

Module Manual

for the

M.Sc. Survey Statistics

04. Juli 2016

Key Skills Qualifications in the Master in Survey Statistics

The Master in Survey Statistics aims at educating the students in the subject matter, as well as in the key skills. Whilst all modules cover the key skills Communication, Application of Number and Problem solving, special focus is laid in each module group on special key skills.

Topic <i>Survey Statistics: Basics</i>	Problem formulation and formalization
Topic <i>Statistical Programming and Computer-intensive Methods</i>	Programming skills, presentations skills for scientific research poster presentations, ICT skills for preparing the presentation, interpersonal skills by working in groups, target-setting for and planning and conducting of a small research agenda
Topic <i>Survey Statistics</i>	Problem formulation and formalization, literacy and numeracy in complex data situation, interpersonal skills by working in groups, presentation skills
Topic <i>Statistics</i>	Problem formulation and formalization, literacy and numeracy in sophisticated problem settings, interpersonal skills by working in groups and finding, exploring, developing and presenting cutting edge scientific research
Topic <i>Statistics: Applications</i>	Problem formulation and formalization, cross-disciplinary transfer of scientific methodology, see also the description of imported modules
Modul <i>Research Project</i>	ICT skills for preparing the presentation, interpersonal skills by working in groups, target-setting for and planning and conducting of a large research agenda
Modul <i>Master's thesis</i>	ICT skills for preparing the presentation, target-setting for and planning and conducting of a large research agenda, self-organization, presentation of scientific research to experts and defend the work against in depth questions

Topic *Survey Statistics: Basics*

Learning Objectives / Competences

The modules gathered under the heading *Survey Statistics: Basics* aim at providing basic knowledge in Statistics, Econometrics and, in particular, Survey Statistics. Thereby, the foundation for an in-depth understanding of the contents of all subsequent courses is laid.. Students get familiarized with the specific way of thinking as well as with the central problems and topics in the field of Survey Statistics. The inclusion of numerous examples provides insight into both theoretical and practical issues, that have to be considered when dealing with problems of Survey Statistics. Furthermore, students are introduced to and trained in working with the statistical software R.

Contents

The modules deal with central elements, methods and problems of Survey Statistics. Students acquire theoretical knowledge and get familiarized with central fields of application of Survey Statistics. Furthermore, they gain insight into typical problems of practical applications. Real data applications and the implementation in R are also part of the curriculum.

Further information

All modules under this heading are mandatory.

Survey Sampling					
ID	Workload	CP	Semester	scheduled	Duration
	150	5	1	annually	1 semester
1	Courses Lecture + Tutorial <i>Survey Sampling (Bamberg/Berlin/Trier)</i>		Contact time 1.5 + 0.5 h/week (30 h)	Self-study 120 h	Course size 20 students
2	Learning Objectives The module aims at providing basic knowledge in Survey Statistics. Therewith, it lays the foundation for an in-depth understanding of the contents of all subsequent courses. Students get to know the basic stages of the sampling process, central concepts and sample selection mechanisms as well as point and variance estimators. In the course of that, both theory and practice of survey sampling are considered. Competences Students will learn to design appropriate sampling schemes, to draw samples and to assess the impact of sampling on statistical methods.				
3	Content <ul style="list-style-type: none"> • Process and basic concepts of survey sampling • Central sampling designs such as stratified sampling, cluster sampling and sampling with unequal probabilities • Design-based and model-assisted estimation methods • Both theoretical foundation and practical application of all methods considered 				
4	Type of courses Lecture and tutorial				
5	Requirements Formal: / Prerequisites: Solid knowledge of basics in descriptive and inferential statistics				
6	Assessment Written exam				
7	Requirements for CPs Passing the written exam				
8	Contact person Prof. Dr. Ralf Münnich				

