



# **Module Handbook**

## **Infection Biology & Control Master of Science**

**Faculty of Medicine  
Institute of Tropical Medicine, Travel Medicine, Human  
Parasitology**

Current as of 15.12.2022

Winter Semester 2023/24

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## 1. General Information about the Programme

**Name of the programme:** Infection Biology & Control

**Degree:** Master of Science (M.Sc.)

**Credits:** 120 CP (30 hours workload per 1 CP)

**Regular duration of study:** 4 semesters

**Type of study:** Full-time study

**Start date:** Winter semester every 2 years

**Number of study places:** 20

**Language of instruction:** English

**Place of Study:** Centre de Recherches Médicales (CERMEL), Lambaréné, Gabun

**The study programme is subject to the examination regulations of the degree programme (Prüfungsordnung), subject to the resolution of the Senate of the University of Tübingen of 02.02.2023.**

## 2. Contact

**Dean of studies:** Prof. Dr. Michael Schindler

**Program management:** Prof. Steffen Borrmann

Office hours and contact details see <https://www.medizin.uni-tuebingen.de>

**Coordinator of the study programme:** Theresa Kahl

**Homepage Master of Science Infection Biology & Control**

The homepage of the study programme will be available after the course goes online.

**Study programmes of the Faculty of Medicine, News**

<https://www.medizin.uni-tuebingen.de/en-de/medizinische-fakultaet/studium-und-lehre>

### **3. Objectives of the Programme**

#### **3.1. Qualification aims**

The declared aim of the proposed M.Sc. programme is to provide graduates with the necessary knowledge and skills for addressing infectious diseases-related research challenges in a region with one of the highest infectious disease burdens globally (estimated to be >50 times higher than in Germany with around two thirds of all-age disability-adjusted life years, DALYs, lost due to infectious diseases). There is a large unmet need for high-quality M.Sc. training in infectious diseases in Central African countries. This also concerns many neglected pathogens with significant disease burden such as unicellular and multicellular parasites mostly absent in Europe. A specific focus of the M.Sc. IBC programme is on vector-borne infectious diseases and related to it, relevant medical entomology to account for the neglected but massive global burden from vector-borne diseases. Research projects with Ph.D. programmes in infection biology and infectious diseases related fields are also the biggest current and future career opportunities for M.Sc. graduates in the Central African region. It is expected that graduates from the M.Sc. IBC programme will be competitive to apply for Ph.D. positions worldwide but also directly support national control programmes or international health agencies.

In summary, we expect our future M.Sc. graduates to demonstrate competence in the following areas:

#### **Subject specific skills**

- Graduates have solid understanding of the fundamental principles of infection biology (microbiology, parasitology and virology), epidemiology, genomics and pathogenesis.
- Graduates understand key mechanisms of major public health relevance in infectious diseases such as immune evasion, drug resistance and virulence
- Graduates understand the application of bioinformatics and statistics in infectious diseases.
- Graduates have practical experiences with key methods in infectious diseases research ranging from laboratory techniques based on good laboratory practice (flow cytometry, ELISA, cell culture, microscopy, PCR/qPCR, sequencing/genomics) to statistics and basic mathematical modelling to epidemiology and designing and conducting clinical trials and infectious diseases surveillance/control programmes
- Graduates understand the one health approach to infectious disease control

#### **Practical research skills**

- Graduates possess key laboratory research skills (microscopy, molecular detection, cell culture, serology, entomology, immunology, microbiology).
- Graduates are able to apply their practical knowledge and skills in transdisciplinary research environments, many with a translational emphasis, such as outbreak responses, laboratory evaluation of new interventions and diagnostics (for instance, assessment of vaccine responses or propensity for rapid evolution of pathogen resistance) or molecular epidemiology.
- Graduates are able to independently design and conduct experiments to address specific scientific questions. They can analyse and interpret the outcomes of their experiments.

- Graduates can perform quantitative and qualitative analyses of obtained data and can present their work in written and oral form.
- Graduates can apply regulations of good scientific practice and research ethics.

### **Personal development and future career**

- Graduates demonstrate well-developed communication skills, both written and oral
- Graduates have developed critical thinking and analytical skills in approaching and solving problems.
- Graduates have gained knowledge in literature search and computational skills.
- Graduates have earned the practical and technical skills relevant to the commencement of a doctoral dissertation.
- Graduates are able to work in various professional fields such as non-governmental organizations, national and international disease control programmes such as Africa CDC and WHO regional offices.

### **3.2. Prerequisites/Application (Admission criteria)**

- The prerequisite for admission to the M.Sc. programme in Infection Biology and Control is a B.Sc. in biological sciences with a final grade of at least 3,0 in the German system or an equivalent degree.
- Places will be awarded based on qualification and experience. Applications and degrees from non-German universities will be subject to recognition by the recognition office of the Kultusministerkonferenz (Central Office for Foreign Education). A bonus can additionally be awarded by the selection committee, especially to graduates who meet the admission requirements and with previous experiences (>2 months) in working in research institutions or laboratories.
- Applicants must provide proof of their English skills (level B2 CEFR and above). For further information, please consult the examination regulations (Prüfungsordnung und Auswahlsetzung) of the degree programme.
- Applicants must provide proof of their French skills (level A2 CEFR and above). For further information, please consult the examination regulations of the degree programme.

### **3.3. Standard duration of study**

The standard period of study for the Master of Science Microbiology degree is four semesters (120 ECTS credits).

At the beginning of each cohort (Winter Semester every two years), the first week will be dedicated to course orientation. During this week, students will be provided with essential information on the CERMEL campus, designated as Centre Hospitalier Universitaire International de Lambaréné (CHUIL)-CERMEL. This will include visits of the research laboratories, teaching facilities and administrative buildings. They will also receive practical guidance on how to settle in Lambaréné.

## 4. Curriculum

### 4.1. Overview by Modules

(according to the module overview in the authoritative Studien- und Prüfungsordnung)

Module number	Compulsory/ elective	Module title	Recommended Semester	CP
IBC101	Compulsory	Introduction to Infectious Diseases	1	6
IBC102	Compulsory	Introduction to Infectious Diseases Epidemiology and Control	1	6
IBC103	Compulsory	Immunology	1	6
IBC104	Compulsory	Current Topics in Infectious Diseases	1	6
IBC105	Compulsory	Laboratory Rotations	1	3
IBC106	Compulsory	Introduction to Scientific Literature	1	3
IBC201	Compulsory	Virology	2	6
IBC202	Compulsory	Parasitology	2	6
IBC203	Compulsory	Microbiology	2	6
IBC204	Compulsory	Laboratory Rotations	2	3
IBC205	Compulsory	Mathematical Modelling and Statistics	2	6
IBC206	Compulsory	Tutorial: Molecular and Cellular Biology	2	3
IBC301	Compulsory	Principles of Pathogen Genomics	3	6
IBC302	Compulsory	Medical Entomology	3	6

IBC303	Compulsory	Study Design/ Analysis and Research Ethics	3	6
IBC304	Compulsory	Emerging Viral Diseases and One Health	3	6
IBC305	Compulsory	Laboratory Rotations	3	3
IBC306	Compulsory	Effective Scientific Writing	3	3
IBC401	Compulsory	Master's Thesis	4	30
			Total	<b>120</b>

<sup>1</sup> Unless stated otherwise in the module descriptions, modules of the Master of Science in Infection Biology & Control are generally graded.

