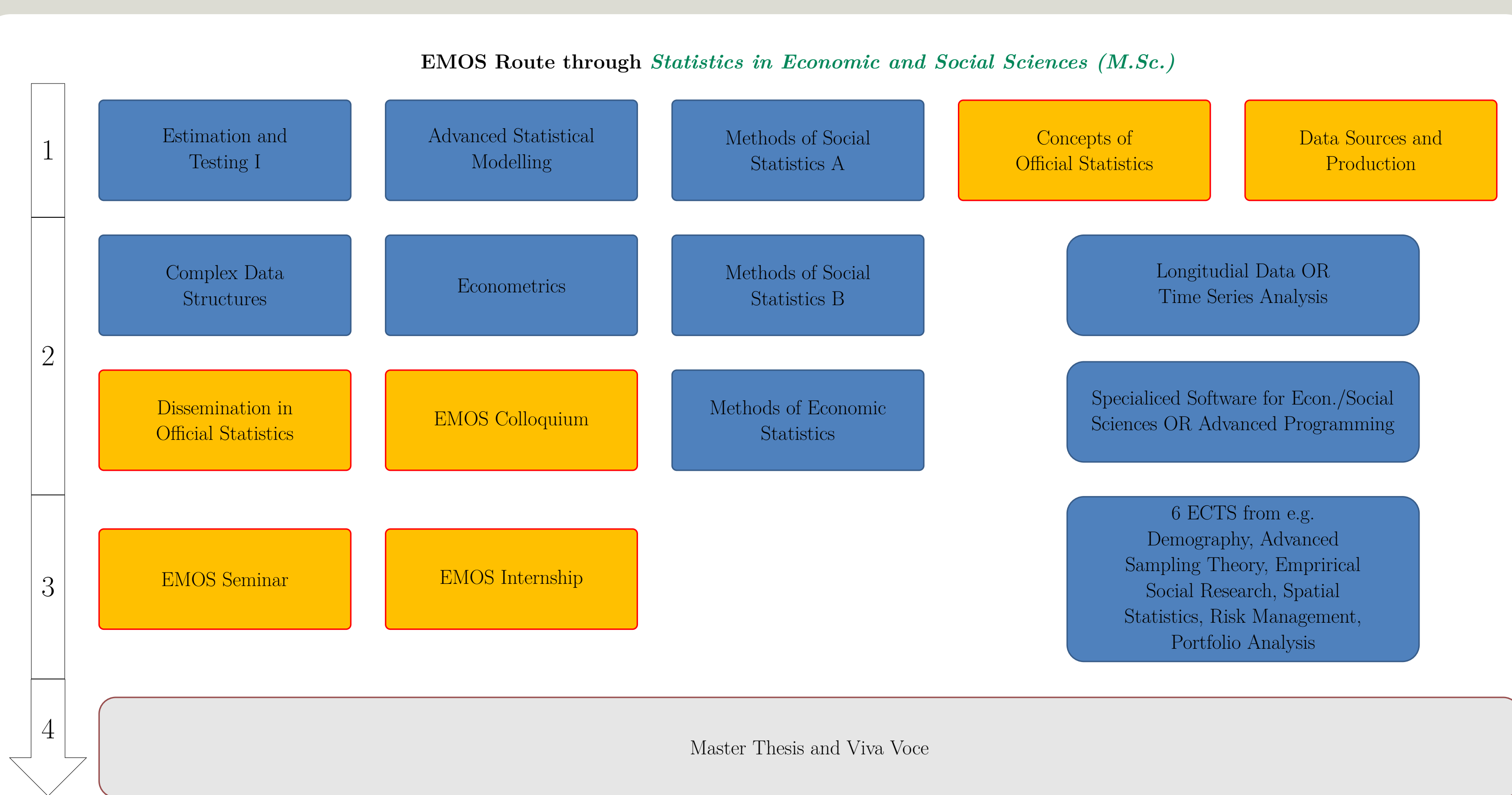


### Programme Outline

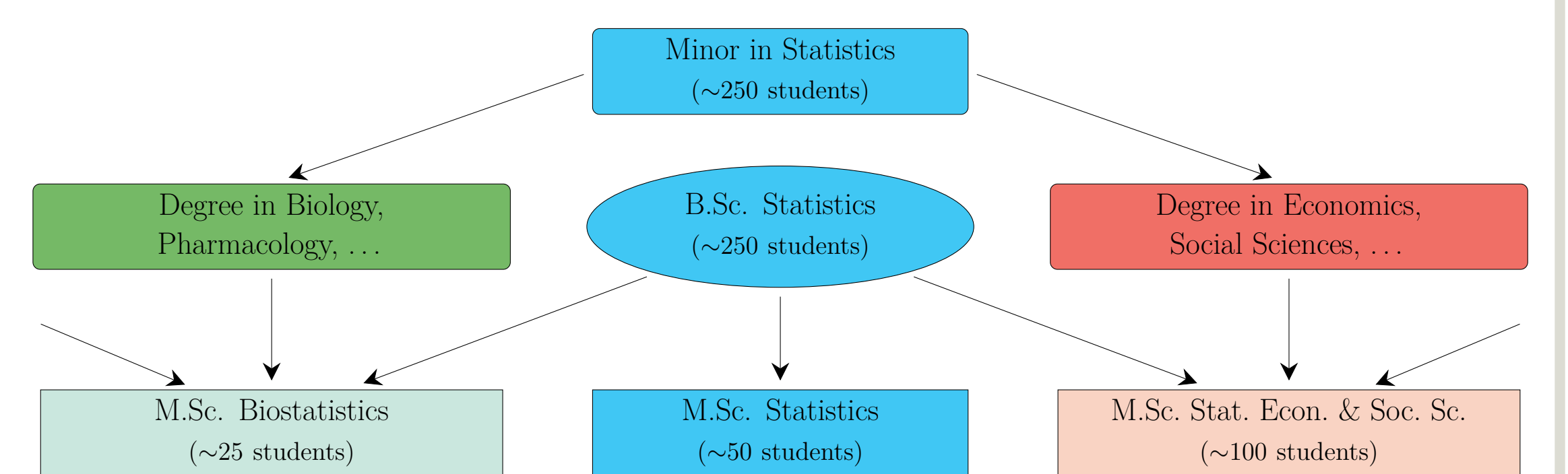


### Department of Statistics

#### Research Groups:

- Methodological Foundations of Statistics and their Applications (Prof. Dr Thomas Augustin)
- Computational Statistics (Prof. Dr Bernd Bischl)
- Biostatistics (Prof. Dr Sonja Greven)
- Methods for Missing Data, Model Selection and Model Averaging (Prof. Dr Christian Heumann)
- Applied Statistics in Social Sciences, Economics and Business (Prof. Dr Göran Kauermann)
- Statistical Consulting Unit (StaBLab) (Prof. Dr Helmut Küchenhoff)
- Financial Econometrics (Prof. Stefan Mittnik, Ph.D.)
- Bioimaging (Prof. Dr Volker Schmid)
- Applied Stochastics (N.N.)
- Data Science (N.N.)
- Planned: Social Surveys (Endowed Professorship by Institute for Employment Research)

