

Handbook International Master of Science Marine Ecosystem and Fisheries Sciences

2023-10-30



The Master of Science in *Marine Ecosystem and Fisheries Sciences* shall be set up as a consecutive and research-oriented degree program. Graduates will have learned the practical and theoretical methods of the research fields of Biological Oceanography (BO) and Fisheries Science (FS) and will be able to apply them in laboratory, field and theoretical studies. Students will possess the ability to develop scientific hypotheses through problem analysis and are able to select approaches to best test these hypotheses. Graduates will be familiar with the current discourse on anthropogenic effects on marine ecosystems and, with their professional knowledge, will be able to contribute to social debates regarding the management and conservation of ocean ecosystems and living marine resources. Consequently, graduates will be in a position to excellence in a future scientific career and/or to contribute to assessment and management of the status of ocean ecosystems.

CP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Semester 1	introduction to BO and FS (i-MARSYS 1)						Data Handling and Visualization (i-MARSYS 3)						Biodiversity of Marine Life (i-MARSYS 2)																		
Semester 2	Advanced BO and FS (i-MARSYS 4)						Data Analysis and Modelling 1 (i-MARSYS 5)						Compulsory elective 1 (i-MARSYS 6a) or (i-MARSYS 6b)																		Elective
Semester 3	Environmental Policy and Management (i-MARSYS 8)						Data Analysis and Modelling 2 (i-MARSYS 9)						Compulsory elective 2 (i-MARSYS 7a) or (i-MARSYS 7b) or (i-MARSYS 7c)																		
Semester 4	Master thesis (i-MARSYS 10)																														

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Module title:	Introduction to Biological Oceanography and Fisheries Science				
Module number / code:	i-MARSYS 1				
Semester	Winter				
Applicability, type of module, and curricular area	<ul style="list-style-type: none"> Compulsory module, advised 1st semester 				
Prerequisites for participation:	None				
Module coordinator:	Prof. Dr. Nicole Aberle-Malzahn, Phone: 42838 6607, nicole.aberle-malzahn (at) uni-hamburg.de				
Instructors:	All lecturers of the study program				
Language:	English				
Intended learning objectives:	Students know and understand basic questions, methods and the current state of knowledge in the fields of Biological Oceanography and Fisheries Science.				
Contents:	Regional Oceanography; taxonomic composition, life cycles, distribution and impact on key groups in phytoplankton, zooplankton, benthos and nekton; key habitats in shelf seas, the open ocean and the deep sea; production processes and control structures in marine food webs; latitudinal gradients and biogeography; life cycles of plankton species; taxonomic groups of commercial importance and their life cycles; fishing techniques and catch trends of main fish stocks; introduction to recruitment research; introduction to fish stock assessment and fisheries management				
Course types and forms of instruction:	<ul style="list-style-type: none"> L: Introduction to Biological Oceanography and Fisheries Science 			3 SEM./HRS	
	<ul style="list-style-type: none"> S: Current Literature in Biological Oceanography and Fisheries Science 			2 SEM./HRS	
Workload (module components and total):	<ul style="list-style-type: none"> L: Introduction to Biological Oceanography and Fisheries Science 	credits	P (hrs)	S (hrs)	PV (hrs)
	<ul style="list-style-type: none"> S: Current Literature in Biological Oceanography and Fisheries Science 		42	40	18
			28	32	20
	Total Workload	6	70	72	38
Coursework and examinations:	<i>Formal requirements for examinations:</i> Active participation in seminar; presentation <i>Examinations:</i> Oral (usually) or written exam (graded; 100%)				
Duration:	One semester				
Module frequency:	Annual				
Literature:	Charles B. Miller „Biological Oceanography“; Timothy R. Parsons and Carol M. Lalli „Biological Oceanography: An Introduction“; Simon Jennings, Michael J. Kaiser and John D. Reynolds "Marine Fisheries Ecology"; Michael King „Fisheries Biology, Assessment and Management“				