## 4.2. Overview by Study Area

Sem.	CP	Master of Science Infection Biology & Control			
		Study area Fundamentals	Study area Consolidation	Study area Subsidiary fields	Study area Research
1.	30		Immunology (6 CP)	Laboratory Rotations (3 CP)	
		Introduction to Infectious Diseases (6 CP)		Introduction to Scientific Literature (3 CP)	
		Introduction to Infectious Diseases Epidemiology and Control (6 CP)		Current topics in infectious diseases (6 CP)	
2.	30	Tutorial: Molecular and Cellular Biology (3 CP)	Virology (6 CP)	Mathematical Modelling and Statistics (6 CP)	
			Parasitology (6 CP)	Laboratory Rotations (3 CP)	
			Microbiology (6 CP)		
3.	30		Emerging Viral Diseases & One Health (6 CP)	Laboratory Rotations (3 CP)	
			Principles of Pathogen Genomics (6 CP)	Study Design, Analysis and Research Ethics (6 CP)	



			Medical Entomology (6 CP)	Effective Scientific Writing (3 CP)	
4.	30				Master's Thesis (30 CP)

### 4.3. Weekly timetables

The regular weekly timetable of the winter semester 2023/24 is as follows:

October	November	December	January	February	March	
1 Su	Exam		Christmas holiday	Laboratory Rotations		
ORIENTATION WEEK		2 Sa			2 Sa	
		3 Su			3 Sa	3 Su
		5 Su		Immunology	4 Su	Exam
7 Sa	6 Sa	Laboratory Rotations				
8 Su	Introduction to Infectious Diseases Epidemiology and Control		7 Su			
ORIENTATION WEEK		9 Sa	Current Topics in Infectious Diseases	10 Sa	Non-lecture period	
	10 Su	11 Su				
	11 Sa	Immunology	13 Sa			
12 Su	14 Su		Exam			
14 Sa	Introduction to Infectious Diseases Epidemiology and Control	Current Topics in Infectious Diseases	Exam			
15 Su				16 Sa		
Introduction to Infectious diseases		17 Su	Current Topics in Infectious Diseases	17 Sa		
	18 Sa	18 Su				
	19 Su	Exam	Mathematical Modelling and Statistics			
21 Sa	20 Sa					
22 Su	Tutorial: Molecular and Cellular Biology	Exam	21 Su			
Introduction to Infectious diseases			23 Sa	24 Sa		
	24 Su	25 Su				
	25 Sa	Mathematical Modelling and Statistics				
26 Su	27 Sa					
28 Sa	Tutorial: Molecular and Cellular Biology	Christmas holiday	28 Su			
29 Su			Laboratory Rotations			
Exam		31 Su				

The regular weekly timetable of the summer semester 2024 is as follows:

April	May	June	July	August	September	
<b>Easter holiday</b>	Virology	1 Sa	Parasitology	Microbiology	<b>Non-lecture period</b>	
		2 Su		3 Sa		
		4 Sa		4 Su		
	5 Su	Microbiology				
	6 Sa					
7 Su	Virology	Laboratory Rotations	6 Sa	Microbiology		
Introduction to Scientific Literature		8 Sa	Exam			10 Sa
		9 Su		11 Su		
		11 Sa				Laboratory Rotations
12 Su	13 Sa					
13 Sa	Exam	15 Sa	13 Sa	Exam		
14 Su					16 Su	14 Su
Introduction to Scientific Literature		Exam	Exam		Tutorial: Molecular and Cellular Biology	
						18 Sa
	19 Su		20 Sa			
20 Sa	21 Su					
21 Su		Holiday	22 Sa	20 Sa	<b>Non-lecture period</b>	
Introduction to Scientific Literature	23 Su					21 Su
			Parasitology	Tutorial: Molecular and Cellular Biology		
	25 Sa					27 Sa
26 Su	28 Su					
27 Sa		29 Sa	27 Sa			
28 Su	30 Su			28 Su		
Virology		Holiday	Microbiology			
	29 Sa					
		30 Su				

The regular weekly timetable of the winter semester 2024/25 is as follows:

October	November	December	January	February	March
Non-lecture period		1 Su	Christmas holiday	1 Sa	Research for and Writing of Master's Thesis
	2 Sa	Principles of Pathogen Genomics		2 Su	
	3 Su		4 Sa		
5 Sa	Study Design/Analysis and Research Ethics		5 Su	Effective Scientific Writing*	
6 Su			Medical Entomology		
Non-lecture period	7 Sa			Exam	
	8 Su	9 Su			
	9 Sa	Study Design/Analysis and Research Ethics	11 Sa	Effective Scientific Writing*	
10 Su	12 Su				
12 Sa	Study Design/Analysis and Research Ethics	14 Sa	Medical Entomology		
13 Su		15 Su			
Emerging Viral Diseases and One Health		16 Sa	Christmas holiday	18 Sa	
	17 Su	19 Su			
	19 Sa	Exam	Exam	22 Sa	
20 Su	23 Su				
Emerging Viral Diseases and One Health	23 Sa	Christmas holiday	25 Sa	Laboratory Rotations	
	24 Su		26 Su		
	26 Sa	Principles of Genetics and Genomics	Christmas holiday	Effective Scientific Writing*	
27 Su	28 Sa				
Exam	29 Su		Exam		
	30 Sa	Christmas holiday			

\*The course "Effective Scientific Writing" will take place weekly for 2-3 hours online from January to March. Exact weekday/time will be announced.

The regular weekly timetable of the summer semester 2025 is as follows:

<b>April</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>August</b>	<b>September</b>
<b>Research for and Writing of Master's Thesis</b>					<b>Preparation for Oral Exam</b>

## **4. Glossary**

### **Module**

Modules refer to bundles of courses and learning times that belong together in terms of content and/or method and are limited in time. They can comprise various forms of teaching and learning (e.g. lectures, exercises, practicals, e-learning, etc.) and are usually completed with an examination only, the result of which is included in the degree certificate. The awarding of ECTS credits does not necessarily require a graded examination, but the successful completion of a module.

Contents, forms of teaching, prerequisites and examination modalities can be found in the module description.

### **Credit Points**

Credit points (CP) are assigned to the individual modules. Credit points are a quantitative measure of the time spent by students on a module or a module component. One credit point represents 30 hours of study. As a rule, 60 credit points are awarded per academic year, i.e., 30 per semester. According to national and international standards, a workload of 30 hours is assumed for one credit point for students in class and self-study. The total workload may not exceed 900 hours in a semester, including the lecture-free period of 1,800 hours in an academic year. It corresponds to an annual time commitment of 45 weeks of 40 hours each. Credit points cover both the actual teaching time in the courses (contact hours) as well as the time spent preparing and reviewing the course material (self-study) and the time spent on individual performances (examination preparation and writing the masters' thesis). Credit points are awarded for attendance and participation in the courses assigned to the modules and are often linked to the completion of course-related individual work. CP are awarded exclusively for completed modules - i.e. neither for participation nor for passing the examination, but for the module in its entirety.

