two attempts will be applied.			
Decision-making body for the module	Fachbereichsrat Mathematik/Informatik			
Use of module				
Prerequisites for participation in this module				

MATH-USRM-VA08: Seminar Environmental Modeling

Identifier	MATH-USW-VA08			
Module title	Seminar Environmental Modeling			
German module title	Seminar Umweltmodellierung			
Authorized module representative	Systems Science working group			
Learning objectives	• To acquire solid knowledge and methods in the field of environmental modeling • To gain an overview of and familiarize oneself with the state of the art • Compare and evaluate advanced environmental models			
Exemplary contents	The seminar will cover recent topics in the field of environmental modeling. The topics will vary from year to year and will be announced at the beginning of the semester.			
Module components with type of component and CP information	Lecture Problem class	1 component 1 component		
CP of the module	6 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Lecture	30	60	90 hours
Module duration	1 semester			
Module frequency	Usually every winter semester			
Course credits				
Required pre-examination achievements				
Type of examination by continuous assessment	Oral presentation and written report			
Examination requirements	Mastering of all contents of the module			
Calculation of module grade				
Regulations for passing the module				
Retaking to improve grades				
Decision-making body for the module	Fachbereichsrat Mathematik/Informatik			
Use of module				
Prerequisites for participation in this module				

MATH-USRM-VB07: Biological Resources Modeling

Identifier	MATH-USW-VB07			
Module title	Biological Resources Modeling			
German module title	Biological Resources Modeling			
Authorized module representative	Systems Science working group			
Learning objectives	• Analyze mathematical models of the dynamics of biological resources, their exploitation, and their management • Investigate and compare different management strategies of biological resources with the help of mathematical modeling • Derive recommendations for resource management, pest control, and biological conservation			
Exemplary contents	• Discrete-time growth models of biological resources • Fisheries, forestry, wildlife hunting, pest species, and pest control • Management strategies for sustainable exploitation • Demographic and environmental stochasticity • Uncertainties: observation error (partial observability) and implementation er-ror (partial controllability)			
Module components with type of component and CP information	Lecture Problem class	1 component 1 component		
CP of the module	6 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Lecture	30	60	90 hours
	Problem class	30	60	90 hours
	Total	60	120	180 hours
Module duration	1 semester			
Module frequency	Usually every other winter semester			
Course credits				
Required pre-examination achievements	Achieve a certain number of points for problem sheet solutions			
Type of examination by continuous assessment	Written exam (90-120 minutes) or oral exam (usually 30 minutes)			
Examination requirements	Mastering of all contents of the module			
Calculation of module grade				
Regulations for passing the module				
Retaking to improve grades	When passed in the first attempt, an exam can be retaken within the standard period of study to improve the grade. The better grade of the two attempts will be applied.			
Decision-making body for the module	Fachbereichsrat Mathematik/Informatik			
Use of module				
Prerequisites for participation in this module				

MATH-USRM-VB10: Statistics for System Scientists

Identifier	MATH-USRM-VB10			
Module title	Applied Statistics for System Scientists			
German module title	Angewandte Statistik für Systemwissenschaftler/-innen			
Authorized module representative	WG System Sciences, PD Dr. Marcus Schulz			
Learning objectives	• The students reproduce the mathematical and numerical principles of multivariate analysis methods. • The students creatively plan statistical analyses of existing data and carry out the analyses independently with statistical software. • The students interpret the analysis results of univariate, bi- and multivariate methods. • The students identify sources of error and possible bias of their analysis results.			
Exemplary contents	• Probability theory and descriptive statistics, • Univariate and multivariate analysis methods, • Correlation and regression analyses; variance, factor and cluster analyses, respectively, and multidimensional scaling, • Discriminant analysis, logistic regression analysis, • contingency analyses, • Basics of Bayesian statistics, artificial neural networks.			
Module components with type of component and CP information	Lectures/Exercises	6 CP		
CP of the module	6 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Lectures	2 SWS (30 h)	60 h	90 h
	Exercises	2 SWS (30 h)	60 h	90 h
	Total	4 SWS (60 h)	120 h	180 h
Module duration	1 Semester			
Module frequency	Every winter semester			
Course credits				
Required pre-examination achievements	Minimum number of points in exercises			
Type of examination by continuous assessment	Final written test (120 min) or oral test (30 min)			
Examination requirements	Mastering of all contents of the module			
Calculation of module grade				
Regulations for passing the module				
Retaking to improve grades				
Decision-making body for the module	Fachbereichsrat Mathematik/Informatik			
Use of module	M.Sc. Environmental Systems and Resources Management (WP)			
Prerequisites for participation in this module	None			

MATH-USW-W01: Geographic Information Systems (B.Sc.)

