module code / module title

MB-A/ Concepts of Marine Biology and Biological Oceanography

28.02.2019

1	**INFORMATION ON THE MODULE**	
1a	module code	MB-A
1b	module title *(German title)*	
1c	module title *(English title)*	Concepts of Marine Biology and Biological Oceanography
1d	credit points	18
1e	responsible for the module	Prof. Dr. Wilhelm Hagen
1f	type of module	compulsory module
1g	programs using the module	
1h	organizational unit offering the module	
1i	content-related prior knowledge or skills	
1j	learning contents	The module starts with an excursion to the North Sea, where students gain an overview on the biodiversity and ecology of important taxa of "Marine Flora and Fauna". This field trip will also provide the opportunity for students with a variety of academic backgrounds and origins to network and socialise and to form a solid common scientific fundament, on which the following courses can be based. The module provides a comprehensive introduction to important concepts of Marine Biology and Biological Oceanography. Students learn what factors govern marine primary and secondary production processes, the role of the ocean for global climate and how marine biota interact with climate change. Fisheries and aquaculture techniques and their environmental impacts are discussed. "Scientific Communication" provides guidance on how to present scientific data in the most accessible way as a poster, oral conference presentation or publication. In addition, students get an insight into the scientific funding system and how to write a convincing proposal for a research project.
1k	learning outcomes/ competencies/ targeted competencies	Upon completion of the module, students are able to comprehend general concepts of marine biology and biological oceanography. They are able to use scientific identification keys and to identify the major taxa of marine algae and invertebrates. Students are able to explain different fisheries and aquaculture techniques and to critically evaluate the impacts of fisheries on marine ecosystems. They are able to produce scientific posters and generate oral presentations.

1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**
	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 236
	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: 80

☒ 4	lecture(s) with	6	SWS/ contact hours	84	hours of presence time
☒ 3	seminar(s) with	3	SWS/ contact hours	42	hours of presence time
☒ 2	exercise(s) with	2	SWS/ contact hours	28	hours of presence time
☐	internship(s) with		sum of working hours		
☐	seminar(s) with		SWS/ contact hours		total hours of presence time
☒ 2	laboratory/laboratories with	2	SWS/ contact hours	28	total hours of presence time
☐	tutorial(s) with		SWS/ contact hours		
☒ 1	excursion(s) with	3	SWS contact hours in total	42	working hours

☐ other form of course (e.g. block seminar), namely this:

with	SWS / with totaly	contact hours	☐ presence time	☐ working hours

= sum of presence time and working hours:
224

	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 540
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* NO *Short description of selection option* n/a
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* winter semester yearly
1p	duration	choose an option one semester
1q	Literature (*optional*)	Kaiser MJ, Attrill MJ, Jennings S, Thomas DN, Barnes DKA, Brierley AS, Hiddink JG, Kaartokallio H, Polunin NVC, Raffaelli DG (2011) Marine Ecology: Processes, Systems, and Impacts. 2nd ed. Oxford University Press, 501 pp. Lalli CM, Parsons TR (1997) Biological Oceanograpy: An Introduction. 2nd ed. The Open University. Butterworth-Heinemann, Oxford, 314 pp. Valiela I (2015) Marine Ecological Processes. 3rd edition. Springer Miller CB, Wheeler PA (2012) Biological Oceanography. 2nd ed. Wiley-Blackwell Heinrich Böll Foundation Schleswig-Holstein (2017) Ocean Atlas 2017. Facts and Figures on the Threats to Our Marine Ecosystems. 52 pp. Download from: https://meeresatlas.org/wp-content/uploads/2017/06/Ocean-Atlas-Web-EN.pdf
1r	more information on the module (*optional*)	The module consists of the following courses: Marine Flora and Fauna; Concepts of Marine Biology and Biological Oceanography; Introduction to Fisheries Biology and Aquaculture; Scientific Communication.
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	
2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 1 ☐ SL | number ☐ PVL | justification If necessary, further explanations:

2c	Give this information for combination examinations only: Weights (in percentage) of component grades	If necessary, further comments: n/a
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☐ Presentation, oral ☒ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☐ Portfolio ☐ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☐ Other (concrete definition is given in the examination regulations):
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:

module code / module title

MB-B/Multi-Disciplinary Oceanography

28.02.2019

1	**INFORMATION ON THE MODULE**	
1a	module code	MB-B
1b	module title *(German title)*	
1c	module title *(English title)*	Multi-Disciplinary Oceanography
1d	credit points	9
1e	responsible for the module	PD Dr. Holger Auel
1f	type of module	compulsory module
1g	programs using the module	
1h	organizational unit offering the module	
1i	content-related prior knowledge or skills	
1j	learning contents	The module will give an introduction to the general functioning of the system Earth on various time scales as well as the transformation and exchange of elements in the marine environment. It deals with chemical, physical, geological as well as biogeochemical processes and reactions and covers climate variability and driving forces. Based on the understanding of these processes, their impact on marine biota and the evolution of key species will be highlighted. The various topics include: • Properties of the ocean and methodology for their measurement • Dynamic forces in the ocean; equatorial and coastal upwelling, subtropical gyres: Sverdrup circulation, vorticity; formation of water masses; thermohaline convection • Thermodynamics and chemical equilibrium, chemical composition of seawater • Marine carbon and nutrient cycles in space and time, including anthropogenic impact (e.g. ocean acidification, global warming, eutrophication, sea-level rise) • Sediment Biogeochemistry

		• Plate tectonics, earth history.
1k	learning outcomes/ competencies/ targeted competencies	Upon completion of the module, students are able to comprehend essential concepts of neighbouring disciplines important for the interpretation of marine biological scientific data. They have the competence to integrate the important role of the oceans in global biogeochemical cycles. They are able to use scientific terminology to communicate with scientists from related ocean sciences, enabling them to co-operate in interdisciplinary research projects.
1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**

☒ 4	lecture(s) with	4	SWS/ contact hours	56	hours of presence time
☒ 2	seminar(s) with	2	SWS/ contact hours	28	hours of presence time
☒ 2	exercise(s) with	2	SWS/ contact hours	28	hours of presence time
☐	internship(s) with		sum of working hours		
☐	seminar(s) with		SWS/ contact hours		total hours of presence time
☐	laboratory/laboratories with		SWS/ contact hours		total hours of presence time
☐	tutorial(s) with		SWS/ contact hours		
☐	excursion(s) with		SWS contact hours in total		working hours
☐	other form of course (e.g. block seminar), namely this:				
with	SWS / with totaly		contact hours	☐ presence time	☐ working hours

= sum of presence time and working hours:

112

	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 118

	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: 40
	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 270
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* NO _____ n/a (courses offered by PEP as alternative; tbc)
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* winter semester, yearly
1p	duration	choose an option One semester
1q	Literature (*optional*)	Segar DA (2018) Introduction to Ocean Sciences. 4th ed. 571 pp. ISBN: 978-0-9857859-1-8. Download from: http://www.reefimages.com/oceansci.php S.M. Libes, 2009. Introduction to Marine Biogeochemistry. Academic Press, 2nd edition, 928 pp. ISBN: 9780120885305 Kump, L.R., Kasting, J.F., Crane, R.G., 2004. The Earth system. Upper Saddle River, New Jersey , USA: Pearson Prentice Hall. Lenton, T.M., Watson, A.J., 2011. Revolutions that made the Earth. Oxford: Oxford University Press. Colin P. Summerhayes, 2015 Earth's Climate Evolution
1r	more information on the module (*optional*)	The module consists of the following courses: Marine Biogeochemistry; Marine Geosciences ; Physical Oceanography; Marine Chemistry).
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	
2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 1 ☐ SL | number ☐ PVL | justification If necessary, further explanations:

2c	Give this information for combination examinations only: Weights (in percentage) of component grades	If necessary, further comments:
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☐ Presentation, oral ☒ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☐ Portfolio ☐ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☐ Other (concrete definition is given in the examination regulations):
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:

module code / module title

MB-C/Tropical Coastal Ecosystems

28.02.2019

1	**INFORMATION ON THE MODULE**	
1a	module code	MB-C
1b	module title *(German title)*	
1c	module title *(English title)*	Tropical Coastal Ecosystems
1d	credit points	6
1e	responsible for the module	Prof. Dr. Martin Zimmer
1f	type of module	compulsory module
1g	programs using the module	M.Sc. Marine Biology (compulsory module for ISATEC students; elective module for Marine Biology students)
1h	organizational unit offering the module	
1i	content-related prior knowledge or skills	
1j	learning contents	The lecture will give an introduction into general characteristics of the tropics (geography, climate, trade winds and monsoon influence, major currents etc.) and coastal ecosystems (tides, marine-terrestrial gradients, etc.). Tropical coastal habitats will be introduced in detail (mangroves, coral reefs, sandy beaches, mudflats, rocky shores, seagrass meadows). Interactions and connectivity of individual ecosystems with each other will be addressed as well as biodiversity, productivity, biomass and turnover. Examples will be presented from current and former projects of the ZMT. The economic and social importance of these ecosystems for local populations and human influences, as well as issues of coastal conservation and management are discussed
1k	learning outcomes/ competencies/ targeted competencies	Upon completion of the module, students are able to understand structure and functioning of tropical coastal ecosystems. They are able to critically evaluate anthropogenic impacts and their consequences for marine communities and coastal populations.

1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**

☒	1	lecture(s) with	2	SWS/ contact hours	28	hours of presence time
☒	1	seminar(s) with	2	SWS/ contact hours	28	hours of presence time
☐		exercise(s) with		SWS/ contact hours		hours of presence time
☐		internship(s) with		sum of working hours		
☐		seminar(s) with		SWS/ contact hours		total hours of presence time
☐		laboratory/laboratories with		SWS/ contact hours		total hours of presence time
☐		tutorial(s) with		SWS/ contact hours		
☐		excursion(s) with		SWS contact hours in total		working hours

☐ other form of course (e.g. block seminar), namely this:

with	SWS / with totaly	contact hours	☐ presence time	☐ working hours

= sum of presence time and working hours:

56

	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 84
	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: 40

	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 180
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* NO Compulsory module for ISATEC students; Elective module for Marine Biology students
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* winter semester, yearly
1p	duration	choose an option one semester
1q	Literature (*optional*)	Pertinent publications and literature will be provided by the lecturers.
1r	more information on the module (*optional*)	
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	
2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☐ PL | 1 ☐ SL | ☐ PVL | justification If necessary, further explanations:

2c	Give this information for combination examinations only: Weights (in percentage) of component grades	If necessary, further comments: n/a
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☐ Presentation, oral ☐ Written examination ☐ Group examination, oral ☒ Presentation and written assignment ☐ Portfolio ☐ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☐ Other (concrete definition is given in the examination regulations):
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:

module code / module title

MB-D/Marine Biological Lab Practical

28.02.2019

1	**INFORMATION ON THE MODULE**	
1a	module code	MB-D
1b	module title *(German title)*	
1c	module title *(English title)*	Marine Biological Lab Practical
1d	credit points	6
1e	responsible for the module	Prof. Dr. Kai Bischof
1f	type of module	cumpolsory module
1g	programs using the module	M.Sc. Marine Biology (elective module for Marine Biology students; not available for ISATEC students)
1h	organizational unit offering the module	
1i	content-related prior knowledge or skills	
1j	learning contents	Advanced courses in marine biology can be chosen from the following options: Invertebrate Nutrition, Trophodynamic Interactions, Phytoplankton Under Global Change. The students will be engaged in intense lab and/or fieldwork. The methodologies will depend on the selected research topic (physiology, biochemistry, ecology, statistics, etc.) and the courses are usually closely related to the research activities of the involved working group.
1k	learning outcomes/ competencies/ targeted competencies	Upon completion of the module, students are able to apply state-of-the-art laboratory methodologies in a selected field. Depending on the chosen course, students have the competence to design experiments and to analyse the respective data according to their working hypotheses with the appropriate statistics.

1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**
	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 112
	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: 12

☐		lecture(s) with		SWS/ contact hours		hours of presence time
☒	1	seminar(s) with	1	SWS/ contact hours	14	hours of presence time
☐		exercise(s) with		SWS/ contact hours		hours of presence time
☐		internship(s) with		sum of working hours		
☐		seminar(s) with		SWS/ contact hours		total hours of presence time
☒	1	laboratory/laboratories with	3	SWS/ contact hours	42	total hours of presence time
☐		tutorial(s) with		SWS/ contact hours		
☐		excursion(s) with		SWS contact hours in total		working hours

☐ other form of course (e.g. block seminar), namely this:

with	SWS / with totaly	contact hours	☐ presence time	☐ working hours

= sum of presence time and working hours:
56

	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 180
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* YES *Short description of selection option* Elective cumpulsory module for Marine Biology students (not available for ISATEC students) Students choose from a selection of practical courses addressing different scientific topics and laboratory methods.
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* winter semester, yearly
1p	duration	one semester module
1q	Literature (*optional*)	Pertinent publications and literature will be provided by the lecturers.
1r	more information on the module (*optional*)	Laboratory practicals on offer may change between years depending on the availability of lecturers and the establishment of new research fields and novel methods. So far, the regular selection includes „Phytoplankton under global change“ (Prof. Dr. Björn Rost, AWI), „Invertebrate Nutrition“ (Dr. Reinhard Saborowski, AWI), and „Trophodynamic Interactions: Field course on Helgoland“ (Prof. Dr. Maarten Boersma, AWI)
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	
2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 1 ☐ SL | ☐ PVL | justification If necessary, further explanations:

2c	Give this information for combination examinations only: Weights (in percentage) of component grades	If necessary, further comments:
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☒ Presentation, oral ☐ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☐ Portfolio ☐ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☐ Other (concrete definition is given in the examination regulations):
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:

MB-E1: Global Change Ecophysiology

module code / module title

28.02.2019

1	**INFORMATION ON THE MODULE**	
1a	module code	MB-E1
1b	module title *(German title)*	Klicken Sie hier, um Text einzugeben.
1c	module title *(English title)*	Global Change Ecophysiology
1d	credit points	9
1e	responsible for the module	Prof. Dr. Hans-Otto Pörtner
1f	type of module	elective module
1g	programs using the module	M.Sc. Marine Biology
1h	organizational unit offering the module	
1i	content-related prior knowledge or skills	
1j	learning contents	Climate change causes oceans to warm and stratify, sea level to rise, and Arctic summer sea ice to shrink. Warming causes oceans to lose oxygen overall and hypoxic water layers to expand. Concomitantly, the accumulation of anthropogenic CO2 in ocean surface waters disturbs water chemistry and causes acidification. Ocean warming, deoxygenation, and acidification alter ocean ecosystems and the services they provide. As a reason species are constrained to limited thermal ranges of performances which define species fitness, including their capacity to interact with each other. Recent meta-analyses indicate that ambient temperature and hypoxia extremes in some regions are already close to tolerance limits of marine organisms and their limits to evolutionary adaptation. The current picture suggests that these changes occur too fast for organisms to be able to adapt, although functional adaptation may occur on longer time scales. The course will focus on the following physiological responses: Monitoring of organism performance parameters in marine animals, energy demand and budget, metabolic changes at whole organism and cellular levels, ion and osmoregulation. Methods: Respirometry (closed and flow-through systems), Spectrophotometry, HPLC / ion chromatography / capillary electrophoresis, Doppler and infrared sensors, Magnetic resonance imaging and spectroscopy, Protein chemistry and transcriptomics