### **Responsible for the module**

For each module there is a responsible person, who is the contact person for all questions regarding the content and organization of the modules and the examinations. The persons responsible for the modules are named in the respective module descriptions. The respective lecturers are responsible for the courses within a module.

### **Module examinations**

The procedure and form of the module examinations are determined by the respective persons responsible for the module and communicated in the module description. A module examination is only passed when all the study achievements required to pass the module have been completed (e.g. protocols, excursions, etc.). One module

examination takes place per module and it can be repeated twice after a first failed attempt. Only examination attempts that have actually been completed count as an examination attempt. If required, a re-examination is possible each semester. After a module examination has been passed, the corresponding CPs are entered together with a grade in the examination database. The personal data sheet with performance status can be viewed by accessing the university examinations portal (ALMA).

### **Lecture period and registration**

Information on the courses and lecture periods can be found on the M.Sc. Infectious Disease and Control website as well as on the university examination and teaching portals (ALMA, ILIAS).

### **Master's Thesis**

The Master's thesis demonstrates that a scientific question can be addressed and presented at an advanced level. The Master's thesis will be written in English. The Master's thesis can only be started when at least 60 credit points have been acquired in the M.Sc. degree programme. 30 credit points (= 6 months of working time) are awarded for the successfully completed Master's thesis and the respective oral exam. The Master's thesis is evaluated by two examiners; a binding list of possible examiners can be found at the Medical Faculty Examination Office. One of these will be the (formal) supervisor of the thesis. Co-Supervisors can come from all partner institutions of the programme (= laboratory where the thesis is carried). An information sheet on the procedures related to the Master's thesis is available on the Master of Science in Infection Biology and Control website.

### **Master's examination, determination of the final grade, certificate**

The Master's examination is taken during the course of study and consists of the examinations of the modules amounting to 90 points as well as the Master's thesis. The Master's programme must be completed by the end of the eighth semester at the latest, otherwise the right to take the examination expires. The overall grade of the Master's examination is the average of the grades of all modules weighted with the credit points of all modules and the Master's thesis, whereby the Master's thesis counts double. Up to 30 points can be acquired in addition to the 120 credit points of the Master's degree. However, the points are not included in the calculation of the grade.

<b>Key</b>	
<b>Grading</b>	g = graded; ug = ungraded (pass/fail)
<b>Type of exam</b>	WE = written exam; O = oral exam; T = term paper; P = classroom presentation; WR = written report; PP = practical performance
<b>Duration</b>	<b>duration of the examination in minutes</b>
<b>Weight</b>	<b>courses: weighting of the examination grade towards the module grade modules: weighting of the module grade towards the final grade</b>
<b>Contact Hours</b>	<b>CH; hours spent in the classroom per week during the semester</b>
<b>Status</b>	<b>o = obligatory; e = elective</b>
<b>Type of course</b>	<b>L = lecture; S = seminar; E = exercise; T = tutorial, P = Practical laboratory course</b>
<b>Credit points</b>	CP (ECTS Credits)
<b>Lectures</b>	Lectures will consist of the lecturers teaching on a particular topic with either a PowerPoint presentation or other forms of material. Students will follow and take notes, and also ask questions.
<b>Seminars</b>	Seminars will consist of students being more involved by either presenting on a chosen topic or discussing a chosen topic in groups. The material involved will be scientific publications or material from the lecturer. It will also include literature search and presentations on particular topics.
<b>Tutorials</b>	All tutorial sessions will consist in reading and discussing the text book <i>Molecular Biology of the Cell</i> (latest edition)



## 5. Module descriptions

<b>Module code:</b> IBC101	<b>Module title:</b> Introduction to Infectious Diseases		<b>Type of module:</b> compulsory						
<b>ECTS-credits</b>	6								
<b>Workload</b> - contact hours - self-study	Total workload: 180 h	Contact hours: 60 h / 4 CH	Self-study: 120 h						
<b>Module duration</b>	2 weeks block								
<b>Frequency of offer</b>	every two years, first year of programme cycle								
<b>Language(s) of instruction</b>	English								
<b>Forms of teaching and learning</b>	Forms of teaching: lecture, seminar Forms of learning: reading course material, independent study, homework								
<b>Module content</b>	This module will introduce the infectious diseases of major public health importance both globally and in the Central African region. There will be an emphasis on medically relevant aspects of pathogen biology such as pathogenicity, transmission, epidemiology, preventive as well as therapeutic interventions and diagnostic strategies. During interactive lectures and seminars, students will discuss biological and medical challenges in infectious disease control and elimination.								
<b>Qualification goals</b>	<p>The students</p> <ul style="list-style-type: none"> <li>possess a solid knowledge of the key aspects of the infectious diseases of major public health relevance</li> <li>have acquired a broad overview of the diagnostic, preventive, therapeutic and public health tools for infectious disease control</li> <li>understand host-pathogen interactions determining disease outcomes, specific pathogenicity mechanisms causing severe and life-threatening infections, principles of protection by innate and acquired immunity, epidemiology of infectious diseases and the molecular basis of medically important traits such as immune/vaccine evasion and drug resistance</li> </ul>								
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>
	<i>Module component</i>	L	o	3	4	W E	90	g	-
	<i>Module component</i>	S	o	1	2	-	-	-	-

	<i>Required coursework:</i>	<i>Preparation of the subject matter prior to attendance in the lecture, oral presentation in the seminar</i>
	<i>Module assessment:</i>	<i>Written exam at the end of the lecture course</i>
<b>Applicability</b>	-	
<b>Prerequisites</b>	none	
<b>Person responsible</b>	Steffen Borrmann, Prof. Dr.	

<b>Module code:</b> IBC102	<b>Module title:</b> Introduction to Infectious Diseases Epidemiology and Control			<b>Type of module:</b> compulsory					
<b>ECTS-credits</b>	6								
<b>Workload - contact hours - self-study</b>	Total workload: 180 h			Contact hours: 60 h / 4 CH			Self-study: 120 h		
<b>Module duration</b>	2 weeks block								
<b>Frequency of offer</b>	every two years, first year of programme cycle								
<b>Language(s) of instruction</b>	English								
<b>Forms of teaching and learning</b>	Forms of teaching: lecture, seminar Forms of learning: reading course material, independent study, homework								
<b>Module content</b>	This module introduces the basic concepts in epidemiology and covers the fundamentals of epidemiology and epidemiological methods. The aim will be to understand, study and conceive control measures for outbreaks, epidemics, and endemic infectious diseases. The module will mainly use practical examples from past and ongoing studies at the CERMEL. Seminars for this course will involve active participation of students in reviewing and discussing current literature in this field.								
<b>Qualification goals</b>	<p>The students</p> <ul style="list-style-type: none"> <li>• Understand basic epidemiological terminology and definitions</li> <li>• Understand and interpret epidemiological research in infectious diseases (e.g., demographic surveillance, cross-sectional studies, cohort studies, case-control studies)</li> <li>• Have gained knowledge to calculate basic epidemiological variables such as sensitivity/specificity</li> <li>• Can critically review and evaluate scientific publications in this field</li> </ul>								
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>
	<i>Module component</i>	L	o	3	4	W E	90	g	-
	<i>Module component</i>	S	o	1	2	-	-	-	-
	<i>Required coursework:</i>	<i>Preparation of the subject matter prior to attendance in the lecture, oral presentation in the seminar</i>							

	<i>Module assessment:</i>	<i>Written exam at the end of the lecture course</i>
<b>Applicability</b>	-	
<b>Prerequisites</b>	none	
<b>Person responsible</b>	Lell, Bertrand, Prof. Dr.	