Module title:	Biodiversity of Marine Life				
Module number / code:	i-MARSYS 2				
Semester	Winter				
Applicability, type of module, and curricular area	<ul style="list-style-type: none"> Compulsory module, advised 1st semester 				
Prerequisites for participation:	None				
Module coordinator:	Prof. Dr. Elisa Schaum, Phone 42838 6618, elisa.schaum(at)uni-hamburg.de				
Instructors:	Prof. Dr. Nicole Aberle-Malzahn, Prof. Dr. Flemming Dahlke, Dr. Jens Floeter, Dr. Rolf Koppelman, Dr. Arne Malzahn, Prof. Dr. Christian Möllmann, Prof. Dr. Elisa Schaum,				
Language:	English				
Intended learning objectives:	Students are familiar with theoretical concepts of biodiversity research and are capable of analysing biodiversity with respect to the taxonomy of important marine organisms with a focus in the North and Baltic Seas.				
Contents:	Marine biodiversity and its ecological background; taxonomy of phyto- and zooplankton, commercial fish species, marine mammals and seabirds; life cycles of key marine species; current advanced topics of biodiversity research.				
Course types and forms of instruction:	<ul style="list-style-type: none"> L: Introduction to Marine Biodiversity S: Current Topics in Marine Biodiversity Research P: Taxonomy of Marine Species 				2 SEM./HRS 2 SEM./HRS 6 SEM./HRS
Workload (module components and total):	<ul style="list-style-type: none"> L: Introduction to Marine Biodiversity S: Current Topics in Marine Biodiversity Research P: Taxonomy of Marine Species 	credits	P (hrs)	S(hrs)	PV (hrs)
			28	30	22
			28	32	30
			84	120	166
	Total Workload	18	140	182	218
Coursework and examinations:	<i>Formal requirements for examinations:</i> Active participation in seminar and practical course; presentation <i>Examinations:</i> Protocol (pass / fail), written examination (graded, 100%)				
Duration:	One semester				
Module frequency:	Annual				
Literature:	Handed out at the beginning of the module				

Module title:	Data Handling and Visualization				
Module number / code:	i-MARSYS 3				
Semester	Winter				
Applicability, type of module, and curricular area	<ul style="list-style-type: none"> Compulsory module, advised 1st semester 				
Prerequisites for participation:	None				
Module coordinator:	Prof. Dr. Christian Möllmann, Phone: 42838 6621, christian.moellmann(at)uni-hamburg.de				
Instructors:	Prof. Dr. Christian Möllmann, Dr. Saskia Otto				
Language:	English				
Intended learning objectives:	Students are able to apply common data handling and visualization tools.				
Contents:	Basic concepts of data types and their organization; basic data handling in spread sheet based software; data handling, manipulation and visualization in the language and environment for statistical computing and graphics R.				
Course types and forms of instruction:	<ul style="list-style-type: none"> L: Introduction to Data Handling and Visualization E: Practical Data Handling and Visualization 				2 SEM./HRS 2 SEM./HRS
Workload (module components and total):	<ul style="list-style-type: none"> L: Introduction to Data Handling and Visualization E: Practical Data Handling and Visualization 	credits	P (hrs)	S (hrs)	PV (hrs)
			28	30	5
			28	42	47
	Total Workload	6	56	72	52
Coursework and examinations:	<i>Formal requirements for examinations:</i> Active participation in exercise course <i>Examinations:</i> Presentation of the results (graded 100%).				
Duration:	One semester				
Module frequency:	Annual				
Literature:	Hadley Wickham, Garrett Grolemund: R for Data Science.				