1k	learning outcomes/ competencies/ targeted competencies	After completion of the module, students understand the principles of acclimation and adaptation of marine animals to climate change, are able to conduct and perform scientific experiments, have acquired experience in state-of-the-art techniques for physiological and molecular investigations, have the ability to calculate, evaluate and present scientific data and to discuss scientific findings.
1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**

☒	1	lecture(s) with	1	SWS/ contact hours	14	hours of presence time
☒	1	seminar(s) with	1	SWS/ contact hours	14	hours of presence time
☐		exercise(s) with		SWS/ contact hours		hours of presence time
☐		internship(s) with		sum of working hours		
☐		seminar(s) with		SWS/ contact hours		total hours of presence time
☒	1	laboratory/laboratories with	4	SWS/ contact hours	56	total hours of presence time
☐		tutorial(s) with		SWS/ contact hours		
☐		excursion(s) with		SWS contact hours in total		working hours

☐ other form of course (e.g. block seminar), namely this:

with SWS / with totaly contact hours ☐ presence time ☐ working hours

= sum of presence time and working hours:

84

	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 146

	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: 40
	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 270
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* NO *Short description of selection option*
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* summer semester yearly
1p	duration	one semester module
1q	Literature (*optional*)	Pörtner HO (2002) Climate variations and the physiological basis of temperature dependent biogeography: systemic to molecular hierarchy of thermal tolerance in animals. Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology, 132(4), 739-761. Dinkwater KF, Beaugrand G, Kaeriyama M, Kim S, Ottersen G, Perry RI, Pörtner HO, Polovina JJ, Takasuka A (2010) On the processes linking climate to ecosystem changes. Journal of Marine Systems, 79(3-4), 374-388. Storch D., Menzel L., Frickenhaus S., Pörtner H.O. (2014) Climate sensitivity across the domains of life: Limits to evolutionary adaptation shape species interactions. Global Change Biology 20, 3059-3067 Pörtner HO, Karl DM, Boyd PW, Cheung WL, Lluch-Cota SE, Nojiri Y, Schmidt DN, and Zavialov PO (2014) Ocean systems. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 411-484.
1r	more information on the module (*optional*)	
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	

2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 1 ☐ SL | ☐ PVL | justification If necessary, further explanations:
2c	Give this information for combination examinations only: Weights (in percentage) of component grades	If necessary, further comments: n/a
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☐ Presentation, oral ☐ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☐ Portfolio ☒ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☐ Other (concrete definition is given in the examination regulations): Project report (protocol of laboratory experiment)
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:

module code / module title

MB-E2: Ecological Modelling: Populations, Climate, Conservation

28.02.2019

1 INFORMATION ON THE MODULE

1a	module code	MB-E2
1b	module title *(German title)*	
1c	module title *(English title)*	Ecological Modelling: Populations, Climate, Conservation
1d	credit points	9
1e	responsible for the module	PD Dr. Hauke Reuter
1f	type of module	elective module
1g	programs using the module	M.Sc. Marine Biology
1h	organizational unit offering the module	
1i	content-related prior knowledge or skills	
1j	learning contents	• Model representation of self-organisation processes and emergent properties, analysis of causal networks • Non spatial approaches to ecological modelling: Population dynamics age-structured approaches and with differential equations • Spatial explicit approaches to ecological modelling: Individual-based models and Actor-based models to represent processes involving spatio-temporal dynamics, meta-population models • Risk assessment framework (stochasticity, causes of extinction, “Population Viability Analysis” - PVA) • Diffusion, Dispersal and connectivity processes • Food web interactions • Representation of biological processes in global climate models (from NPZD – nutrient, phytoplankton, zooplankton, detritus – to more sophisticated models (e.g. Geider model) • Model use in conservation, Population dyanmics of key species, MPA design • Model parameterisation and evaluation • Model application examples

1k	learning outcomes/ competencies/ targeted competencies	• Participants have learned how to analyse complex interaction networks and the formal representation of complex interactions. • Participants have learned to deal with interdisciplinary applications of systems approaches in different fields and as a management tool. • Participants have gained basic knowledge on different mathematical representation of ecological dynamics and acquired and understood the role of models in ecological knowledge acquisition. • Participants acquired knowledge to apply different ecological models to specific problem settings in conservation biology and climate models, including choice of modelling approach, evaluation and estimation of time and effort for the model development process.
1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**

☒ 1	lecture(s) with	1r	SWS/ contact hours	14	hours of presence time
☒ 1	seminar(s) with	1	SWS/ contact hours	14	hours of presence time
☒ 1	exercise(s) with	4	SWS/ contact hours	56	hours of presence time
☐	internship(s) with		sum of working hours		
☐	seminar(s) with		SWS/ contact hours		total hours of presence time
☒	laboratory/laboratories with		SWS/ contact hours		total hours of presence time
☐	tutorial(s) with		SWS/ contact hours		
☐	excursion(s) with		SWS contact hours in total		working hours

☐ other form of course (e.g. block seminar), namely this:

Klicken Sie hier, um Text einzugeben.

with SWS / with totaly contact hours ☐ presence time ☐ working hours

= sum of presence time and working hours:

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	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 146

	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: 40
	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 270
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* NO *Short description of selection option* As part of the Profilisation and Specialisation section, Marine Biology students choose three modules (6 SWS, 9 CP each) from a wide selection of advanced practical courses covering different marine ecological, ecophysiological and applied topics. ISATEC students must take module MB-E4 "Coastal Planning, Management and Governance" (8 SWS, 12 CP) and in addition choose two more modules (6 SWS, 9 CP each) from a wide selection of advanced practical courses covering different marine ecological, ecophysiological and applied topics.
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* summer semester yearly
1p	duration	one semester module
1q	Literature (*optional*)	Jopp, Breckling, Reuter 2011 Modelling Complex Ecological Interactions, Springer, Chapters 1-13, 23,24 Burgmann, M.A., Ferson, S. and Akcakaya, 1993. Risk assessment in conservation biology. London: Chapman & Hall. Fennel, W. Neumann, T., 2015: Introduction to the Modelling of Marine Ecosystems (Second Edition), Elsevier, ISBN 978-0-444-63363-7 Crawley, M.J., 2011. The R book, Reprinted with corrections 2009, reprinted. ed. Wiley, Chichester.Hanski, I. 1990. Metapopulation Ecology. Oxford University Press Morris, W.F., Doak, D.F. 2002. Quantitative Conservation Biology: Theory and Practise of Population Viability Analysis. Sinauer Associates, Sunderland Soetart, Hermann, 2009, A Practical Guide to Ecological Modelling, Using R as a Simulation Platform, Springer
1r	more information on the module (*optional*)	
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	
2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)