<b>Module code:</b> IBC103	<b>Module title:</b> Immunology				<b>Type of module:</b> compulsory				
<b>ECTS-credits</b>	6								
<b>Workload - contact hours - self-study</b>	Total workload: 180 h		Contact hours: 60 h / 4 CH		Self-study: 120 h				
<b>Module duration</b>	2 weeks block								
<b>Frequency of offer</b>	every two years, first year of programme cycle								
<b>Language(s) of instruction</b>	English								
<b>Forms of teaching and learning</b>	Forms of teaching: lecture, seminar Forms of learning: reading course material, independent study, homework								
<b>Module content</b>	At the end of this module the students have acquired detailed knowledge on the cellular and humoral components of the immune system. Model systems and techniques used in studying the immune system will be covered. Emphasis will be on the innate and acquired immune responses to infection and vaccines, but also autoimmune diseases, allergy, immune suppression and cancer immunology will be covered. The practical part of this module will introduce students to commonly used immunological protocols, including cell culture techniques, ELISA, flow cytometry, ELISpot and others to investigate innate and adaptive immune cell responses. Seminars will consist of discussion of current literature in the field and serve as repetitive exercise for the lectures.								
<b>Qualification goals</b>	<p>The students</p> <ul style="list-style-type: none"> <li>• Understand the basic concepts of the immunology</li> <li>• Know the major effector mechanisms of innate and the acquired immune responses</li> <li>• Understand the principles of passive and active vaccination</li> <li>• Can carry out key assays used in immunology (ELISA, flow cytometry)</li> <li>• Are familiar with the current literature in immunology research and understand model systems used in research</li> </ul>								
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>
	<i>Module component</i>	<i>L</i>	<i>o</i>	<i>3</i>	<i>4</i>	<i>W E</i>	<i>90</i>	<i>g</i>	<i>-</i>
	<i>Module component</i>	<i>S</i>	<i>o</i>	<i>1</i>	<i>2</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>-</i>

	<i>Required coursework:</i>	<i>Preparation of the subject matter prior to attendance in the lecture, oral presentation in the seminar</i>
	<i>Module assessment:</i>	<i>Written exam at the end of the lecture course</i>
<b>Applicability</b>	-	
<b>Prerequisites</b>	none	
<b>Person responsible</b>	Fendel, Rolf, Dr.	

<b>Module code:</b> IBC104	<b>Module title:</b> Current Topics in Infectious Diseases		<b>Type of module:</b> compulsory							
<b>ECTS-credits</b>	6									
<b>Workload</b> - contact hours - self-study	Total workload: 180 h	Contact hours: 60 h / 4 CH	Self-study: 120 h							
<b>Module duration</b>	2 weeks block									
<b>Frequency of offer</b>	every two years, first year of programme cycle									
<b>Language(s) of instruction</b>	English									
<b>Forms of teaching and learning</b>	Forms of teaching: seminar, journal club Forms of learning: reading course material, independent study,									
<b>Module content</b>	At the end of this module, students will be familiarised with current major research questions and challenges, established and novel experimental approaches, and analytical tools. Seminars for this course will involve active participation of students in selection and review of current literature.									
<b>Qualification goals</b>	<p>The students</p> <ul style="list-style-type: none"> <li>Gain specialised knowledge and understanding in infection biology and infectious diseases</li> <li>Gain in-depth knowledge in the state-of-the-art research strategies, modern methodologies, and open questions in selected fields of infection biology</li> </ul>									
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>	
	<i>Module component</i>	<i>S</i>	<i>o</i>	<i>4</i>	<i>3</i>	<i>WR</i>	<i>-</i>	<i>g</i>	<i>-</i>	
	<i>Required coursework:</i>	<i>Preparation of subject matter prior to seminar and journal club. Oral presentation at journal club (not graded).</i>								
	<i>Module assessment:</i>	<i>At the end of the module, students will write a final report on the topics covered.</i>								
<b>Applicability</b>	-									
<b>Prerequisites</b>	none									
<b>Person responsible</b>	Borrmann, Steffen, Prof. Dr.									

<b>Module code:</b> IBC105	<b>Module title:</b> Laboratory Rotations		<b>Type of module:</b> compulsory							
<b>ECTS-credits</b>	3									
<b>Workload</b> - contact hours - self-study	Total workload: 90 h	Contact hours: 0h	Self-study: Lab time: 30h Study time: 60 h							
<b>Module duration</b>	2 weeks block									
<b>Frequency of offer</b>	every two years, first year of programme cycle									
<b>Language(s) of instruction</b>	English, French									
<b>Forms of teaching and learning</b>	Forms of teaching: Practical laboratory course Forms of learning: the student will integrate an ongoing research in the respective laboratory and be supervised by a postdoc or an advanced doctoral student.									
<b>Module content</b>	Students will perform a 2-week attachment to specific research projects at the CERMEL. The projects include laboratory-based studies, field research and clinical trial associated activities. Tandems of 2 students will be attached to the different laboratories and projects. The project is assigned in accordance with ongoing research in the respective laboratory; 2-week attachments are concluded by a written report and by an oral presentation of the project.									
<b>Qualification goals</b>	The students <ul style="list-style-type: none"> <li>Gain exposure to ongoing research at CERMEL, often as part of large collaborative international projects in infectious diseases</li> <li>Acquire a wide range of practical skills in state-of-the-art methods</li> <li>Are trained in the analysis of data for scientific reports</li> <li>Receive training necessary for writing scientific reports</li> </ul>									
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>	
	<i>Module component</i>	<i>P</i>	<i>o</i>	<i>-</i>	<i>3</i>	<i>PP</i>	<i>-</i>	<i>g</i>	<i>-</i>	
	<i>Required coursework:</i>	<i>Laboratory practical. Student will prepare written report and oral presentation which will be mandatory but will not count towards the final grading</i>								
	<i>Module assessment:</i>	<i>The practical performance will be graded by the supervisor.</i>								
<b>Applicability</b>	-									
<b>Prerequisites</b>	none									