Elements of statistics and econometrics					
ID	Workload	CP	Semester	scheduled	Duration
	300	10	1	annually	1 semester
1	Courses Lecture + Tutorial <i>Elements of statistics and econometrics</i>		Contact time 4+2 h/week (90 h)	Self-study 210 h	Course size 20 students
2	<p>Learning Objectives The module aims at providing basic knowledge in Statistics and Econometrics. Therewith, it lays the foundation for an in-depth understanding of the contents of all subsequent courses. The course provides a basic knowledge of mathematical statistics, which is essential for the understanding of complex statistical and econometrical methods.</p> <p>Competences Students will learn the elementary mathematical and statistical methods that are necessary for most methods in statistics and econometrics. This toolbox shall enable students to understand the proofs in empirical research and to develop proofs for own theorems in the field of statistics and econometrics.</p>				
3	<p>Inhalt</p> <ul style="list-style-type: none"> • Basic knowledge on multivariate random variables and their distribution • In-depth knowledge on properties of the multivariate normal distribution • Tools like transformation theorems, generating and characteristic functions • Important sampling distributions • Concepts of convergence • Estimation and statistical testing 				
4	<p>Type of courses Lecture and tutorial</p>				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of basics in descriptive and inferential statistics</p>				
6	<p>Assessment Written exam</p>				
7	<p>Requirements for CPs Passing the written exam</p>				
8	<p>Contact person Prof. Dr. Ralf Münnich</p>				

Topic *Statistical Programming and Computer-intensive Methods*

Learning Objectives/ Competences

The modules in the field of *statistical programming and computer-intensive methods* aim at providing in-depth skills in statistical programming and at providing basic insight into computer-intensive statistical methods. They, therewith, prepare students for research and applications in the field of statistics – tasks that nowadays require fundamental programming skills.

Content

The modules deal with statistical programming with R and with central methods of computer-intensive statistics.

Further information

The module Monte-Carlo simulation methods is mandatory.

Monte-Carlo simulation methods					
ID	Workload	CP	Semester	Scheduled	Duration
	300	10	1	annually	1 semester
1	Courses Compact one-week lecture Statistical Programming with R Lecture + Tutorial <i>Monte-Carlo methods</i>		Contact time 6 h/day (30 h) 2+1 h/week (60 h)	Self-study 210 h	Course size 20 students
2	Learning Objectives The module covers theoretical and practical aspects of simulation methods (Monte-Carlo methods), computational statistics and statistical programming with R. The compact one-week lecture Statistical Programming with R will introduce the students to the art of programming with R. The Student learns to implement standard statistical and computational methods, to visualize statistical content and to produce reusable programming code in R. Competences The lecture and tutorial on Monte-Carlo methods enables the student to plan and conduct a simulation study and to illustrate and interpret the results. Further, the presentation of research results will be trained.				
3	Content <ul style="list-style-type: none"> • Statistical Programming with R <ul style="list-style-type: none"> ○ Basic principles and central commands ○ Graphics ○ Programming style / Programming tools, e.g., git version control • Monte-Carlo methods <ul style="list-style-type: none"> ○ Generation of random numbers ○ Planning and conducting simulation studies ○ Monte-Carlo methods ○ Types of simulation studies 				
4	Type of courses Lecture and tutorial				
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics in descriptive and inferential statistics				
6	Assessment Thesis/Poster + Presentation				
7	Requirements for CPs Posterpresentation				

8	Contact person Prof. Dr. Ralf Münnich
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Topic *Survey Statistics*

Learning Objectives/ Competences

Aim of the modules gathered under the heading *Survey Statistics* is to provide an in-depth insight into methods and problems of different specific subareas of Survey Statistics. Students acquire profound methodological knowledge and are, therewith, prepared to thoroughly understand and judge statistical methods from a theoretical, as well as from a practical, point of view. Usually the implementation of the considered methods in the statistical software R is part of the course.

Content

The courses deal with specific methods and problems of Survey Statistics. The selection of topics covered is guided by the requirements that are posed by the practical process of planning, conducting and analysing a complex survey. These topics are, therewith, also subject to modern statistical research. Courses cover theoretical aspects as well as possible areas of application and the specific challenges of applying the elaborate statistical methods in practice. Selected data sets are used and the implementation in R is trained in regular computer tutorials.

Further information

All modules are semi-elective. Students can choose from the modules described on the following pages.

Weighting and calibration					
ID	Workload	CP	Semester	Scheduled	Duration
	150	5	1-3	irregularly	1 semester
1	Courses Lecture + Tutorial <i>Weighting and Calibration (Berlin)</i>		Contact time 1.5 + 0.5 h/week (30 h)	Self-Study 120 h	Course size 20 students
2	<p>Learning Objectives The courses provide in-depth methodological knowledge on sampling designs and weighting methods. Students acquire profound methodological knowledge and are, therewith, prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view. The courses also teach students how to implement the considered methods in R.</p> <p>Competences Students will be able to construct calibration weights appropriately due to different sources of survey errors and to apply them in a survey estimation context.</p>				
3	<p>Content</p> <ul style="list-style-type: none"> • Theory and practice of weighting and calibration in complex surveys • Design weights • Weighting in the case of outliers • Weighting in the case of unit-nonresponse 				
4	Type of courses Lecture and tutorial				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of basics in descriptive and inferential statistics</p>				
6	Assessment Exam or thesis				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Ralf Münnich				