2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 1 ☐ SL | ☐ PVL | justification If necessary, further explanations:
2c	Give this information for combination examinations only: Weights (in percentage) of component grades	If necessary, further comments: n/a
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☐ Presentation, oral ☐ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☐ Portfolio ☐ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☒ Other (concrete definition is given in the examination regulations): Poster presentation on one of the course topics with application/development of a small model
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:

module code / module title

MB-E3: Rocky Shore Ecology on Helgoland

28.02.2019

1	**INFORMATION ON THE MODULE**	
1a	module code	MB-E3
1b	module title *(German title)*	Klicken Sie hier, um Text einzugeben.
1c	module title *(English title)*	Rocky Shore Ecology on Helgoland
1d	credit points	9
1e	responsible for the module	Prof. Dr. Kai Bischof
1f	type of module	elective module
1g	programs using the module	M.Sc. Marine Biology (elective module for Marine Biology students; not available for ISATEC students)
1h	organizational unit offering the module	
1i	content-related prior knowledge or skills	
1j	learning contents	The structure and function of rocky shore communities will be assessed in the framework of emerging topics in marine environmental change. The course will provide an understanding of the principal biotic and abiotic factors shaping algal zonation or the distribution patterns of intertidal invertebrates, epibiosis, competitive interactions of native species and neobiota, or the impact of marine litter in the marine and coastal environment. The course will integrate physiological and ecological methods, introduce into experimental design, community analyses, physiological stress indicators, and will apply the appropriate statistical tools for each topic.
1k	learning outcomes/ competencies/ targeted competencies	After successful completion of this course, students are familiar with basic concepts and current topics in rocky shore ecology, are capable of formulating research questions based on (their own) field observations, are able to design experiments tailored to answer the respective research questions and can apply state-of-the-art tools in community analyses and ecophysiology.

1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**

☒	1	lecture(s) with	1	SWS/ contact hours	14		hours of presence time
☒	1	seminar(s) with	1	SWS/ contact hours	4	1	hours of presence time
☐		exercise(s) with		SWS/ contact hours			hours of presence time
☐		internship(s) with		sum of working hours			
☐		seminar(s) with		SWS/ contact hours			total hours of presence time
☒	1	laboratory/laboratories with	4	SWS/ contact hours	56		total hours of presence time
☐		tutorial(s) with		SWS/ contact hours			
☐		excursion(s) with		SWS contact hours in total			working hours

☐ other form of course (e.g. block seminar), namely this:

with	SWS / with totaly	contact hours	☐ presence time	☐ working hours

= sum of presence time and working hours:

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	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 146
	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: 40

	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 270
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* NO *Short description of selection option*
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* summer semester yearly
1p	duration	one semester module
1q	Literature (*optional*)	Bartsch I, Wiencke C, Bischof K, Buchholz CM, Buck BH, Eggert A, Feuerpfeil P, Hanelt D, Jacobsen S, Karez R, Karsten U, Molis M, Roleda M, Schubert H, Schumann R, Valentin K, Weinberger F, Wiese J (2008) The genus Laminaria sensu lato: recent insights and developments. Eur J Phycol 43:1-86 Hurd CL, Harrison PJ, Bischof K, Lobban CS (2014) Seaweed Ecology and Physiology, 2nd Edition. Cambridge University Press, 551 pp Wahl M 1989 Marine epibiosis. Fouling and antifouling: some basic aspects. Mar Ecol Prog ser 58: 175-189 Buschbaum C, Chapman AS, Saier B 2006. How an introduced seaweed can affect epibiota diversity in different coastal systems. Mar Biol 148: 743-754 GREGORY M. RUIZ*,2 JAMES T. CARLTONf, EDWIN D. GROSHOLZ:):, AND ANSON H. HINES* 1997 Global Invasions of Marine and Estuarine Habitats by Non-Indigenous Species: Mechanisms, Extent, and Consequences' . AMER. ZOOL., 37:621-632 (1997) Kent and Coker. Vegetation description and analysis. Begon Harper Townsend. Ecology. Verge´s A et al. 2014 The tropicalization of temperate marine ecosystems: climate-mediated changes in herbivory and community phase shifts. Proc. R. Soc. B 281: 20140846. http://dx.doi.org/10.1098/rspb.2014.0846 Teagle H, Hawkins SJ, Moore PJ, Smale DA 2017. The role of kelp species as biogenic habitat formers in coastal marine ecosystems. JEMBE 492: 81-98
1r	more information on the module (*optional*)	
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	

2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 1 ☐ SL | ☐ PVL | justification If necessary, further explanations:
2c	Give this information for combination examinations only: Weights (in percentage) of component grades	If necessary, further comments: n/a
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☒ Presentation, oral ☐ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☐ Portfolio ☐ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☐ Other (concrete definition is given in the examination regulations):
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:

module code / module title

MB-E4: Coastal Planning, Management and Governance

28.02.2019

1	**INFORMATION ON THE MODULE**	
1a	module code	MB-E4
1b	module title *(German title)*	
1c	module title *(English title)*	Profilisation and Specialisation: Coastal Planning, Management and Governance
1d	credit points	12
1e	responsible for the module	Prof. Dr. Achim Schlüter
1f	type of module	compulsory module
1g	programs using the module	M.Sc. Marine Biology (compulsory module for ISATEC students; elective module for Marine Biology students)
1h	organizational unit offering the module	
1i	content-related prior knowledge or skills	
1j	learning contents	*Marine sciences requires an understanding of the human dimension. This course gives an introduction to iethods, theories, concepts and approaches in the field of marine social sciences. Social-ecological systems and their resilience, sustainability and sustainable development are important concepts to be taught. Marine governance is at the centre of the course, and is dealt with in an interdisciplinary social science perspective, ranging from law to planning, ecological economics and environmental psychology. Interdisciplinarity between natural and social sciences is addressed. Important social science methods applied in the field are introduced, like participatory methods, stakeholder analysis, surveys, economic valuation and social science experimental design.*
1k	learning outcomes/ competencies/ targeted competencies	Students, who successfully participated in the course, have • knowledge of basic social science research principles for natural scientists • an overview of social science theories and methods applied in marine and coastal research contexts • understood the legal and ethical considerations of participatory research • understood the importance, potential, pathways, and complexities of inter- and transdisciplinary research • an overview of the law of the sea and environmental maritime law • an overview of social-ecological systems concepts and ecological economics

1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**

☒ 3	lecture(s) with	3	SWS/ contact hours	42	hours of presence time
☒ 2	seminar(s) with	2	SWS/ contact hours	28	hours of presence time
☒ 2	exercise(s) with	2	SWS/ contact hours	28	hours of presence time
☐	internship(s) with		sum of working hours		
☐	seminar(s) with		SWS/ contact hours		total hours of presence time
☐	laboratory/laboratories with		SWS/ contact hours		total hours of presence time
☐	tutorial(s) with		SWS/ contact hours		
☐ 1	excursion(s) with	1	SWS contact hours in total	14	working hours
☐	other form of course (e.g. block seminar), namely this:				
with	SWS / with totaly		contact hours	☐ presence time	☐ working hours

= sum of presence time and working hours:

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	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 188
	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: 60

	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 360
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* NO *Short description of selection option* As part of the Profilisation and Specialisation section, Marine Biology students choose three modules (6 SWS, 9 CP each) from a wide selection of advanced practical courses covering different marine ecological, ecophysiological and applied topics. ISATEC students must take module MB-E4 "Coastal Planning, Management and Governance" (8 SWS, 12 CP) and in addition choose two more modules (6 SWS, 9 CP each) from a wide selection of advanced practical courses covering different marine ecological, ecophysiological and applied topics.
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* summer semester yearly
1p	duration	one semester module
1q	Literature (*optional*)	Bryman A (2001) Social Research Methods. Oxford, UK: Oxford University Press. Bunce L, Townsley P, Pomeroy RS, Pollnac R (2000) Socioeconomic Manual for Coral Reef Management. Townsville, Austalia: Global Coral Reef Monitoring Network (GCRMN) and Australian Institute of Marine Science (AIMS). Churchill RR, Lowe AV (1999). The law of the sea. Manchester University Press. Common M, Stagl S (2005) Ecological Economics: an introduction. University Press, Cambridge. Oeberg G (2011) Interdisciplinary Environmental Studies: A Primer. Wiley-Blackwell. Poteete AR, Janssen M, Ostrom E (2010) Working Together: Collective Action, the Commons and Multiple Methods in Practice. University Press, Princeton. Apart from the mentioned textbooks the course is mainly based on recent research articles, showing practical examples of tropical coastal marine social science or social ecological science research.
1r	more information on the module (*optional*)	
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	