**Person  
responsible**

Borrmann, Steffen, Prof. Dr

<b>Module code:</b> IBC106	<b>Module title:</b> Introduction to Scientific Literature		<b>Type of module:</b> compulsory							
<b>ECTS-credits</b>	3									
<b>Workload - contact hours - self-study</b>	Total workload: 90 h	Contact hours: 30 h / 2 CH	Self-study: 60 h							
<b>Module duration</b>	3-week block									
<b>Frequency of offer</b>	Every two years									
<b>Language(s) of instruction</b>	English									
<b>Forms of teaching and learning</b>	Form of teaching: Lectures, journal club Form of learning: Small group discussions, written essay									
<b>Module content</b>	This module introduces students to the content and publishing process of scientific manuscripts. It is designed for students to get an appreciation of the importance of scientific publications, understand the notion of intellectual property (citing/referencing), and develop their critical analysis skills. Core concepts will be covered using a combination of lectures and journal club sessions.									
<b>Qualification goals</b>	The students will learn to: <ul style="list-style-type: none"> <li>• Distinguish between the different types of scientific manuscripts.</li> <li>• Recognize the essential components of each section of a primary research article and identify the study's aim, hypothesis, main findings, and interpretations.</li> <li>• Critically analyse and discuss primary scientific articles in a group.</li> <li>• Appropriately reference scientific literature (in-text and bibliography).</li> </ul>									
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>	
	<i>Module component</i>	-	o	2	3	-	-	ug	-	
	<i>Required coursework:</i>	<i>Attendance to lecture and participation to journal clubs is mandatory</i>								
	<i>Module assessment:</i>	<i>This is a "Pass/Fail" course. Students will be evaluated based on their participation to journal club session (80%) and a written exercise (20%), and must obtain a final grade of at least 60% to be granted a "Pass".</i>								
<b>Applicability</b>	-									
<b>Prerequisites</b>	none									

**Person  
responsible**

Lapointe, Tamia, Dr.

<b>Module code:</b> IBC201	<b>Module title:</b> Virology		<b>Type of module:</b> compulsory							
<b>ECTS-credits</b>	6									
<b>Workload - contact hours - self-study</b>	Total workload: 180 h	Contact hours: 60 h / 4 CH	Self-study: 120 h							
<b>Module duration</b>	2 weeks block									
<b>Frequency of offer</b>	every two years, first year of programme cycle									
<b>Language(s) of instruction</b>	English									
<b>Forms of teaching and learning</b>	Forms of teaching: lecture, seminar, laboratory practical Forms of learning: reading course material, independent study									
<b>Module content</b>	Students will learn the central concepts of virology such as virus biology and infectious cycle, viral genomics and genetics as well pathogenesis, diagnosis and virulence of viruses, host innate and adaptive immune response to viruses. Novel therapeutic and preventive approaches will be introduced. During seminars, students will discuss the current literature in this field.									
<b>Qualification goals</b>	<p>The students</p> <ul style="list-style-type: none"> <li>• Understand the biology of viruses</li> <li>• Have in-depth understanding of the biology of major human viruses including vector-borne viruses</li> <li>• Will gain experience in laboratory techniques such as PCR, fluorescence microscopy and serology/ELISA required for the diagnosis and study of viruses</li> <li>• Can critically review scientific literature and communicate effectively in groups</li> </ul>									
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>	
	<i>Module component</i>	L	o	2	3	W E	90	g	-	
	<i>Module component</i>	S	o	2	3	-	-	-	-	
	<i>Required coursework:</i>	<i>Preparation of the subject matter prior to attendance in the lecture, oral presentation in the seminar</i>								
	<i>Module assessment:</i>	<i>Written exam at the end of the lecture course</i>								
<b>Applicability</b>	-									

<b>Prerequisites</b>	none
<b>Person responsible</b>	Schindler, Michael, Prof. Dr.

<b>Module code:</b> IBC202	<b>Module title:</b> Parasitology		<b>Type of module:</b> compulsory							
<b>ECTS-credits</b>	6									
<b>Workload - contact hours - self-study</b>	Total workload: 180 h	Contact hours: 60 h / 4 CH	Self-study: 120 h							
<b>Module duration</b>	2 weeks block									
<b>Frequency of offer</b>	every two years, first year of programme cycle									
<b>Language(s) of instruction</b>	English									
<b>Forms of teaching and learning</b>	Forms of teaching: lecture, seminar, laboratory practical Forms of learning: reading course material, attending lectures, independent study									
<b>Module content</b>	Students will be introduced to the principles in parasitology. This includes aspects of eukaryotic cell biology important for the understanding of single cell and multicellular parasites; complexity of life cycles including vector transmission; virulence and pathogenicity factors; epidemiology; pathology; and drug and vaccine targets. Current research in anti-parasitic vaccine and drug development will be emphasised. Various aspects of clinical research such as drug and vaccine trials as well as drug resistance will be covered. Immune evasion mechanisms and innate/acquired immune responses to parasites will be explained.									
<b>Qualification goals</b>	<p>The students</p> <ul style="list-style-type: none"> <li>• Demonstrate understanding of the biology of parasitic infections</li> <li>• Have a clear understanding of the advancement and challenges in anti-parasitic drug and vaccine research</li> <li>• Have gained practical skills in key laboratory techniques in parasitology: microscopy and cell culture</li> </ul>									
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>	
	<i>Module component</i>	L	o	2	3	W E	90	g	-	
	<i>Module component</i>	S	o	2	3	-	-	-	-	
	<i>Required coursework:</i>	<i>Preparation of the subject matter prior to attendance in the lecture, oral presentation in the seminar</i>								
	<i>Module assessment:</i>	<i>Written exam at the end of the lecture course</i>								

<b>Applicability</b>	-
<b>Prerequisites</b>	none
<b>Person responsible</b>	Borrmann, Steffen, Prof. Dr.

<b>Module code:</b> IBC203	<b>Module title:</b> Microbiology		<b>Type of module:</b> compulsory							
<b>ECTS-credits</b>	6									
<b>Workload - contact hours - self-study</b>	Total workload: 180 h	Contact hours: 60 h / 4 CH	Self-study: 120 h							
<b>Module duration</b>	2 weeks block									
<b>Frequency of offer</b>	every two years, first year of programme cycle									
<b>Language(s) of instruction</b>	English									
<b>Forms of teaching and learning</b>	Forms of teaching: lecture, seminar, laboratory practical Forms of learning: reading course material, independent study, lecture attendance									
<b>Module content</b>	Students will be introduced to the key concepts in microbiology such as prokaryotic cell biology, metabolic pathway diversity and bacterial genetics. The development of anti-bacterial drugs, including the development of virulence blocking molecules will be covered. During laboratory practical sessions, the students will learn techniques in microbiology research such as media preparation, plating, liquid culture. In seminars, students will discuss the current literature in the field.									
<b>Qualification goals</b>	<p>The students</p> <ul style="list-style-type: none"> <li>• Have a broad overview of microbial pathogens and their life cycle</li> <li>• Understand the concept of virulence in microbiology and the mechanism of virulence of microorganisms</li> <li>• They understand the current methods used in microbiology research and have gained hands on experience in bacterial cell culture, plating and cloning, and they can implement these in group work.</li> </ul>									
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>	
	<i>Module component</i>	L	o	2	3	W E	90	g	-	
	<i>Module component</i>	S	o	2	3	-	-	-	-	
	<i>Required coursework:</i>	<i>Preparation of the subject matter prior to attendance in the lecture, oral presentation in the seminar</i>								
	<i>Module assessment:</i>	<i>Written exam at the end of the lecture course</i>								
<b>Applicability</b>	-									



<b>Prerequisites</b>	none
<b>Person responsible</b>	Wolz, Christiane, Prof. Dr.