Variance Estimation					
ID	Workload	CP	Semester	Scheduled	Duration
	150	5	1-3	irregularly	1 semester
1	Courses Lecture + Tutorial <i>Variance Estimation</i>		Contact time 1.5 + 0.5 h/week (30 h)	Self-Study 120 h	Course size 20 students
2	<p>Learning Objectives Aim of the module is to provide an in-depth insight to methods and problems of variance estimation in survey statistics. Students acquire profound methodological knowledge and are, therewith, prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view. The courses also teach students how to implement the considered methods in R.</p> <p>Competences Students will be enabled to assess the quality of survey estimates in complex survey designs.</p>				
3	<p>Content</p> <ul style="list-style-type: none"> • Methods of variance estimation • Linearisation (e.g. Taylor-linearisation or Woodruff-linearisation) • Resampling methods (Bootstrap, Jackknife) • Special topics <ul style="list-style-type: none"> ○ Variance estimation for measures of change ○ Variance estimation in the case of missing values 				
4	Type of courses Lecture and tutorial				
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics in descriptive and inferential statistics				
6	Assessment Oral exam or thesis				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Ralf Münnich				

Introduction to Bayes statistics					
ID	Workload	CP	Semester	Scheduled annually (winter semester)	Duration
	150	5	1-3		1 semester
1	Courses Lecture + Tutorial <i>Introduction to Bayes statistics (Bamberg)</i>		Contact time 1.5 + 0.5 h/week (30 h)	Self-Study 120 h	Course size 20 students
2	Learning Objectives The module provides an introduction to Bayesian Statistics and Empirical Bayes Methods. Competences Students will be able to apply Bayes methods in a variety of contexts.				
3	Content Introduction to Bayes-Statistics using conjugate priors and MCMC-methods.				
4	Type of courses Lecture and tutorial				
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics in descriptive and inferential statistics				
6	Assessment Exam or thesis				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Ralf Münnich				

Statistical analysis of incomplete data					
ID	Workload	CP	Semester	Scheduled annually (summer semester)	Duration
	150	5	1-3		1 semester
1	Courses Lecture + Tutorial <i>Statistical analysis of incomplete data (Bamberg)</i>		Contact time 1.5 + 0.5 h/week (30 h)	Self-Study 120 h	Course size 20 students
2	Learning Objectives The courses provide an introduction to the statistical analysis of incomplete data. They especially focus on multiple imputation methods for missing data. Competences Students will be taught how to properly handle missing values in a data set and how to derive correct estimation results from this completed data set.				
3	Content <ul style="list-style-type: none"> • Theoretical and practical aspects of methods for dealing with missing values in surveys • Mostly methods based on Bayes Statistics • Focus on multiple imputation 				
4	Type of courses Lecture and tutorial				
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics in statistics and survey statistics; Knowledge of basics in Bayes statistics				
6	Assessment Exam or thesis				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Ralf Münnich				

Panel Surveys					
ID	Workload	CP	Semester	Scheduled	Duration
	150	5	1-3	irregularly	1 semester
1	Courses Lecture + Tutorial <i>Panel Surveys (Berlin)</i>		Contact time 1.5 + 0.5 h/week (30 h)	Self-Study 120 h	Course size 20 students
2	<p>Learning Objectives The courses cover complex methods of survey sampling. With this module, students acquire methodological and practical skills to understand and deal with current research problems in panel estimation in the field of survey methodology. The methods considered are applied to the Socio-economic Panel.</p> <p>Competences Students will learn how to correctly deduce results from panel surveys under a complex survey design.</p>				
3	<p>Content</p> <ul style="list-style-type: none"> • Weighting methods for non-proportional samples • Weighting methods for dealing with missing values 				
4	<p>Type of courses Lecture and tutorial</p>				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics</p>				
6	<p>Assessment Exam or thesis</p>				
7	<p>Requirements for CPs Passing the assessment</p>				
8	<p>Contact person Prof. Dr. Ralf Münnich</p>				

