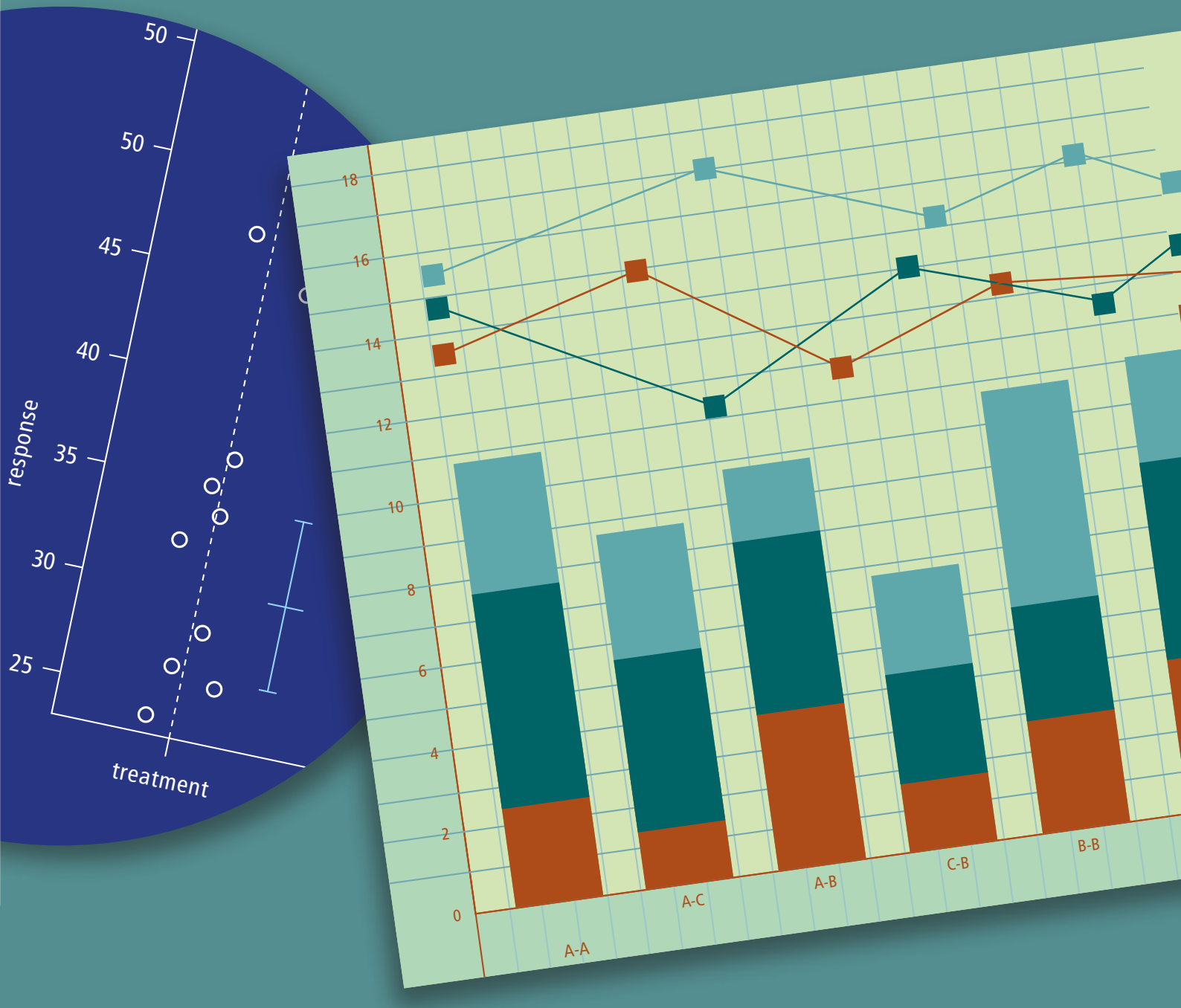
Cursussen Statistiek

Courses in Statistics

Permanente Vorming in de wetenschappen – Continuing Education in Science



UNIVERSITEIT GENT

2013-2014

Inhoud / Contents

Faculty of Sciences

Center for Statistics
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Institute for Continuing Education in Science

Instituut voor Permanente Vorming in de Wetenschappen

Our courses are also listed under www.flames-statistics.eu

Deze reeks omvat cursussen die zijn opgenomen in de Doctoral Schools programma's.

This series encompasses courses that are included in the Doctoral Schools programs.

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Introduction

The power of data and the information contained within them is entering the heart of almost any section of society. One is discovering that processes can be better understood, predictions made, causal effects estimated and decisions optimized. All this is within reach once studies have been appropriately designed, data carefully gathered and well analyzed to come to useful conclusions with well understood error margins. As with any sharp instrument, statistics can also be misused - at one's peril. Good statistical practice is a key component of scientific integrity that can generate better quality as well as cost-efficiency. Scientists and professionals from a range of fields add tremendously to their market value, once data analytic skills join their subject matter expertise.

To prepare professionals for 'big data' in tomorrow's job market and allow them to face the facts with the necessary statistical skills, the Ghent Center for Statistics together with the Institute for Continuing Education of the Faculty of Sciences (ICES) organizes their yearly series of targeted training modules. The goal is to provide insight in the basics of statistical research and develop the technical skills to come to results using statistical software. Thanks to blended learning, with hands-on sessions on PC's or laptops, participants gain firsthand experience in applying the newly learned knowledge. Our courses target professionals and participants with an academic training, who wish to refresh their knowledge, keep it up to date or discover new areas of research. The program has a modular architecture to facilitate flexible entry and training trajectories.

The Flemish Community recognizes the value of lifelong learning for the region's economic development. Employers are granted financial support through the government's introduction of the KMO-portfolio. More about this stimulating initiative can be found on the website: www.kmo-portefeuille.be (in Dutch).

Doctoral Schools support young researchers in acquiring the necessary skills. Several modules can, under certain conditions, be incorporated in the program of the Doctoral Schools (see page 16).

From November 2013 to April 2014, the program offers a classic series of basic modules which gradually build up statistical knowledge and techniques. Prior to this, from October 2013, three courses introduce the statistical software SPSS, SAS and R, two commercial and a freeware package, respectively. Every year, the program offers an additional number of more specialized courses: 'Applied Longitudinal Analysis', starts in February 2014, 'Multilevel Analysis for Grouped and Longitudinal Data' and 'Survey Analysis' kick off in April 2014, and 'Nonparametric Methods' in May 2014. With exception of Module 2, all modules are taught in English to give international candidates the opportunity to participate. Classes take place in a pleasant atmosphere with ample opportunity to interact with the lecturers.

More information about additional short courses will be posted on our website or can be requested through use of the form on page 19 of this brochure.

For more information on complementary statistical training and consulting services at Ghent University visit the website of the Ghent Center for Statistics, www.cvstat.ugent.be or page 4 of this brochure.

Hoping the new program meets your expectations, we look forward to meeting you and wish you an enjoyable and productive learning experience!