<b>Module code:</b> IBC204,	<b>Module title:</b> Laboratory Rotations		<b>Type of module:</b> compulsory						
<b>ECTS-credits</b>	3								
<b>Workload</b> - contact hours - self-study	Total workload: 90 h	Contact hours: 0h	Self-study: Lab time: 30h Study time: 60 h						
<b>Module duration</b>	2 weeks block								
<b>Frequency of offer</b>	every two years, first year of programme cycle								
<b>Language(s) of instruction</b>	English, French								
<b>Forms of teaching and learning</b>	Forms of teaching: Practical laboratory course Forms of learning: the student will integrate an ongoing research in the respective laboratory and be supervised by a postdoc or an advanced doctoral student.								
<b>Module content</b>	Students will perform a 2-week attachment to specific research projects at the CERMEL. The projects include laboratory-based studies, field research and clinical trial associated activities. Tandems of 2 students will be attached to the different laboratories and projects. The project is assigned in accordance with ongoing research in the respective laboratory; 2-week attachments are concluded by a written report and by an oral presentation of the project.								
<b>Qualification goals</b>	The students <ul style="list-style-type: none"> <li>• Are exposed to ongoing research at CERMEL, often as part of large collaborative international projects in infectious diseases</li> <li>• Acquire a wide range of practical skills in state-of-the-art methods</li> <li>• Are trained in the analysis of data for scientific reports</li> <li>• Receive training necessary for writing scientific reports</li> </ul>								
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>
	<i>Module component</i>	<i>P</i>	<i>o</i>	<i>-</i>	<i>3</i>	<i>PP</i>		<i>g</i>	
	<i>Required coursework:</i>	<i>Laboratory practical. Written report and oral presentation are mandatory</i>							
	<i>Module assessment:</i>	<i>The practical performance will be graded by the supervisor</i>							
<b>Applicability</b>	-								
<b>Prerequisites</b>	none								
<b>Person responsible</b>	Borrmann, Steffen, Prof. Dr								

<b>Module code:</b> IBC205	<b>Module title:</b> Mathematical Modelling and Statistics		<b>Type of module:</b> compulsory						
<b>ECTS-credits</b>	6								
<b>Workload - contact hours - self-study</b>	Total workload: 180 h	Contact hours: 60 h / 4 CH	Self-study: 120 h						
<b>Module duration</b>	2 weeks block								
<b>Frequency of offer</b>	every two years, first year of programme cycle								
<b>Language(s) of instruction</b>	English								
<b>Forms of teaching and learning</b>	Forms of teaching: lecture, seminar Forms of learning: reading course material, independent study								
<b>Module content</b>	This module provides a broad understanding of mathematical modelling and biostatistics and how they are applied in infectious disease research. It provides students with an introduction to the theory of infectious disease modelling, with a focus on evolutionary ecology and epidemiology, and how it forms the basis of key epidemiological concepts such as the basic reproductive number ( $R_0$ ), critical vaccination threshold and herd immunity. In the second part students will be introduced to statistical methods employed in infection biology research.								
<b>Qualification goals</b>	<p>The students</p> <ul style="list-style-type: none"> <li>• Understand key epidemiological concepts from first principle</li> <li>• Understand the concept of mathematical modelling, biostatistics and their application in infectious diseases Demonstrate an understanding of the impact of models on infectious disease dynamics as well as control measures</li> <li>• Can choose and apply appropriate statistical methods for common and basic problems in infectious disease research</li> <li>• Understand when and why Bioinformatics tools are used in scientific research</li> <li>• Can use open-source statistical software and programming language (e.g., R)</li> </ul>								
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>
	<i>Module component</i>	L	o	2	3			ug	-
	<i>Module component</i>	S	o	2	3	-	-	-	-
	<i>Required coursework:</i>	<i>Preparation of the subject matter prior to attendance in the lecture, oral presentation in the seminar</i>							

	<p><i>Module assessment:</i></p>	<p><i>This is a “Pass/Fail” course. Students will be evaluated based on their participation in lecture (asking questions and involvement in discussion 35%) and an exercise (65%) and must obtain a final grade of at least 60% to be granted a “Pass”.</i></p>
<b>Applicability</b>	-	
<b>Prerequisites</b>	none	
<b>Person responsible</b>	Recker, Mario, Prof. Dr.; Berens, Philipp, Prof. Dr.	

<b>Module code:</b> IBC206	<b>Module title:</b> Tutorial: Molecular and Cellular Biology		<b>Type of module:</b> compulsory							
<b>ECTS-credits</b>	3									
<b>Workload - contact hours - self-study</b>	Total workload: 90 h	Contact hours: 30 h / 2 CH	Self-study: 60 h							
<b>Module duration</b>	1-week block									
<b>Frequency of offer</b>	every two years, first year of programme cycle									
<b>Language(s) of instruction</b>	English									
<b>Forms of teaching and learning</b>	Forms of teaching: tutorials Forms of learning: reading course material, independent study									
<b>Module content</b>	This module provides students with a solid foundation in the fundamental concepts and principles of cellular and molecular biology. Tutorial sessions will consist of active discussions and exchange with lecturer and students. Using the “switched classroom” teaching concept, students will be required to present their understanding of the book content, chapter by chapter. Students will be tasked with continued reading of pre-selected chapters (1 chapter per week) until the 3 <sup>rd</sup> semester. Subsequent modules will provide 2 hours per week slots for allowing students to ask questions regarding pre-scheduled chapters.									
<b>Qualification goals</b>	The students <ul style="list-style-type: none"> <li>• Understand principles fundamental concepts in cell biology and molecular biology required for infectious diseases research</li> <li>• Are recognising the benefits of textbooks for self-studies in their careers</li> </ul>									
<b>Requirements for obtaining credit / grading</b>		<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>	
	<i>Module component</i>	-	o	2	3	W E	-	g	-	
	<i>Required coursework:</i>	<i>Preparation of tutorial material and active participation in tutorial sessions</i>								
	<i>Module assessment:</i>	<i>Reports will be submitted at the end of the module.</i>								
<b>Applicability</b>	-									
<b>Prerequisites</b>	none									

**Person  
responsible**

Borrmann, Steffen, Prof. Dr.