Indicators of Economic and Social Statistics					
ID	Workload	CP	Semester	Scheduled	Duration
	150	5	1-3	irregularly	1 semester
1	Courses Lecture + Tutorial <i>Indicators of Economic and Social Statistics (Trier)</i>		Contact time 1.5 + 0.5 h/week (30 h)	Self-Study 120 h	Course size 20 students
2	Learning Objectives The courses cover methodological and practical aspects of important indicators of economic and social statistics. Competences Students learn to properly handle and use indicators. Further, they learn to implement respective methods in R and to visualize, present and interpret indicators.				
3	Content <ul style="list-style-type: none"> • Central economic and social indicators (price indices, measures of inequality, composite indicators...) • Theoretical aspects: Theoretical requirements, properties, mathematical foundations • Important areas of application • Implementation in R • Visualization and presentation of indicators 				
4	Type of courses Lecture and tutorial				
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics				
6	Assessment Exam or thesis				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Ralf Münnich				

Statistical Disclosure Control					
ID	Workload	CP	Semester	Scheduled	Duration
	150	5	1-3	irregularly	1 semester
1	Courses <i>Seminar Statistical Disclosure Control</i>		Contact time 1.5 + 0.5 h/week (30 h)	Self-Study 120 h	Course size 20 students
2	<p>Learning Objectives Aim of the courses is to convey an understanding of the importance and implementation of data protection.</p> <p>Competences Students get to know innovative methods of data protection and learn to implement them. They acquire the knowledge to evaluate respective methods and to judge the disclosure risk for a given data set.</p>				
3	<p>Content</p> <ul style="list-style-type: none"> • Stochastic and deterministic approaches to disclosure control for micro and macro data • Methods of information reduction and perturbative protection methods • Pre- and posttabular methods for tabular data • Comparison of methods and approaches • Case studies 				
4	Type of courses Seminar				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics</p>				
6	Assessment Exam or thesis				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Ralf Münnich				

Small Area Estimation					
ID	Workload	CP	Semester	Scheduled	Duration
	150	5	1-3	irregularly	1 semester
1	Courses Lecture + Tutorial <i>Small Area Estimation</i>		Contact time 1.5 + 0.5 h/week (30 h)	Self-Study 120 h	Course size 20 students
2	Learning Objectives The module covers theoretical and practical aspects of small area statistics. Students acquire advanced methodological knowledge and are, therewith, prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view. Competences Students will be enabled to use and implement small area estimation methods in R.				
3	Content <ul style="list-style-type: none"> • Foundations: design-based, model-based and synthetic estimators • Standard methods of small area estimation • Current developments • Implementation in R 				
4	Type of courses Lecture and tutorial				
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics				
6	Assessment Oral exam or exam or thesis				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Ralf Münnich				

Survey Econometrics					
ID	Workload	CP	Semester	Scheduled	Duration
	150	5	1-3	irregularly	1 semester
1	Courses Lecture + Tutorial <i>Survey Econometrics</i>		Contact time 1.5 + 0.5 h/week (30 h)	Self-Study 120 h	Course size 20 students
2	Learning Objectives The courses teach students how methods of survey statistics can be applied and in which situations they have to be considered when dealing with practical economic research questions.				
	Competences Students will be able to apply survey statistical methods to econometric applications.				
3	Content <ul style="list-style-type: none"> • Process of obtaining micro data for economic models/economic analyses • Consequences of the survey process for the estimation of econometric models • Application of considered methods (case studies with selected data sets) • Implementation in R 				
4	Type of courses Lecture and tutorial				
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics, basic knowledge in econometrics, survey sampling and MC-methods recommended				
6	Assessment Exam or electronic exam				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Ralf Münnich				

Modern Methods in Survey Statistics					
ID	Workload	CP	Semester	Scheduled	Duration
	150	5	1-3	irregularly	1 semester
1	Courses Lecture + Tutorial <i>Modern Methods in Survey Statistics</i>		Contact time 1.5 + 0.5 h/week (30 h)	Self-Study 120 h	Course size 20 students
2	<p>Learning Objectives The courses deal with cutting-edge methods and problems of survey statistics. They, therewith, provide up-to-date in-depth knowledge in specific, highly advanced subareas of the discipline and permit insight into topics of modern statistical research.</p> <p>Competences Students will get deeper insight into hot topics in survey statistics and learn to decide on which method to apply in a specific situation.</p>				
3	<p>Content Specific up-to-date problems and methods of survey statistics</p>				
4	<p>Type of courses Lecture and tutorial</p>				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics; Depending on the topics covered, possible further prerequisites will be communicated</p>				
6	<p>Assessment Oral exam or Exam or thesis</p>				
7	<p>Requirements for CPs Passing the assessment</p>				
8	<p>Contact person Prof. Dr. Ralf Münnich</p>				