2a	type of examination	☒ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ module exam; i.e. exam with only one component (MP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 4 ☐ SL | ☐ PVL | justification If necessary, further explanations: .
2c	Give this information for combination examinations only: Weights (in percentage) of component grades	PL 1: 25% PL 2: 25% PL 3: 25%. PL 4: 25% If necessary, further comments: n/a
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☒ Assignment ☐ Oral examination (single) ☐ Presentation, oral ☐ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☐ Portfolio ☐ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☐ Other (concrete definition is given in the examination regulations): four assignments in group work.
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:

module code / module title

MB-E5: Marine Biodiversity and Food Webs

28.02.2019

1	**INFORMATION ON THE MODULE**	
1a	module code	MB-E5
1b	module title *(German title)*	
1c	module title *(English title)*	Marine Biodiversity and Food Webs
1d	credit points	9
1e	responsible for the module	PD Dr. Holger Auel
1f	type of module	elective module
1g	programs using the module	M.Sc. Marine Biology
1h	organizational unit offering the module	
1i	content-related prior knowledge or skills	
1j	learning contents	*The course will introduce students to concepts and methodologies related to marine biodiver¬sity and food webs, focusing both on plankton and benthos communities. Students will learn about abundance, biomass, taxonomic composition, and community structure of plankton and benthos communities and how to sample them. They acquire a sound knowledge of the major taxonomic groups and how to identify them. Zooplankton vertical distribution and vertical migra¬¬tions will also be covered. Students will analyse biodiversity patterns with different metrics including species richness, evenness, and different biodiversity indices. Multivariate statistics will be introduced for community analysis, including cluster analysis and multi-dimensional scaling. Students will learn about population dynamics, growth, and feeding ecology of benthic communities, individual and population energy budgets, focusing on the North Sea and Wadden Sea as example regions. Data will be assembled for a basic food web model of the North Sea and compared to other climate zones on a global scale.*
1k	learning outcomes/ competencies/ targeted competencies	Upon completion of the module, students understand principles determining marine biodiver¬sity and how to measure them. They have a sound knowledge about plankton and benthos ecology and are familiar with the major taxonomic groups. Students can apply methods to analyse biological communities. They understand population dynamics and can quantify carbon and energy fluxes through marine food webs.

1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**

☒	1	lecture(s) with	1	SWS/ contact hours	14	hours of presence time
☒	1	seminar(s) with	1	SWS/ contact hours	14	hours of presence time
☐		exercise(s) with		SWS/ contact hours		hours of presence time
☐		internship(s) with		sum of working hours		
☐		seminar(s) with		SWS/ contact hours		total hours of presence time
☐	1	laboratory/laboratories with	4	SWS/ contact hours	56	total hours of presence time
☐		tutorial(s) with		SWS/ contact hours		
☐		excursion(s) with		SWS contact hours in total		working hours

☐ other form of course (e.g. block seminar), namely this:

with	SWS / with totaly	contact hours	☐ presence time	☐ working hours

= sum of presence time and working hours:

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	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 146
	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: 40

	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 270
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* NO *Short description of selection option*
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* summer semester yearly
1p	duration	one semester module
1q	Literature (*optional*)	Pertinent publications and literature will be provided by the lecturers.
1r	more information on the module (*optional*)	Klicken Sie hier, um Text einzugeben.
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	
2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 1 ☐ SL | ☐ PVL | justification If necessary, further explanations:

2c	Give this information for combination examinations only: Weights (in percentage) of component grades	If necessary, further comments: n/a
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☒ Presentation, oral ☐ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☐ Portfolio ☐ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☐ Other (concrete definition is given in the examination regulations):
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this:

module code / module title

MB-E6: Cell Physiology of Marine Organisms

28.02.2019

1	INFORMATION ON THE MODULE	
1a	module code	MB-E6
1b	module title *(German title)*	Klicken Sie hier, um Text einzugeben.
1c	module title *(English title)*	Profilisation and Specialisation: Cell Physiology of Marine Organisms
1d	credit points	9
1e	responsible for the module	Dr. Gisela Lannig-Bock
1f	type of module	elective module
1g	programs using the module	M.Sc. Marine Biology
1h	organizational unit offering the module	Klicken Sie hier, um Text einzugeben.
1i	content-related prior knowledge or skills	Klicken Sie hier, um Text einzugeben.
1j	learning contents	*In this course, the students will deepen their knowledge of cell physiology of marine ectotherms such as fish and bivalves. The topics will be i) environmental impact on function of cells and mitochondria, ii) aerobic and anaerobic energy metabolism, iii) cellular energy budget and metabolite status and iv) analytical Nuclear Magnetic Resonance (NMR) techniques. The students will be introduced to the following methods i) isolation and preparation of primary cells/tissue samples, ii) respirometry (closed and flow-through systems), iii) spectrophotometry and iv) NMR spectroscopy.* *Students will be involved in the conceptual development of experiments, perform in vivo experiments on freshly isolated cells/tissue samples, quantify cellular processes (e.g. ATP-synthesis, protein synthesis) and identify a selective number of metabolites to detect changes from "normality" (metabolic fingerprinting).*
1k	learning outcomes/ competencies/ targeted competencies	Upon completion of the module, students understand the principles of cell metabolism under physiological control and stress conditions. They are familiarized with NMR spectroscopy and are able to conduct and perform biochemical analyses, interpret the related signals and data as well as present and discuss them in a broader scientific context.

1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**
	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 116
	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: 70

☒ 1	lecture(s) with	1	SWS/ contact hours	14	hours of presence time
☒ 1	seminar(s) with	1	SWS/ contact hours	14	hours of presence time
☐	exercise(s) with		SWS/ contact hours		hours of presence time
☐	internship(s) with		sum of working hours		
☐	seminar(s) with		SWS/ contact hours		total hours of presence time
☐ 1	laboratory/laboratories with	4	SWS/ contact hours	56	total hours of presence time
☐	tutorial(s) with		SWS/ contact hours		
☐	excursion(s) with		SWS contact hours in total		working hours

☐ other form of course (e.g. block seminar), namely this:

Klicken Sie hier, um Text einzugeben.

with SWS / with totaly contact hours ☐ presence time ☐ working hours

= sum of presence time and working hours:

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	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 270
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* NO *Short description of selection option*
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* summer semester yearly Klicken Sie hier, um Text einzugeben.
1p	duration	one semester module Klicken Sie hier, um Text einzugeben.
1q	Literature (*optional*)	Pörtner HO, Lannig G. (2009) Oxygen and capacity limited thermal tolerance. In "Fish Physiology: Hypoxia" (eds. J.G. Richards, A.P. Farrell, C.J. Brauner), Academic Press, Elsevier Inc., ISBN: 978-0-12-374632-0, Vol 27, p. 143-191. Sokolova IM, Frederich M, Bagwe R, Lannig G, Sukhotin AA (2012) Energy homeostasis as an integrative tool for assessing limits of environmental stress tolerance in aquatic invertebrates. Marine Environmental Research, 79: 1-15.
1r	more information on the module (*optional*)	Klicken Sie hier, um Text einzugeben.
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	
2a	type of examination	☐ module exam; i.e. exam with only one component (MP) ☒ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 2 ☐ SL | ☐ PVL | justification If necessary, further explanations: Klicken Sie hier, um Text einzugeben.