<b>Module code:</b> IBC301	<b>Module title:</b> Principles of Pathogen Genomics		<b>Type of module:</b> compulsory							
<b>ECTS-credits</b>	6									
<b>Workload - contact hours - self-study</b>	Total workload: 180 h	Contact hours: 60 h / 4 CH	Self-study: 120 h							
<b>Module duration</b>	2 weeks block									
<b>Frequency of offer</b>	every two years, second year of programme cycle									
<b>Language(s) of instruction</b>	English									
<b>Forms of teaching and learning</b>	Forms of teaching: lecture, seminar Forms of learning: reading course material, independent study, lecture attendance									
<b>Module content</b>	This module covers the advances in DNA sequencing techniques and technologies and its application in infectious disease research, surveillance and outbreak investigation. High-throughput screening methods and specific bioinformatic tools will be introduced; their application in studying infectious diseases virulence, pathogenesis and resistance will be discussed.									
<b>Qualification goals</b>	<p>The students</p> <ul style="list-style-type: none"> <li>• Gain in-depth knowledge of concepts in sequencing approaches</li> <li>• Understand the genetics and genomics of pathogens and how it can be used for studying virulence, drug and vaccine resistance, epidemics and for measuring the impact of infectious diseases control strategies</li> <li>• Have a broad overview of high-throughput methods and associated bioinformatic tools</li> <li>• Understand the application of genomics in the study of infectious diseases</li> </ul>									
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>	
	<i>Module component</i>	L	o	2	3	W E	90	g	-	
	<i>Module component</i>	S	o	2	3	-	-	-	-	
	<i>Required coursework:</i>	<i>Preparation of the subject matter prior to attendance in the lecture, oral presentation in the seminar</i>								
	<i>Module assessment:</i>	<i>Written exam at the end of the lecture course</i>								
<b>Applicability</b>	-									

<b>Prerequisites</b>	none
<b>Person responsible</b>	Schmidt, Thorsten, Dr.



<b>Module code:</b> IBC302	<b>Module title:</b> Medical Entomology		<b>Type of module:</b> compulsory							
<b>ECTS-credits</b>	6									
<b>Workload - contact hours - self-study</b>	Total workload: 180 h	Contact hours: 60 h / 4 CH	Self-study: 120 h							
<b>Module duration</b>	2 weeks block									
<b>Frequency of offer</b>	every two years, second year of programme cycle									
<b>Language(s) of instruction</b>	English									
<b>Forms of teaching and learning</b>	Forms of teaching: lecture, seminar, laboratory practical Forms of learning: reading course material, independent study, lecture attendance									
<b>Module content</b>	This module covers relevant aspects of medical entomology. It will provide students with knowledge about the critical role of vectors for pathogen transmission as well as applications in vector control. Students will study medically important vectors including morphological and molecular methods for species distinction, research approaches for assessing vector competency, mosquito immunity, insecticide resistance, and vector surveillance.									
<b>Qualification goals</b>	The students <ul style="list-style-type: none"> <li>• Gain knowledge of medically important vectors</li> <li>• Gain practical experience in techniques for vector collection, vector species identification and other laboratory critical methods in medical entomology</li> <li>• Gain knowledge in strategies for vector surveillance and control</li> </ul>									
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>	
	<i>Module component</i>	<i>L</i>	<i>o</i>	<i>2</i>	<i>3</i>	<i>W E</i>	<i>90</i>	<i>g</i>	<i>-</i>	
	<i>Module component</i>	<i>S</i>	<i>o</i>	<i>2</i>	<i>3</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>-</i>	
	<i>Required coursework:</i>	<i>Preparation of the subject matter prior to attendance in the lecture, oral presentation in the seminar</i>								
	<i>Module assessment:</i>	<i>Written exam at the end of the lecture course</i>								
<b>Applicability</b>	-									

<b>Prerequisites</b>	none
<b>Person responsible</b>	Wondji, Charles, Prof. Dr. (CRID, Yaoundé, Cameroon)

<b>Module code:</b> IBC303	<b>Module title:</b> Study Design/Analysis and Research Ethics		<b>Type of module:</b> compulsory						
<b>ECTS-credits</b>	6								
<b>Workload - contact hours - self-study</b>	Total workload: 180 h	Contact hours: 60 h / 4 CH	Self-study: 120 h						
<b>Module duration</b>	2 weeks block								
<b>Frequency of offer</b>	every two years, second year of programme cycle								
<b>Language(s) of instruction</b>	English								
<b>Forms of teaching and learning</b>	Forms of teaching: lecture, seminar Forms of learning: reading course material, independent study, lecture attendance								
<b>Module content</b>	<p>This module equips the students with a solid understanding of study design and analysis that will provide the foundation for devising independent applied research projects later in their careers. The development of hypotheses, endpoint definitions, sample size calculations, principles of statistical inference, and confidence interval estimation will be covered.</p> <p>They will also develop awareness of the ethical and social implications of research in infection biology. They will gain an understanding of good scientific practice and the basics of bioethics and medical ethics, as well as the social roles and responsibilities of scientists beyond their own scientific research. Students will learn the ethical principles guiding of research involving patients, volunteers and populations.</p>								
<b>Qualification goals</b>	<p>The students</p> <ul style="list-style-type: none"> <li>• have knowledge of the main types of intervention and epidemiological study designs</li> <li>• Identify the strengths and weaknesses of each study design</li> <li>• Have a basic understanding of the approaches to statistical analysis that can be used with each study designs</li> <li>• Assess whether research studies are using the most appropriate design</li> <li>• Demonstrate knowledge of devising a clear specific and testable research question</li> <li>• Understand ethical implications of research</li> </ul>								
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade</i>
	<i>Module component</i>	<i>L</i>	<i>o</i>	<i>2</i>	<i>3</i>	<i>WE</i>	<i>90</i>	<i>g</i>	<i>-</i>

	<i>Module component</i>	S	o	2	3	-	-	-	-
	<i>Required coursework:</i>	<i>Preparation of the subject matter prior to attendance in the lecture, oral presentation in the seminar</i>							
	<i>Module assessment:</i>	<i>Written exam at the end of the lecture course</i>							
<b>Applicability</b>	-								
<b>Prerequisites</b>	none								
<b>Person responsible</b>	Borrmann, Steffen, Prof. Dr.; Ntoumi, Francine, Prof. Dr.								

<b>Module code:</b> IBC304	<b>Module title:</b> Emerging Viral Diseases and One Health		<b>Type of module:</b> compulsory							
<b>ECTS-credits</b>	6									
<b>Workload - contact hours - self-study</b>	Total workload: 180 h	Contact hours: 60 h / 4 CH	Self-study: 120 h							
<b>Module duration</b>	2 weeks block									
<b>Frequency of offer</b>	every two years, second year of programme cycle									
<b>Language(s) of instruction</b>	English									
<b>Forms of teaching and learning</b>	Forms of teaching: lecture, seminar Forms of learning: reading course material, independent study, lecture attendance									
<b>Module content</b>	This module deals with emerging viruses of global relevance, details factors that contribute to emergence and re-emergence of viruses on a local and a global scale. It also covers the management of outbreaks and the importance of monitoring, surveillance and reporting to assist in reduction of transmission. Selected viruses of global health relevance will be discussed. The one-health concept will be discussed with respect to emerging viruses.									
<b>Qualification goals</b>	<p>The students</p> <ul style="list-style-type: none"> <li>• Are able to identify, define and critically compare factors influencing the emergence and re-emergence of viral infections</li> <li>• Have in-depth knowledge of the methods used for the prevention and control of emerging and re-emerging viral infections</li> <li>• Understand the one health concept and the connection between the environment and animals in human health</li> </ul>									
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>	
	<i>Module component</i>	<i>L</i>	<i>o</i>	<i>2</i>	<i>3</i>	<i>W E</i>	<i>90</i>	<i>g</i>	<i>-</i>	
	<i>Module component</i>	<i>S</i>	<i>o</i>	<i>2</i>	<i>3</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>-</i>	
	<i>Required coursework:</i>	<i>Preparation of the subject matter prior to attendance in the lecture, oral presentation in the seminar</i>								
	<i>Module assessment:</i>	<i>Written exam at the end of the lecture course</i>								