Methods of Survey Statistics					
ID	Workload	CP	Semester	Scheduled	Duration
	150	5	1-3	irregularly	1 semester
1	Courses <i>Seminar Methods of Survey Statistics</i>		Contact time 2h/week (30 h)	Self-Study 120 h	Course size 20 students
2	<p>Learning Objectives Aim of the module is to provide an in-depth insight into cutting-edge methods and problems of survey statistics.</p> <p>Competences Students learn to autonomously acquire and present the current state of research in a specific area. Furthermore, they gain advanced methodological knowledge in a topical research field.</p>				
3	<p>Content Specific up-to-date problems and methods in selected areas of survey statistics</p>				
4	<p>Type of courses Seminar</p>				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics</p>				
6	<p>Assessment Presentation and thesis</p>				
7	<p>Requirements for CPs Passing the assessment</p>				
8	<p>Contact person Prof. Dr. Ralf Münnich</p>				

Survey Methodology					
ID	Workload	CP	Semester	Scheduled	Duration
	150	5	1-3	irregularly	1 semester
1	Courses Lecture + Tutorial		Contact time 2h/week (30 h)	Self-Study 120 h	Course size 20 students
2	<p>Learning Objectives Aim of the module is to provide relevant basic competences in survey research and methodology. It studies the associated survey data collections techniques, for example questionnaire design and other aspects of survey methodology, such as interviewer effect, nonresponse handling, and follow-up techniques.</p> <p>Competences Students will be able to handle survey methodological issues and to decide on which method to use in a specific situation.</p>				
3	<p>Content</p> <ul style="list-style-type: none"> - Cognitive and perceptual psychological basics of data collection - Questionnaire design - Different data collection forms (observation, non-reactive measuring methods, evaluations, quasi-experiments, cohort studies, etc.) - Development of different instruments for data collection - Evaluate and test questions - Handling problems like interviewer effect, nonresponse, and other 				
4	Type of courses Lecture + Tutorial				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics</p>				
6	Assessment Oral Exam or Exam or Thesis				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Johannes Kopp				

Optimization in Survey Statistics					
ID	Workload	CP	Semester	Scheduled	Duration
	150	5	1-3	irregularly	1 semester
1	Courses Lecture + Tutorial		Contact time 2h/week (30 h)	Self-Study 120 h	Course size 20 students
2	<p>Learning Objectives Modern survey statistics has a strong need for computational methods allowing for, e.g., design efficient surveys under constraints and estimation of model parameters in a high dimensional parameter space. Solutions to such problems are generally computationally complex and time demanding. Hence, mathematical optimization methods are needed to speed up computations or make them feasible at all. This course provides insights in different optimization methods used in modern survey statistics.</p> <p>Competences Students will be able to optimize computational algorithms and to decide on which method to use in a specific situation.</p>				
3	<p>Content Different up to date optimization methods in survey statistics. E.g., optimal allocation of a given sample size under constraints and machine learning algorithms.</p>				
4	<p>Type of courses Lecture and tutorial</p>				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of survey statistics and mathematics and a strong interest in optimization. Depending on the topics covered, possible further prerequisites will be communicated.</p>				
6	<p>Assessment Thesis/Poster or oral exam</p>				
7	<p>Requirements for CPs Passing the assessment</p>				
8	<p>Contact person Prof. Dr. Ralf Münnich</p>				

Use of Non-sampling Data					
ID	Workload	CP	Semester	Scheduled	Duration
	150	5	1-3	irregularly	1 semester
1	Courses Lecture + Tutorial		Contact time 2h/week (30 h)	Self-Study 120 h	Course size 20 students
2	<p>Learning Objectives The module covers theoretical and practical aspects of dealing with data not obtained via classical sampling. Since increasingly more data is acquired via non-probability sampling techniques, especially in the big data context, new methodology has to be employed. The course includes a considerable amount of exercises to convey the theoretical knowledge taught into practice.</p> <p>Competences Students will learn to use non-sampling data and to overcome the herewith linked statistical challenges.</p>				
3	<p>Content</p> <ul style="list-style-type: none"> • Data mining vs. data sampling • Determining the sampling universe • Overcoming the lack of representativity • Practical considerations for the use of non-probability samples 				
4	<p>Type of courses Lecture/Seminar</p>				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics; Depending on the topics covered, possible further prerequisites will be communicated</p>				
6	<p>Assessment Thesis/Poster or presentation or oral exam</p>				
7	<p>Requirements for CPs Passing the assessment</p>				
8	<p>Contact person Prof. Dr. Ralf Münnich</p>				