Professor Els Goetghebeur
Director ICES

Additional training and consulting services at Ghent University

Training

FLAMES

Flames, Flanders training network in Methodology and Statistics (www.flames-statistics.eu) is an interuniversity initiative providing further training to young researchers in Ghent and beyond.

One year Master in Statistical Data Analysis

The UGent advanced Master's program in Statistical Data Analysis leads to a dedicated degree following more intensive training in the methods of practical statistics offered to scientists in diverse areas.

Consulting

Stat-Gent CRESCENDO

Stat-Gent CRESCENDO unites statistical expert knowledge of the Ghent University Center for Statistics aiming to support applied research. It provides consulting services in collaboration with companies, government and other research groups.

We offer an operational framework for statistics and data analysis contract work, in flexible formats including data analysis projects, customized training and software solutions. Data analysis projects add maximum value when the statistical method is integrated in the complete trajectory from objective setting to report writing. We therefore strive for stable and sustained relationships with our partners in mutually rewarding research collaborations.

High-quality work is delivered by well-trained and dedicated statistical consultants, under guidance and supervision of UGent statistics professors.

Stat-Gent has expertise in a broad range of applications, such as (but not limited to)

- design and analysis of clinical trials,
- health economics, epidemiology, electronic health records, quality of care, drug compliance, and evidence-based medicine.
- business analytics
- biotech and agriculture,
- statistical genetics/genomics: biomarkers, micro-arrays, qPCR, next-generation sequencing.

We use a wide variety of statistical methods going from basic regression, analysis of variance, mixed models and multivariate techniques, to more specific methods in causal analysis, data mining, functional data analysis, experimental design, longitudinal analysis, missing data, multiple testing, robust and non-parametric statistics and survival analysis.

Do not hesitate to contact us with questions or for more information at statgent@ugent.be.

FIRE

The FIRE (Fostering Innovative Research based on Evidence) statistical consulting service offers statistical and methodological support for UGent doctoral students and post-docs during their scientific research. Personalized advice and help is provided during all phases of the research including study design, data collection, statistical analysis, and interpretation and reporting of results.

Book your FIRE consulting slot by filling out the application form at www.cvstat.ugent.be/FIRE or, contact us at fire@ugent.be for more information.

MODULE 1

Introduction to R

Kristof De Beuf
(Stat-Gent CRESCENDO – FIRE Statistical Consulting, UGent)

Course description

R is an environment for statistical computing and graphics, which is becoming increasingly popular as a tool to get insight in often complex data. While somewhat similar to other programming languages (such as C, Java and Perl), R is particularly suited for data analysis because ready-made functions are available for a wide variety of statistical (classical statistical tests, linear and nonlinear modeling, time-series analysis, classification, clustering, ...) and graphical techniques. The base R program can be extended with user-submitted packages, which means new techniques are often implemented in R prior to being available in other software. This is one of the reasons why R is becoming the de facto standard in certain fields such as bioinformatics (Bioconductor) and financial services.

This course introduces the use of the R environment for the implementation of data management, data exploration, basic statistical analysis and automation of procedures.

The course starts with a description of the R GUI, the use of the command line and an overview of basic data structures. The application of standard procedures to import data or to export results to external files will be illustrated. Creation of new variables, subsetting, merging and stacking of data sets will be covered in the data management section. Exploration of the data by histograms, box plots, scatter plots, summary numbers, correlation coefficients and cross-tabulations will be performed. Simple statistical procedures that will be covered are: comparison of observed group means (t-test, ANOVA and their nonparametric versions) and proportions, test for independence in 2-way cross tables and linear regression (focusing on the implementation in R of the statistical methods that are the subject of other modules of the statistics course). Finally, installing new packages and automation of analysis procedures will also be discussed.

Practical sessions and specific exercises will be provided to allow participants to practice their R skills in interaction with the teacher.

Dates and venue

October 1, 3, 15 and 17, 2013 from 5.30 pm to 9 pm, at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

This course targets participants with little to no R-programming experience who wish to start using R for their data manipulation, data exploration or statistical analysis.

Course prerequisites

The course is open to all interested persons. Knowledge of basic statistical concepts and experience with other programming languages are considered advantages, but not required for learning the R language.

Course material

Copies of lecture notes. The presented material is the result of an UA-UGent collaboration in the context of Flames.

Fees

Reduced prices apply to students and participants of non-profit and public services. These prices are available at the ICES website. The registration fee amounts to 325 EUR for participants of the private sector.

MODULE 2

Inleiding tot SPSS

Kris Erauw
(UGent)

Beschrijving

We leven in een kennismaatschappij. Heel veel mensen verzamelen gegevens of willen bepaalde ideeën met onderzoeksbevindingen ondersteunen. Denk aan de jongeren in een stedelijke jeugdraad die in hun jeugdwerkbeleidsplan de geformuleerde beleidslijnen moeten ondersteunen met onderzoeksbevindingen; of aan de voorzitter van een oudercomité die de standpunten van ouders op een wetenschappelijk verantwoorde manier wil bevragen. Het inzamelen en opslaan van al die gegevens is vaak niet zo evident als het lijkt. Zeker niet als het de bedoeling is de gegevens later op een professionele manier te verwerken.
Deze lessenreeks is er op gericht data in een bruikbare vorm te verzamelen, de ingezamelde data in SPSS op te slaan en met SPSS de eerste beschrijvende statistieken te produceren.
De verschillende lessen in de reeks zijn ervaringsgericht opgevat. De deelnemers worden met een aantal problemen geconfronteerd waarna mogelijke oplossingen besproken en gedemonstreerd worden.

Les 1
Data en dataverzameling: data in SPSS invoeren en definiëren, data uit andere programma's importeren en gebruiken.

Les 2
Elementaire bewerkingen: samenvattende statistieken en voorstellingen genereren, variabelen herschrijven en combineren, databestanden bewerken en combineren.

Les 3
Gemiddelden vergelijken: grafische voorstelling van gemiddelden, t-toetsen en one-way variantie-analyse.

Les 4
Meer uit je databestand halen: de eerste stappen in lineaire regressie.

Data

7, 8, 10 en 11 oktober 2013 telkens van 17u tot 20u.

Plaats

pc-klas 1 van de Faculteit Psychologische en Pedagogische Wetenschappen, Henri Dunantlaan 1, Gent.

Doelpubliek

Deze practica zijn gericht op alle personen die gegevens inzamelen en/of opslaan, met de bedoeling deze statistisch te analyseren en te interpreteren.

Toelatingsvoorwaarden

Geen.

Lesmateriaal

Oefeningenbundel.

Prijs

Gereduceerde prijzen gelden voor studenten en personeel in de non-profit- en overheidssector. Deze vindt u op de IPVW-website. De deelnameprijs bedraagt 325 EUR voor deelnemers uit de private sector.