Module title:	Advanced Biological Oceanography and Fisheries Science				
Module number / code:	i-MARSYS 4				
Semester	Summer				
Applicability, type of module, and curricular area	<ul style="list-style-type: none"> Compulsory elective module, advised 2nd semester 				
Prerequisites for participation:	Strongly recommended: i-MARSYS 1				
Module coordinator:	Prof. Dr. Inga Hense, Phone: 42838 6641 inga.hense(at)uni-hamburg.de;				
Instructors:	Prof. Dr. Nicole Aberle-Malzahn, Prof. Dr. Flemming Dahlke, Prof. Dr. Inga Hense, Prof. Dr. Christian Möllmann, Prof. Dr. Elisa Schaum				
Language:	English				
Intended learning objectives:	Students have a deeper insight into the current research topics in Biological Oceanography and Fisheries Science.				
Contents:	Climate change effects on marine plankton and fish species populations and communities; evolution in marine plankton; ecophysiology of key marine species; recent developments in marine ecosystem modelling; complex interactions in food webs; anthropogenic effects on marine ecosystems and food webs.				
Course types and forms of instruction:	<ul style="list-style-type: none"> L: Advanced Biological Oceanography and Fisheries Science S: Current Topics in Biological Oceanography and Fisheries Science 			2 SEM./HRS 2 SEM./HRS	
Workload (module components and total):	<ul style="list-style-type: none"> L: Advanced Biological Oceanography and Fisheries Science S: Current Topics in Biological Oceanography and Fisheries Science 	credits	P (hrs) 28	S (hrs) 30	PV (hrs) 29
			28	25	40
	Total Workload	6	56	55	69
Coursework and examinations:	<i>Formal requirements for examinations:</i> Active participation in seminar, presentation <i>Examinations:</i> Written (usually) or oral examination (graded, 100%)				
Duration:	One semester				
Module frequency:	Annual				
Literature:	Handed out at the beginning of the lecture				

Module title:	Data Analysis and Modelling 1				
Module number / code:	i-MARSYS 5				
Semester	Summer				
Applicability, type of module, and curricular area	<ul style="list-style-type: none"> Compulsory module, advised 2nd semester 				
Prerequisites for participation:	i-MARSYS 3				
Module coordinator:	Prof. Dr. Christian Möllmann, Phone: 42838 6621, christian.moellmann(at)uni-hamburg.de				
Instructors:	Prof. Dr. Christian Möllmann, Dr. Saskia Otto				
Language:	English				
Intended learning objectives:	Students are familiar with basic and advanced statistical methodology for analyzing monitoring, field and laboratory data. Students are able to perform data analysis and modelling in the language and environment for statistical computing and graphics R.				
Contents:	Parametric and nonparametric statistical tests; analysis of variance; linear and non-linear regression; multivariate statistics.				
Course types and forms of instruction:	<ul style="list-style-type: none"> L: Introduction to Data Analysis and Modelling 1 E: Applying Statistical Methodology 			2 SEM./HRS 2 SEM./HRS	
Workload (module components and total):	<ul style="list-style-type: none"> L: Introduction to Data Analysis and Modelling 1 E: Applying Statistical Methodology 	credits	P (hrs) 28 28	S (hrs) 40 30	PV (hrs) 10 44
	Total Workload	6	56	70	54
Coursework and examinations:	<i>Formal requirements for examinations:</i> Active participation in exercise course <i>Examinations:</i> Presentation of the results of an analytical case study (graded 100%).				
Duration:	One semester				
Module frequency:	Annual				
Literature:	Handed out at the beginning of the lecture				

Module title:	Marine Ecosystem Dynamics and Management				
Module number / code:	i-MARSYS 6a				
Semester	Summer				
Applicability, type of module, and curricular area	<ul style="list-style-type: none"> Compulsory elective module 				
Prerequisites for participation:	i-MARSYS 1, i-MARSYS 2, i-MARSYS 3				
Module coordinator:	Prof. Dr. Christian Möllmann Phone: 42838 6621, christian.moellmann(at)uni-hamburg.de				
Instructors:	Dr. Jens Floeter, Prof. Dr. Christian Möllmann, Dr. Saskia Otto				
Language:	English				
Intended learning objectives:	Students are familiar with current methodology in assessing marine ecosystem dynamics for ecosystem-based management based on field sampling and monitoring data.				
Contents:	In-situ sampling techniques from research vessels: e.g., plankton nets, fishing gear, hydroacoustic recordings, optical underwater sampling techniques, benthos grabs and dredges; development of ecosystem survey strategies; analysis of survey and monitoring data with the focus on spatial-, and temporal variability; development and application of qualitative and quantitative ecosystem indicator frameworks; assessment and prediction of tipping points in socio-economic fishery systems.				
Course types and forms of instruction:	<ul style="list-style-type: none"> P: Marine Ecosystem Dynamics and Management 				12 SEM./HRS
Workload (module components and total):	<ul style="list-style-type: none"> P: Marine Ecosystem Dynamics and Management 	credits	P (hrs) 168	S(hrs) 220	PV (hrs) 62
	Total Workload	15	168	220	62
Coursework and examinations:	<i>Formal requirements for examinations:</i> Active participation <i>examinations:</i> Protocol (graded; 100%)				
Duration:	One semester				
Module frequency:	Annual				
Literature:	Handed out at the beginning of the lecture				