Topic *Statistics*

Learning Objectives/ Competences

Aim of the modules gathered under the heading *Statistics* is to provide an in-depth insight into methods and problems in different specific subareas of the discipline Statistics. Students acquire profound methodological knowledge and are, therewith, prepared to thoroughly understand and judge statistical methods from a theoretical, as well as from a practical, point of view. Usually the implementation of the considered methods in the statistical software R is part of the course.

Content

The courses deal with specific methods and problems of Statistics. They provide in-depth knowledge of complex methods. The selection of topics covered is guided by the current state of research in the respective area. Courses cover theoretical aspects as well as possible areas of application and the specific challenges of applying the elaborate statistical methods in practice. Selected data sets are used and the implementation in R is trained in regular computer tutorials.

Further information

All modules are semi-elective. Students can choose from the modules described on the following pages. Additionally, students can select the modules *Applied time series analysis* and *Financial Econometrics* (further information in the module guide of the MSc. Economics).

Multivariate Statistics					
ID	Workload	CP	Semester	Scheduled	Duration
	300	10	2	irregularly	1 semester
1	Courses Lecture + Tutorial <i>Multivariate Verfahren</i> Seminar		Contact time 2+1 h/week (45 h) 2 h week/ (30 h)	Self-study 225 h	Course size 20 students
2	<p>Learning Objectives Aim of the module is to provide an in-depth insight into methods and problems of multivariate statistics. Students acquire advanced methodological knowledge. The courses also teach students how to implement the considered methods in R.</p> <p>Competences Students are prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view. They learn to condense the vast amount of literature within a short thesis.</p>				
3	<p>Content</p> <ul style="list-style-type: none"> • Statistical methods for multidimensional problems • Structure detection methods (Principal component analysis, factor analysis, cluster analysis) • Tests for multivariate structure (Conjoint analysis, confirmatory factor analysis) • Graphical tools for analysing multidimensional data 				
4	<p>Type of courses Lecture and Tutorial Seminar</p>				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics</p>				
6	<p>Assessment "Prüfungsvorleistung" and thesis</p>				
7	<p>Requirements for CPs Passing the assessment</p>				
8	<p>Contact person Prof. Dr. Ralf Münnich</p>				

Statistical Modeling					
ID	Workload	CP	Semester	Scheduled	Duration
	300	10	2	irregularly	1 semester
1	Courses Lecture + Tutorial <i>Statistical Modeling</i> Seminar		Contact time 2+1 h/week (45 h) 2 h week/ (30 h)	Self-study 225 h	Course size 20 students
2	Learning Objectives Aim of the module is to provide an in-depth insight into methods and problems of statistical modelling. Students acquire advanced methodological knowledge. The courses also teach students how to implement the considered methods in R. Competences Students are prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view. Further, they learn how to write empirical or methodological articles and prepare these formally ready for submission to a journal.				
3	Content <ul style="list-style-type: none"> • Different statistical models for economic and social research problems • Generalized linear regression models • Mixed models • Robust methods • Taking account of the survey design in statistical modelling 				
4	Type of courses Lecture and Tutorial Seminar				
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics				
6	Assessment "Prüfungsvorleistung" and thesis				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Ralf Münnich				

Experimental Design					
ID	Workload	CP	Semester	Scheduled	Duration
	300	10	2	irregularly	1 semester
1	Courses Lecture + Tutorial <i>Experimental Design</i> Seminar		Contact time 2+1 h/week (45 h) 2 h week/ (30 h)	Self-study 225 h	Course size 20 students
2	Learning Objectives Aim of the module is to provide an in-depth insight into methods and problems of experimental design. Students acquire advanced methodological knowledge. The courses also teach students how to implement the considered methods in R. Competences Students are prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view.				
3	Content <ul style="list-style-type: none"> • Different designs for experimental analysis in economics and social sciences • Methodological issues and applications 				
4	Type of courses Lecture and Tutorial Seminar				
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics				
6	Assessment "Prüfungsvorleistung" and thesis				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Ralf Münnich				