MODULE 3

Introduction to SAS

Kristof De Beuf
(Stat-Gent CRESCENDO – FIRE Statistical Consulting, UGent)

Course description

The amount of data collected and stored in industry as well as society grows exponentially. Data collections range in size from small datasets as seen in preclinical trials to high-dimensional data gathered in data warehouses. Raw data are typically not suitable for immediate analysis. They may be noisy, stored across different tables or require transformation before richer information is readily extracted. Hence, the first task typically involves manipulation of the data: combining tables, selecting relevant data, addressing missing values, modifying and creating variables. Once an adequate analysis dataset is obtained, it becomes possible to apply subsequent statistical analysis techniques (to implement for instance linear regression or survival analysis).

This course aims to empower participants to manipulate data by learning the SAS programming language. SAS offers a unique combination of a complete set of database capabilities, advanced statistical techniques and a powerful programming language. Compared to the interactive SAS Enterprise Guide, using the SAS syntax directly allows total control of data manipulation, more flexibility to define model parameters and easier replication of analyses. In addition to data manipulation, we will illustrate by hands-on practice how you can use SAS statistical procedures to subsequently analyze/model your data. Upon finishing this course, you should have a solid foundation for performing data manipulation and basic statistical analyses using the SAS programming language.

Dates and venue

October 22, 24, 29 and 31, 2013 from 5.30 pm to 9 pm, at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

This course will benefit participants from diverse backgrounds, ranging from investigators working with clinical trial data to data analysts working on high-dimensional data stored in data warehouses. It is suited for those who have not used SAS or any other statistical software before, but equally for those who have already worked with SAS but want a better understanding of the capabilities of the SAS programming language.

Course prerequisites

The course is open to all interested persons. Knowledge of basic statistical concepts is considered an advantage, but not required for learning the SAS programming language.

Course material

Copies of lecture notes.
The course is based on the programming manual: "The Little SAS Book: A Primer", L. D. Delwiche and S. J. Slaughter (2012), 5th ed., ISBN 9781612903439.
If you don't already own this book it is highly recommended to order a copy.

Fees

Reduced prices apply to students and participants of non-profit and public services. These prices are available at the ICES website. The registration fee amounts to 325 EUR for participants of the private sector.
The book can be bought at the additional cost of 50 EUR. Please indicate this clearly on the registration form.

MODULE 4

Introductory Statistics. Basics of Statistical Inference

Els Adriaens
(Adriaens Consulting bvba)

Course description

This course aims to provide insight into basic statistical concepts with emphasis on practical applications. Mathematical formulae will be kept to a minimum. The theory and the methods of analysis will be extensively illustrated with examples relating to a wide variety of different fields.

We start with concise graphical and numerical descriptions of data obtained from observational or experimental studies. The most common and frequently used probability distributions of discrete and continuous variables will be presented. Statistical inference draws conclusions about a population based on sampled data. Chance variations are taken into account such that a level of confidence is attached to these conclusions. We present the reasoning behind significance tests for the comparison of observed data with a hypothesis, the validity of which we want to assess. We apply this procedure to data obtained either from one or from two populations. The correct use of the t-test will be discussed. Nonparametric methods are considered as a possible alternative in case the requirements of the t-test are not met. We cover the basic concepts of hypothesis testing for categorical data, including the chi-square test. Quite often the relationship between two variables, where the outcome of one variable is seen as depending on the value of the other, is the focus of scientific interest. We will give an introduction to linear regression analysis, where a regression line based on observations obtained in a sample describes this relation.

Dates and venue

November 5, 12, 19 and 26, December 3, 10 and 17, 2013 from 5.30 pm till 9.30 pm (each lecture is followed by a hands-on practical session) at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

This course will benefit investigators from diverse areas, research scientists, clinical research associates, and, in general, anyone who comes in contact with data handling and who wants to acquire insight into basic statistical methods or who feels that his/her knowledge and practice of statistics needs refreshing.

Exam

Participants can, if they wish, take part in an exam. A certificate from Ghent University will be issued to participants with a university degree at the bachelors level or an equivalent degree upon succeeding in this test. As such this course can be incorporated in a doctoral training program.

Course prerequisites

The course is open to all interested persons. No extensive background in mathematics is required.

Course material

Copies of lecture notes.
Recommended handbooks are:
Book 1: "Fundamentals of Biostatistics", B. Rosner, 7th ed. (2010), Thomson Brooks/Cole, ISBN 978-0538735896. The examples used in this book are restricted to the field of bioscience. The book is therefore recommended if you have a background in a related research area, such as (veterinary) medicine, biotechnology, biology, pharmacy, a.s.o.
Book 2: "Introduction to the Practice of Statistics", D.S. Moore, G.P. McCabe and B. Craig, 7th ed. (2010), W.H. Freeman, ISBN 978-1429240321. This book uses examples from a wide range of research areas and is therefore recommended if you have no background in the research areas mentioned for book 1.

Fees

Reduced prices apply to students and participants of the non-profit and public sector. These prices are available at the ICES website. The registration fee amounts to 800 EUR for participants of the private sector. Both books are optional and can be bought at the additional cost of 75 EUR per book. Please indicate this clearly on the registration form.
The examination fee is 30 EUR.

MODULE 5

Analysis of Variance

Ella Roelant
(KaHo Sint-Lieven - StatUA)

Course description

Analysis of variance (ANOVA) is a statistical tool used in the comparison of means of a random variable in populations that differ in a characteristic (factor), e.g. treatment, age, sex, subject, etc. First, we cover one-way ANOVA, where only one factor is of concern. Depending on the type of the factor, the conclusions pertain to just those factor levels included in the study (fixed factor model), or the conclusions extend to a population of factor levels of which the levels in the study are a sample (random effects model). In two-way and multi-way ANOVA (populations differ in more than one characteristic), the effects of factors are studied simultaneously to obtain information about the main effects of each of the factors as well as about any special joint effects (factorial design). In nested designs, where each level of a second factor (mostly a random factor) occurs in conjunction with only one level of the first factor, analysis of variance enables us to extract the variability induced by the nested factor from the effects of the main factor. For correct analysis of the data in multi-way ANOVA, not only the linear model and the type of factor have to be considered but, also, the assumptions that must be satisfied.

In this course we will focus on correct execution of data analysis and understanding the results of this analysis. We will provide insight into the conclusions and pay attention to expressing these conclusions in a correct and understandable way. The different methods will be extensively illustrated with examples from scientific studies in a variety of fields.

Dates and venue

January 8, 15, 22 and 29, February 5, 12 and 19, 2014, from 5.30 pm to 9.30 pm (each lecture, except on January 8, is followed by a hands-on practical session) at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

This course will benefit investigators from a diversity of areas, who need to use statistical methods in the collection and handling of data in their research, in particular for assessing the effect of e.g. different treatments.

Exam

Participants can, if they wish, take part in an exam. A certificate from Ghent University will be issued to participants with a university degree at the bachelor level or an equivalent degree upon succeeding in this test. As such this course can be incorporated in a doctoral training program.