2c	Give this information for combination examinations only: Weights (in percentage) of component grades	PL 1: Seminar talk: oral presentation of a scientific publication, 30 min incl. discussion/questions (40%) PL 2: Poster presentation: presentation of the scientific data that are collected during the practical work, 30 min incl. discussion/questions (60%) If necessary, further comments: n/a
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☐ Presentation, oral ☐ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☒ Portfolio ☐ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☐ Other (concrete definition is given in the examination regulations):
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.

MB-E7: Fisheries Biology

	module code / module title	
		28.02.2019
1	INFORMATION ON THE MODULE	
1a	module code	MB-E7
1b	module title *(German title)*	Klicken Sie hier, um Text einzugeben.
1c	module title *(English title)*	Fisheries Biology
1d	credit points	9
1e	responsible for the module	Prof. und Dir. Dr. Gerd Kraus, Prof. Dr. Reinhold Hanel
1f	type of module	elective module
1g	programs using the module	M.Sc. Marine Biology
1h	organizational unit offering the module	Klicken Sie hier, um Text einzugeben.
1i	content-related prior knowledge or skills	Klicken Sie hier, um Text einzugeben.
1j	learning contents	*The module introduces students to the basic concepts in fisheries biology including aspects of aquaculture as well as fisheries and aquaculture economics and management. This includes a systematic overview of the diversity of fishes, their ecological and anatomic variability as well as insights into fish husbandry and breeding and their diseases. An introduction to methods for estimating the most important biological parameters is provided to describe individual fitness and health and to model population dynamic processes as a basis for fish stock assessment and management.* *During the introduction to the different elements of the course students will gain an overview on the environmental requirements of and anthropogenic impacts on aquatic living resources in open and managed systems as well as the economics thereof. During the lab practicals, students will be introduced to the comparative anatomy/morphology of fish, species identification with a focus on the north Atlantic as well as a stock structure analysis comprising: practical work with selected fish species to obtain information about fish length, weight, age, sex, maturity status, common diseases and parasites as well as immune status estimation; preparation of fish otoliths for age reading; based on data obtained from the practical work with fish, students will investigate fish stock demography and extract basic information needed to describe and model fish population dynamics, such as size and age structure of the stock, sex ratios, maturity ogives and aspects related to fish nutrition, such as condition factor. Students will apply basic population dynamic equations to determine e.g. mortality and growth rates of fish. Lectures will be given on aquaculture as a form of husbandry of fish and other aquatic organisms in controlled conditions.*
1k	learning outcomes/ competencies/ targeted competencies	Upon completion of the module, students have a basic understanding of the taxonomy, ecology and evolution of fish, their biodiversity and interactions with environmental variables. They will comprehend general concepts in fishery biology, e.g. determining fish stock structures and are able to apply the fundamental equations of population dynamics to determine mortality and growth rates of exploited fish populations. Students have gained insight into the principles of fish stock assessment and management including economic and social dimension of fisheries as

		well as into basics of aquaculture. Students are able to explain different fishing gears and production technologies and to critically evaluate the impacts of fisheries and aquaculture on fish stocks, habitats and ecosystems.
1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**

☒ 1	lecture(s) with	1	SWS/ contact hours	14	hours of presence time
☒ 1	seminar(s) with	1	SWS/ contact hours	14	hours of presence time
☐	exercise(s) with		SWS/ contact hours		hours of presence time
☐	internship(s) with		sum of working hours		
☐	seminar(s) with		SWS/ contact hours		total hours of presence time
☒ 1	laboratory/laboratories with	4	SWS/ contact hours	56	total hours of presence time
☐	tutorial(s) with		SWS/ contact hours		
☐	excursion(s) with		SWS contact hours in total		working hours

☐ other form of course (e.g. block seminar), namely this:

Klicken Sie hier, um Text einzugeben.

with SWS / with totaly contact hours ☐ presence time ☐ working hours

= sum of presence time and working hours:

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	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 146
	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: 40

	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 270
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* NO *Short description of selection option*
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* summer semester yearly Klicken Sie hier, um Text einzugeben.
1p	duration	one semester module Klicken Sie hier, um Text einzugeben.
1q	Literature (*optional*)	1. Handbook of Fish Biology and Fisheries, Vol. 1 und Vol.2, von Hart & Reynods 2. Fisheries Biology, Assessment and Management, 2nd edition von Michael King
1r	more information on the module (*optional*)	Klicken Sie hier, um Text einzugeben.
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	
2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 1 ☐ SL | ☐ PVL | justification If necessary, further explanations: Klicken Sie hier, um Text einzugeben.

2c	Give this information for combination examinations only: Weights (in percentage) of component grades	PL 1: Klicken Sie hier, um Text einzugeben. PL 2: Klicken Sie hier, um Text einzugeben. PL 3: Klicken Sie hier, um Text einzugeben. PL 4: Klicken Sie hier, um Text einzugeben. If necessary, further comments: n/a
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☐ Presentation, oral ☒ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☐ Portfolio ☐ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☐ Other (concrete definition is given in the examination regulations): Klicken Sie hier, um Text einzugeben.
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.

module code / module title

MB-E8: Marine Molecular Biology

date / version of the module description	28.02.2019

1	INFORMATION ON THE MODULE	
1a	module code	MB-E8
1b	module title *(German title)*	Klicken Sie hier, um Text einzugeben.
1c	module title *(English title)*	Marine Molecular Biology
1d	credit points	9
1e	responsible for the module	Dr. Uwe John,
1f	type of module	elective module
1g	programs using the module	
1h	organizational unit offering the module	
1i	content-related prior knowledge or skills	
1j	learning contents	The course provides theoretical and practical foundations for using molecular methods in marine biodiversity and micro- and macro-evolutionary research. Overview lectures and hands-on practicals lead the students from laboratory protocols through data analysis to interpretation. **A) The main topics are:** 1- marine molecular ecology: an overview of methods and approaches 2- introduction to molecular phylogenetics and phylogeography: the tree of life; phylogenetic marker sequences and their evolution and species identification via DNA barcoding 3 - sequence analysis basics: sequence alignment, search tools (e.g. BLAST), primer design and in silico evaluation (e.g. intro to ecoPrimers and ecoPCR), and phylogenetic inference 4 - population genetics basics: intraspecific genetic variation and markers; linkage disequilibrium, Hardy-Weinberg,

		population structure 5 - genotyping and fragment analysis; microsatellite, ddRADSeq and PoolSeq data analysis 6 - Introduction to landscape/seascape genetics 7 - high throughput sequencing in marine molecular ecology: Metabarcoding and metagenomics 8 - An introduction to gene expression and transcriptomics 9 - Case studies **B) Methodologies, applied in the laboratory part**: 1- DNA extraction and quality checking: (spectrophotometry - NanoDrop, fluorometer (Qubit or others), gel electrophoresis - Bioanalyser) 2- PCR amplification of marker sequences (ribosomal DNA sequences) 3- - High resolution genotyping methods: microsatellites, (dd)RADSeq, PoolSeq): laboratory methods and fragment analysis 4-- Metabarcoding libraries, sequencing, and analysis.
1k	learning outcomes/ competencies/ targeted competencies	Upon completion of the module, students have an understanding of the principles of molecular evolution, phylogenetics and population genetics as applied in marine biodiversity research. Application of basic methods of molecular phylogenetics and populations genetics from bench work to data analysis. Learn outcome: Understanding the specific application ranges of different types of molecular markers and their survey methods. Ability to design and conduct a molecular phylogenetic or population genetic survey in a specific project. An understanding of high-throughput sequencing studies including metabarcoding, metagenomics and transcriptomics Competence in the interpretation and transfer of problems and concepts in molecular biodiversity research and the ability to present and discuss in an audience. They are able to produce scientific posters and generate oral presentations
1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**