Modern Methods in Statistics					
ID	Workload	CP	Semester	Scheduled	Duration
	300	10	2	irregularly	1 semester
1	Courses Lecture + Tutorial <i>Modern Methods of Statistics</i> Seminar		Contact time 2+1 h/week (45 h) 2 h week/ (30 h)	Self-study 225 h	Course size 20 students
2	<p>Learning Objectives Aim of the module is to provide an in-depth insight into cutting-edge methods and problems of statistics. Students learn to autonomously acquire and present the current state of research in a specific area. They furthermore gain advanced methodological knowledge in a topical research field.</p> <p>Competences Students are prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view.</p>				
3	<p>Content Specific up-to-date problems and methods in selected areas of statistics</p>				
4	<p>Type of courses Lecture and Tutorial Seminar</p>				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics</p>				
6	<p>Assessment "Prüfungsvorleistung" and thesis</p>				
7	<p>Requirements for CPs Passing the assessment</p>				
8	<p>Contact person Prof. Dr. Ralf Münnich</p>				

Optimization Methods in Statistics					
ID	Workload	CP	Semester	Scheduled	Duration
	300	10	2-3	irregularly	1 semester
1	Courses Lecture + Tutorial Seminar		Contact time 2+1 h/week (45 h) 2 h week/ (30 h)	Self-study 225 h	Course size 20 students
2	<p>Learning Objectives The course aims at providing insights in different optimization methods used in modern statistics. Statistical methods become more and more sophisticated. Often, closed form solutions are not easily attainable anymore. This module covers different optimizations methods and algorithms used in practice to find numerical solutions in such cases.</p> <p>Competences Students are prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view.</p>				
3	<p>Content Different up to date optimization methods in statistics used for, e.g., Support Vector Machines, and LASSO regression.</p>				
4	<p>Type of courses Lecture and Tutorial Seminar</p>				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of basic statistics and mathematics and a strong interest in optimization. Depending on the topics covered, possible further prerequisites will be communicated.</p>				
6	<p>Assessment "Prüfungsvorleistung" and Thesis/Poster</p>				
7	<p>Requirements for CPs Passing the assessment</p>				
8	<p>Contact person Prof. Dr. Ralf Münnich</p>				

Statistical Literacy					
ID	Workload	CP	Semester	Scheduled	Duration
	300	10	2-3	irregularly	1 semester
1	Courses Lecture + Tutorial Seminar		Contact time 2+1 h/week (45 h) 2 h week/ (30 h)	Self-study 225 h	Course size 20 students
2	<p>Learning Objectives/Competences</p> <p>Aim of this module is the ability to present elaborate statistical results in an appropriate and understandable manner. Students learn to process, express and visualize methods and findings of state-of-the-art research. It also aims at strengthen the ability to read and critically judge published statistical findings.</p> <p>Competences Students are prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view. They learn to condense the vast amount of literature within a short thesis.</p>				
3	<p>Content Specific up-to-date methods and visualization techniques in selected areas of statistics.</p>				
4	<p>Type of courses Lecture and Tutorial Seminar</p>				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics</p>				
6	<p>Assessment "Prüfungsvorleistung" and Thesis/Poster</p>				
7	<p>Requirements for CPs Passing the assessment</p>				
8	<p>Contact person Prof. Dr. Ralf Münnich</p>				

Topic *Statistics: Applications*

Learning Objectives/Competences

All modules under the heading Statistics: Applications are elective. They provide the opportunity to set a specific individual focus.

Content

Students can select from a range of different courses so that they can set a specific focus depending on their individual interests and carrier plans. They have the opportunity to further deepen and broaden their methodological knowledge by opting for additional modules from the topic Statistics. Alternatively, they can select courses from an area of application such as social sciences, economics or geography. Finally, there is the opportunity to specialize in methods and problems of official statistics in Europe by electing the module Official Statistics.

Further information

All modules are elective modules. Students can choose from the modules on the following pages. Alternatively, they can select a further module from the topic Statistics.

Application					
ID	Workload	CP	Semester	Scheduled	Duration
	300	10	3	irregularly	1 semester
1	Courses Miscellaneous		Contact time Depends on the courses elected	Self-study Depends on the courses elected	Course size Depends on the courses elected
2	Learning Objectives This module gives students the opportunity to set a specific focus depending on their individual interests and carrier plans. They have the opportunity to further deepen and broaden their methodological knowledge by opting for additional modules from the topic Statistics. Alternatively, they can select courses from an area of application such as social sciences, economics or geography.				
	Competences Depends on the courses elected				
3	Content Depends on the courses elected				
4	Type of courses Depends on the courses elected				
5	Requirements Depends on the courses elected				
6	Assessment Depends on the courses elected				
7	Requirements for CPs Depends on the courses elected				
8	Contact person Prof. Dr. Ralf Münnich , N.N.				