Course prerequisites

Participants are expected to have an active knowledge of the basic principles underlying statistical strategies, at a level equivalent to the "Introductory Statistics" course of this program. In the first session, on January 8, 2014, these principles will be briefly reviewed. This review session is open to interested participants of subsequent modules. Participants who have recently followed the introductory course are exempt from that first session.

Course material

Recommended handbook: "Applied Linear Statistical Models", M.H. Kutner, C.J. Nachtsheim, J. Neter and W. Li, 5th ed. (2004), McGraw-Hill, ISBN 978-0071122214.

Fees

Reduced prices apply to students and participants of non-profit and public services. These prices are available at the ICES website. The registration fee amounts to 800 EUR for participants of the private sector.
The book is optional and can be bought at the additional cost of 65 EUR. Please indicate this clearly on the registration form.
The examination fee is 30 EUR.

MODULE 6

Applied Longitudinal Analysis

Stijn Vansteelandt
(UGent)

Course description

Longitudinal studies, employing repeated measurement of subjects over time, play a prominent role in the biomedical and pharmaceutical sciences. They provide valuable insights into both the development and persistence of disease and those factors that can alter the course of disease development. In this course, we will offer a systematic presentation of modern methods for the analysis of such studies, with an emphasis on practical applications in biomedical research.

The course will begin with a discussion of the usefulness of longitudinal studies over cross-sectional studies and the limitations of standard regression methods for analyzing longitudinal studies. The course will then cover the general linear mixed model for the analysis of continuous responses. A wide range of examples drawn from real-world studies will be used to illustrate the methods for estimating models in SAS and R and for interpreting model coefficients. The regression modeling will cover model building for the mean and covariance structure to choose parsimonious models, predictions of patient-specific profiles and verification of goodness-of-fit of the model.
In the final lecture, we will briefly discuss specialized topics, including the problem of missing data in longitudinal studies, adjustment for baseline responses and evaluation of the effect of time-varying exposures.

All methods will be illustrated with annotated computer output from SAS and R. Hands-on computer sessions will help practice the principles to which one is exposed in this course.

This course will be supplemented with an optional module on the analysis of repeated binary outcomes. After a brief recapitulation of logistic regression modeling, this part of the course will offer an introduction to logistic mixed effect models, and to marginal logistic regression models and the generalized estimating equations method.

Dates and venue

February 27, March 6, 13, 20 and 27, April 3, 2014 from 5.30 pm to 9 pm at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent. The optional module will take place on April 24, May 8 and 15, 2014.

Target audience

This course will benefit medical investigators, research scientists, clinical research associates, … who need to use statistical methods for analyzing data that are collected over time, in particular for assessing the effect of different treatments on the evolution in (health) outcomes over time.

Exam

Participants can, if they wish, take part in an exam. A certificate from Ghent University will be issued to participants with a university degree at the bachelor level or an equivalent degree upon succeeding on this test. As such this course can be incorporated in a doctoral training program.

Course prerequisites

Participants are expected to be familiar with the basic principles of statistical inference and of linear regression analysis.

Course material

Copies of lecture notes.
Recommended handbook: “Applied Longitudinal Analysis”, G.M. Fitzmaurice, N.M. Laird and J.H. Ware, 2nd ed. (2011), John Wiley and Sons, ISBN 978-0470380277.

Fees

Reduced prices apply to students and participants of non-profit and public services. These prices are available at the ICES website. The registration fee amounts to 800 EUR for participants of the private sector (+400 EUR for the optional module). Ways to register for the optional module will be communicated once enrolled for this module.
The book is optional and can be bought at the additional cost of 105 EUR. Please indicate this clearly on the registration form. The examination fee is 30 EUR.

MODULE 7

Applied Linear Regression

Kristof Vansteelandt
(FIRE Statistical Consulting, UGent)

Course description

Linear regression addresses how a continuous dependent variable is affected by one or more continuous predictors. The fact that many practical problems deal with continuous variables (e.g. income, blood pressure, temperature, affect) makes linear regression a popular tool, and most of us will be familiar with the concept of drawing a line through a cloud of data points.

The first two sessions of this module introduce the conceptual framework of this method using the simple case of a single predictor. Formulas and technicalities are kept to a minimum and the main focus will be on interpretation of results and assessing model validity. This includes confidence statements on the predictor effect (hypothesis tests and confidence intervals), using the regression model to predict future results, and verification of model assumptions.

In session 3 and 4 the conceptual framework will be expanded to accommodate more than one predictor leading to the multiple linear regression model. How to deal with these complex models in general and how to come to the most simple model starting from a large number of predictors will be discussed in detail. In these complex linear models special attention will be given to interpreting individual predictor effects, as these can be complicated by underlying relations between predictors (confounding).

In the last session a real world data example will be discussed at length and will be used to illustrate concepts from the previous sessions. Finally, we will briefly touch on problems where the linear regression model is not appropriate and needs to be replaced by related approaches such as generalized linear models and mixed models. Different aspects will be illustrated with case examples from the instructors practical experience, and students are encouraged to bring examples from their work.

Exercises on PC are made with the SPSS software. If preferred, participants can use SAS or R.

Dates and venue

March 4, 11, 18 and 25, April 1, 2014 from 5.30 pm to 9.30 pm (each lecture is followed by a hands-on practical session) at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

Participants can, if they wish, take part in an exam. A certificate from Ghent University will be issued to participants with a university degree at the bachelor level or an equivalent degree upon succeeding in this test. As such this course can be incorporated in a doctoral training program.

Course prerequisites

Participants are expected to have an active knowledge of the basic principles underlying statistical strategies, at a level equivalent to the "Introductory Statistics" course of this program. In the first session of Module 5, "Analysis of Variance", on January 8, 2014, these principles will be briefly reviewed. This session is free and open to interested participants of this year's program.

Course material

Copies of lecture notes.
Recommended handbook: "Applied Linear Statistical Models", M.H. Kutner, C.J. Nachtsheim, J. Neter and W. Li, 5th ed. (2004), McGraw-Hill, ISBN 978-0071122214. Please note that this is the same book as recommended for Module 5 'Analysis of Variance'.

Fees

Reduced prices apply to students and participants of non-profit and public services. These prices are available at the ICES website. The registration fee amounts to 800 EUR for participants of the private sector.
The book is optional and can be bought at the additional cost of 65 EUR. Please indicate this clearly on the registration form.
The examination fee is 30 EUR.

MODULE 8

Multilevel Analysis for Grouped and Longitudinal Data

Leoniek Wijngaards-de Meij
(University of Utrecht, NL)

Course description

Social research often concerns relationships between individuals and the social contexts to which they belong. Individuals and their social contexts can be conceptualized as a hierarchical structure, with individuals nested within groups. Classical examples are educational research, with pupils nested within schools, and cross-national research, with individuals nested within their national units. Such systems can be observed at two levels, and as a result we have data with group level variables and individual level variables. To analyze such hierarchical structures, we need multilevel modeling, which allows us to study the relationships between variables observed at different levels in the hierarchical structure.