Module title:	Ecology of living marine resources				
Module number / code:	i-MARSYS 6b				
Semester	Summer				
Applicability, type of module, and curricular area	<ul style="list-style-type: none"> Compulsory elective module 				
Prerequisites for participation:	i-MARSYS 1, i-MARSYS 2, i-MARSYS 3				
Module coordinator:	Prof. Dr. Flemming Dahlke, Phone: 42838 6600, flemming.dahlke(at)uni-hamburg.de				
Instructors:	Prof. Dr. Flemming Dahlke, Dr. Arne Malzahn				
Language:	English				
Intended learning objectives:	Students are familiar with the theory, methods and practical application of marine ecophysiology in fisheries science, aquaculture and biodiversity conservation.				
Contents:	Theoretical knowledge of marine ecophysiology and lifecycle ecology, with emphasis on the influence of climate change on metabolism, development, growth, reproduction, and species biogeography. Methods in field research, including telemetry, genetics and tissue analysis. Methods in laboratory research, with a focus on multi-factorial experiments with fish and invertebrates. Physiological methods to study development, metabolism, growth and reproduction. Application of ecophysiological data in habitat modelling and risk assessment.				
Course types and forms of instruction:	<ul style="list-style-type: none"> P: Ecology of living marine resources 				12 SEM./HRS
Workload (module components and total):	<ul style="list-style-type: none"> P: Ecology of living marine resources 	credits	P (hrs) 168	S(hrs) 220	PV (hrs) 62
	Total Workload	15	168	220	62
Coursework and examinations:	<i>Formal requirements for examinations:</i> Active participation <i>examinations:</i> Protocol (graded; 100%)				
Duration:	One semester				
Module frequency:	Annual				
Literature:	Handed out at the beginning of the lecture				

Module title:	Plankton Ecology and Evolution				
Module number / code:	i-MARSYS 7a				
Semester	Winter				
Applicability, type of module, and curricular area	<ul style="list-style-type: none"> Compulsory elective module 				
Prerequisites for participation:	i-MARSYS 1, i-MARSYS 2, i-MARSYS 3				
Module coordinator:	Prof. Dr. Elisa Schaum, Phone: 42838 6625, elisa.schaum(at)uni-hamburg.de				
Instructors:	Prof. Dr. Elisa Schaum				
Language:	English				
Intended learning objectives:	Students are familiar with current scientific laboratory methodology concerning sampling, maintenance and experimental procedures of microbial primary producers at the foundation of aquatic ecosystems; analysis of current underlying theory and literature for shaping the way experiments are conducted on microbial primary producers.				
Contents:	Laboratory methodology, e.g. maintenance and qualitative/quantitative assessment of plankton cultures (molecular and physiological characterizations); experiments on the effects of biotic and abiotic factors on fitness and phenotypes of phytoplankton cultures. Empirical and theoretical approaches, experimental design, analytical approaches for tolerance curves (environments that phytoplankton can survive in) and the associated parameters spaces of phenotypic traits (traits that phytoplankton display in the environments that they can grow in). Assessments of environments that help or hinder evolution of phytoplankton in a changing world.				
Course types and forms of instruction:	<ul style="list-style-type: none"> P: Plankton Ecology and Evolution 				12 SEM./HRS
Workload (module components and total):	<ul style="list-style-type: none"> P: Plankton Ecology and Evolution 	credits	P (hrs)	S(hrs)	PV (hrs)
			168	220	62
	Total Workload	15	168	220	62
Coursework and examinations:	<i>Formal requirements for examinations:</i> Active participation <i>examinations:</i> Protocol (graded; 100%)				
Duration:	One semester				
Module frequency:	Annual				
Literature:	Handed out at the beginning of the lecture				