Official Statistics					
ID	Workload	CP	Semester	Scheduled	Duration
	300	10	1-3	irregularly	1 semester
1	Courses Miscellaneous		Contact time Depends on the courses elected	Self-study Depends on the courses elected	Course size Depends on the courses elected
2	Learning Objectives This module gives students the opportunity to specialize in methods and problems of official statistics in Europe. Competences Students are prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view. A deep understanding of methods used in the European statistical system and their implications in statistical institutes is aimed for.				
3	Content Import from EMOS. Focus on methods and problems of official statistics in Europe (statistical production process, ESS, methods of official statistics)				
4	Type of courses Depends on the courses elected				
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics				
6	Assesment Exam/ Oral exam in cooperation with Eurostat/ ESS				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Ralf Münnich, N.N.				

EMOS					
ID	Workload	CP	Semester	scheduled	Duration
	300	10	1	irregularly	1 semester
1	Courses Different lectures		Contact time 2 h/week or EMOS summer/spring school	Self-study 120 h	Course size
2	Learning Objectives The EMOS core module covers topics of European Official Statistics and aims at providing a broad overview on the ESS, the data production process as well as on methods for analysing the data and presenting respective results. Competences Students are prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view.				
3	Content E.g. Data Quality, Sampling Theory, Statistical Disclosure Control, Big Data, Metadata, Statistical Data Editing, National Accounts, Price indices.				
4	Type of courses Weekly lecture or EMOS summer/spring school				
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics				
6	Assessment				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Ralf Münnich, N.N.				
9	Further information Courses are provided in cooperation of the Bamberg/Berlin/Trier network and Official Statistics. The module can be substituted by an EMOS spring or summer school.				

Modul *Research Project*

Survey Statistics: Research Project					
ID	Workload	CP	Semester	Scheduled	Duration
	300	10	3	annually	1 semester
1	Courses Colloquium/Seminar		Contact time 2 h/week (30 h)	Self-study 270 h	Course size Up to 5 students
2	<p>Learning Objectives/Competences In this module, students can either participate in an existing research project or autonomously pursue and answer a specific research question in an individual project. They, therewith, gain experiences in planning and conducting statistical research.</p> <p>Competences Students practice the intensive engagement with a complex statistical problem, the implementation of respective methods in R, and the writing of a scientific thesis. Alternatively, in the EMOS context, the students are expected to conduct a research project and an internship in official statistics.</p>				
3	<p>Content The topic is chosen after consultation with the individual advisor.</p>				
4	<p>Type of courses Individual counselling, meetings in small groups, seminar, colloquium</p>				
5	<p>Requirements Formal: / Prerequisites: Solid Knowledge of basic survey statistics</p>				
6	<p>Assessment Presentation of intermediate and final results; research report</p>				
7	<p>Requirements for CPs Passing the assessment</p>				
8	<p>Contact person Prof. Dr. Ralf Münnich, N.N.</p>				
9	<p>Further information This module is mandatory.</p> <p>Upon request, the module can be substituted by an internship or by the assistance in a research project (at least 3 month). In this case the assessment is a report, which contains an adequate statistical-methodological part.</p>				

Modul *Master's thesis*

Master's thesis					
ID	Workload	CP	Semester	Scheduled	Duration
	750	30	4	Annually	1 semester
1	Courses Research Colloquium Master's thesis		Contact time 1 h week/ (15 h) 1 h week/ (15 h)	Self-study 720 h	Course size 15 students 1 student
2	Learning Objectives/Competences Writing of a scientific thesis. Presentation skills.				
3	Content The topic is chosen after consultation with the individual advisor.				
4	Lehrformen Individual counselling, colloquium				
5	Requirements Formal: Survey Statistics: Basis and Monte-Carlo-Methods plus 30CP Prerequisites: /				
6	Assessment Presentation of immediate results, thesis				
7	Requirements for CPs Passing the assessment				
8	Contact person Prof. Dr. Ralf Münnich, N.N.				
9	Further information This module is mandatory. Possibility of cooperating with a statistical institution (e.g. Eurostat, ESS).				