Multilevel modeling can also be used to analyze data from longitudinal research, by viewing measurement occasions as being nested within respondents. This has several advantages compared to more classical approaches to longitudinal data. In addition, multilevel models have been generalized to cover situations where data do not have a simple multilevel structure, such as cross-classified data or multiple-membership models.

This short course is intended as a basic and nontechnical introduction to multilevel analysis. It starts with a description of some examples, and shows why multilevel models are necessary if the data have a hierarchical structure. It then covers the basic theory of two- and three-level models. Next it explains how multilevel models can be applied to analyzing longitudinal data, and why and when this may be an attractive analysis approach, as compared to more classical analysis methods such as multivariate analysis of variance (Manova).

The course includes three computer labs, where multigroup and longitudinal data are analyzed. The computer labs in the course use the multilevel program HLM and the SPSS Mixed procedure, which is available in SPSS starting with version 11.5.

Dates and venue

April 9, 10 and 11, 2014, from 9 am till 4 pm at the Faculty of Psychology and Educational Sciences, Dunantlaan 1, Ghent.

Target audience

This course will not only benefit applied researchers in the behavioral and social sciences, but whoever deals with data with a hierarchical or multilevel structure.

Exam

Participants can, if they wish, take part in an exam. A certificate from Ghent University will be issued to participants with a university degree at the bachelor level or an equivalent degree upon succeeding in this test. As such this course can be incorporated in a doctoral training program.

Course prerequisites

The course assumes reasonable familiarity with analysis of variance and multiple regression analysis, but prior knowledge of multilevel modeling is not assumed.

Course material

Copies of course notes.
The course is based on: "Multilevel Analysis. Techniques and Applications", J.J. Hox (2010), 2nd ed., New York: Routledge, ISBN 978-1848728462.

Fees

Reduced prices apply to students and participants of non-profit and public services. These prices are available at the ICES website. The registration fee amounts to 900 EUR for participants of the private sector.
The book is optional and can be bought at the additional cost of 45 EUR. Please indicate this clearly on the registration form.
The examination fee is 30 EUR.

MODULE 9

Survey Analysis

Daniel Oberski
(Tilburg University, NL)

Course description

In September 2011, the BBC News website celebrated the UK Office of National Statistics' 70-year anniversary by running a story on surveys. Online readers commenting on stories, launched a range of pertinent questions: on the selection of respondents ("How come I've never been asked?"), on the wording of questions and answers, on the variability of answers within (depending on the mood) and between people, on the truthfulness of given answers… This course aims to make you familiar with the approach of survey methodologists to these types of questions. On the first day, we will discuss "representation errors", on the second, "measurement errors" and throughout the 2.5 days participants will work on a small project in survey analysis, which is presented on the final day.

Representation of a population can be achieved by probability sampling. The probability of including a specific unit need not be identical across the sample: stratified, clustered, and other unequal probability samples are, in fact, more common than simple random samples. Ignoring such "complex" sampling designs can seriously bias parameter estimates and their standard errors. Day one of the course therefore studies the effect of complex sampling on estimates and explains how they can be handled in applied data analysis. Nonresponse effects form a particularly tricky issue which require additional assumptions and models: the theory behind them is given as a separate topic.

Measurement concerns the extent to which obtained numbers correspond to the true values of interest. For example, when assessing drug compliance, asking 'how often people visited a doctor in the past year' may suffer from imperfect recall and the desire to give a pleasing answer, so that the answers are not perfectly reliable. On day two of the course, we will practice accounting for validity and reliability when designing survey questions. We will further study how validity and reliability of survey questions can be evaluated in practice, and consider additional complications that may arise from comparing groups such as countries or different language speakers.

In summary, these two and a half days will give participants an overview of issues arising when designing and analyzing surveys, and will offer some hands on experience running related analyses. We will be pointing towards further reading in books, software, and other resources.

Dates and venue

April 16, 17 and 18, 2014, from 10 am to 1 pm and from 2 pm to 5 pm, at the Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

(Post)graduates and practitioners who wish to analyze complex surveys, to design a survey, or to acquire practice with general topics in the field survey methodology.

Exam

Participants can, if they wish, receive a grade for their project presentation and the work behind it. A certificate from Ghent University will be issued to participants with a university degree at the bachelor level or an equivalent degree upon succeeding on this test. As such this course can be incorporated in a doctoral training program.

Course prerequisites

Participants are expected to be familiar with basic data analysis methods, and to show personal initiative in the class exercises. They can bring their own laptop if they wish. A cursory familiarity with R is desirable (Literature recommendations are given on the website).

Course material

Handouts.
For recommendations of literature that may be of interest to participants, visit the ICES website. None of these readings are mandatory. Those who read the three journal articles will find themselves well-prepared.
Recommended books:
Book 1: Lumley, T. (2011). Complex surveys: A guide to analysis using R. New York: Wiley.
Book 2: Saris, W. E., & Gallhofer, I. N. (2007). Design, evaluation, and analysis of questionnaires for survey research. New York: Wiley-Interscience.

Fees

Reduced prices apply to students and participants of non-profit and public services. These prices are available at the ICES website. The registration fee amounts to 900 EUR for participants of the private sector.
The books are optional and can be bought at the additional cost of 65 EUR (Lumley) and 100 EUR (Saris & Gallhofer). Please indicate this clearly on the registration form.
The examination fee is 30 EUR.

MODULE 10

Nonparametric Methods

Olivier Thas
(UGent)

Course description

Nonparametric methods are often used in situations where the assumptions of parametric methods do not hold or cannot be assessed (e.g. in small samples).

The focus of this course is on nonparametric tests for comparative studies (e.g. comparing two treatments). In the first lecture the basics of statistical hypothesis testing are illustrated on the parametric two-sample t-test. From there we move on to exact permutation tests. The second lecture is devoted to rank tests. After a traditional introduction to rank tests, we spend time on some typical pitfalls related to the use and the interpretation of rank tests. In particular, the roles of the location-shift assumption and the probabilistic index are explained. The connection between rank tests and effect size estimation is also part of this lecture. An extensive overview of the most popular nonparametric tests is the topic of the third lecture. We also stress the relationship between the study design and the choice of the statistical method. All tests and their interpretations are illustrated using R and/or SAS. In the fourth lecture some more advanced methods are briefly discussed: probabilistic index models (PIM), rank tests for clustered data and sample size calculation. Finally, a few methods for nonparametric regression are discussed in the fifth lecture: basics of smoothers and (generalized) additive models.