<b>Applicability</b>	-
<b>Prerequisites</b>	none
<b>Person responsible</b>	Tordo, Noël, Prof. Dr. (Institut Pasteur)

<b>Module code:</b> IBC305	<b>Module title:</b> Laboratory Rotations		<b>Type of module:</b> compulsory							
<b>ECTS-credits</b>	3									
<b>Workload</b> - contact hours - self-study	Total workload: 90 h	Contact hours: 0h	Self-study: Lab time: 30h Study time: 60 h							
<b>Module duration</b>	2 weeks block									
<b>Frequency of offer</b>	every two years, first year of programme cycle									
<b>Language(s) of instruction</b>	English, French									
<b>Forms of teaching and learning</b>	Forms of teaching: Practical laboratory course Forms of learning: the student will integrate an ongoing research in the respective laboratory and be supervised by a postdoc or an advanced doctoral student.									
<b>Module content</b>	Students will perform a 2-week attachment to specific research projects at the CERMEL. The projects include laboratory-based studies, field research and clinical trial associated activities. Tandems of 2 students will be attached to the different laboratories and projects. The project is assigned in accordance with ongoing research in the respective laboratory; 2-week attachments are concluded by a written report and by an oral presentation of the project.									
<b>Qualification goals</b>	The students <ul style="list-style-type: none"> <li>• Are exposed to ongoing research at CERMEL, often as part of large collaborative international projects in infectious diseases</li> <li>• Acquire a wide range of practical skills in state-of-the-art methods</li> <li>• Are trained in the analysis of data for scientific reports</li> <li>• Receive training necessary for writing scientific reports</li> </ul>									
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>	
	<i>Module component</i>	<i>P</i>	<i>o</i>	<i>-</i>	<i>3</i>	<i>PP</i>	<i>-</i>	<i>g</i>	<i>-</i>	
	<i>Required coursework:</i>	<i>Laboratory practical. Students will present their laboratory projects by a written report and by an oral presentation of the project</i>								
	<i>Module assessment:</i>	<i>The practical performance will be graded by the supervisor</i>								
<b>Applicability</b>	-									

<b>Prerequisites</b>	none
<b>Person responsible</b>	Borrmann, Steffen, Prof. Dr



<b>Module code:</b> IBC306	<b>Module title:</b> Effective scientific writing		<b>Type of module:</b> compulsory						
<b>ECTS-credits</b>	3								
<b>Workload - contact hours - self-study</b>	Total workload: 90 h	Contact hours: 30 h / 2 CH	Self-study: 60 h						
<b>Module duration</b>	3 <sup>rd</sup> semester (4-5 months)								
<b>Frequency of offer</b>	every two years, second year of programme cycle								
<b>Language(s) of instruction</b>	English								
<b>Forms of teaching and learning</b>	Forms of teaching: seminars, workshop Forms of learning: reading course content, writing practice								
<b>Module content</b>	This module will use a practice-based approach to help student strengthen their scientific writing skills in preparation for the write up of their M.Sc. thesis. It focuses on the structure, content, and style of scientific manuscripts, with a particular emphasis on the notion of academic integrity and intellectual property ( <i>i.e.</i> , appropriate paraphrasing, citing, and referencing). Core concepts will be covered using a combination of lectures, small-group exercises, and written essays, for which students will receive extensive personalized feedback.								
<b>Qualification goals</b>	<p>The students</p> <ul style="list-style-type: none"> <li>Recognize the essential components and writing particularities of each section of a primary research article (abstract, introduction, methods, results, discussion).</li> <li>Effectively write scientific texts (paraphrasing, flow, grammatical specificities, etc.).</li> <li>Design clear and informative figures.</li> <li>Appropriately reference scientific literature (in-text and bibliography).</li> <li>Accurately present scientific data (academic integrity).</li> </ul>								
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>
	<i>Module component</i>	-	0	2	3	-	-	ug	-
	<i>Required coursework:</i>	<i>Lecture attendance, mandatory written essays</i>							

	Module assessment:	<i>This is a "Pass/Fail course". Students will be evaluated on four individual written essays (Paraphrasing, Introduction, Results, Abstract) and must obtain a final grade of at least 60% to be granted a "Pass":</i>
<b>Applicability</b>	-	
<b>Prerequisites</b>	none	
<b>Person responsible</b>	Lapointe, Tamia, Dr.	

<b>Module code:</b> IBC401	<b>Module title:</b> Master's Thesis		<b>Type of module:</b> compulsory							
<b>ECTS-credits</b>	30									
<b>Workload - contact hours - self-study</b>	Total workload: 900 h	Contact hours: 0h	Self-study: 900 h							
<b>Module duration</b>	1 semester									
<b>Frequency of offer</b>	every two years, second year of programme cycle									
<b>Language(s) of instruction</b>	English									
<b>Forms of teaching and learning</b>	Forms of teaching: Practical laboratory work Forms of learning: the student will integrate an ongoing research in the respective laboratory and be supervised by a postdoc or an advanced doctoral student. At the end of the practical training, the student will generate a Master Thesis and defend their experimental results via oral presentation									
<b>Module content</b>	The master thesis concludes the master's degree. It consists of the implementation of a research project, the evaluation and the preparation of the results as well as the structured writing of the results. The results should contribute to scientific knowledge									
<b>Qualification goals</b>	<p>The students</p> <ul style="list-style-type: none"> <li>• Are able to familiarize themselves with the current research problem within a given time. They can increasingly apply suitable scientific methods independently and present the results in a scientifically appropriate form</li> <li>• Can independently work on a challenging scientific topic and apply their knowledge of biological methods in the process</li> <li>• Deepen their problem-solving skills and can transfer methodological knowledge</li> <li>• Are able to work in a team in an international scientific environment</li> </ul>									
<b>Requirements for obtaining credit / grading</b>	<i>Title</i>	<i>Type of course</i>	<i>Status</i>	<i>CH</i>	<i>ECTS-credits</i>	<i>Type of Exam</i>	<i>Duration</i>	<i>Grading</i>	<i>Grade weight</i>	
	<i>Master's Thesis</i>	<i>P</i>	<i>o</i>	<i>-</i>	<i>25</i>	<i>WR</i>	<i>-</i>	<i>g</i>	<i>80</i>	
	<i>Oral Exam</i>	<i>-</i>	<i>o</i>	<i>-</i>	<i>5</i>	<i>OE</i>	<i>30</i>	<i>g</i>	<i>20</i>	
	<i>Required coursework:</i>	none								
	<i>Module assessment:</i>	<i>Graded thesis and oral exam</i>								

<b>Applicability</b>	-
<b>Prerequisites</b>	Completed 60 ECTS out of the 90 ECTS total coursework
<b>Person responsible</b>	Steffen Borrmann, Prof, Dr.