☒	1	lecture(s) with	1	SWS/ contact hours	14	hours of presence time
☒	1	seminar(s) with	1	SWS/ contact hours	14	hours of presence time
☐		exercise(s) with		SWS/ contact hours		hours of presence time
☐		internship(s) with		sum of working hours		
☐		seminar(s) with		SWS/ contact hours		total hours of presence time

		☐ 1	laboratory/laboratories with	4	SWS/ contact hours	56	total hours of presence time
		☐	tutorial(s) with		SWS/ contact hours		
		☐	excursion(s) with		SWS contact hours in total		working hours
		☐ other form of course (e.g. block seminar), namely this:					
		with	SWS / with totaly		contact hours	☐ presence time	☐ working hours
		= sum of presence time and working hours: 84					
	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 146					
	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: 40					
	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 270					
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* NO *Short description of selection option*					

1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* summer semester yearly
1p	duration	one semester module
1q	Literature (*optional*)	Pertinent publications and literature will be provided by the lecturers.
1r	more information on the module (*optional*)	
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	
2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 1 ☐ SL | ☐ PVL | justification If necessary, further explanations: Klicken Sie hier, um Text einzugeben.
2c	Give this information for combination examinations only: Weights (in percentage) of component grades	If necessary, further comments:

		n/a
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☐ Presentation, oral ☐ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☐ Portfolio ☐ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☒ Other (concrete definition is given in the examination regulations): Poster presentation
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.

module code / module title

MB-F/ Marine Ecological Field Practical

28.02.2019

1	INFORMATION ON THE MODULE	
1a	module code	MB-F
1b	module title *(German title)*	Klicken Sie hier, um Text einzugeben.
1c	module title *(English title)*	Marine Ecological Field Practical
1d	credit points	3
1e	responsible for the module	PD Dr. Holger Auel
1f	type of module	compulsory module
1g	programs using the module	M.Sc. Marine Biology (compulsory module for Marine Biology students; not availabe for ISATEC students)
1h	organizational unit offering the module	Klicken Sie hier, um Text einzugeben.
1i	content-related prior knowledge or skills	Klicken Sie hier, um Text einzugeben.
1j	learning contents	Field methods in marine biological research for the assessment of marine biodiversity and community composition. Depending on the field practical chosen, students will be exposed to either marine coastal communities in different seas (Bay of Biscay, Brittany, Mediterranean Sea) or field work on a research vessel. They will learn different sampling methods for plankton, benthic animals and fish as well as supplementary physical data (e.g. temperature, salinity). Methods for biodiversity assessment and community analysis will be applied to marine ecosystems from different regions. Students leran how to conduct vertical zonation studies in the field and experimental approaches with living organisms such as feeding studies.
1k	learning outcomes/ competencies/ targeted competencies	Upon completion of the module, students have gained first-hand experience regarding biodiversity and community composition of marine ecosystems in other regional seas or oceans. They are able to apply and adjust field methods to different marine habitats.

1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**

☐		lecture(s) with		SWS/ contact hours		hours of presence time
☒	1	seminar(s) with	1	SWS/ contact hours	14	hours of presence time
☐		exercise(s) with		SWS/ contact hours		hours of presence time
☐		internship(s) with		sum of working hours		
☐		seminar(s) with		SWS/ contact hours		total hours of presence time
☒	1	laboratory/laboratories with	4	SWS/ contact hours	56	total hours of presence time
☐		tutorial(s) with		SWS/ contact hours		
☒	1	excursion(s) with	1	SWS contact hours in total	14	working hours

☐ other form of course (e.g. block seminar), namely this:

Klicken Sie hier, um Text einzugeben.

with SWS / with totaly contact hours ☐ presence time ☐ working hours

= sum of presence time and working hours:

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	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 6
	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: Klicken Sie hier, um Text einzugeben.

	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 90
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* YES *Short description of selection option* Students choose from a selection of marine ecological field practicals on offer.
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* winter semester yearly Klicken Sie hier, um Text einzugeben.
1p	duration	one semester module Klicken Sie hier, um Text einzugeben.
1q	Literature (*optional*)	Pertinent publications and literature will be provided by the lecturers.
1r	more information on the module (*optional*)	The selection of marine ecological field practicals on offer may change between years. So far, the regular selection included field practicals in Brittany, France, and at the Mediterranean Sea. Alternatively, student participation in research expeditions can be accepted as marine ecological field practical. Students may also choose excursions or field practicals offered by other universities or research institutions. For instance, field courses offered by UNIS on Svalbard or by Aarhus University on Greenland are very popular among Marine Biology students
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	
2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 1 ☐ SL | number ☐ PVL | justification If necessary, further explanations: Klicken Sie hier, um Text einzugeben.

2c	Give this information for combination examinations only: Weights (in percentage) of component grades	PL 1: Klicken Sie hier, um Text einzugeben. PL 2: Klicken Sie hier, um Text einzugeben. PL 3: Klicken Sie hier, um Text einzugeben. PL 4: Klicken Sie hier, um Text einzugeben. If necessary, further comments: n/a
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☐ Presentation, oral ☐ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☐ Portfolio ☒ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☐ Other (concrete definition is given in the examination regulations): Klicken Sie hier, um Text einzugeben.
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.

MB-G: Student Research Project and Grant Proposal

module code / module title

28.02.2019

1	**INFORMATION ON THE MODULE**	
1a	module code	MB-G
1b	module title *(German title)*	Klicken Sie hier, um Text einzugeben.
1c	module title *(English title)*	Student Research Project and Grant Proposal
1d	credit points	27
1e	responsible for the module	Prof. Dr. Wilhelm Hagen / Prof. Dr. Martin Zimmer (ZMT)
1f	type of module	compulsory module
1g	programs using the module	M.Sc. Marine Biology
1h	organizational unit offering the module	Klicken Sie hier, um Text einzugeben.
1i	content-related prior knowledge or skills	
1j	learning contents	Student Research Project: From a large spectrum of scientific projects students can select their preferred topic and working group. They will get involved in all phases of an experimental research project: Development of working hypotheses, experimental design, method selection, experimental work, analytics, data treatment and statistics, writing a research report and presenting the project results in a seminar. Grant Proposal: Theoretical knowledge: • Presentation of the different funding institutions, explanation of funding guidelines • Explanations and advice on proper project management Practical skills: • Writing of a grant proposal (in context with the planned thesis work) • Defence (oral presentation and discussion) of the grant proposal (to supervisors and co-students)
1k	learning outcomes/ competencies/ targeted competencies	During practical courses the students will get acquainted with various research topics and working groups at the participating institutions. In the selected research project, the students will learn how to address scientific questions. They will get involved in all phases of an experimental

		research project: Development of working hypotheses, experimental design, method selection, experimental work, analytics, data treatment and statistics, writing a research report and presenting the project results in a seminar. During their field trip, the students will learn to observe and investigate ecological or physiological phenomena at field stations or on board research vessels, they will deepen their taxonomic knowledge and if performing a mini-project during a field trip, they will learn the relevant concepts and methodologies.
1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**