The following topics are included:

- rank and permutation tests: general principles (permutation null distribution, asymptotic distributions, power, efficiency, …)
- some classical rank tests: Wilcoxon-Mann-Whitney, Kruskal-Wallis, Friedman, Mantel-Haenszel, …
- interpretation of the hypotheses and the effect sizes: location-shift model, probabilistic index
- how nonparametric are nonparametric methods? assumptions and pitfalls, semiparametric interpretation
- nonparametric estimators for effect sizes: Hodges-Lehman, rank regression, probabilistic index models
- multiple comparisons of means: family wise error rate (FWER), false discovery rate (FDR), permutation methods
- correcting for continuous covariates: rank tests for stratified designs, rank regression, probabilistic index models
- on the relation between the design and the (nonparametric) statistical analysis: Friedman (randomized complete blocks), Mack-Skillings (randomized complete block with recurrences), Skillings-Mack (balanced incomplete block designs), …
- rank tests for clustered data
- sample size calculation
- nonparametric regression: smoothers, bandwidth selection, generalized additive models

The course consists of 5 theoretic lessons of 2 hours and 5 practicals of 1 hour in which SAS or R can be used.

Dates and venue

May 26, 27 and 28, 2014. Monday and Tuesday from 10 am to 1 pm and from 2 pm to 5 pm, Wednesday from 10 am to 1 pm. Faculty of Science, Building S9, Campus Sterre, Krijgslaan 281, Ghent.

Target audience

This course targets all researchers who need to analyze small data sets or data for which the common assumptions of parametric methods do not hold.

Exam

Participants can, if they wish, take part in an exam. A certificate from Ghent University will be issued to participants with a university degree at the bachelor level or an equivalent degree upon succeeding in this test. As such this course can be incorporated in a doctoral training program.

Course prerequisites

Participants are expected to be familiar with the basics of statistical inference, particularly hypothesis testing and linear regression.

Course material

Copies of slides.

Fees

Reduced prices apply to students and participants of non-profit and public services. These prices are available at the ICES website. The registration fee amounts to 600 EUR for participants of the private sector.

The examination fee is 30 EUR.

The teachers

Dr. Els Adriaens studied biology, obtained a PhD in pharmaceutical sciences and a Master in Statistical Data Analysis at Ghent University. She is a consultant in statistical data analysis mainly in the field of the development and validation of alternatives to laboratory animals.

Dr. ir. Kristof De Beuf has a Master in Bioscience Engineering and a Master and PhD in Statistical Data Analysis from Ghent University. He has broad experience in teaching practical sessions in a variety of statistics courses. He is currently working at Stat-Gent CRESCENDO, the Industrial Research Fund (IOF) valorization consortium with the mission to valorize UGent statistical expertise. He also provides personalized advice to UGent doctoral students and postdocs at the FIRE statistical and methodological consulting service.

De heer Kris Erauw is stafmedewerker bij de dienst onderwijsondersteuning van de Faculteit Psychologie en Pedagogische Wetenschappen aan de Universiteit Gent. Hij stond jarenlang mee in voor de begeleiding van studenten bij de vakken statistiek en methodologie, en bij het schrijven van hun scriptie. Daarnaast ondersteunt hij onderzoekers bij het ontwikkelen van een gepast onderzoeksopzet en bij het verwerken van hun data.

Dr. Daniel Oberski is postdoctoral researcher at the Department of Methodology and Statistics of the Faculty of Social Sciences at Tilburg University. He has taught graduate courses in questionnaire design, comparative survey analysis, experimental design for survey methodologists, structural equation modeling, and programming in R. He obtained his PhD on the topic of measurement error in comparative surveys while working at the Research and Expertise Center for Survey Methodology at Universitat Pompeu Fabra, Barcelona, part of the central coordinating team of the European Social Survey. He was visiting Assistant Professor in the Joint Program for Survey Methodology at the University of Maryland. Currently his research focuses on applying survey methodology to latent class and structural equation models and vice versa.

Dr. Ella Roelant has a PhD in statistics from Ghent University (2008) on robust multivariate methods. After her PhD she worked with medical data at the Antwerp University Hospital and the Institute of Health and Society, Newcastle University. Currently she lectures in statistics at KaHo Sint-Lieven and for StatUA Antwerp University where she teaches statistics courses to PhD students.

Prof. dr. Olivier Thas is Professor of Statistics at Ghent University, Department of Mathematical Modelling, Statistics and Bioinformatics. He is chairing the Program Committee of the Advanced Master of Statistical Data Analysis and he is the co-director of Stat-Gent CRESCENDO, which is a university platform that unites statistics expert knowledge and expertise to make it easily accessible for external consulting and contract research. He teaches courses in basic statistics, multivariate and high dimensional data analysis, experimental design and statistical genomics. His research focuses on the development and application of nonparametric and semiparametric statistical methods for the bio and life sciences.

Dr. Kristof Vansteelandt obtained a PhD in Psychology and a Master in Statistics at the KU Leuven. He worked as a postdoctoral researcher with main interests in the use of formal models to describe and understand individual differences in intra-individual relations between psychological variables using Ecological Momentary Assessment (EMA) data. In addition, he worked as a statistical consultant at the University Psychiatric Center – KU Leuven – Campus Kortenberg. Currently, he is working at Ghent University as coordinator for Flanders Training Network for Methodology and Statistics (FLAMES) and as statistical consultant for Fostering Innovative Research based on Evidence (FIRE), the statistical consulting service for UGent PhD students and postdoctoral researcher.

Prof. dr. Stijn Vansteelandt is Professor at Ghent University, Department of Applied Mathematics and Computer Sciences, Faculty of Science. He teaches courses in statistics to students in the Faculty of Science, the Faculty of Pharmaceutical Science and the Masters program in Statistical Data Analysis. He did postdoctoral research at the Harvard School of Public Health and Ghent University. His current research focuses mainly on mediation analysis and causal inference in longitudinal studies.

Prof. dr. Leoniek Wijngaards-de Meij is Professor in Applied Statistics at the Department of Methodology and Statistics of the Faculty of Social Sciences at Utrecht University, the Netherlands. She received a Master in Clinical Psychology and a PhD in Dyadic processes of parents grieving their child in Clinical Psychology at Utrecht University. She has worked as statistical consultant on multilevel analysis for numerous social science research projects. She has been teaching courses on Multilevel Analysis on both Graduate and Undergraduate level. These courses include Multilevel for Research Masters, ML Minor courses and a Multilevel Summer School at Utrecht University, and PhD courses for several institutes including the KLI (Research Institute for Social Psychology), the EPP (Research Institute for PsychoPathology) and the Erasmus University.

Practical information

Registration

Please use the registration form in this brochure or on our website: **www.ipvw-ices.UGent.be**.

Your registration is valid from the moment you receive an e-mail confirmation from ICES. If you have not received this mail within a week, please contact ICES to double check. From the moment the confirmation e-mail is sent the payment and cancellation conditions are in effect.

The registration fee covers tuition, some or all of the course materials, use of auditoria and PCs, drinks and sandwiches. Reduced prices apply to students and participants of non-profit and public services. These prices are available on the ICES website. The examination fee for each module that has an exam connected to it is 30 EUR.

Payment

The registration fee is due within 30 days following receipt of the invoice. Payment is possible through bank transfer with clear statement of the structured message on the invoice. All mentioned amounts are free from VAT.