Identifier	MATH-USW-W01			
Module title	**Geographic Information Systems (M.Sc.)**			
German module title	**Geographische Informationssysteme (M.Sc.)**			
Authorized module representative	Dr. Jürgen Berlekamp (AG Systems Science)			
Learning objectives	• Knowledge of basic structures and methods of geographic information systems • Implementation of concepts and methods for system-scientific relevant questions on selected examples • Social skills: ability to cooperate, consulting skills • Self-competence: Time management, creativity, precision • Methodological skills: Learning strategies, research skills, project management			
Exemplary contents	• Coordinate systems and projections • Specific data structures of spatial data • Methods for acquisition, storage, processing, analysis and presentation of geodata • Basic functionalities for editing vector and raster data			
Module components with type of component and CP information	lecture and exercises (block course)	Component 1: lectures (3 CP) Component 2: exercises (3 CP)		
CP of the module	6 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Component 1	2 SWS (30 Std.)	60 Std.	90 Std.
	Component 2	2 SWS (30 Std.)	60 Std.	90 Std.
	Total	4 SWS (60 Std.)	120 Std.	180 Std.
Module duration	1 Semester			
Module frequency	Usually every summer semester			
Course credits				
Required pre-examination achievements	Participation in the exercises of the block course			
Type of examination by continuous assessment	Examination (90-120 min) or oral examination (usually 30 min) and written homework (protocols of the exercises incl. answering of exercise questions); if necessary further (project work)			
Examination requirements	Mastering of all contents of the module			
Calculation of module grade	Weighting: written or oral exam (60%) and term paper (40%)			
Regulations for passing the module	Both partial examinations must be passed			
Retaking to improve grades				
Decision-making body for the module	School Executive Board Mathematics/Informatics			
Use of module	B.Sc. Environmental Systems Science (WP) 2-FB Environmental Systems Science (WP)			
Prerequisites for participation in this module	none			

MATH-USW-W05: Population and individual based modelling (B.Sc.)

Identifier	MATH-USW-W05			
Module title	**Population and individual based modelling (B.Sc.)**			
German module title	**Populations- und individuenbasierte Modellierung (B.Sc.)**			
Authorized module representative	Systems Science Group (Prof. Andreas Huth)			
Learning objectives	• knowledge and understanding of selected modelling approaches in ecology • implementation of a modelling approach for a given ecological research question • interpretation and discussion of model results			
Exemplary contents	• dynamic population models, individual based models, meta populations • food webs, competition between species, stability of food webs • modelling of vegetation and forest ecosystems • stochastic models, extinction of populations • modelling biodiversity, island theory, neutral models (Hubbell) • remote sensing and ecological modelling			
Module components with type of component and CP information	VL + Ü	6 CP		
CP of the module	6 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	VL	2 SWS (30 Std.)	60 Std.	90 Std.
	Ü	2 SWS (30 Std.)	60 Std.	90 Std.
	Total	4 SWS (60 Std.)	120 Std.	180 Std.
Module duration	1 Semester			
Module frequency	each			
Course credits				
Required pre-examination achievements	successful working on a project			
Type of examination by continuous assessment	presentation with written draft **or** oral examination			
Examination requirements	mastering of all contents of the module			
Calculation of module grade				
Regulations for passing the module	successful participation at the module			
Retaking to improve grades	**will be decided by the examination committee**			
Decision-making body for the module	Fachbereichsrat Mathematik/Informatik			
Use of module	see overview on module description for degree course			
Prerequisites for participation in this module	see examination regulations			

MATH-USW-W022: Mathematical Ecology

Identifier	MATH-USW-W02			
Module title	Mathematical Ecology			
German module title	Mathematische Ökologie			
Authorized module representative	Systems Science working group			
Learning objectives	• To formulate and analyze mathematical models in population biology • To interpret model results • To derive recommendations for the management of ecological systems			
Exemplary contents	• Population dynamics • Harvesting models • Hysteresis and mass outbreaks of insects • Interspecific competition • Predator-prey systems • Mutualism • Spatiotemporal and discrete-time population dynamics			
Module components with type of component and CP information	Lecture Problem class	1 component 1 component		
CP of the module	6 CP			
SWS (hours per week during the semester) of the module		Contact hours	Working hours	Total
	Lecture	30	60	90 hours
	Problem class	30	60	90 hours
	Total	60	120	180 hours
Module duration	1 semester			
Module frequency	Usually in the summer semester			
Course credits				
Required pre-examination achievements	Achieve a certain number of points for problem sheet solutions			
Type of examination by continuous assessment	Written exam (90-120 minutes) or oral exam (usually 30 minutes)			
Examination requirements	Mastering of all contents of the module			
Calculation of module grade				
Regulations for passing the module				
Retaking to improve grades				
Decision-making body for the module	Fachbereichsrat Mathematik/Informatik			
Use of module				
Prerequisites for participation in this module				