☐		lecture(s) with		SWS/ contact hours		hours of presence time
☒	1	seminar(s) with	3	SWS/ contact hours	42	hours of presence time
☐		exercise(s) with		SWS/ contact hours		hours of presence time
☐		internship(s) with		sum of working hours		
☐		seminar(s) with		SWS/ contact hours		total hours of presence time
☒	1	laboratory/laboratories with	40	SWS/ contact hours	560	total hours of presence time
☐		tutorial(s) with		SWS/ contact hours		
☐		excursion(s) with		SWS contact hours in total		working hours

☐ other form of course (e.g. block seminar), namely this:

Klicken Sie hier, um Text einzugeben.

with SWS / with totaly contact hours ☐ presence time ☐ working hours

= sum of presence time and working hours:

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	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 208

	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours:
	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 810
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* YES *Short description of selection option* yes for Marine Biology students; no for ISATEC students By default, the module consists of a Student Research Project (SRP) of 14 weeks embedded in a marine research team at Bremen University or at one of the associated research institutions. For ISATEC students, the SRP must be conducted as a research stay in a tropical country under the supervision of lecturers from Bremen. Marine Biology students may opt to (partly) replace the SRP by additional advanced university courses, for instance during a study period abroad at an international partner university (e.g. via Erasmus+ or Promos exchange). If so, type of examination and form of assessment may differ. Bremen University will acknowledge the grades obtained at partner universities.
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* winter semester yearly
1p	duration	one semester Klicken Sie hier, um Text einzugeben.
1q	Literature (*optional*)	Pertinent publications and literature will be provided by the lecturers.
1r	more information on the module (*optional*)	
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	
2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)

2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 2 ☐ SL | ☐ PVL | justification If necessary, further explanations: Klicken Sie hier, um Text einzugeben.
2c	Give this information for combination examinations only: Weights (in percentage) of component grades	PL 1: Klicken Sie hier, um Text einzugeben. PL 2: Klicken Sie hier, um Text einzugeben. PL 3: Klicken Sie hier, um Text einzugeben. PL 4: Klicken Sie hier, um Text einzugeben. If necessary, further comments: n/a
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☐ Presentation, oral ☐ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☐ Portfolio ☐ Project report ☐ Bachelor Thesis ☐ Internship report ☐ Colloquium ☐ Master Thesis ☒ Other (concrete definition is given in the examination regulations): Written grant proposal according to the guidelines of the German Science Foundation (DFG) and oral defense
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.

module code / module title

MB-H/ Application: Master Thesis and Colloquium

Klicken Sie hier, um Text einzugeben.

1	INFORMATION ON THE MODULE	
1a	module code	MB-H
1b	module title *(German title)*	Klicken Sie hier, um Text einzugeben.
1c	module title *(English title)*	Application: Master Thesis and Colloquium
1d	credit points	30
1e	responsible for the module	Prof. Dr. Kai Bischof / Prof. Dr. Wilhelm Hagen
1f	type of module	compulsory module
1g	programs using the module	M.Sc. Marine Biology
1h	organizational unit offering the module	Klicken Sie hier, um Text einzugeben.
1i	content-related prior knowledge or skills	Klicken Sie hier, um Text einzugeben.
1j	learning contents	As the concluding module of the MSc programme, it comprises the research-specific objectives, methodologies, data analysis and critical evaluation as well as thesis writing and defence. Thereby, the students will investigate a specific research question.
1k	learning outcomes/ competencies/ targeted competencies	The graduates will have a proven level of knowledge and understanding of marine biology and related disciplines, with particular expertise in their specific field of research. They will be able to apply their academic knowledge and understanding in a broad and multidisciplinary context and acquire new knowledge. They will know how to approach and to conduct a largely self-directed complex scientific project (including analytical applications), solve problems and present and defend their data and conclusions to a scientific auditorium. They have learned to manage and complete a clearly defined research project within a given time frame (24 weeks).

1l	calculation of student workload *(part a: calculation of presence time and working hours)*	**The total amount of the presence time and working hours of the module has to be calculated additionally in the detailed calculation a) to c).** **a)** detailed calculation: **SWS / presence time/working hours in each course of the module**

☐	lecture(s) with	SWS/ contact hours	hours of presence time
☐	seminar(s) with	SWS/ contact hours	hours of presence time
☐	exercise(s) with	SWS/ contact hours	hours of presence time
☐	internship(s) with	sum of working hours	
☐	seminar(s) with	SWS/ contact hours	total hours of presence time
☐	laboratory/laboratories with	SWS/ contact hours	total hours of presence time
☐	tutorial(s) with	SWS/ contact hours	
☐	excursion(s) with	SWS contact hours in total	working hours

☐ other form of course (e.g. block seminar), namely this:

Klicken Sie hier, um Text einzugeben.

with SWS / with totaly contact hours ☐ presence time ☐ working hours

= sum of presence time and working hours:

Klicken Sie hier, um Text einzugeben.

	calculation of student workload *(part b: preparation time and follow-up work/self-study)*	**b) working hours for preparation/follow-up work of the course(s) and/or self-study** = sum of working hours: 900
	calculation of student workload *(part c: exam preparation etc.)*	**c) exam preparation (incl. examination)** = sum of working hours: Klicken Sie hier, um Text einzugeben.

	calculation of student workload *(total amount of hours including a) - c))*	**Total amount of the presence time and working hours a) to c):** 900
1m	description of possible optional courses in the module	*Can a student choose between different courses within the module?* NO *Short description of selection option* n/a
1n	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.
1o	frequency	*(regular cycle module is offered) e.g.: winter semester, yearly or summer semester, yearly or each semester* each semester Klicken Sie hier, um Text einzugeben.
1p	duration	one semester module Klicken Sie hier, um Text einzugeben.
1q	Literature (*optional*)	Klicken Sie hier, um Text einzugeben.
1r	more information on the module (*optional*)	Klicken Sie hier, um Text einzugeben.
2	**INFORMATION ON THE MODULE EXAMINATION** (see also AT Art. 5 section 8)	
2a	type of examination	☒ module exam; i.e. exam with only one component (MP) ☐ combination exam, i.e. exam with several components (administered by instructors) (KP) ☐ partial exam; i.e. exam with several components (administered by registrar) (TP)
2b	exam components or prerequisites *(type, number)*	***PL*** *= graded component of the examination* ***SL*** *= ungraded component of the examination, coursework* ***PVL*** *= prerequisite of the examination (see AT Art. 5 Section 10)* ☒ PL | 2 ☐ SL | ☐ PVL | justification If necessary, further explanations: Klicken Sie hier, um Text einzugeben.

2c	Give this information for combination examinations only: Weights (in percentage) of component grades	PL 1: Master Thesis 75% PL 2: Colloquium 25% PL 3: Klicken Sie hier, um Text einzugeben. PL 4: Klicken Sie hier, um Text einzugeben. If necessary, further comments: .
2d	form of examination (see AT BPO/AT MPO Art. 8, 9 and 10)	☐ Assignment ☐ Oral examination (single) ☐ Presentation, oral ☐ Written examination ☐ Group examination, oral ☐ Presentation and written assignment ☐ Portfolio ☐ Project report ☐ Bachelor Thesis ☐ Internship report ☒ Colloquium ☒ Master Thesis ☐ Other (concrete definition is given in the examination regulations): Klicken Sie hier, um Text einzugeben.
2e	language(s) of instruction	☐ German ☒ English ☐ Spanish ☐ French ☐ Other, namely this: Klicken Sie hier, um Text einzugeben.