Additional reduction

When 3 or more participants from the same company or institute register simultaneously for the same module(s), an additional overall reduction of 20% is granted, books and exam fees not included. Therefore, please check before enrolling if anyone else at your institute or company is interested to participate. This reduction does not apply to (doctoral) students.

Cancellation

- Participants can cancel their registration in writing only and until 5 working days before the start of the module concerned, in which case 25% of the registration fee will be retained. In case of cancellation within 5 working days before the start of the module, the full registration fee is due.
- ICES reserves the right to cancel or postpone one or more modules for organizational reasons, in which case participants are given the option of a full refund of the registration fee.

The complete cancellation conditions are available on our website: **www.ipvw-ices.UGent.be**

Financial support from the government: the KMO-portfolio

- **The training vouchers** (opleidingscheques) are an initiative of the Flemish Community. Recent changes in government policy appear to exclude permanent education. Pending negotiations with the different universities we can no longer accept them. Please check the ICES website regularly for the latest state of affairs.
- **Employers** on the other hand can make use of the **KMO-portfolio**. Please read through the whole procedure before opening an account on **www.kmo-portefeuille.be** and fill in all the required information on the registration form.

Doctoral schools

The five doctoral schools at Ghent University are concentrated around the following domains of research:

- Arts, Humanities and Law
  (Director: prof. Mark Van Hoecke)
- Social and Behavioural Sciences
  (Director: prof. Hans Verstraeten)
- Natural Sciences
  (Director: prof. Frank Witlox)
- (Bioscience) Engineering
  (Director: prof. Paul Van der Meeren)
- Life Sciences and Medicine
  (Director: prof. Jozef Vercruysse)

These institutions, in close consultation with the faculties, support doctorandi: on the one hand they organize specialized training and workshops in research skills and "transferable skills", on the other hand they set up guest lectures and information sessions, and invest in promotional tasks and contacts with the industry.

To check if and under which conditions one of our courses is eligible for a refund from your UGent doctoral school, please visit the training pages on the website of your DS (www.ugent.be/doctoralschools/en/doctoraltraining/courses). In all cases **initial payment stays with your department**. Your DS will only refund the registration fee (books excluded) to your department upon proving to them that you attended the course and paid for it. Additionally, if an exam is connected to the course you need to pass this exam in order to get a refund. For further information please contact your DS.

Inschrijvingsformulier Statistiek 2013/2014

Dit formulier is ook beschikbaar op onze website: **www.ipvw-ices.UGent.be**
Stuur dit formulier ten minste 5 werkdagen voor de start van de eerste geselecteerde module via post, fax of e-mail naar het IPVW.
Plaatsen worden toegekend volgens chronologie van inschrijven.
Adres: UGent-IPVW – Krijgslaan 281, S9 – 9000 Gent Fax: +32 (0)9 264 85 90 E-mail: ipvw-ices@UGent.be
Uw inschrijving is niet geldig zolang u geen bevestigingsmail van het IPVW hebt ontvangen.
Zodra de bevestigingsmail is verstuurd bent u ingeschreven en treden de betalings- en annuleringsvoorwaarden in werking.[6]

Naam: Voornaam:

Functie:

Bedrijf/organisatie:

Adres[1]: Postcode: Gemeente:

Tel.: Fax: E-mail:

Geboortedatum[2]: / / 19 Geboorteplaats[2]: Geslacht[2]: ☐ M ☐ V

Ja, ik schrijf me in voor de volgende module(s) van de cursus Statistiek 2013-2014, georganiseerd door het Centrum voor Statistiek i.s.m. het Instituut voor Permanente Vorming in de Wetenschappen:

☐ **M1: Introduction to R**[3]		
☐ **M2: Inleiding tot SPSS**		
☐ **M3: Introduction to SAS**[3]		◯ *Boek (Delwiche & Slaughter)*
☐ **M4: Introductory Statistics. Basics of Statistical Inference**[3]	◯ *Examen*	◯ *Boek 1 (Rosner)*
		◯ *Boek 2 (Moore et al.)*
☐ **M5: Analysis of Variance**[3]	◯ *Examen*	◯ *Boek (Kutner et al.)*
☐ **M6: Applied Longitudinal Analysis**[3]	◯ *Examen*	◯ *Boek (Fitzmaurice et al.)*
☐ **M7: Applied Linear Regression**[3]	◯ *Examen*	◯ *Boek (Kutner et al.)*
☐ **M8: Multilevel Analysis for Grouped and Longitudinal Data**[3]	◯ *Examen*	◯ *Boek (Hox)*
☐ **M9: Survey Analysis**[3]	◯ *Examen*	◯ *Boek 1 (Lumley)*
		◯ *Boek 2 (Saris & Gallhofer)*
☐ **M10: Nonparametric Methods**[3]	◯ *Examen*	

Het totale bedrag van mijn inschrijving (incl. boeken en examengeld) komt op ..... EUR.
Alle bedragen zijn vrijgesteld van BTW.
Betalingswijze[4]**:**

◯ **Ik ben UGent-student of -personeelslid en betaal d.m.v. een SAP interne bestelbon: 4 3 . . . . . .** [5]

◯ **Ik betaal als privé-persoon.**

◯ **Mijn bedrijf betaalt en**
- ◯ **maakt géén gebruik van steunmaatregelen.**
- ◯ **maakt gebruik van de KMO-portefeuille. Hiertoe werd een portefeuille geopend op datum van . . / . . / 201 . voor een bedrag van ..... EUR, met projectnummer: 201 . /KMO/ . . . . . .**

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Naam: .....

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BTW nr: BE . . . / . . . / . . .

Vereist: ☑ Door me in te schrijven verklaar ik me akkoord met de betalings- en annuleringsvoorwaarden [6].

Datum: ..... Handtekening:

.....

1 Getuigschriften worden naar dit adres opgestuurd.
2 Deze informatie wordt vermeld op de certificaten.
3 Deze cursussen worden in het Engels gedoceerd.
4 Slechts één mogelijkheid kan worden gekozen.
Opleidingscheques: elke werknemer in Vlaanderen en Brussel heeft jaarlijks recht op 250 EUR aan opleidingscheques. Deze kunnen worden aangevraagd op de website van de VDAB: www.vdab.be/opleidingscheques. De factuur wordt dan per definitie op naam en adres van de deelnemer opgemaakt.
KMO-portefeuille: alle informatie over deze steunmaatregel vindt u op www.KMO-portefeuille.be
5 Check eerst de gereduceerde tarieven voor UGent-deelnemers op onze website. Gelieve ook de goedgekeurde SAP-bestelbon zelf, met dit formulier mee te sturen.
6 De volledige voorwaarden vindt u op de IPVW-website. De betalings- en annuleringsvoorwaarden treden in werking van zodra de e-mail ter bevestiging van uw inschrijving door het IPVW werd verstuurd, ongeacht eventueel nog ontbrekende documenten in uw inschrijvingsdossier. Betaling gebeurt binnen 30 dagen na ontvangst van de factuur met vermelding van de gestructureerde mededeling. Deelnemers kunnen hun inschrijving enkel schriftelijk annuleren tot 5 werkdagen voor de startdatum van de module, in welk geval 25% van het inschrijvingsgeld wordt aangerekend. In geval van annulering minder dan 5 werkdagen voor de startdatum van de module, wordt het volledige inschrijvingsbedrag aangerekend. Een deelnemer kan zich, indien vooraf schriftelijk gemeld aan het IPVW, wel kosteloos laten vervangen door een collega voor een volledige module.