Module title:	Experimental ecology of marine Zooplankton				
Module number / code:	i-MARSYS 7b				
Semester	Winter				
Applicability, type of module, and curricular area	<ul style="list-style-type: none"> Compulsory elective module 				
Prerequisites for participation:	i-MARSYS 1, i-MARSYS 2, i-MARSYS 3				
Module coordinator:	Prof. Dr. Nicole Aberle-Malzahn, Phone: 42838 6607 nicole.aberle-malzahn (at)uni-hamburg.de				
Instructors:	Dr. Rolf Koppelman				
Language:	English				
Intended learning objectives:	Students are familiar with current scientific laboratory methodology concerning sampling, maintenance, and experimental procedures of marine zooplankton and ichthyoplankton including assessments of vital rates (growth, feeding and survival) and anthropogenic drivers of populations such as climate change.				
Contents:	In-situ and on-board assessment of metabolic rates of zooplankton and ichthyoplankton; laboratory methodology, e.g. maintenance and qualitative/quantitative assessment of zoo- and ichthyoplankton cultures and basic ecophysiology; experiments on how environmental factors interact to affect the dynamics of behavior and growth.				
Course types and forms of instruction:	<ul style="list-style-type: none"> P: Experimental ecology of marine Zooplankton 				12 SEM./HRS
Workload (module components and total):	<ul style="list-style-type: none"> P: Experimental ecology of marine Zooplankton 	credits	P (hrs) 168	S(hrs) 220	PV (hrs) 62
	Total Workload	15	168	220	62
Coursework and examinations:	<i>Formal requirements for examinations:</i> Active participation <i>examinations:</i> Protocol (graded; 100%)				
Duration:	One semester				
Module frequency:	Annual				
Literature:	Handed out at the beginning of the lecture				

Module title:	Advanced Marine Ecosystem Modelling				
Module number / code:	i-MARSYS 7c				
Semester	Winter				
Applicability, type of module, and curricular area	<ul style="list-style-type: none"> Compulsory elective module 				
Prerequisites for participation:	i-MARSYS 1, i-MARSYS 2, i-MARSYS 3, i-MARSYS 5 strongly recommended: knowledge of a programming language				
Module coordinator:	Prof. Dr. Inga Hense, Phone: 42838 6641 inga.hense(at)uni-hamburg.de				
Instructors:	Prof. Dr. Inga Hense				
Language:	English				
Intended learning objectives:	Students are familiar with state-of-the-art marine ecosystem and individual based modelling approaches. They are able to develop advanced models, run these models and interpret the results, using programming languages and visualization tools of their choice.				
Contents:	Coupled differential equations, spatially resolved ecosystem models, compartment (NPZD-type) models. Individual Based Models (IBM), comparison of IBMs and compartment-based (NPZD-type) models.				
Course types and forms of instruction:	<ul style="list-style-type: none"> P: Advanced Marine Ecosystem Modelling 				12 SEM./HRS
Workload (module components and total):	<ul style="list-style-type: none"> P: Advanced Marine Ecosystem Modelling 	credits	P (hrs) 168	S(hrs) 220	PV (hrs) 62
	Total Workload	15	168	220	62
Coursework and examinations:	<i>Formal requirements for examinations:</i> Active participation <i>examinations:</i> Report (graded; 100%)				
Duration:	One semester				
Module frequency:	Annual				
Literature:	Handed out at the beginning of the lecture				