#### Available Study Programmes:



### Overview of Courses

Name	Outcome Coverage (ECTS)	With support of	Short Description
Data Sources and Data Production	3	Department of Sociology (LMU)	The course addresses different types of surveys and study designs, from planning through data collection to data analysis. The handling of different types of data sources and a critical analysis of their quality are addressed.
Basic Methods in Social Statistics A + B	6	Institute for Employment Research	These lectures introduce and deepen selected statistical applications in the Social Sciences. Part A presents a variety of statistical techniques in the context of research problems in the Social Sciences. Further, it focuses on the design and management of data production processes and data quality monitoring including issues on data quality (e.g. missing data) and methods to handle these issues (e.g. imputation methods). Part B addresses the appropriate design and preparation of data collections as well as the acquisition of convenient paradata / metadata.
Concepts of Official Statistics	3	All partners	This course gives insight into key areas and current developments of Official Statistics. This includes basic principles of Official Statistics as well as an overview of institutions of the European Statistical System and its organisational structure. Moreover, selected information sources provided by Official Statistics and legal duties of national statistical institutes are addressed.
Dissemination in Official Statistics	3	All partners	Within this course a more detailed focus on specific international institutions (e.g. Eurostat, European Central Bank, OECD) of Official Statistics and its data sources is set. It deepens the knowledge about different sources of Official Statistics and provides the ability of presenting data in a manner appropriate for the corresponding field.
EMOS Colloquium	3		Based on an accompanying colloquium (preparing the internship and on voluntary basis during the internship), students discuss about good practice in Official Statistics. This particularly includes aspects of anonymisation and disclosure control in dissemination.
Econometrics	6		This course extends the scope of the linear regression model by addressing specific characteristics that are inherent in many economic data sets, such as dynamic structures, dependence, simultaneity, and endogeneity as well as limited endogenous variables. In particular, the following topics are covered: seemingly unrelated regressions, simultaneous systems of equations, multivariate time series analysis, and models with limited dependent variables.
Advanced Methods in Complex Data Structures	6		The course deepens methods for handling complex, especially, high dimensional data. Advanced topics of multivariate methods and techniques for dimension reduction will be discussed in detail. Techniques for variable selection and classification will be elaborated and illustrated with concrete applications.
Analysis of Longitudinal Data	6		The lecture develops central concepts and methods of the Analysis of Longitudinal Data. Important properties of the main statistical models are presented and illustrated via selected examples. Marginal and random effects models for normal distributed and discrete random variables are addressed.
Time Series Analysis	6	ifo Institute	This course shows how to model, estimate, and forecast time series. Time series comprise the most important economic data such as GDP, stock prices or interest rates. Main emphasis is placed on the classical Box-Jenkins approach and its class of ARIMA processes which are designed for linearly modelling the conditional expectation of a time series. Furthermore, the class of GARCH processes is presented.
Advanced Sampling Theory	3		In this lecture complex sampling techniques are introduced. Furthermore, a number of practical problems are discussed, which result in biased estimates. These problems include non-responder problems, selection bias and measurement error.
Spatial Statistics	6		The lecture covers stochastic processes that can be applied in the analysis of spatially aligned data. These are stationary Gaussian processes (Kriging), Markov random fields and spatial point processes.
Statistical Software in Economic and Social Science A + B	6		This course presents further applications of statistical methods using a statistical programming language like R or Matlab. At the outset, students will acquire a general and fundamental knowledge of the applied software package, as well as some of its functions specifically geared towards statistical and econometric applications. In the sequel, the versatility of using a programming language is illustrated by its implementation to some selected problems.
Methods in Economic Statistics	3	Bavarian State Office for Statistics	This course addresses the fundamental problem of Empirical Economics arising from the fact that most economic data are observations in a non-experimental setting, and highlights the impact on the analysis of causal relationships derived from economic theory. Key indicators are introduced and their importance for economic science is explained. This particularly includes operating numbers and indicators which are created by Official Statistics. Moreover, the extraction of patterns inherent to some economic data by filtering methods is considered
Financial Econometrics: Risk Management	6		This course presents the fundamental notions of financial risks such as market, credit and operational risks. In particular, it introduces methods from the field of statistics and financial econometrics which are used for measurement and modelling of risks.
Empirical Social Research	3		The lecture deepens fundamental aspects of social research from a statistical perspective. It starts by expounding the problems of the operationalization of complex constructs. Then central methods and concepts from the theory of measurement and testing are discussed. Finally techniques to handle measurement error and missing data are introduced.
Advanced Programming	3		The course presents advanced methods of data analysis and programming using statistical software. This includes efficient software usage, more complex methods of data transformation, import of data in irregular format, basic principles of data visualisation, conditional and interactive graphics and implementation using object-oriented programming methods. Final topics are version management, software publication, and quality assurance.
Financial Econometrics: Portfolio Analysis	6		This course covers the econometrics of modern portfolio analysis. Starting from the classical approach to portfolio optimisation due to Markowitz, its estimation and problems in situations where a large number of stocks is involved are discussed, as well as alternative approaches based on index models to reduce the dimensionality. Finally, the CAPM is presented as an equilibrium model of capital markets, along with methods for estimation and testing.
Demography	6	MPI for Demographic Research	The lecture introduces in the first part the basic concepts to analyse structure and dynamics of empirical populations. Then different population models are characterized and compared to real populations.
Consulting	3	All partners	In this module the cooperation with practitioners is improved by practical collaborative project work. The main issues are the adequate choice of statistical methods, data analysis, and the presentation of statistical results.
EMOS Seminar	3	All partners	Specific research areas of Official Statistics as well as selected issues especially occurring in the context of Official Statistics are examined more extensively. This includes special sampling methods, small area estimation, non-response adjustments, imputation techniques and data editing and integration, metadata management and data archiving. Furthermore, legal aspects of confidential issues and business architecture of Official Statistics are covered.
Master Thesis and Viva Voce	12	All partners	The students show that they have proficient knowledge in the area of Economic and Social Statistics enabling them to conduct and present autonomous research based on scientific principles in the field of Official Statistics

Colours indicate a learning outcome: System of official stat (red), Production models/methods (blue), Specific themes (green), Statistical Methods (purple), Dissemination (orange)