Registration form Statistics 2013/2014

This form can also be found on our website: **www.ipvw-ices.UGent.be**
Please send, fax or e-mail this form to ICES no later than 5 working days before the start of the first selected module.
Acceptance is on a first-come, first-serve basis.
Address: UGent-ICES – Krijgslaan 281, S9 – 9000 Ghent Fax: +32 (0)9 264 85 90 E-mail: ipvw-ices@UGent.be
Your registration is not valid until you receive an e-mail confirmation from ICES.
From the moment the confirmation e-mail is sent you are enrolled and the payment and cancellation conditions are put into effect.[6]

Last name: First name:

Function:

Company/organization:

Address[1]: Postal code: City:

Phone: Fax: E-mail:

Date of birth[2]: / / 19 Place of birth[2]: Gender[2]: ☐ M ☐ F

Yes, I register for the following module(s) of the course in Statistics 2013-2014, organized by the Center for Statistics, in co-operation with the Institute for Continuing Education in Science:

☐ **M1: Introduction to R**		
☐ **M2: Inleiding tot SPSS** [3]		
☐ **M3: Introduction to SAS**		◯ *Book (Delwiche & Slaughter)*
☐ **M4: Introductory Statistics. Basics of Statistical Inference**	◯ *Exam*	◯ *Book 1 (Rosner)*
		◯ *Book 2 (Moore et al.)*
☐ **M5: Analysis of Variance**	◯ *Exam*	◯ *Book (Kutner et al.)*
☐ **M6: Applied Longitudinal Analysis**	◯ *Exam*	◯ *Book (Fitzmaurice et al.)*
☐ **M7: Applied Linear Regression**	◯ *Exam*	◯ *Book (Kutner et al.)*
☐ **M8: Multilevel Analysis for Grouped and Longitudinal Data**	◯ *Exam*	◯ *Book (Hox)*
☐ **M9: Survey Analysis**	◯ *Exam*	◯ *Book 1 (Lumley)*
		◯ *Book 2 (Saris & Gallhofer)*
☐ **M10: Nonparametric Methods**	◯ *Exam*	

The total amount for my registration, including books and exam fees, adds up to ..... EUR.
All amounts are free from VAT.
Payment[4]**:**

◯ **I am UGent-student or staff and will pay with an SAP internal order: 4 3 . . . . . [5]**

◯ **I am registering as a private person.**

◯ **My company will pay and** ◯ **will not make use of support measures.**

◯ **will make use of the KMO-portfolio. A portfolio was opened on . . / . . / 201 .**

for an amount of ..... EUR, with project number: 201 . /KMO/ . . . . .

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Name: .....

Address: ..... Postal code: ..... City: .....

VAT-n°: BE . . . / . . . / . . .

Mandatory: ☑ By registering I agree with the payment and cancellation conditions [6].

Date: ..... Signature:

.....

1 Certificates are sent to this address.
2 This information is mentioned on the certificates.
3 This course is taught in Dutch.
4 Please choose one option.
Training vouchers: every employee in Flanders or Brussels is entitled yearly to 250 EUR in training vouchers. These can be ordered on the VDAB website: www.vdab.be/opleidingscheques (Dutch website). The invoice is then made out by definition to your home address mentioned on the vouchers.
KMO-portfolio: all information about this support measure is available on www.KMO-portefeuille.be
5 Please check the reduced prices for UGent participants on our website first. Please also send along the approved SAP-order itself, together with this registration form.
6 Full conditions are available on the ICES website. The payment and cancellation conditions are put into effect from the moment the e-mail confirmation is sent, regardless of documents that are possibly still lacking in your registration file. Payment is due within 30 days upon receipt of the invoice with clear statement of the structured message. Participants can cancel their registration in writing only and until 5 working days before the start of the module, in which case 25% of the registration fee is due. In case of cancellation within 5 working days before the start of the module, the full registration fee is due. A participant who cannot attend a course can be replaced free of charge by a colleague if this is reported to ICES in writing and before the start of the course.

Stay informed of other ICES activities

In addition to the course in Statistics, ICES also organizes a variety of other courses on statistics and broader scientific subjects in the framework of continuing education. To stay informed of our activities on a regular basis you can subscribe to one or more of our mailing lists.

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Postal Code: ..... City: ..... Country: .....

Phone: ..... Fax: ..... E-mail: .....

CORPORATE INFORMATION

Company: .....

Function: .....

Address: Street: ..... N°: ..... Bus: .....

Postal Code: ..... City: ..... Country: .....

Phone: ..... Fax: ..... E-mail: .....

Where and how do you wish to be informed?

Where? ☐ at home ☐ at work

How? ☐ through e-mail ☐ through post

of the following ICES courses:

- ☐ Biologische Basis van Ons Gedrag*
- ☐ Inleiding in de Biotechnologie*
- ☐ Introduction to Bio-informatics
- ☐ Kristallijne Gesteenten en Platentektoniek*
- ☐ Kunststoffen: Van 'plastiek' tot high tech materialen*
- ☐ Milieu en Onderzoek*
- ☐ Permanente Vorming voor Landmeters-Experten*
- ☐ Permanente Vorming voor Leerkrachten Wetenschappen in SO*
- ☐ Statistics

And/or more specifically about the short courses:

- ☐ Numerical Literacy
- ☐ Meta-Analysis

- ☐ Workshops on Transferable Skills

of future ICES courses within these fields of research:

- ☐ Analytical chemistry
- ☐ Applied mathematics and computer science
- ☐ Biochemistry, physiolgy and microbiology
- ☐ Biology
- ☐ Geography
- ☐ Geology and soil science
- ☐ Inorganic and physical chemistry
- ☐ Molecular biology
- ☐ Molecular genetics
- ☐ Organic chemistry
- ☐ Pure mathematics and computer algebra
- ☐ Solid state sciences
- ☐ Subatomic physics and radiation physics

* These courses are taught in Dutch.

Your personal data is processed in accordance with the stipulations of the Law of December 8, 1992, safeguarding individual privacy in connection with the process of personal data, as altered in the Law of December 11, 1998.

Course locations

For all further information:

UNIVERSITEIT GENT

Faculty of Sciences

ICES, Krijgslaan 281, building S9, 9000 Ghent
Phone 09 264 44 26 (am) – www.ipvw-ices.UGent.be
ipvw-ices@UGent.be

vorm www.johnnybekaert.be