Module title:	Environmental Policy and Management				
Module number / code:	i-MARSYS 8				
Semester	Winter				
Applicability, type of module, and curricular area	<ul style="list-style-type: none"> Compulsory module, advised 3rd semester 				
Prerequisites for participation:	None				
Module coordinator:	Prof. Dr. Christian Möllmann, Phone: 42838 6621, christian.moellmann(at)uni-hamburg.de				
Instructors:	Dr. Jens Floeter, Prof. Dr. Christian Möllmann				
Language:	English				
Intended learning objectives:	Students are familiar with national and European Union environmental and fisheries management policies. Students know concepts of ecosystem-based management.				
Contents:	National and EU institutions; EU Marine Strategy Framework Directive, EU Marine Spatial Planning Directive, EU Common Fisheries Policy; strategies for environmental management, ecosystem-based fisheries management, ecosystem-based management; socioecological system; economic approaches to resource management.				
Course types and forms of instruction:	<ul style="list-style-type: none"> L: Introduction to Environmental Policy and Management S: Actual Topics in Environmental Policy and management 				2 SEM./HRS 2 SEM./HRS
Workload (module components and total):	<ul style="list-style-type: none"> L: Introduction to Environmental Policy and Management S: Actual Topics in Environmental Policy and Management 	credits	P (hrs)	S (hrs)	PV (hrs)
			28	20	20
			28	25	59
	Total Workload	6	56	45	79
Coursework and examinations:	<i>Formal requirements for examinations:</i> Active participation in seminar, presentation <i>Examinations:</i> Oral examination (Poster presentation on a pre-defined topic environmental policy and management) (graded 100%).				
Duration:	One semester				
Module frequency:	Annual				
Literature:	Handed out at the beginning of the lecture				

Module title:	Data Analysis and Modelling 2				
Module number / code:	i-MARSYS 9				
Semester	Winter				
Applicability, type of module, and curricular area	<ul style="list-style-type: none"> Compulsory module, advised 3rd semester 				
Prerequisites for participation:	i-MARSYS 5				
Module coordinator:	Prof. Dr. Inga Hense, Phone: 42838 6641, inga.hense(at)uni-hamburg.de				
Instructors:	Dr. Jens Floeter, Prof. Dr. Inga Hense, Dr. Saskia Otto				
Language:	English				
Intended learning objectives:	Students are familiar with basic and advanced methodology for modelling marine ecosystem, food web and fish stock dynamics. Students are able to perform data analysis and modelling in the language and environment for statistical computing and graphics R.				
Contents:	Principles techniques for modelling ecosystem, food web and fish stock dynamics.				
Course types and forms of instruction:	<ul style="list-style-type: none"> L: Introduction to Data Analysis and Modelling 2 E: Application of Modelling Techniques 			2 SEM./HRS	
Workload (module components and total):	<ul style="list-style-type: none"> L: Introduction to Data Analysis and Modelling 2 E: Application of Modelling Techniques 	credits	P (hrs)	S (hrs)	PV (hrs)
			28	40	10
			28	30	44
	Total Workload	6	56	70	54
Coursework and examinations:	<i>Formal requirements for examinations:</i> Active participation in exercise <i>Examinations:</i> Presentation of the results of a modelling case study (graded 100%).				
Duration:	One semester				
Module frequency:	Annual				
Literature:	Handed out at the beginning of the lecture				

Module title:	Master thesis				
Module number / code:	i-MARSYS 10				
Semester	Summer				
Applicability, type of module, and curricular area	<ul style="list-style-type: none"> Compulsory module, advised 4th semester 				
Prerequisites for participation:	All compulsory elective modules and i-MARSYS 9 have to be passed successfully.				
Module coordinator:	Supervisor of the thesis				
Instructors:	All lecturers of the study program				
Language:	<i>English</i>				
Intended learning objectives:	Students are able to think and work in the scientific fields of the MSc Marine Ecosystem and Fisheries Science. They have gained experience in presentation and evaluation of their own scientific work in the context of the current scientific state of the art and they are able to solve scientific problems.				
Contents:					
Course types and forms of instruction:					
Workload (module components and total):		credits	P (hrs)	S (hrs)	PV (hrs)
	Total Workload	30			
Coursework and examinations:	<i>Formal requirements for examinations:</i> Active working <i>Examinations:</i> Thesis (graded; 100%), oral examination (pass/fail)				
Duration:	One semester				
Module frequency:	Every semester				
Literature:					